

Science 2019 (Outside Delhi)

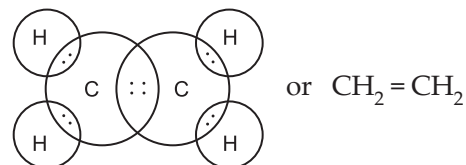
Set-I

Time allowed : 3 hours

Maximum marks : 80

General Instructions :

- (i) The question paper comprises **five** Sections, A, B, C, D and E. You are to attempt **All** the sections.
- (ii) **All** questions are compulsory.
- (iii) Internal choice is given in Sections B, C, D and E.
- (iv) Questions number **1** and **2** in Section A are one-mark questions. They are to be answered in one word or in one sentence.
- (v) Questions number **3** to **5** in Section B are two-marks questions. These are to be answered in about 30 words each.
- (vi) Questions number **6** to **15** in Section C are three-marks questions. These are to be answered in about 50 words each.
- (vii) Questions number **16** to **21** in Section D are five-marks questions. These are to be answered in about 70 words each.
- (viii) Questions number **22** to **27** in Section E are based on practical skills. Each question is a two-marks question. These are to be answered in brief.



4. Given reasons :

- (a) **Platinum, gold and silver** are used to make jewellery.
- (b) **Metals like sodium and potassium** are stored under oil.

OR

Silver articles become black when kept in open for some time, whereas copper vessels lose their shiny brown surfaces and gain a green coat when kept in open. Name the substances present in air with which these metals react and write the name of the products formed. [2]

Answer :

- (a) Platinum, gold and silver are used to make jewellery because of its bright and shiny surface. This property is called metallic lustre.
- (b) Metals like sodium and potassium are stored under oil because they are very reactive in nature, they react with oxygen present in air. Thus to prevent their oxidation they are kept in the oil.

OR

Silver articles become black when kept in open for some time, whereas copper vessel lose their shiny brown surfaces and gain a green coat when kept in open because silver articles reacts with sulphur compounds such as hydrogen sulphide present in the air to form silver sulphide (Ag_2S) whereas copper reacts slowly with CO_2 and water present in the air to form green coating of mixture of copper carbonate and copper hydroxide.

5. **The absolute refractive index of Ruby is 1.7. Find the speed of light in Ruby. The speed of light in vacuum is 3×10^8 m/s.** [2]

Answer : We know that,
Refractive index of ruby

$$= \frac{\text{Speed of light in air (or vacuum)}}{\text{Speed of light in ruby}}$$

SECTION - A

1. **Name two industries based on forest produce.** [1]

Answer : Timber industries and paper manufacturing industries are based on forest produce.

2. **Why are the heating elements of electric toasters and electric irons made of an alloy rather than a pure metal ?** [1]

Answer : The resistivity of an alloy is generally higher than that of its constituent metals. Alloys do not oxidise (burn) readily at higher temperatures. Therefore, conductors of electric heating devices, such as toasters and electric irons, are made up of an alloy rather than pure metal.

SECTION - B

3. **Write the molecular formula of ethene and draw its electron dot structure.** [2]

Answer : Molecular formula of ethene is C_2H_4
Electron dot structure of ethene.

$$\text{So, } 1.70 = \frac{3 \times 10^8}{\text{Speed of light in ruby}}$$

$$\text{or Speed of light in ruby} = \frac{3 \times 10^8}{1.7} \text{ ms}^{-1}$$

$$= 1.76 \times 10^8 \text{ ms}^{-1}$$

Thus, speed of light in ruby is $1.76 \times 10^8 \text{ ms}^{-1}$.

SECTION - C

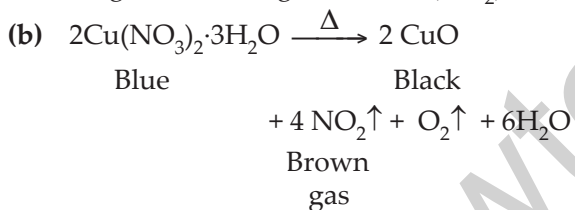
6. On heating blue coloured powder of copper (II) nitrate in a boiling tube, black copper oxide, O_2 and a brown gas X is formed. [3]

- Identify the type of reaction and the gas X.
- Write balanced chemical equation of the reaction.
- Write the pH range of aqueous solution of the gas X.

Answer :

(a) Decomposition reaction

The gas X is Nitrogen dioxide (NO_2)



(c) Oxides of non-metals are acidic. Therefore aqueous solution of this gas would be acidic. The pH would be less than 7

7. (a) While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid?

(b) Dry hydrogen chloride gas does not change the colour of dry litmus paper why?

OR

How is sodium hydroxide manufactured in industries? Name the process. In this process a gas X is formed as by-product. This gas reacts with lime water to give a compound Y, which is used as a bleaching agent in the chemical industry. Identify X and Y and write the chemical equation of the reaction involved. [3]

Answer :

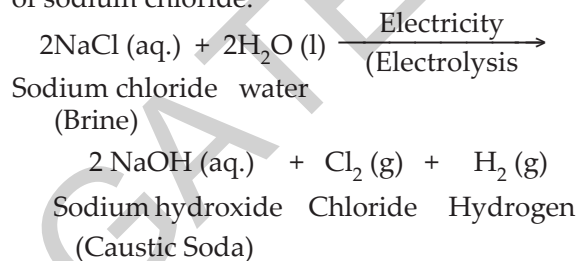
(a) The process of mixing the concentrated acid with water is highly exothermic.

So, when a concentrated acid is added to water then heat is easily absorbed by the large amount of water. Thus it is recommended to add acid to water and not water to the acid.

(b) Dry hydrogen chloride does not contain any hydrogen ions in it, so it does not show acidic behaviour and thus does not change the colour of dry litmus paper.

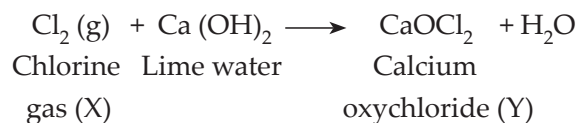
OR

Sodium hydroxide is manufactured by the electrolysis of concentrated aqueous solution of sodium chloride.



The process of manufacture of sodium hydroxide by electrolysis process is called chlor-alkali process.

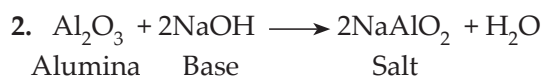
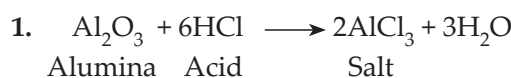
Gas X is chlorine gas and compound Y is calcium oxychloride (Bleaching powder)



8. What are amphoteric oxides? Give an example. Write balanced chemical equations to justify your answer. [3]

Answer : Those oxides which behave both acidic and basic oxides are called amphoteric oxides.

Example : Al_2O_3 (Alumina)



9. What is a homologous series of carbon compounds? Give an example and list its three characteristics. [3]

Answer : A homologous series is a group of organic compounds having similar structures

and similar chemical properties in which the successive compounds differ by CH_2 group.

Example : Alkanes with general formula $\text{C}_n\text{H}_{2n+2}$

Characteristics :

- All the members of a homologous series can be represented by the same general formula.
 - Any two adjacent homologues differ by 1 carbon atom and 2 hydrogen atoms in their molecular formulae.
 - The difference in the molecular masses of any two adjacent homologues is 14 u.
10. List in tabular form three distinguishing features between autotrophic nutrition and heterotrophic nutrition. [3]

Answer :

S. No.	Autotrophic nutrition	Heterotrophic nutrition
1.	In this mode of nutritio organisms make their own food.	In this mode of nutriton the organ-isms do not make their own food.
2.	CO_2 and H_2O are required for the preparation of food as raw materials.	They depend on autotrophs for their food either directly or indirectly.
3.	Chlorophyll and sunlight are essentially needed.	Chlorophyll and sunlight are not needed.

11. What is transpiration ? List its two functions.

OR

- What is translocation ? Why is it essential for plants ?
- Where do the substances in plants reach as a result of translocation ? [3]

Answer : The evaporation of water from the leaves of a plant is called transpiration.

Functions of transpiration

- It helps in the upward movement of water and minerals from root to the leaves through the stem.
- Helps in cooling the plant surface.

OR

- The transport of food from leaves to other parts of the plant is called translocation. Translocation is essential for plants because without it food prepared by the leaves cannot reach other parts of the plant for their growth and development.
 - The substances in plants reach to other tissues in plants from the leaves as a result of translocation.
12. What is carpel ? Write the function of its various parts. [3]

Answer : The flask-shaped organ in the centre of a flower is called carpel. It is also called as female reproductive organ of the plant.

It is made up of three parts :

- Stigma 2. Style 3. Ovary.
- Stigma is the top part of carpel and is sticky. So, it receives the pollen from the anther of stamen.
 - Style connects stigma to ovary.
 - Ovary contains female gametes of the plant and helps in reproduction.
13. A student holding a mirror in his hand, directed the reflecting surface of the mirror towards the Sun. He then directed the reflected light on to a sheet of paper held close to the mirror.

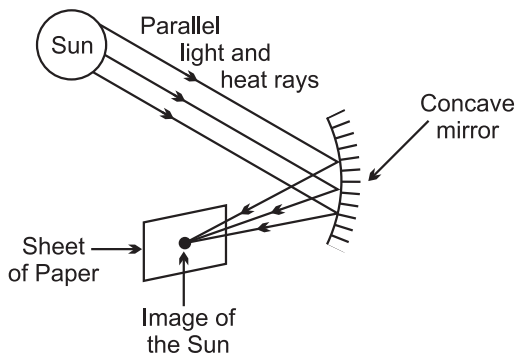
- What should he do to burn the paper ?
- Which type of mirror does he have ?
- Will he be able to determine the approximate value of focal length of this mirror from this activity ? Give reason and draw ray diagram to justify your answer in this case.

OR

A 10 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 12 cm. The distance of the object from the lens is 18 cm. Find the nature, position and size of the image formed. [3]

Answer :

- (a) He should place the sheet of paper at the focus of the mirror to burn the paper.
- (b) He has a concave mirror.
- (c) Yes, the sheet of paper will start burning at the focus of the mirror which will give approximate value of focal length, *i.e.*, the distance between mirror and the point where the sheet of paper starts burning.



A concave mirror forms a real image of the sun.

OR

Given : Height of object, $h_1 = + 10$ cm.

Focal length, $f = + 12$ cm.

Object distance, $u = - 18$ cm.

From the lens formula,

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{v} - \frac{1}{-18} = \frac{1}{12}$$

$$\frac{1}{v} + \frac{1}{18} = \frac{1}{12}$$

$$\frac{1}{v} = \frac{1}{12} - \frac{1}{18}$$

$$\frac{1}{v} = \frac{3-2}{36} = \frac{1}{36}$$

$$v = 36 \text{ cm}$$

$$\text{Magnification, } m = \frac{v}{u} = \frac{36}{-18} = -2$$

The position of image formed is at distance of 36 cm from convex lens.

Since the value of magnification is more than 1 (it is 2), the image formed is larger than object.

The minus sign of magnification shows that image is formed below the principal axis. Hence, the image formed is real and inverted.

- 14. What are solar cells ? Explain the structure of solar panel. List two principal advantages associated with solar cells. [3]**

Answer :

Solar cells are the devices which convert solar energy into electricity.

A simple solar cell is made up of sandwich of a silicon-boron layer and a silicon-arsenic layer. Boron and arsenic are present in a very small amount. A piece of wire is soldered into the top of upper layer of cell and another piece of wire is soldered at the bottom of the lower layer to pass on the current. The solar cell is covered with a glass cover for protection.

Advantages :

1. Solar cells have no moving parts.
2. It requires no maintenance.

- 15. Write the essential function performed by ozone at the higher levels of the Earth's atmosphere ? How is it produced ? Name the synthetic chemicals mainly responsible for the drop of amount of ozone in the atmosphere. How can the use of these chemicals be reduced ? [3]**

Answer : Ozone layer absorbs most of the harmful ultraviolet radiations from the sun to the earth. It is formed high up in the atmosphere by the action of ultraviolet radiation on oxygen gas. Chlorofluorocarbons are the synthetic chemicals responsible for the drop of amount of ozone in the atmosphere.

The use of these chemicals can be reduced by :

1. Replacement of chlorofluorocarbons with hydrochlorofluorocarbons because it breaks down more quickly.
2. Safe disposal of old appliances such as refrigerators and freezers.

SECTION - D

16. (a) List any three observations which posed a challenge to Mendeleev's Periodic law.
- (b) How does the metallic character of elements vary on moving from
- left to right in a period,
 - from top to bottom in a group of the Modern Periodic Table ?

Give reason for your answer.

OR

The electrons in the atoms of four elements A, B, C and D are distributed in three shells having 1, 3, 5 and 7, electrons respectively in their outermost shells. Write the group numbers in which these elements are placed in the Modern Periodic Table. Write the electronic configuration of the atoms of B and D, and the molecular formula of the compound formed when B and D combine.

[5]

Answer :

- (a) Three observations which posed a challenge to Mendeleev's Periodic law are :
- The position of isotopes could not be explained.
 - Wrong order of atomic masses of some elements could not be explained.
 - A correct position could not be assigned to hydrogen in the periodic table.
- (b) (i) On moving from left to right in a period, the metallic character of elements decreases because electropositive character decreases.
- (ii) On going down in a group of the periodic table, the metallic character of elements increases because electropositive character of elements increases.

OR

A – 1st group.

B – 13th group.

C – 15th group.

D – 17th group.

Electronic configuration

B → Atomic number = 13.

K L M

2 8 3

D → Atomic number = 17

K L M

2 8 7

The molecular formula of the compound when B and D combine is BD_3 .

17. (a) Why is the use of iodised salt advisable ? Name the disease caused due to deficiency of iodine in our diet and state its one symptom.
- (b) How do nerve impulses travel in the body ? Explain.

OR

What is hydrotropism ? Design an experiment to demonstrate this phenomenon. [5]

Answer :

- (a) Iodised salt is advisable because iodine is necessary for the formation of thyroxine hormone by thyroid gland. Goitre is the disease caused due to its deficiency.

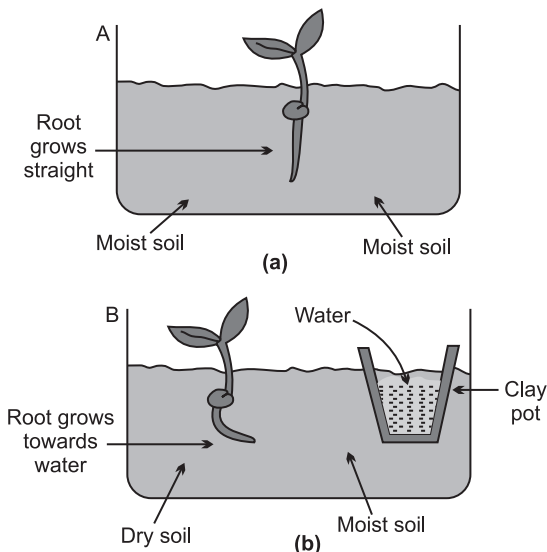
Symptom : The neck of the person appears to be swollen due to the enlargement of thyroid gland.

- (b) Two neurons are not joined to one another completely. There is a small gap between a pair of neuron. This gap is called synapse. The nerve impulse are carried out to this gap by the help of neuro transmitter (chemical substance). The conduction of nerve impulse through the synapse takes place in the form of electrical nerve impulse. When a stimulus acts on the receptor, an electrical impulse is produced with the help of chemical reaction. This electrical impulse passes through the synapse and then to the other neuron. Thus, in this way nerve impulses travel in the body.

OR

The movement of root of plants towards water is called hydrotropism.

Take two glass troughs A and B fill each one of them two-thirds with soil. In trough A plant a tiny seedling figure (a). In trough B plant a similar seedling and also place a small 'clay pot' inside the soil figure (b). Water the soil in trough A daily and uniformly. Do not water the soil in trough B but put some water in the clay pot buried in the soil. Leave both the troughs for a few days.



Now, dig up the seedlings carefully from both the trough without damaging their roots. We will find that the root of seedling in trough A is straight. On the other hand, the root of seedling in trough B is found to be bent to the right side (towards the clay pot containing water) figure (b). This can be explained as follows.

In trough A, the root of seedling gets water from both sides (because the soil is watered uniformly) in trough B, the roots gets water oozing out from the clay pot which is kept on the right side. So, the root of seedling in trough B grows and bends towards the source of water to the right side. The experiment shows that the root of a plant grows towards water. In other words, the root of a plant is positively hydrotropic.

18. (a) What are homologous structures ? Give an example.
- (b) "The sex of a new born child is a matter of chance and none of the parents may be considered responsible for it." Justify this statement with the help of a flow chart

showing sex-determination in human beings. [5]

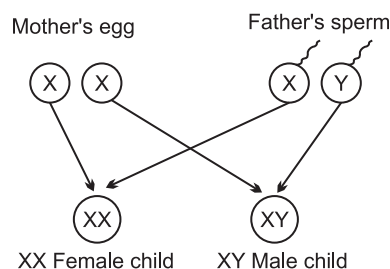
Answer :

- (a) The structures which have the same basic design but different functions are called homologous structures or homologous organs.

Example : Forelimbs of a man, a lizard, a frog they have same basic design of bones but perform different functions.

- (b) The sex of a newborn depends on what happens at the time of fertilization.

- If a sperm carrying X chromosome fertilizes the ovum carrying X chromosome, then the girl child will be born and the child will have XX combination of sex chromosomes.
- If a sperm carrying Y chromosome fertilizes the ovum carrying X chromosome, then the child born will be a boy and the child will have XY combination of sex chromosome.



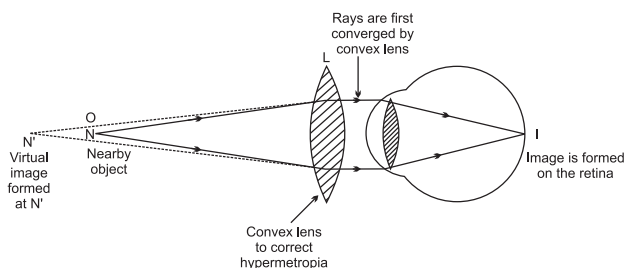
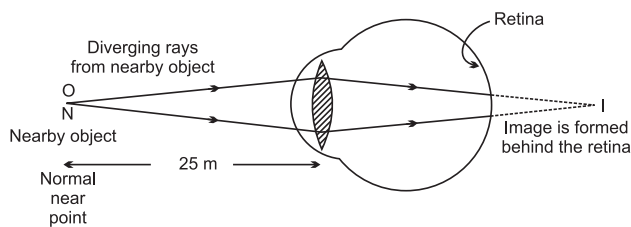
The above presentation clearly shows that it is matter of chance whether the newborn will be boy or girl and none of the parents may be considered responsible for it.

19. When do we consider a person to be myopic or hypermetropic ? List two causes of hypermetropia. Explain using ray diagrams how the defect associated with hypermetropic eye can be corrected. [5]

Answer : Myopia is the defect in vision in which a person cannot see the distant objects clearly whereas in hypermetropia is the defect in which a person cannot see nearby objects clearly. Hypermetropia is caused due to :

- Decrease in converging power of eye-lens.
- Too short eye ball.

In a hypermetropic eye, the image of near by object lying at normal near point N (at 25 cm) is formed behind the retina.



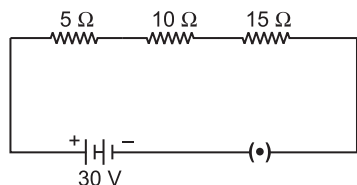
Hypermetropia and its correction by using convex lens.

Hypermetropic eye can be corrected using convex lenses. When a convex lens of suitable power is placed in front of hypermetropic eye, then the diverging rays of light from the object are converged first by the convex lens used. This form a virtual image of the object at another near point N'.

Now, the rays can be easily focused by the eye lens to form an image on retina.

20. (a) How will you infer with the help of an experiment that the same current flows through every part of a circuit containing three resistors in series connected to a battery ?

(b) Consider the given circuit and find the current flowing in the circuit and potential difference across the 15 Ω resistor when the circuit is closed. [5]

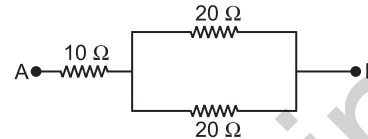


OR

(a) Three resistors R_1 , R_2 and R_3 are connected in parallel and the combination is

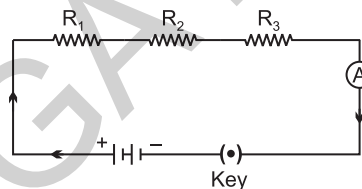
connected to a battery, ammeter, voltmeter and key. Draw suitable circuit diagram and obtain an expression for the equivalent resistance of the combination of the resistors.

(b) Calculate the equivalent resistance of the following network :



Answer :

(a) Let three resistors R_1 , R_2 and R_3 are connected in series which are also connected with a battery, an ammeter and a key as shown in figure.



When key is closed, the current starts flowing through the circuit. Take the reading of ammeter. Now change the position of ammeter to anywhere in between the resistors and take its reading. We will observe that in both the cases reading of ammeter will be same showing same current flows through every part of the circuit above.

(b) Given,

$$R_1 = 5 \Omega, R_2 = 10 \Omega, R_3 = 15 \Omega, V = 30 \text{ V}$$

$$\text{Total resistance, } R = R_1 + R_2 + R_3$$

[∵ 5 Ω, 10 Ω and 15 Ω are connected in series]

$$= 5 + 10 + 15$$

$$= 30 \Omega$$

$$\text{Potential difference, } V = 30 \text{ V}$$

$$\text{Current in the circuit, } I = ?$$

From Ohm's law.

$$I = \frac{V}{R} = \frac{30}{30} = 1 \text{ A}$$

∴ Current flowing in the circuit = 1 A

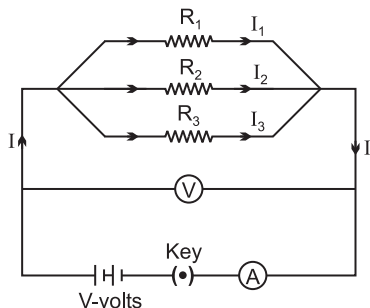
$$\text{Potential difference across } 15 \Omega \text{ resistors} = IR_3$$

$$= 1 \times 15$$

$$= 15 \text{ V}$$

OR

(a) Let R_1 , R_2 and R_3 are three resistance connected in parallel to one another and R is the equivalent resistance of the circuit. A battery of V volts has been applied across the ends of this combination. When the switch of the key is closed, current I flows in the circuit such that,



From Ohm's law,

$$I = \frac{V}{R} \quad \dots(i)$$

$$I_1 = \frac{V}{R_1} \quad \dots(ii)$$

$$I_2 = \frac{V}{R_2} \quad \dots(iii)$$

$$I_3 = \frac{V}{R_3} \quad \dots(iv)$$

$$I = I_1 + I_2 + I_3 \quad \dots(v)$$

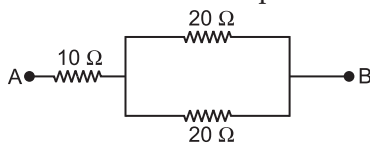
Putting the values of I , I_1 , I_2 and I_3 in equation (v),

$$\frac{V}{R} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

$$V \left(\frac{1}{R} \right) = V \left(\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \right)$$

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

(b) Let R_p is the equivalent resistance of resistors connected in parallel.



\therefore Equivalent resistance of resistors in parallel :

$$\frac{1}{R_p} = \frac{1}{20} + \frac{1}{20}$$

$$\frac{1}{R_p} = \frac{1+1}{20} = \frac{2}{20} = \frac{1}{10}$$

$$R_p = 10 \Omega.$$

Now, equivalent circuit becomes.

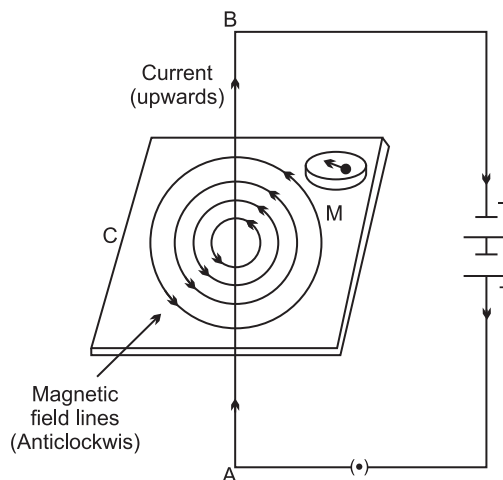


\therefore 10Ω and 10Ω are connected in series.

$$\begin{aligned} \therefore \text{Equivalent resistance of the circuit} \\ &= 10 \Omega + 10 \Omega \\ &= 20 \Omega \end{aligned}$$

21. Draw the pattern of magnetic field lines produced around a current carrying straight conductor passing perpendicularly through a horizontal cardboard. State and apply right-hand thumb rule to mark the direction of the field lines. How will the strength of the magnetic field change when the point where magnetic field is to be determined is moved away from the straight conductor ? Give reason to justify your answer. [5]

Answer : Maxwell's Right Hand Thumb rule states that if current carrying wire is imagined to be held in the right hand so that thumb points in the direction of current, then the direction in which fingers encircle the wire will give the direction of magnetic field lines around the wire. If we hold the current carrying straight wire so that thumbs



Magnetic field pattern due to a straight current-carrying wire

in upward direction points the direction of current, the direction of magnetic field lines will be anticlockwise. The strength of magnetic field is inversely proportional to

the distance of the point of observation from the wire. So, as we move away from the wire the strength of magnetic decreases.

SECTION - E

22. A teacher provided acetic acid, water, lemon juice, aqueous solution of sodium hydrogen carbonate and sodium hydroxide to students in the school laboratory to determine the pH values of these substances using pH papers. One of the students reported the pH values of the given substances as 3, 12, 4, 8 and 14 respectively. Which one of these values is not correct ? Write its correct value stating the reason.

OR

What would a student report nearly after 30 minutes of placing duly cleaned strips of aluminium, copper, iron and zinc in freshly prepared iron sulphate solution taken in four beakers ? [2]

Answer : The value of pH for water is not correct. The correct value of pH of water is 7 because it has almost equal concentration of H^+ and OH^- due to which it is neutral.

OR

Aluminium displaces the iron from iron sulphate and the colour of two solution changes from green to brown.

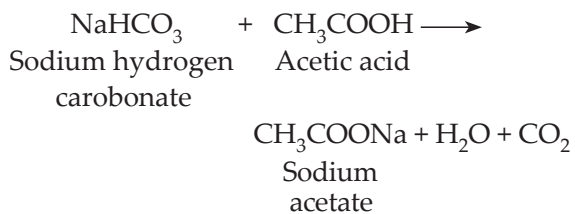
No change takes place when copper strip is dipped in iron sulphate solution.

No change will be observed when iron strips are dipped in iron sulphate solution.

The colour of the solution changes from green to colourless when zinc is added to iron sulphate solution.

23. What is observed when a pinch of sodium hydrogen carbonate is added to 2 mL of acetic acid taken in a test tube ? Write chemical equation for the reaction involved in this case. [2]

Answer : CO_2 gas is evolved with brisk effervescence when sodium hydrogen carbonate is added to acetic acid.



24. List in proper sequence four steps of obtaining germinating dicot seeds.

OR

After examining a prepared slide under the high power of a compound microscope, a student concludes that the given slide shows the various stages of binary fission in a unicellular organism. Write two observations on the basis of which such a conclusion may be drawn. [2]

Answer :

1. The root is formed when radicle of seed grows.
2. The root grows downward into the soil and absorbs water and minerals from the soil.
3. The shoot is formed from the upward growth of plumule.
4. The green leaves are developed when shoot comes above the ground.

OR

1. A single parent divides to form two daughter cells.
2. The nucleus of mature cell seems elongated and a groove is formed in cell which divides the nucleus.

25. List four precautions which a student should observe while preparing a temporary mount of a leaf peel to show stomata in his school laboratory. [2]

Answer :

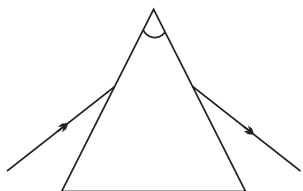
1. Freshly plucked leaf should be taken for epidermal peel.
2. Hold the slide by its edges.
3. Peel should be cut to a proper size.
4. The peel should be allowed to dry.

26. Draw the path of a ray of light when it enters one of the faces of a glass slab at an angle of nearly 45° . Label on it (i) angle of refraction, (ii) angle of emergence and (iii) lateral displacement.

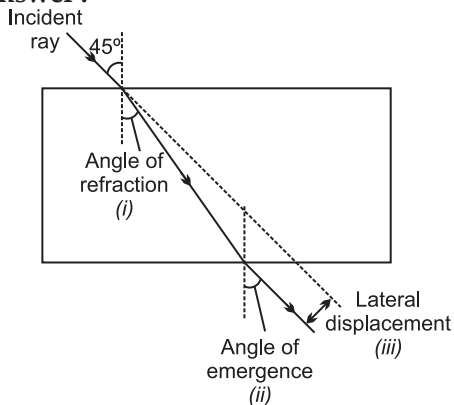
OR

A student traces the path of a ray of light through a glass prism as shown in the diagram, but leaves it incomplete and unlabelled. Redraw and complete the diagram. Also label on it $\angle i$, $\angle e$, $\angle r$, and $\angle D$.

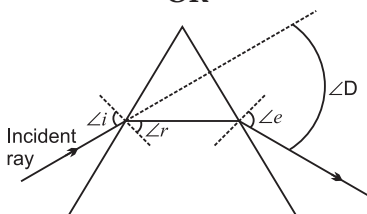
[2]



Answer :

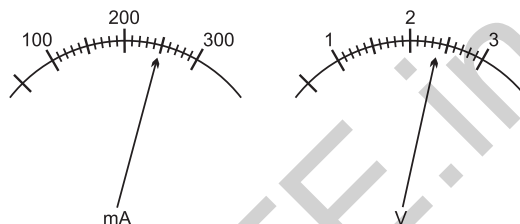


OR



27. The current flowing through a resistor connected in a circuit and the potential difference developed across its ends are as shown in the diagram by milliammeter and voltmeter readings respectively : [2]

- (a) What are the least counts of these meters ?
 (b) What is the resistance of the resistor ?



Answer :

- (a) 10 mA and 0.1 V
 (b) $V = 2.4$ volt, $I = 250$ mA = 0.25 A
 From Ohm's law.

$$R = \frac{V}{I} = \frac{2.4}{0.25} = 9.6 \Omega$$

Science 2019 (Outside Delhi)

Set II

Note : Except for the following questions, all the remaining questions have been asked in previous set.

SECTION - A

1. Write two advantages associated with water harvesting at the community level. [1]

Answer :

- Exploitation of water resources will be reduced.
 - It helps to recharge natural wells.
2. Should the resistance of a voltmeter be low or high ? Give reason. [1]

Answer : The resistance of a voltmeter should be high, because voltmeter is connected parallel to the component of a circuit and it also takes negligible current from the circuit in order to measure the potential difference accurately.

SECTION - B

3. Draw electron dot structure of carbon dioxide and write the nature of bonding between carbon and oxygen in its molecule.

OR

List two properties of carbon which lead to the huge number of carbon compounds we see around us, giving reason for each. [2]

Answer : $\text{:}\ddot{\text{O}}\text{:} \text{:C:} \text{:}\ddot{\text{O}}\text{:}$ or $\text{O}=\text{C}=\text{O}$

Covalent bond (double bond) is present in between C and O.

OR

Two properties of carbon which lead to the huge number of carbon compounds are :

- Catenation :** It is the ability of carbon to form bonds with other atoms of carbon.
 - Tetravalency :** With the valency of four, carbon is capable of bonding with 4 other atoms. This forms huge number of compounds.
4. Give reason :
- Carbonate and sulphide ores are usually converted into oxides during the process of extraction.
 - Aluminium is a highly reactive metal; still it is widely used in making cooking utensils. [2]

Answer :

SECTION - C

- (a) Carbonate and sulphide ores are usually converted into oxides during the process of extraction because obtaining a metal from its metal oxide is much easier than from metal carbonates and sulphides.
- (b) Aluminium is highly reactive metal still it is widely used in making cooking utensils because it reacts with O_2 present in air to form aluminium oxide that forms a protective layer and protects the metal from corrosion.
5. The power of a lens in +5 diopters. What is the nature and focal length of this lens ? At what distance from this lens should an object be placed so as to get its inverted image of the same size ? [2]

Answer : Given, $P = +5D$

We have,

$$\begin{aligned} \text{Power, } P &= \frac{1}{f(\text{in meter})} \\ +5 &= \frac{1}{f} \\ f &= \frac{1}{5} \text{ m} \\ &= \frac{100}{5} = 20 \text{ cm} \end{aligned}$$

Focal length, $f = 20 \text{ cm}$ (or $+20 \text{ cm}$).

Since, focal length of the lens is positive. Therefore, the nature of lens is convex.

Same size and inverted image is formed when

Magnification, $m = -1$

Also, $m = \frac{v}{u}$

$$v = -u$$

From the lens formula,

$$\begin{aligned} \frac{1}{v} - \frac{1}{u} &= \frac{1}{f} \\ -\frac{1}{u} - \frac{1}{u} &= \frac{1}{f} \\ \frac{-2}{u} &= \frac{1}{f} \end{aligned}$$

$$u = -2f$$

$$\begin{aligned} u &= -2 \times 20 \quad [\because f = 20 \text{ cm}] \\ &= -40 \text{ cm}. \end{aligned}$$

6. List two types of the transport system in human beings and write the functions of any one of these. [3]

Answer : Lymphatic system and blood circulatory system are two types of the transport system in human beings.

Functions of blood circulatory system :

1. It carries nutrients and oxygen to all cells in the body.
2. Removes CO_2 from the body cells.
3. It carries digested food from the small intestine to other parts of the body.
4. It carries hormones from endocrine glands to different organs of the body.

7. Distinguish between pollination and fertilisation. Mention the site and the product of fertilisation in a flower. [3]

Answer :

1. The transfer of pollen grains from anther of a stamen to the stigma of a carpel is called pollination whereas fertilisation is the process when the male gamete present in pollen grain joins the female gamete present in ovule.
2. Pollination is an external mechanism whereas fertilisation is an internal mechanism which takes place inside the flower.

Site of fertilisation in flower is **ovary**.

Product of fertilisation in flower is **zygote**.

10. List three environmental consequences of using fossil fuels. Suggest three steps to minimise the pollution caused by various energy sources. [3]

Answer : The combustion of fossil fuels releases different harmful products. Three environmental consequences of using fossil fuels are :

1. It releases CO_2 which is a greenhouse gas which traps the solar energy falling on earth and it leads to global warming.
2. Carbon monoxide is poisonous gas which when enters in the blood stream stops the functioning of red blood cells to carrying oxygen from lungs to other parts of the body. It also causes death.



3. Sulphur dioxide released during the burning of fossil fuels is harmful for lungs and causes bronchitis and other diseases.

Steps to minimise the pollution caused by various energy sources are :

1. Solar cookers should be used to cook food wherever possible.
2. Use of Biogas as domestic fuel should be encouraged in rural areas.
3. Three R's strategy—Reduce, Reuse and Recycle should be practiced.

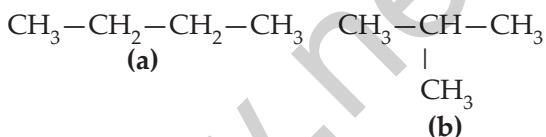
14. Which compounds are called (i) alkanes, (ii) alkenes and (iii) alkynes ? C_4H_{10} belongs to which of these ? Draw two structural isomers of this compound. [3]

Answer :

- (i) The hydrocarbons in which carbon atoms are connected by only single covalent bonds are called alkanes.
- (ii) The hydrocarbons in which carbon atoms are connected by double bond are called alkene.
- (iii) The hydrocarbons in which carbon atoms are connected by triple bond are called alkynes.

C_4H_{10} belongs to alkane

Structural Isomers of C_4H_{10} :



SECTION - D

16. (a) What are dominant and recessive traits ?
 (b) "Is it possible that a trait is inherited but may not be expressed in the next generation ?" Give a suitable example to justify this statement. [5]

Answer :

- (a) The trait which can express its effect over contrasting trait is called dominant trait whereas the trait which cannot express its effect over contrasting trait or which gets suppressed by the contrasting trait is called recessive trait. The inherited trait which is not expressed will be a recessive trait.

(b) In Mendel's experiment, when pure tall pea plants were crossed with pure dwarf pea plants, only tall pea plants were obtained in F_1 generation. On selfing the pea plants of F_1 generation both tall and dwarf pea plants were obtained in F_2 generation. Reappearance of the dwarf pea plants in F_2 generation proves that the dwarf trait was inherited but not expressed in F_1 generation. The recessive trait does not express itself in the presence of the dominant trait. So, it is possible that one trait may be inherited but may not be expressed in an organism.

20. (a) What is scattering of light ? Explain how the colour of the scattered light depends on the size of the scattering particles.
 (b) Explain the reddish appearance of the Sun at sunrise or sunset. Why does it not appear red at noon ? [5]

Answer :

- (a) Scattering of light is the phenomenon in which a part of the incident light is dispersed in different directions.

Dependence of colour and scattered light on the size of particles :

1. When the particles like dust and water droplets present in the atmosphere are large in size, the scattered light appears white.
2. When the particles are extremely minute in size, they will scatter blue light present in the white sunlight.

(b) The reddish appearance of the sun at sunrise and sunset is due to the scattering of blue colour present in the sunlight away from our line of sight and leaves behind mainly red colour of the direct sunlight which reaches human eye.

The reason for Sun not appearing red at the noon is that the light has to travel a relatively shorter distance through the atmosphere to reach us and therefore, only a little of blue colour of the white light is scattered.

Note : Except for the following questions, all the remaining questions have been asked in previous sets.

SECTION - A

1. Why does the cord of an electric oven not glow while its heating element does ? [1]

Answer : The resistance of heating element of an electric oven is very high. As the current flows through the heating element it becomes too hot and glows red. On the other hand cord of an electric oven low resistance hence it does not become red during the flow of current.

2. Although coal and petroleum are produced by the degradation of biomass, yet we need to conserve these resources. Why ? [1]

Answer : We need to conserve coal and petroleum because they are formed in millions of years and are non-renewable also and their rate of consumption is very high. So these are limited and cannot last for longer time.

SECTION - B

3. What is atmospheric refraction ? List two phenomena which can be explained on the basis of atmospheric refraction. [2]

Answer : In atmosphere, there are layers of different densities and refractive indices, when light ray is passed through these layers refraction of light takes place which is called atmospheric refraction.

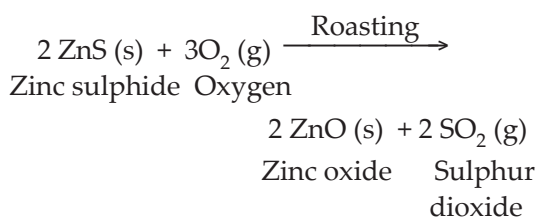
Two phenomenon that can be explained on the basis of atmospheric refraction are :

1. Twinkling of stars.
 2. Early sunset and delayed sunrise.
4. Name a metal of medium reactivity and write three main steps in the extraction of this metal from its sulphide ore. [2]

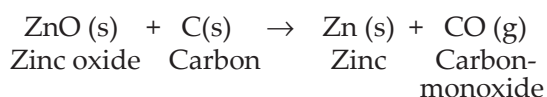
Answer : Zinc

The steps involved in extraction of zinc from zinc sulphide are :

1. Roasting of sulphide ore in the presence of air to convert it into metal oxide.



2. Reduction of metal oxide with carbon to get the free metal.



3. Refining of impure metal to get pure metal.
5. List two chemical properties on the basis of which ethanol and ethanoic acid may be differentiated and explain how.

OR

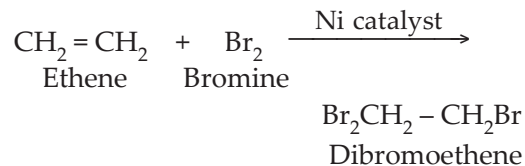
Unsaturated hydrocarbons contain multiple bonds between two carbon atoms and these compounds show addition reactions. Out of saturated and unsaturated carbon compounds, which compounds are more reactive ? Write a test to distinguish ethane from ethene. [2]

Answer :

1. Ethanol does not react with sodium bicarbonate but ethanoic acid reacts with sodium bicarbonate releasing CO₂ gas.
2. Ethanol does not change the colour of blue litmus paper but ethanoic acid changes the colour of blue litmus to red due to presence of carboxylic acid group.

OR

Unsaturated carbon compounds are more reactive than saturated carbon compounds. Bromine water is decolourized by ethene but there is no change of colour of bromine water with ethane.



SECTION - C

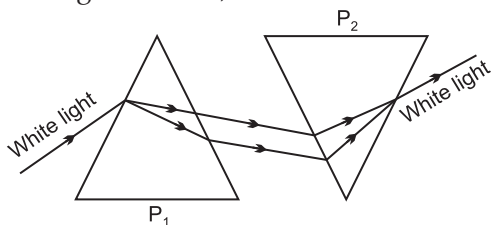
6. What happens to a beam of white light when it gets refracted through glass prism ? Which colour deviates the most and the least after refraction through a prism ? What is likely to happen if a second identical prism is placed in an inverted position with respect to the first prism. Justify your answer.

OR

A student needs spectacles of power – 0.5 D for the correction of his vision. [3]

- (i) Name the defect in vision the student is suffering from.
- (ii) Find the nature and focal length of the corrective lens.
- (iii) List two causes of this defect.

Answer : When white light is refracted through a glass prism, it gets split into its constituting colours at different angles. This phenomenon is called Dispersion of Light. Forming a rainbow,



Least deviated colour is red whereas most deviated colour is violet.

When second identical prism is placed in an inverted position with respect to first prism, recombination of the spectrum will take place and white light will be obtained.

OR

- (i) Myopia.
- (ii) Concave lens with the focal length of 200 cm

Given, $P = -0.5 \text{ D}$
We have,

$$P = \frac{1}{f} \text{ m}$$

$$f = \frac{1}{P} = \frac{1}{(-0.5)}$$

$$f = -2 \text{ m}$$

$$f = -200 \text{ cm}$$

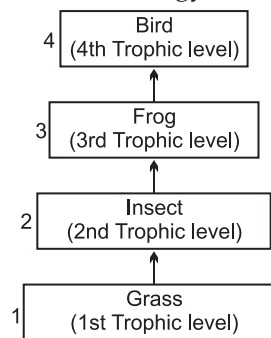
- (iii) Two causes of Myopia are :

1. Elongation of eye ball.
2. High converging power of eye less.

7. Define a food chain. Design a terrestrial food chain of four trophic levels. If a pollutant enters at the producer level, the organisms of which trophic level will have the maximum concentration of the pollutant in their bodies ? What is this phenomenon called ? [3]

Answer : It is the sequence of arrangement of living organism in a community in which

one organism consumes another organism to transfer food energy.



Grass → Insect → Frog → Bird

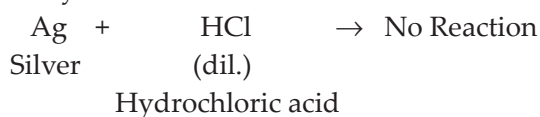
The organism at higher trophic level will have the maximum concentration of pollutants. This phenomenon is called biological magnification.

9. During the reaction of some metals with dilute hydrochloric acid, the following observations were made by a student :
- (a) Silver does not show any change.
 - (b) Some bubbles of a gas are seen when lead is reacted with the acid.
 - (c) The reaction of sodium is found to be highly explosive.
 - (d) The temperature of the reaction mixture rises when aluminium is added to the acid.

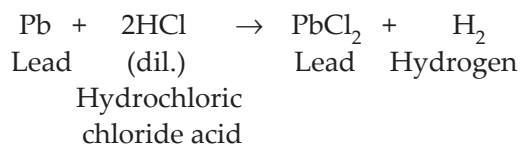
Explain these observations giving appropriate reason. [3]

Answer :

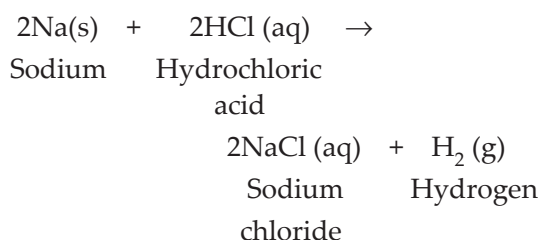
- (a) Silver is covered with a thin layer of silver chloride, so it does not react with dilute hydrochloric acid.



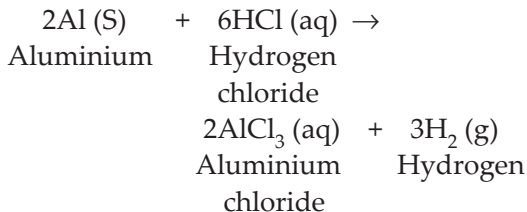
- (b) Bubbles of hydrogen gas are evolved when lead is reacted with the acid.



- (c) The reaction of sodium is found to be highly explosive because sodium is very reactive in nature.



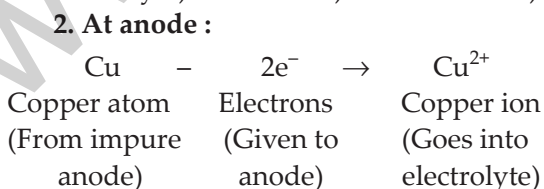
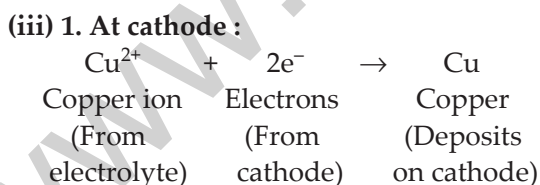
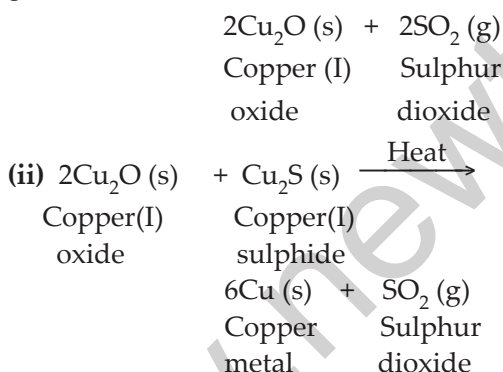
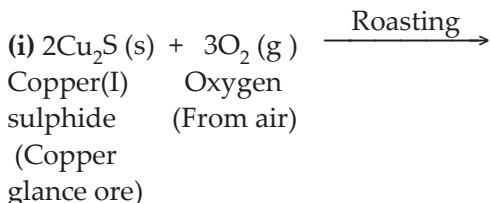
- (d) The temperature of the reaction mixture rises when aluminium is added to the acid because the reaction is highly exothermic in nature.



10. Given below are the steps for the extraction of copper from its ore. Write the chemical equation of the reactions involved in each case. [3]

- (i) Roasting of copper(I) sulphide.
(ii) Reduction of copper(I) oxide from copper(I) sulphide
(iii) Electrolytic refining.

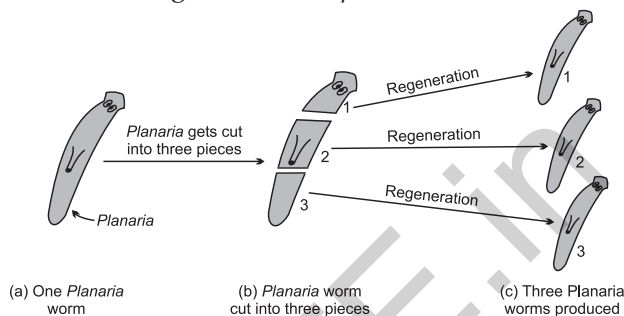
Answer :



15. (a) Budding, fragmentation and regeneration, all are considered as asexual mode of reproduction. Why ?
(b) With the help of neat diagrams, explain the process of regeneration in *Planaria*. [3]

Answer :

- (a) Budding, fragmentation and regeneration are considered as asexual mode of reproduction because only one parent is involved no sex cells are involved.
(b) Regeneration in *planaria*.



Regeneration in Planaria

The process of getting back a full organism from its body parts is called regeneration. *Planaria* reproduces by this method in which if the body of *Planaria* somehow gets cut into a number of pieces, then each body piece can regenerate into a complete *Planaria* by growing all the missing parts.

SECTION - D

16. A 6 cm tall object is placed perpendicular to the principal axis of a concave mirror of focal length 30 cm. The distance of the object from the mirror is 45 cm. Use mirror formula to determine the position, nature and size of the image formed. Also draw labelled ray diagram to show the image formation in this case.

OR

An object 6 cm in size is placed at 50 cm in front of a convex lens of focal length 30 cm. At what distance from the lens should a screen be placed in order to obtain a sharp image of the object ? Find the nature and size of the image. Also draw labelled ray diagram to show the image formation in this case. [5]

Answer : Given, Height of the object = 6 cm
Focal length, $f = -30$ cm
Object distance, $u = -45$ cm
Image distance, $v = ?$
Height of image, $h_i = ?$
We have,

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

$$\frac{1}{-30} = \frac{1}{v} + \frac{1}{-45}$$

$$\frac{-1}{30} + \frac{1}{45} = \frac{1}{v}$$

$$\frac{1}{v} = \frac{-3+2}{90}$$

$$v = -90 \text{ cm}$$

Also, we have

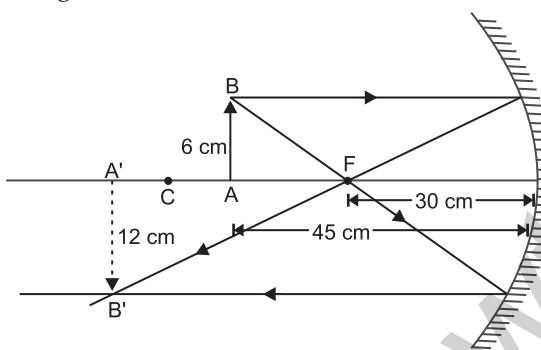
$$m = \frac{h_i}{h_o} = \frac{-v}{u}$$

$$\frac{h_i}{6} = \frac{-(-90)}{-45}$$

$$\frac{h_i}{6} = -2$$

$$h_i = -12$$

Image is real and inverted.

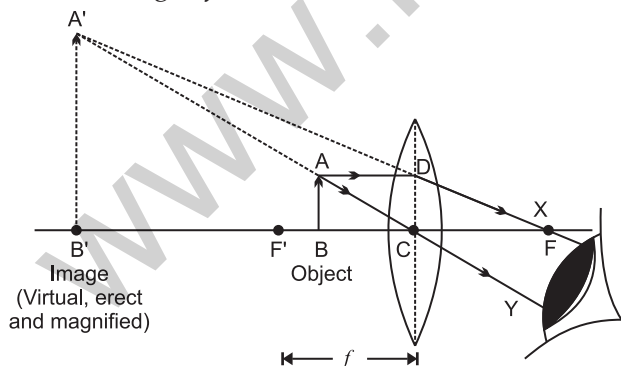


OR

Height of object $h_o = +6 \text{ cm}$

Object distance, $u = -50 \text{ cm}$

Focal length, $f = +30 \text{ cm}$



Formation of image by a convex lens when the object is placed between its optical centre (C) and focus (F').

Using lens formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$$

$$\frac{1}{v} = \frac{1}{30} - \frac{1}{50}$$

$$= \frac{5-3}{150}$$

$$= \frac{2}{150}$$

∴ Image distance, $v = +75.5 \text{ cm}$

$$\frac{h_i}{h_o} = \frac{v}{u}$$

$$\frac{h_i}{6} = \frac{-75.5}{-50}$$

$$h_i = \frac{75.5 \times 6}{50}$$

$$= 9.06 \text{ cm}$$

Hence, image formed is virtual, erect and magnified.

20. What is sexual reproduction ? Explain how this mode of reproduction gives rise to more viable variations that asexual reproduction. How does this affect the evolution ? [5]

Answer : The production of new organisms from two parents by making use of their sex cells is called sexual reproduction.

In sexual reproduction more viable variations are observed than asexual reproduction as two parent are involved. In case of asexual reproduction single parent organism gives rise to offsprings which are genetically identical to their parents. This limits the scope of variation in characters of off springs. Due to sexual reproduction the extent of variation is much large and therefore choices of evolution is also high. The variations in the characters of the obtained offsprings from sexual reproduction enable them to adopt according to the environment and struggle for their existence.

Over a period of time the characters accumulate within the species and the formed species gives rise to new species and this process goes on.

••

SECTION – A

1. What is the function of a galvanometer in a circuit? [1]

Answer : Galvanometer is a device that detects the presence of current in a circuit. It is also used for measuring the amount of current in the circuit.

2. Why is biogas considered an excellent fuel? [1]

Answer : Biogas is considered as an excellent fuel because :

1. It causes no pollution, as it is environmental friendly.
2. Biogas plant from which biogas is produced serves as an excellent way of waste disposal.
3. It is economical and produces a large amount of heat per unit mass.

SECTION – B

3. How it can be proved that the basic structure of the Modern Periodic Table is based on the electronic configuration of atoms of different elements?

OR

The electronic configuration of an element is 2, 8, 4. State its:

- (a) group and period in the Modern Periodic Table.
- (b) name and write its one physical property. [2]

Answer :

(a) Modern periodic law states that the physical and chemical properties of an element are the periodic function of the atomic number of that element.

Electronic configuration of the elements play an important role in the placement of element in the modern periodic table. The valence shell electron of an element decides its position in a particular group or period for example : if the configuration of an element is 2, 1 it means that the

Li = 2, 1

It belongs to the 2nd period and 1st group.

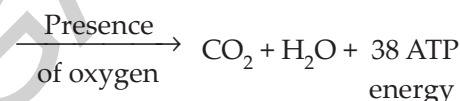
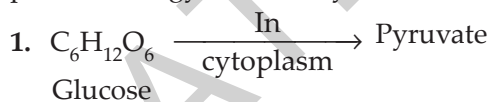
OR

(b) Si = 2, 8, 4

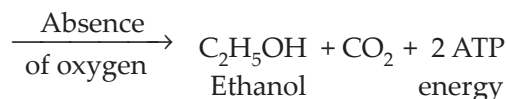
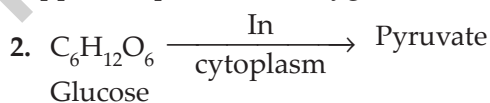
1. It means that it belongs to 3rd period and 14th group.
2. The name of element is Silicon. It is a metalloid. (*i.e.* element that has properties of both metals and non-metals).

4. Write two different ways in which glucose is oxidized to provide energy in human body. Write the products formed in each case. [2]

Answer : Glucose is oxidised in two forms to provide energy to the body :



This is an example of Aerobic Respiration that happens in presence of oxygen.



This is an example of Anaerobic Respiration.

5. Define the term power of accommodation. Write the modification in the curvature of the eye lens which enables us to see the nearby objects clearly? [2]

Answer : The ability of the eye lens to adjust its focal length, is called the power of accommodation. There should be a contraction of ciliary muscles, that will increase the curvature of the eye lens and becomes thicker, so the focal length of the eye lens will decrease. It will thus enable us to see the objects clearly.

SECTION – C

6. 2 g of silver chloride is taken in a china dish and the china dish is placed in sunlight for sometime. What will be your observation in this case? Write the chemical reaction involved in the form of a balanced chemical equation. Identify the type of chemical reaction.

OR

Identify the type of reactions taking place in each of the following cases and write the balanced chemical equation for the reactions.

- (a) Zinc reacts with silver nitrate to produce zinc nitrate and silver.
 (b) Potassium iodide reacts with lead nitrate to produce potassium nitrate and lead iodide. [3]

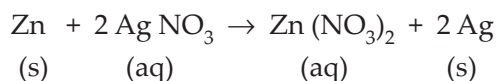


Initially the colour of silver chloride is white but when it is kept in sunlight it breaks down to give silver and chlorine. Hence, the colour changes to grey.

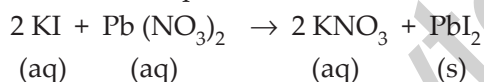
It is an example of Photo-Chemical Decomposition.

OR

- (a) The given reaction is a displacement reaction.



- (b) It is a double displacement reaction.



7. Identify the acid and the base from which sodium chloride is obtained. Which type of salt is it? When is it called rock salt? How is rock salt formed? [3]

Answer : NaCl is made by reacting an acid and a base. The base is NaOH (Sodium hydroxide). So,



It is a Neutralization Reaction.

It is known as rock salt in crystalline form.

It is the result of the evaporation of ancient oceans millions of years ago. Sometimes pressure from deep inside the Earth forces up large masses of rocks to form salt like domes.

8. Based on the group valency of elements write the molecular formula of the following compounds giving justification for each :

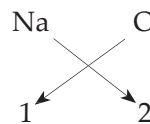
- (i) Oxide of first group elements.
 (ii) Halide of the elements of group thirteen, and

- (iii) Compound formed when an element, A of group 2 combines with an element, B of group seventeen. [3]

Answer :

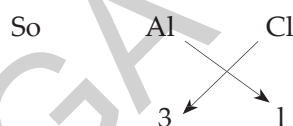
- (i) Sodium is a group one element (Na) so its configuration is 2, 8, 1 and its valency is 1. Oxide has a valency of 2.

So their formula would be



Formula for sodium oxide is Na_2O .

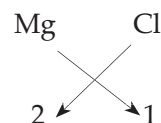
- (ii) Halide is any Halogen. Group 13 means for example, we take Aluminium (Al) its configuration is 2, 8, 3, valency of Al is 3, valency of Cl is 1



Formula would be AlCl_3 (Aluminium chloride)

- (iii) Element of group 2 for example Mg 2, 8, 2 its valency would be 2.

Element of group 17 would be Cl 2, 8, 7 valency would be 1.



Formula would be MgCl_2 - (Magnesium Chloride)

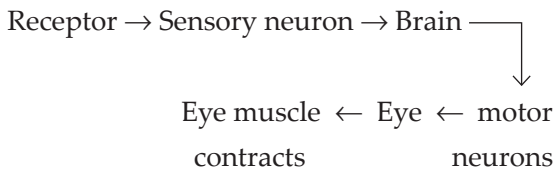
9. Write three types of blood vessels. Give one important feature of each. [3]

Answer : The three types of blood vessels are :

1. Arteries
 2. Veins
 3. Capillaries
1. **Arteries :** They carry oxygenated blood from the heart and transport it to organs.
 2. **Veins :** They carry deoxygenated blood from organs and take this blood to the heart.
 3. **Capillaries :** Arteries and veins divide to form arterioles and venules. The nutrients, hormones and gases can diffuse into the tissue cells through the walls of capillaries and vice versa.

10. Trace the sequence of events which occur when a bright light is focused on your eyes. [3]

Answer : When bright light is focussed on our eyes it goes to brain, the brain reverts back the message by motor neuron which contracts the pupil. The sequence of events which occur is as follows :



11. What are plant hormones? Name the plant hormones responsible for the following :

- (i) Growth of stem
- (ii) Promotion of cell division
- (iii) Inhibition of growth
- (iv) Elongation of cells [3]

Answer : In plants, growth, development and response to the environment are controlled and co-ordinated by a special class of chemical substances known as phytohormones. They are synthesised in minute amounts.

- (i) Gibberellins
- (ii) Cytokinins
- (iii) Abscisic acid
- (iv) Auxins

12. Name the plant Mendel used for his experiment. What type of progeny was obtained by Mendel in F₁ and F₂ generations when he crossed the tall and short plants? Write the ratio he obtained in F₂ generation plants.

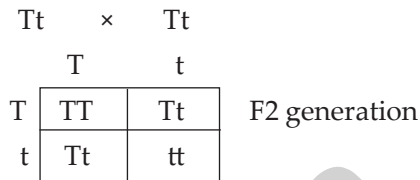
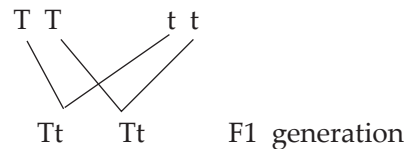
OR

List two differences between acquired traits and inherited traits by giving an example of each. [3]

Answer : Mendel used pea plant (*Pisum sativum*) when he crossed tall and short plants the progeny obtained in F₁ generation were tall. When the F₁ plants were selfed the F₂ generations showed three tall and one dwarf plant. The genotypic ratio of F₂ generation is 1 : 2 : 1

(TT : Tt : Tt : tt)

The phenotypic ratio is 3 : 1 (Tall : Dwarf)

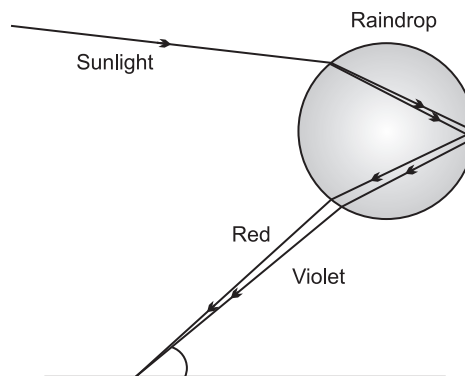


OR

S. No.	Acquired Traits	Inherited Traits
1.	These are somatic variations.	These are genetic variations.
2.	These traits develop throughout the life time of an individual. Example learning of dance and music.	These traits are transferred by or (inherited) by the parents to the offspring. Example Eye colour, Hair colour.

13. What is a rainbow? Draw a labelled diagram to show the formation of a rainbow. [3]

Answer : The Rainbow is a natural phenomenon in which the white light or sunlight splits into beautiful 7 colours by the water droplets which remain suspended in air after rain.



Rainbow formation

14. How can we help in reducing the problem of waste disposal? Suggest any three methods. OR

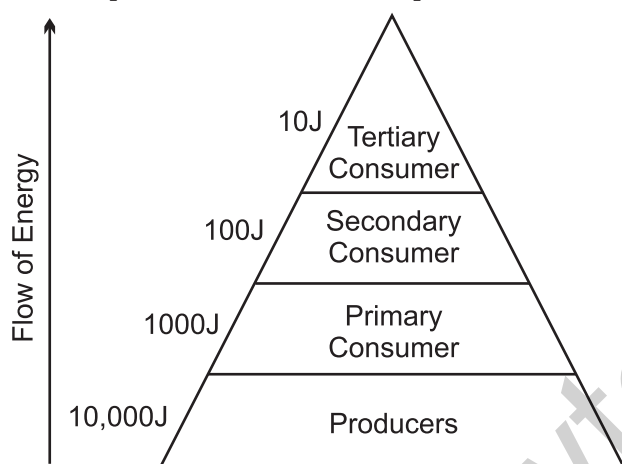
Define an ecosystem. Draw a block diagram to show the flow of energy in an ecosystem. [3]

Answer : The three methods by which we can reduce the problem of waste disposal are :

1. Adopting the 3R approach i.e.–Reduce, Reuse, Recycle.
2. Segregation of waste into biodegradable and non-biodegradable waste.
3. Conversion of waste into useful components like biogas and then using compost as a fertiliser.

OR

Ecosystem refers to the interaction of all the biotic and abiotic components present in a particular area. Energy flows across the trophic levels following the 10% law. Only 10% of the energy available to a trophic level is passed on to the next trophic level.



1. For example 10,000 J energy is available to producer.
2. Then 1000 J energy will be available to primary consumer.
3. 100J energy will be available to secondary consumer.
4. 10 J energy will be available to tertiary consumers.

15. What is water harvesting? List two main advantages associated with water harvesting at the community level. Write two causes for the failure of sustained availability of groundwater. [3]

Answer : Water harvesting means capturing rain where it falls or capturing the run off in village or town. It can be done by capturing run off from roof tops and local catchments.

Advantages :

1. Harvesting water allows capturing better utilization of an energy resource or when there is an immediate need.
2. This water is suitable for irrigation.

Causes for failure of sustained ground water availability are :

1. Increase in agricultural activities leads to depletion of ground water.
2. Increase in population and industries are also responsible for the same.

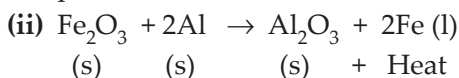
SECTION – D

16. (a) List in tabular form three chemical properties on the basis of which we can differentiate between a metal and a non-metal.
- (b) Give reasons for the following:
- (i) Most metals conduct electricity well.
 - (ii) The reaction of iron (III) oxide [Fe₂O₃] with heated aluminium is used to join cracked machine parts. [5]

Answer :

S. No.	Metals	Non Metals
1.	They react with oxygen to form basic oxides. $2 \text{Mg} + \text{O}_2 \rightarrow 2 \text{MgO}$ Magnesium Magnesium oxide	They react with oxygen to produce acidic or neutral oxides. $4 \text{C(S)} + \text{O}_2 \text{(g)} \rightarrow \text{CO}_2 \text{(S)}$ Carbon Carbondioxide
2.	They react with water to produce metal hydroxide and hydrogen gas. $\text{Mg} + 2\text{H}_2\text{O} \rightarrow \text{Mg(OH)}_2 + \text{H}_2$	They do not react with water.
3.	Generally they do not combine with hydrogen except sodium, potassium, calcium which form ionic hydrides.	They react with hydrogen to form covalent hydrides.

(b) (i) Metals for example Na has an electronic configuration of 2, 8, 1 i.e. It has one free electron. This electron moves through the metal and conducts electric current due to the presence of free electron.



It is thermite reaction

This reaction is an exothermic reaction the reaction produces large amount of heat due to which iron metal is produced in molten form and use to join the tracks.

17. Write the chemical formula and name of the compound which is the active ingredient of all alcoholic drinks. List its two uses. Write chemical equation and name of the product formed when this compound reacts with-

- (i) sodium metal
- (ii) hot concentrated sulphuric acid

OR

What is methane? Draw its electron dot structure. Name the type of bonds formed in this compound. Why are such compounds:

- (i) poor conductors of electricity ? and
- (ii) have low melting and boiling points? What happens when this compound burns in oxygen? [5]

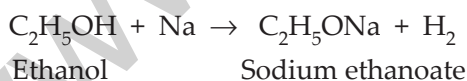
Answer : The name of the ingredient of the alcoholic drink is ethanol.

Its formula is $\text{C}_2\text{H}_5\text{OH}$.

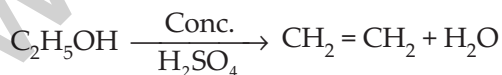
Two uses of ethanol ($\text{C}_2\text{H}_5\text{OH}$) are :

1. It is used as a solvent in various industries.
2. It is also used as an antiseptic solution.

(i) Reaction of ethanol with sodium metal



(ii) Reaction of ethanol with conc. H_2SO_4



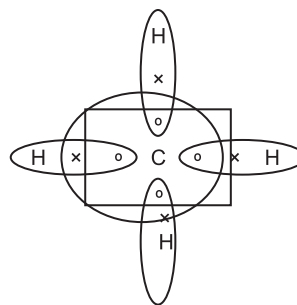
Ethanol Ethene

OR

Methane is a Hydrocarbon formed by the combination of carbon with Hydrogen.

Its molecular formula is CH_4 . It is a main green house gas. The type of bond formed in methane is covalent bond.

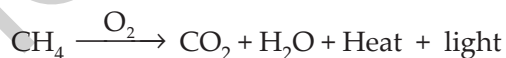
Electron dot structure of methane (CH_4) :



(i) Covalent compounds are poor conductors of electricity because it has no free electrons to conduct electricity. Moreover this compound is formed by sharing of electrons. So no electron is available for the conduction.

(ii) They have weak forces of attraction between them so less energy is required to break the force of binding. Thus they have low melting and boiling points.

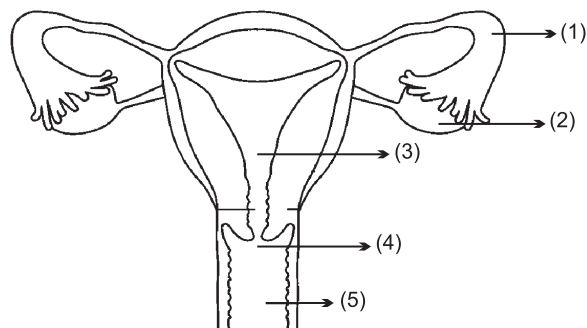
When this compound burns in oxygen, combustion reaction takes place.



18. Define pollination. Explain the different types of pollination. List two agents of pollination ? How does suitable pollination lead to fertilization ?

OR

(a) Identify the given diagram. Name the parts 1 to 5.



(b) What is contraception? List three advantages of adopting contraceptive measures. [5]

Answer : Pollination is the transfer of pollen from the anther of the stamen to the stigma of the pistil with the help of air, water and insects.

Types of pollination :

- 1. Self pollination :** Transfer of pollen grain from the anther to the stigma of the same flower.
- 2. Cross pollination :** Transfer of pollen grain from the anther of one flower to the stigma of other flower of the same species.

Two agents of pollination are air, water, insects etc.

When correct species of pollen grain lands on the stigma it results in some chemical response from the ovary that causes the growth of pollen tube from pollen grain. The pollen grain slides down the pollen tube and enters the ovary where it meets the egg. This process is called as fertilization and leads to the formation of zygote.

OR

The parts of the female Reproductive system are as follows :

1. Fallopian tube or Oviduct
2. Ovary
3. Uterus
4. Cervix
5. Vagina

Contraception is the method by which a female inhibits fertilization and hence prevents pregnancy.

The three advantages of contraception are :

1. It makes the people more aware about the concept of family planning.
2. It educates the people about Sexually Transmitted Diseases and ways to avoid it.
3. It helps the female to space children.
4. It reduces the risk of unwanted pregnancies.

19. An object is placed at a distance of 60 cm from a concave lens of focal length 30 cm.

- (i)** Use lens formula to find the distance of the image from the lens.
- (ii)** List four characteristics of the image (nature, position, size, erect/inverted) formed by the lens in this case.
- (iii)** Draw ray diagram to justify your answer of part (ii). [5]

Answer :

(i) $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$ [lens formula]

$$\frac{1}{f} + \frac{1}{u} = \frac{1}{v}$$

$$u = -60$$

$$f = -30 \text{ (In case of Concave lens)}$$

Hence, putting the values in formula, we get

$$\frac{1}{-30} + \frac{1}{-60} = \frac{1}{v}$$

$$\frac{-2-1}{60} = \frac{1}{v}$$

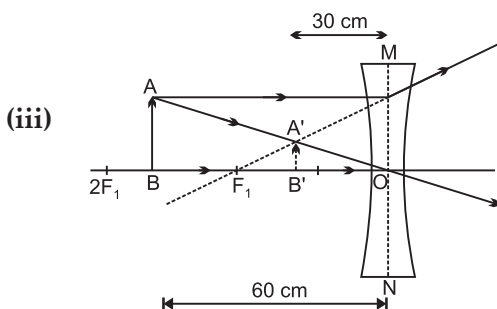
$$\frac{-3}{60} = \frac{1}{v}$$

$$\frac{1}{v} = \frac{-1}{20}$$

$$\therefore v = -20 \text{ cm}$$

$$\therefore m = \frac{v}{u} = \frac{-20}{-60} = 0.33$$

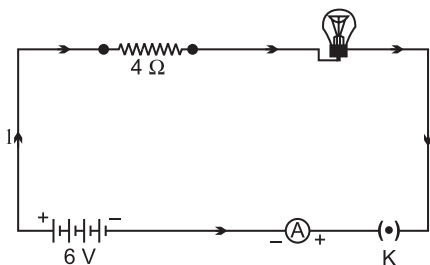
- (ii)** So, the image formed will be virtual, erect, small in size and image will be formed between F_1 and O.



- 20. (a)** With the help of a suitable circuit diagram prove that the reciprocal of the equivalent resistance of a group of resistances joined in parallel is equal to the sum of the reciprocals of the individual resistances.
- (b)** In an electric circuit two resistors of 12Ω each are joined in parallel to a 6 V battery. Find the current drawn from the battery.

OR

An electric lamp of resistance 20Ω and a conductor of resistance 4Ω are connected to a 6 V battery as shown in the circuit. Calculate :



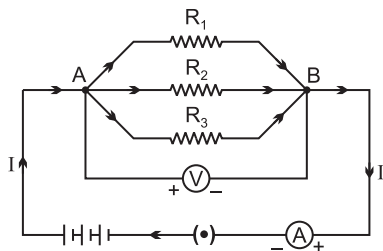
- (a) the total resistance of the circuit,
- (b) the current through the circuit,
- (c) the potential difference across the
 - (i) electric lamp and (ii) conductor, and
- (d) power of the lamp. [5]

Answer :

- (a) It is observed that total current I is equal to the sum of separate currents.

$$I = I_1 + I_2 + I_3 \quad \dots(i)$$

Let R_p be the equivalent resistance of the parallel combination of resistors.



So, by applying ohm's law

$$I = V/R_p$$

$$I_1 = V/R_1, I_2 = V/R_2 \text{ and } I_3 = V/R_3$$

So, now from equation (i), we have

$$V/R_p = V/R_1 + V/R_2 + V/R_3$$

and
$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

Hence, if n resistors are connected in parallel, then the equivalent resistance of the circuit is given by -

$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots + \frac{1}{R_n}$$

- (b) Given, Two resistors of 12Ω connected in parallel.

$$V = 6 \text{ V}$$

$$\therefore \frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$\therefore \frac{1}{R_{eq}} = \frac{1}{12} + \frac{1}{12}$$

$$\frac{1}{R_{eq}} = \frac{2}{12}$$

$$R_{eq} = \frac{12}{2} = 6 \Omega$$

According to ohm's law $V = IR$

$$6 = I \times 6$$

$$\frac{6}{6} = I$$

$$I = 1 \text{ ampere.}$$

OR

- (a) Given, $R_1 = 20 \Omega, R_2 = 4 \Omega$

Since, in Series

$$R = R_1 + R_2$$

\therefore Total resistance of circuit :

$$R = 20 + 4$$

$$= 24 \Omega$$

- (b) Current through circuit :

$$V = 6V, R = 24 \Omega$$

According to ohm's law

$$V = IR$$

So,
$$I = \frac{V}{R}$$

$$I = \frac{6}{24}$$

$$= \frac{1}{4} = 0.25 \text{ ampere}$$

- (c) (i) Potential difference across conduction :

$$I = \frac{1}{4}, R = 20\Omega$$

$$V_1 = IR_1$$

$$V_1 = \frac{1}{4} \times 20$$

$$= 5V$$

- (ii) Potential difference across lamp

$$V_2 = IR_2$$

$$= \frac{1}{4} \times 4$$

$$V_2 = 1V$$

(d) Power of lamp :

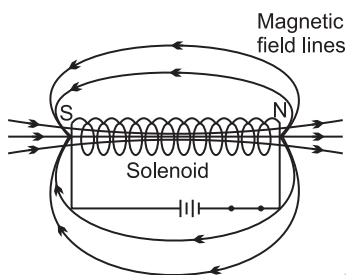
$$\begin{aligned}
 P &= I^2R \\
 &= \left(\frac{1}{4}\right)^2 \times 20 \\
 &= \frac{1}{4} \times \frac{1}{4} \times 20 \\
 &= \frac{5}{4} \text{ watt}
 \end{aligned}$$

or $P = 1.25 \text{ watt}$

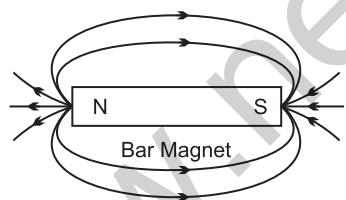
21. What is a solenoid? Draw the pattern of magnetic field lines of (i) a current carrying solenoid and (ii) a bar magnet. List two distinguishing features between the two fields. [5]

Answer : Solenoid is a long cylindrical coil of wire consisting of a large number of turns bound together very tightly.

(i)



(ii)



Distinguishing features are as follows :

1. Magnetic field outside the solenoid is negligible as compared to the bar magnet.
2. Magnetic field of solenoid can be varied as per our requirement just by changing current or core of solenoid but in bar magnet it is fixed.

SECTION – E

22. Blue litmus solution is added to two test tubes A and B containing dilute HCl and NaOH solution respectively. In which test tube a colour change will be observed? State the colour change and give its reason.

OR

What is observed when 2 mL of dilute hydrochloric acid is added to 1 g of sodium carbonate taken in a clean and dry test tube? Write chemical equation for the reaction involved. [2]

Answer : Test tube A will show colour change because acids turn blue litmus to red. So the final colour of test tube would be red.

OR

A brisk effervescence would be observed if HCl is added to Na_2CO_3 due to the evolution of CO_2 gas.



23. In three test tubes A, B and C, three different liquids namely, distilled water, underground water and distilled water in which a pinch of calcium sulphate is dissolved, respectively are taken. Equal amount of soap solution is added to each test tube and the contents are shaken. In which test tube will the length of the foam (lather) be longest? Justify your answer. [2]

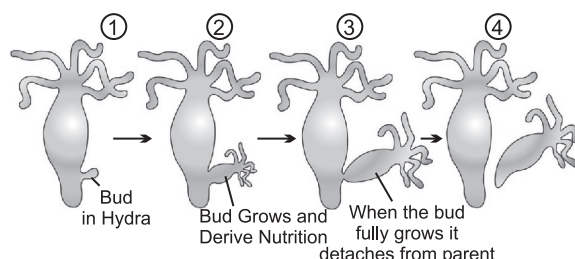
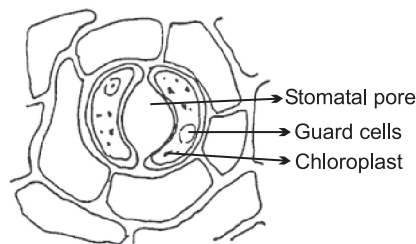
Answer : Length of foam would be longest in test tube A. It is because it does not have any ions, so length of the foam would be longest.

24. A student is observing the temporary mount of a leaf peel under a microscope. Draw labelled diagram of the structure of stomata as seen under the microscope. [2]

OR

Draw a labelled diagram in proper sequence to show budding in hydra. [2]

Answer :



25. In the experimental set up to show that "CO₂ is given out during respiration", name the substance taken in the small test tube kept in the conical flask. State its function and the consequence of its use. [2]

Answer : The chemical kept in the test tube is KOH–Potassium Hydroxide. The function of this chemical is to absorb the vapours of CO₂.

26. While studying the dependence of potential difference (V) across a resistor on the current (I) passing through it, in order to determine the resistance of the resistor, a student took 5 readings for different values of current and plotted a graph between V and I. He got a straight line graph passing through the origin. What does the straight line signify? Write the method of determining resistance of the resistor using this graph.

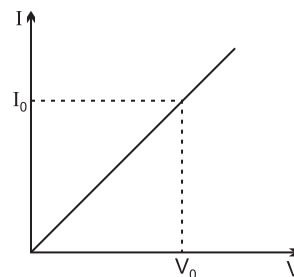
OR

What would you suggest to a student if while performing an experiment he finds that the pointer/needle of the ammeter and voltmeter do not coincide with the zero marks on the scales when circuit is open? No extra ammeter/voltmeter is available in the laboratory. [2]

Answer : The straight line in the graph signify that potential difference and current are directly proportional to each other.

The method of determining resistance of resistor using the graph is by Ohm's law,

$V = IR$ and by calculating the slope from the points mentioned on the graph



$$\therefore R = \frac{1}{\text{Slope of } V - I \text{ graph}}$$

OR

This is called the zero error of the scale of ammeter or voltmeter. If there is a zero error then this error is subtracted from the value that depicts when the circuit is closed otherwise accurate readings will not be recorded.

27. List four precautions which a student should observe while determining the focal length of a given convex lens by obtaining image of a distant object on a screen. [2]

Answer : Precautions are as follows :

1. Fix the lens vertically in lens holder.
2. Base of lens and white screen should be in a line with measuring scale.
3. There should not be any obstacle in path of lens.
4. Record the position of lens and screen when sharp image is formed.

Science 2019 (Delhi)

Set-II

Note : Except for the following questions, all the remaining questions have been asked in previous set.

SECTION-A

1. Name and define the SI unit of current. [1]

Answer : 'Ampere' is the SI unit of current.

1 Ampere current can be defined as a unit charge flowing per second in the circuit.

$$\therefore 1 \text{ amp} = \frac{1 \text{ coulomb}}{1 \text{ second}}$$

2. Write the name of the main constituent of biogas. Also state its percentage. [1]

Answer : Methane is the main constituent of biogas. Its formula is CH₄. Its percentage is approximately 50–75%.

SECTION-B

3. Write the name, symbol and electronic configuration of an element X whose atomic number is 11.

OR

Can the following groups of elements be classified as Dobereiner's triad:

(a) Na, Si, Cl (b) Be, Mg, Ca

Atomic mass of Be-9; Na-23, Mg-24, Si-28, Cl-35, Ca-40, Justify your answer in each case. [2]

Answer : The element whose atomic number is 11 is Sodium
 Its symbol is Na
 Electronic configuration – 2, 8, 1
 Valency 1

OR

(a) Na, Si, Cl cannot be classified as Dobereiner’s triad because here the elements do not belong to the same group and have different electronic configuration.

Na– 2, 8, 1; Si – 2, 8, 4 and Cl – 2, 8, 7

(b) Be, Mg, Ca are the elements of Dobereiner’s triad because the mass of Mg is the arithmetic mean of the other two elements

$$\text{i.e; Be and Ca} = \frac{9 + 40}{2} = 24.$$

4. How is O₂ and CO₂ transported in human beings? [2]

Answer : Oxygenated blood is transported in human beings by the arteries. The deoxygenated blood is carried by the veins.

5. Write the structure of eye lens and state the role of ciliary muscles in the human eye. [2]

Answer : The eye lens of the human eye is a convex lens that is thick in the middle and thin from the edges. It converges the incident light rays and forms the image on retina.

Role of ciliary muscles :

1. It changes the shape of the lens in eye to help with focussing.
2. It helps to regulate the flow of aqueous humor in eye.

SECTION-C

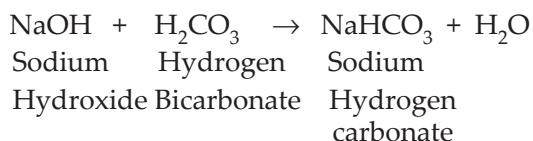
6. Identify the acid and base which form sodium hydrogen carbonate. Write chemical equation in support of your answer. State whether this compound is acidic, basic or neutral. Also write its pH value. [3]

Answer : The acid and base that forms Sodium Hydrogen Carbonate are as follows:

Acid – H₂CO₃

Base – NaOH

The chemical equation for its formation will be



The compound will be basic and its pH value will be around 8.

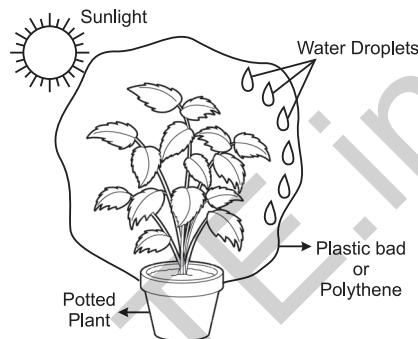
9. Define the term transpiration. Design an experiment of demonstrate this process. [3]

Answer : Loss of excess water from the leaves of plants with the help of stomata is called as transpiration.

Transpiration Experiment

Material Required :

A potted plant, A polythene, Tape



1. Take a potted plant and enclose the leaves of the plant with a big plastic or polythene bag.
2. Now keep the plant in sunlight for two hours.
3. After sometime you will be observe the water droplets on the polythene sheet.
4. It depicts the loss of water from the leaves of the plant depicting transpiration.

10. What is feedback mechanism of Hormonic regulation. Take the example of insulin to explain this phenomenon. [3]

Answer : Hormones control many cell activities, so they are very important for homeostasis most hormones are regulated by feedback mechanisms. A feedback mechanism is a loop in which a product feeds back to control its own production. Most hormone feedback mechanism involves negative feedback loops. Negative feedback keeps the concentration of a hormone within a narrow range.

For example,

The control of blood sugar by insulin is an example of a negative feedback mechanism. When blood sugar rises, receptors in a body sense a change. In turn the control center secretes insulin into the blood effectively lowering the blood sugar level.

13. Why should there be equitable distribution of resources? List three forces that would be working against an equitable distribution of our resources. [3]

Answer : There should be equitable distribution of the resources so that all the

people irrespective of being rich and poor have access and makes use of the resources. Equitable resource distribution also leads to sustainable development.

Three factors that work against equitable distribution of resources are :

1. Over exploitation of resources by industrialists for short-term gains.
2. Improper management which has led

to access of natural raw material to certain group of people which are either influential.

3. Wastage by the people who have indifferent attitude towards environment, use the resources with short term aim hence leading to depletion of resources.

Science 2019 (Delhi)

Set-III

Note : Except for the following questions, all the remaining questions have been asked in previous sets.

SECTION – A

1. If you could use any source of energy for heating your food which one would you prefer? State one reason for your choice. [1]

Answer : I would prefer a solar cooker for heating food because solar cooker is environmental friendly and causes no pollution.

2. Write the function of voltmeter in an electric circuit. [1]

Answer : Voltmeter measures the potential difference across two points in a circuit. It is always connected in parallel in the circuit.

SECTION – B

3. What happens to the image distance in the normal human eye when we decrease the distance of an object, say 10 m to 1 m? Justify your answer. [2]

Answer : The image distance will remain unaffected even if we change the object distance because the image is formed on the retina.

4. List two different functions performed by pancreas in our body. [2]

Answer :

1. Pancreas makes two hormones i.e., insulin and glycogen that regulates blood sugar level.

2. It secretes pancreatic juice that aids in the digestion of food.

SECTION – C

7. List three advantages each of :

- (i) exploiting resources with short term aims, and
- (ii) using a long term perspective in managing our natural resources. [3]

Answer :

- (i) 1. Short term exploitation will meet the demand of present generation.
2. There will be no shortage of resources.
3. Larger aspect regarding the details of a reserve can be studied also.
- (ii) 1. Long term management of natural resources would meet the demand of present and future generation.
2. No harmful impact on the environment.
3. Equitable distribution of resources amongst the rich and poor.

9. Nervous and hormonal systems together perform the function of control and coordination in human beings, Justify this statement with the help of an example. [3]

Answer : The nervous system controls and coordinates all the functions in the body. It carries out its function in close coordination with hormonal system. Nerves don't reach every hook and corner of body, hence needs assistance from hormones to control all the parts of body. Nervous control is faster.

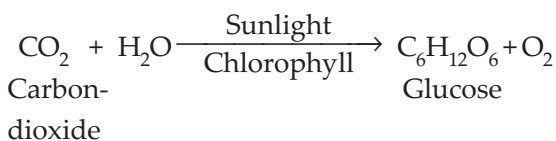
Hormonal control is slower. Hormonal control is based on feedback mechanism and tells body to pace up or slow down. Nervous control is on other hand a direct control. So we can say that both system work in harmony.

11. What is photosynthesis? Explain its mechanism. [3]

Answer : The green plants are called autotrophes. They make their own food by the process of photosynthesis. In this process the plants capture the sun rays by the pigment present in the leaf called as chlorophyll.

Then in the presence of carbon dioxide and water they make food for the plants in the form of glucose. In this process oxygen gas is also evolved.

Equation for the mechanism :



15. Explain the following : [3]

(a) Sodium chloride is an ionic compound which does not conduct electricity in solid state whereas it does conduct electricity in molten state as well as in aqueous solution.

(b) Reactivity of aluminium decrease if it is dipped in nitric acid.

(c) Metals like calcium and magnesium are never found in their free state in nature.

Answer :

(a) Sodium chloride is an ionic compound but it conducts electricity only in molten and aqueous state because in molten and aqueous form the compound liberate to give ions. These ions move freely and hence conduct electricity.

(b) Reactivity of aluminium decreases if it is dipped in nitric acid because it is a strong oxidising reagent. The layer of aluminium oxide prevents further reaction of aluminium due to which its reactivity decreases.

(c) Metals like calcium and magnesium are never found in their free states in nature because these metals are present on the top of the reactivity series. They are so reactive that they react with gases and surrounding

elements, form compounds and thus are not found in free state.

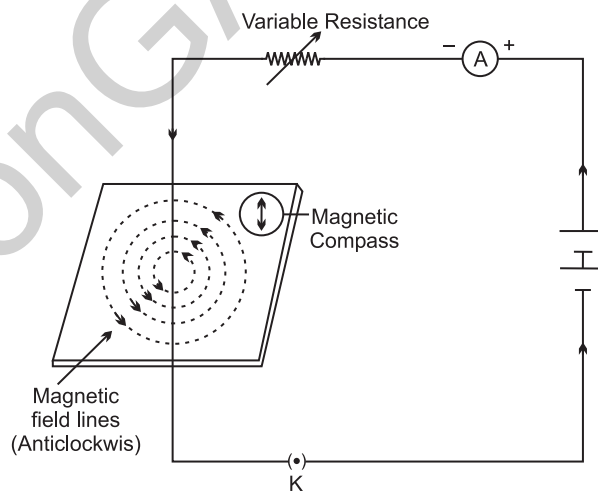
SECTION-D

17. (a) Draw magnetic field lines produced around a current carrying straight conductor passing through a cardboard. Name, state and apply the rule to mark the direction of these field lines.

(b) How will the strength of the magnetic field change when the point where magnetic field is to be determined is moved away from the straight wire carrying constant current? Justify your answer. [5]

Answer :

(a) Right Hand Thumb rule is used to mark the direction of magnetic field lines produced around a straight current carrying conductor.



The Right Hand Thumb rule indicates the direction of magnetic field for a known direction of current. When the thumb is in downwards direction then the direction in which fingers are wrapped is clockwise. So magnetic field is clockwise.

(b) To determine the magnetic field, compass needle is used. On moving away from the compass needle from the straight wire, the deflection of the compass needle decreases showing the decrease in the strength of magnetic field. It happens because the strength of magnetic field produced by a straight wire at any point, is inversely proportional to the distance of wire from the point.

Science 2018

Time allowed : 3 hours

Maximum marks : 80

SECTION—A

1. A Mendelian experiment consisted of breeding pea plants bearing violet flowers with pea plant bearing white flowers. What will be the result in F_1 progeny ? [1]

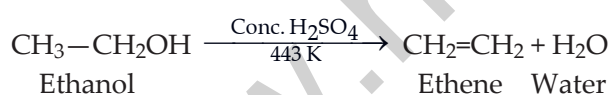
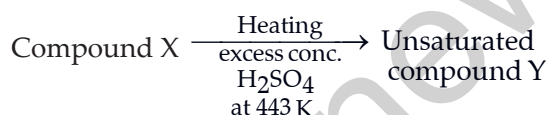
Answer : All the progeny of F_1 generation will have violet flowers because violet colour is dominant over the recessive white colour.

2. Write the energy conversion that takes place in a hydropower plant. [1]

Answer : In a hydropower plant, the potential energy of the water stored in a dam is converted into kinetic energy then the turbine converts the kinetic energy of falling water into mechanical energy and after that generator converts mechanical energy into electrical energy.

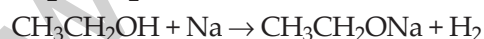
3. A compound 'X' on heating with excess conc. sulphuric acid at 443 K gives an unsaturated compound 'Y'. 'X' also reacts with sodium metal to evolve a colourless gas 'Z'. Identify 'X', 'Y' and 'Z'. Write the equation of the chemical reaction of formation of 'Y' and also write the role of sulphuric acid in the reaction. [2]

Answer :



X = $\text{CH}_3\text{CH}_2\text{OH}$ -ethanol

Y = $\text{CH}_2 = \text{CH}_2$ -ethene



Z = Hydrogen gas.

Here concentrated sulphuric acid acts as a dehydrating agent, it removes water molecule from ethanol.

4. (a) Name one gustatory receptor and one olfactory receptor present in human beings.

- (b) Write a and b in the given flow chart of neuron through which information travels as an electrical impulse.

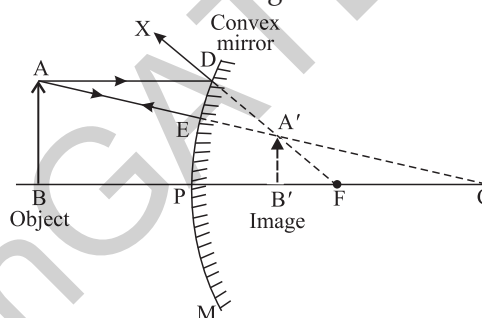
Dendrite → [a] → [b] → End point of Neuron

[2]

Answer :

- (a) Tongue is the gustatory receptor present in the human body.
 (b) Dendrite → Cell body → Axon → End point of Neuron
5. If the image formed by a spherical mirror for all positions of the object placed in front of it is always erect and diminished, what type of mirror is it ? Draw a labelled ray diagram to support your answer. [2]

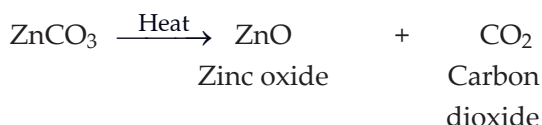
Answer : Convex mirror always forms erect and diminished image.



In the above ray diagram, the image formed is behind the mirror between pole (P) and focus (F), virtual, erect and diminished.

6. Decomposition reactions require energy either in the form of heat or light or electricity for breaking down the reactants. Write one equation each for decomposition reactions where energy is supplied in the form of heat, light and electricity. [3]

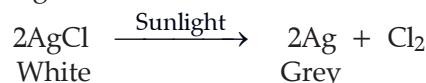
Answer : Decomposition of zinc carbonate when heat is applied.



Decomposition of water in presence of electricity :



Decomposition of silver chloride in presence of light :



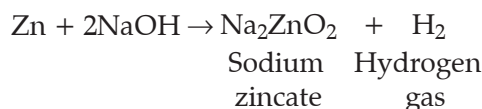
7. 2 ml of sodium hydroxide solution is added to a few pieces of granulated zinc metal taken in a test tube. When the

contents are warmed a gas evolves which is bubbled through a soap solution before testing. Write the equation of the chemical reaction involved and the test to detect the gas. Name the gas which will be evolved when the same metal reacts with dilute solution of a strong acid ?

OR

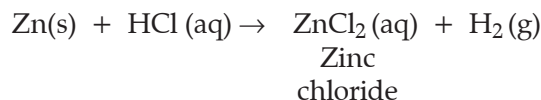
The pH of a salt used to make tasty and crispy pakoras is 14. Identify the salt and write a chemical equation for its formation. List its two uses. [3]

Answer :



When a burning candle is brought towards the hydrogen gas, it burns with the pop sound and the candle will go off.

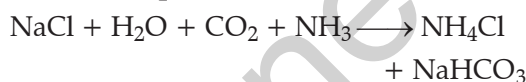
When Zinc metal reacts with dilute solution of strong acid then zinc chloride and hydrogen gas will be formed.



OR

The salt commonly used to make tasty and crispy pakoras is baking soda *i.e.*, sodium hydrogen carbonate (NaHCO_3).

Chemical equation for its formation :



Uses of Baking Soda :

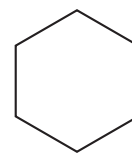
1. It is used in fire extinguisher.
2. It is also used as ingredient of antacid.

8. (a) Why are most carbon compounds poor conductors of electricity ?

(b) Write the name and structure of a saturated compound in which the carbon atoms are arranged in a ring. Give the number of single bonds present in this compound. [3]

Answer :

- (a) Electricity is conducted by moving electrons. But carbon forms covalent bonds by sharing of electrons. It does not have free electrons.
- (b) Cyclohexane is a saturated compound in which carbon atoms are arranged in a ring.



Cyclohexane

There are 6 single bonds present in this compound.

9. Name the hormones secreted by the following endocrine glands and specify one function of each :

(a) Thyroid (b) Pituitary (c) Pancreas [3]

Answer :

- (a) Thyroid gland secretes thyroxine. It regulates the metabolism and blood pressure of human beings.
- (b) Pituitary secretes growth hormone. It helps the bones and other body organs to grow properly.
- (c) Pancreas secretes insulin. Insulin helps to lower blood sugar level.

10. Write one main difference between asexual and sexual mode of reproduction. Which species is likely to have comparatively better chances of survival—the one reproducing asexually or the one reproducing sexually ? Give reasons to justify your answer. [3]

Answer : Asexual reproduction involves only one parent and the offsprings produced are clone and similar copies of their parents whereas sexual reproduction involves two parents and the offsprings produced are different from their parents. Offsprings produced by sexual reproduction have better chances of survival.

Sexual reproduction leads to variation because it leads to the formation of offspring by the combination of DNA from both the parents, so the species will have better adaptability and better survival rate.

11. State the laws of refraction of light. Explain the term 'absolute refractive index of a medium' and write an expression to relate it with the speed of light in vacuum.

OR

What is meant by power of a lens ? Write its SI unit. A student uses a lens of focal length 40 cm and another of -20 cm. Write the nature and power of each lens. [3]

Answer : The two laws of refraction are :

1. The Incident ray, the refracted ray and the normal at the point of incidence, all lie in the same plane.
2. The ratio of the sine of angle of incidence (i) to the sine of angle of refraction (r) at a point in a medium is constant. *i.e.*,

$$\frac{\sin i}{\sin r} = \text{Constant}$$

Absolute refractive index : It is the ratio of speed of light in vacuum (or air) to the speed of light in the given medium.

Refractive index (n)

$$= \frac{\text{Speed of light in vacuum or air } (c)}{\text{Speed of light in medium } (v)}$$

OR

The power of a lens is a measure of the degree of convergence or divergence of light rays falling on it. It is also defined as the reciprocal of its focal length in metres.

The S.I. unit of power is dioptre (D).

Focal length of a convex lens is positive.

$$\text{So, } F_{\text{convex}} = 40 \text{ cm} = \frac{40}{100} \text{ m}$$

$$\text{Power} = \frac{1}{\text{Focal length}} = \frac{1}{\frac{40}{100}}$$

$$= \frac{100}{40} = +2.5 \text{ D}$$

So, lens having focal length 40 cm is convex.

Focal length of a concave lens is negative.

$$F_{\text{concave}} = -20 \text{ cm} = \frac{-20}{100} \text{ m}$$

$$\text{So, } \text{Power} = \frac{1}{\text{Focal length}} = \frac{1}{\frac{-20}{100}} = \frac{-100}{20} = -5 \text{ D}$$

So, lens having focal length - 20 cm is concave.

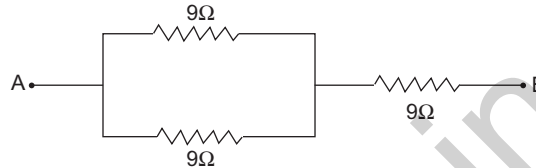
12. Show how would you join three resistors, each of resistance 9Ω so that the equivalent resistance of the combination is (a) 13.5Ω (b) 6Ω ?

OR

- (a) Write Joule's law of heating.
- (b) Two lamps, one rated 100 W; 220 V, and the other 60 W; 220 V, are connected in

parallel to electric mains supply. Find the current drawn by two bulbs from the line, if the supply voltage is 220 V. [3]

Answer: (a) To get an equivalent resistance of 13.5Ω , the resistances should be connected as shown in the figure given below :



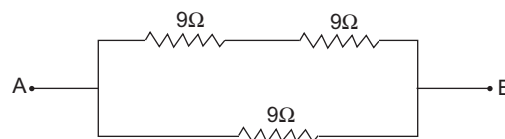
$$\begin{aligned} \text{So, } \frac{1}{R_P} &= \frac{1}{R_1} + \frac{1}{R_2} \\ &= \frac{1}{9} + \frac{1}{9} \\ &= \frac{1+1}{9} = \frac{2}{9} \end{aligned}$$

$$\frac{1}{R_P} = \frac{2}{9}$$

$$R_P = \frac{9}{2} = 4.5 \Omega$$

$$\begin{aligned} \text{Now, } R_S &= R_3 + 4.5 \Omega \\ &= 9 \Omega + 4.5 \Omega \\ &= 13.5 \Omega \end{aligned}$$

- (b) To get an equivalent resistance of 6Ω , the resistances should be connected as shown in the figure :



$$\begin{aligned} R_S &= R_1 + R_2 \\ &= 9 + 9 \\ &= 18 \Omega \end{aligned}$$

Now both the resistors are in parallel with each other so,

$$\begin{aligned} R_P &= \frac{1}{\frac{1}{18} + \frac{1}{9}} \\ &= \frac{1+2}{18} = \frac{3}{18} \end{aligned}$$

$$= \frac{1}{6} \Omega$$

$$\text{So, } R_P = 6 \Omega$$

OR

- (a) According to Joule's law of heating, the heat produced in a wire is directly proportional to

1. square of current (I^2),
2. resistance of wire (R),
3. time (t) for which current is passed.

Thus, the heat produced in the wire by current I in time ' t ' is

$$H \propto I^2 R t$$

or $H = K I^2 R t$

But $K = 1$, $H = I^2 R t$

- (b) We know that, $P = VI$

$$\Rightarrow I = \frac{P}{V}$$

First lamp : $P_1 = 100 \text{ W}, V = 220 \text{ volt}$

$$I_1 = \frac{P_1}{V} = \frac{100}{220} = 0.45 \text{ A}$$

Second lamp : $P_2 = 60 \text{ W}, V = 220 \text{ volt}$

$$I_2 = \frac{P_2}{V} = \frac{60}{220} = 0.27 \text{ A}$$

So, Total current = $I_1 + I_2$

$$= 0.45 + 0.27$$

$$= 0.72 \text{ A}$$

13. (a) List the factors on which the resistance of a conductor in the shape of wire depends.

- (b) Why are metals good conductors of electricity whereas glass is a bad conductor of electricity? Give reason.

- (c) Why are alloys commonly used in electrical heating devices? Give reason.

[3]

Answer :

- (a) Resistance of a conductor depends directly on its length, inversely proportional to the area of cross-section, directly proportional to the temperature and it depends on the nature of the conductor.

- (b) Metals have free electrons which can move and conduct electricity, whereas glass does not have free electrons which can flow freely to conduct electricity.

- (c) The resistivity of an alloy is generally higher than that of pure metal. Alloys do not oxidise (burn) readily at higher temperatures. Therefore, conductors of electric heating devices, such as toasters and electric irons, are made of an alloy rather than pure metal.

14. Students in a school listened to news read in the morning assembly that the mountains of garbage in Delhi, suddenly exploded and various vehicles got buried under it. Several people were also injured and there was traffic jam all around. In the brain storming session the teacher also discussed this issue and asked the students to find out a solution to the problem of garbage. Finally they arrived at two main points—one is self management of the garbage we produce and second is to generate less garbage at individual level.

- (a) Suggest two measures to manage the garbage we produce.

- (b) As an individual what can we do to generate the least garbage? Give two points.

- (c) List two values the teacher instilled in his students in this episode**. [3]

Answer :

- (a) 1. Segregate the garbage produced into biodegradable and non-biodegradable waste.

2. Stop using plastic bags instead of it more of cotton and jute bags should be used.

- (b) 1. We should generate less garbage as much as possible.

2. Recycling and reuse of materials should be adopted in order to minimise the waste.

15. What is a dam? Why do we seek to build large dams? While building large dams, which three main problems should particularly be addressed to maintain peace among local people? Mention them. [3]

Answer : A dam is a barrier constructed to hold back water and raise its level forming a reservoir used to generate electricity or as a water supply.

**Answer is not given due to change in the present syllabus.

Large dams are built in order to generate electricity from water supply.

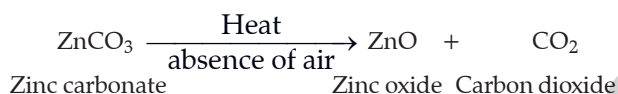
While making large dams, social problems should be addressed. Proper rehabilitation should be provided to people.

Judicious use of people's money should be done to ensure economic prosperity. Environmental problems, excessive cutting of trees, biological diversity loss should be checked.

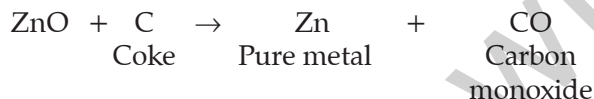
16. (a) Write the steps involved in the extraction of pure metals in middle of the activity series from carbonate ores.
 (b) How is copper extracted from its sulphide ore ? Explain the various steps supported by chemical equations. Draw labelled diagram for electrolytic refining of copper. [5]

Answer :

- (a) First the carbonate ore of a metal is heated in absence of air. This process is called calcination.



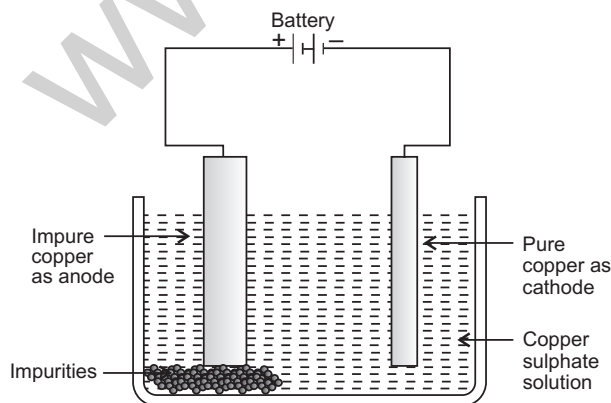
Then, ZnO is heated with coke.



- (b) Copper is extracted from sulphide ore by the process of roasting. It is done in presence of air :



Electrolytic Refining of Copper :



17. (a) The modern periodic table has been evolved through the early attempts of Dobereiner, Newland and Mendeleev. List one advantage and one limitation of all three attempts.
 (b) Name the scientist who first of all showed that atomic number of an element is a more fundamental property than its atomic mass.
 (c) State Modern Periodic law. [5]

Answer : (a) 1. Dobereiner :

Advantage : Group three elements having similar properties they were called as the Dobereiner triads. He arranged them in order of increasing atomic mass and the mass of middle element was equal to the average of the other two elements.

Limitation : He was able to identify only 4 triads but he failed in his attempt to group nitrogen, phosphorus and arsenic because atomic mass of phosphorus is not the average of other two.

2. Newland :

Advantages : He arranged the elements in horizontal rows in order of increasing atomic mass. The property of every 8th element was similar to the 1st element.

Limitation : His arrangement was only applicable to lighter elements.

3. Mendeleev :

Advantage : He arranged the elements in order of their increasing atomic mass and he corrected the mass of beryllium from 4.5 to 13.5 u.

Limitation : Position of hydrogen and isotopes were not justified in his periodic table.

- (b) Henry Moseley showed that atomic number of an element is a more fundamental property than its atomic mass.
 (c) Modern periodic law states that "the properties of elements are a periodic function of their atomic number. Repetition of properties is due to the same outer electronic configuration."

18. (a) Mention any two components of blood.
 (b) Trace the movement of oxygenated blood in the body.
 (c) Write the function of valves present in between atria and ventricles.
 (d) Write one structural difference between the composition of artery and veins.

OR

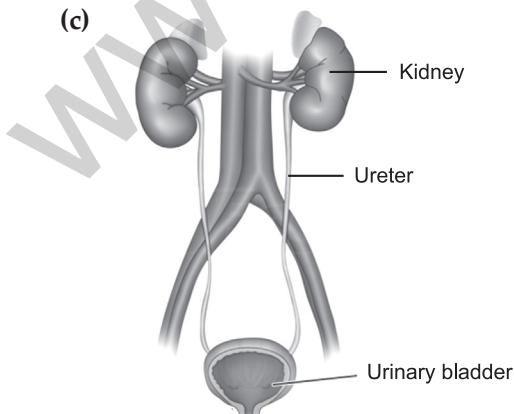
- (a) Define excretion.
 (b) Name the basic filtration unit present in the kidney.
 (c) Draw excretory system in human beings and label the following organs of excretory system which perform the following functions :
 (i) forms urine.
 (ii) is a long tube which collects urine from kidney.
 (iii) Store urine until it is passed out. [5]

Answer :

- (a) Red blood cells and white blood cells are the components of blood.
 (b) The oxygenated blood goes into the left atrium from there it goes to the left ventricle and then to all the body organs.
 (c) Valves prevents the backflow of blood from the ventricles to the atrium.
 (d) Walls of arteries are thick and they carry oxygenated blood whereas walls of vein are thin and they carry deoxygenated blood.

OR

- (a) The process of removing toxic waste from the human body is called excretion.
 (b) Nephron is the basic filtration unit present in the kidney.
 (c)



- (i) Kidney, (ii) Ureter, (iii) Urinary Bladder.

19. (a) Write the function of following parts in human female reproductive system :

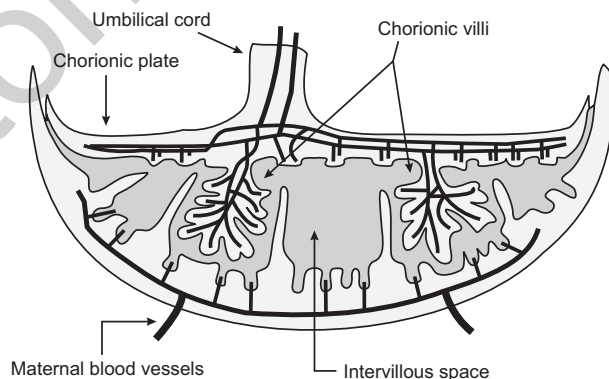
(i) Ovary (ii) Oviduct (iii) Uterus

- (b) Describe in brief the structure and function of placenta. [5]

Answer :

- (a) (i) **Ovary** : It produces egg for fertilisation. It secretes estrogen and progesterone. Estrogen regulates secondary sexual characters and progesterone controls the thickness of the lining of uterus.
 (ii) **Oviduct** : It is the site of fertilization and carries egg or fertilized ovum (zygote) to the uterus.
 (iii) **Uterus** : It helps to nourish the fertilised ovum that will develop into foetus. It holds the baby till it is ready for birth.

- (b) **Placenta** is a disc shaped structure on uterine wall before implantation of embryo. It provides oxygen and nutrients to the foetus.



It helps to remove waste also. The placenta is composed of both material tissues and tissue derived from the embryo. The chorion is the embryonic derived portion of the placenta. It is composed of fetal blood vessels and trophoblasts which are organized into finger-like structures called chorionic villi.

20. (a) A student is unable to see clearly the words written on the black board placed at a distance of approximately 3 m from him. Name the defect of vision the boy is suffering from. State the possible causes of this defect and explain the method of correcting it.

- (b) Why do stars twinkle ? Explain.

OR

- (a) Write the function of each of the following parts of human eye :
 (i) Cornea (ii) Iris (iii) Crystalline lens
 (iv) Ciliary muscles
- (b) Why does the sun appear reddish early in the morning ? Will this phenomenon be observed by an astronaut on the Moon ? Give reason to justify your answer. [5]

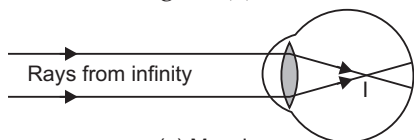
Answer :

- (a) The boy is suffering from myopia.

This defect is caused :

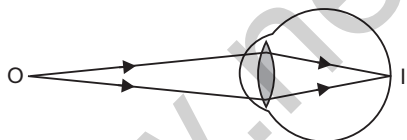
1. due to increase in length of eyeball, and
2. decrease in focal length of eye lens, when the eye is fully relaxed.

Correction : The image of a distant object (*i.e.*, at infinity) is formed in front of the retina of eye suffering from myopia as shown in figure (a).



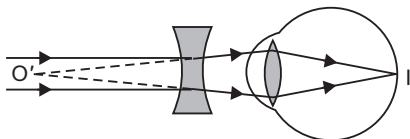
(a) Myopic eye

As the image of the object lying at infinity is not formed on the retina of the eye, so such object can not be seen clearly by the myopic eye. The far point of such an eye is near to the eye as shown in fig. (b).



(b) Far point of a myopic eye

This defect can be corrected by using a concave lens (minus powered) of suitable focal length. So, a man suffering from this defect wears spectacles having concave lens of suitable focal length. The concave lens diverges the rays of light entering the eye from infinity. Hence, this lens makes the rays of light appear to have come from the far point (O') of the defective eye as shown in figure (c).



(c) Correction of myopia

- (b) The twinkling of a star is due to atmospheric refraction of starlight. The atmospheric refraction occurs in a medium of gradually changing refractive index.

Since the atmosphere bends starlight towards the normal, the apparent position of the star is slightly different from its actual position. This apparent position of the star is not stationary, but keeps on changing slightly, as the physical conditions of the earth's atmosphere are not stationary. Since the stars are very distant, they approximate point-sized sources of light. As the path of light rays coming from the star goes on varying slightly, the apparent position of the star fluctuates and the amount of starlight entering the eye flickers *i.e.*, the star sometimes appear brighter, and at some other time, fainter, which is the twinkling effect.

OR

- (a) (i) **Cornea :** It is a thin membrane, covering the surface of eyeball, through which light enters. It acts as a primary lens, which provides the refraction for light rays entering the eye.
- (ii) **Iris :** It is a dark muscular diaphragm that controls the size of the pupil and is located just behind the cornea in the eye.
- (iii) **Crystalline lens :** It is converging in nature, made by the jelly-like proteinaceous material. The focal length of the crystalline lens is changed by the ciliary muscles. Its function is to focus the incoming light rays from the object on the retina using its refractive property.
- (iv) **Ciliary muscles :** It modifies the curvature and thereby the focal length of the eye lens by contracting or relaxing itself to focus the image of an object on the retina according to the distance of the object. It also holds the eye lens in position.

- (b) At the sunrise, the light from the sun has to travel the longest distance to reach the observer. Therefore, the sun

looks almost reddish because only red colour ($\lambda_b < \lambda_r$) which is least scattered, is received by our eye and appears to come from the sun. Hence, the appearance of the sun at the sunrise, near the horizon looks almost reddish.

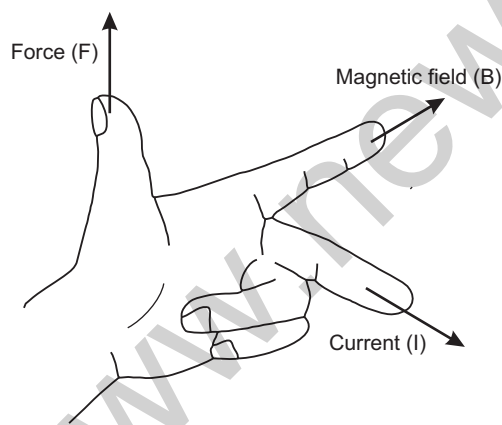
This phenomenon will not be observed by an astronaut on Moon, since there is no atmosphere so no scattering of light takes place, thus the Sun appears dark.

21. (a) State Fleming's left hand rule.
 (b) Write the principle of working of an electric motor.
 (c) Explain the function of following parts of an electric motor:
 (i) Armature (ii) Brushes (iii) Split ring.

[5]

Answer :

- (a) According to this rule, stretch the thumb, forefinger and middle finger of your left hand such that they are mutually perpendicular. If the first finger points in the direction of magnetic field and the second finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor.



- (b) **Principle of electric motor :** When a coil carrying current is placed in a magnetic field, it will experience a force. As a result of this force, the coil begins to rotate.
- (c) (i) **Armature :** It creates a magnetic field and the second role is to generate electromotive force.
 (ii) **Brushes :** Carbon brushes are used to make contact with the rotating rings of the commutator and through them to supply current to the coil.

- (iii) **Split ring :** Split rings are used to reverse the direction of current flowing through the coil every time the coil just passes the vertical position during a revolution.

SECTION-B

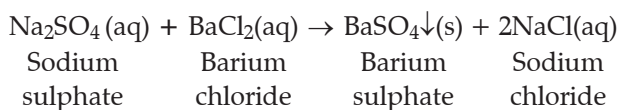
22. A student added few pieces of aluminium metal to two test tubes A and B containing aqueous solution of iron sulphate and copper sulphate. In the second part of her experiment, she added iron metal to another test tube C and D containing aqueous solution of aluminium sulphate and copper sulphate.

In which test tube or test tubes will she observe colour change ? On the basis of this experiment state which one is the most reactive metal and why? [2]

Answer : Only in test tubes A, B and D she will observe colour change from green to colourless in A because aluminium is more reactive than iron, it will displace iron. She will observe colour change from blue to colourless in test tube B. She will also observe colour change in test tube D from blue to light green. Aluminium is the most reactive metal because it displaces all the other three metals.

23. What is observed when a solution of sodium sulphate is added to a solution of barium chloride in a test tube ? Write equation for the chemical reaction involved and name the type of reaction in this case. [2]

Answer :



It is an example of double displacement reaction.

24. List the steps of preparation of temporary mount of a leaf Peel to observe stomata.[2]

Answer : 1. Remove a peel from lower surface of leaf using forceps and put it in water.

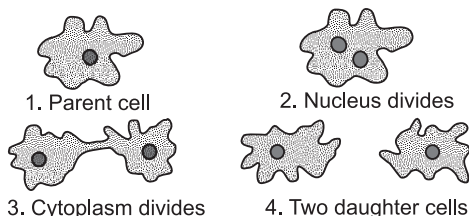
2. Put few drops of safranin stain in a watch glass.
3. After 2-3 mins. take out the peel and put it on a slide.
4. Put a drop of glycerine and put a coverslip over the peel.

25. Name the process by which an amoeba reproduces. Draw the various stages of its reproduction in a proper sequence.

OR

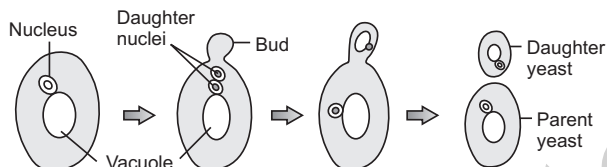
A student is viewing under a microscope a permanent slide showing various stages of asexual reproduction by budding in yeast. Draw diagram of what he observes in proper sequence. [2]

Answer : Amoeba reproduces by binary fission. It results in division of nucleus followed by division of cytoplasm.



Binary fission in Amoeba

OR



Budding in Yeast

26. An object of height 4.0 cm is placed at a distance of 30 cm from optical centre 'O' of a convex lens of focal length 20 cm. Draw a ray diagram to find the position and size of the image formed. Mark optical centre 'O' and principal focus 'F' on the diagram. Also find the approximate ratio of size of image to the size of object. [2]

Answer : Given, $f = + 20$ cm, $u = - 30$ cm,

$$h_o = 4 \text{ cm}$$

We know that,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{20} = \frac{1}{v} - \frac{1}{-30}$$

$$\frac{1}{v} = \frac{1}{60}$$

$$\Rightarrow v = 60 \text{ cm}$$

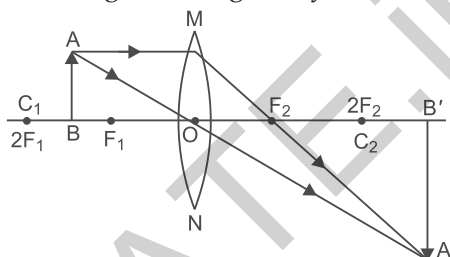
$$\text{So, } \frac{h_i}{h_o} = \frac{v}{u}$$

$$\frac{h_i}{4} = \frac{60}{-30}$$

$$\Rightarrow h_i = -8 \text{ cm}$$

Thus, the height or size of the image is 8 cm. The minus sign shows that this height is in the downward direction, that is, the image is formed below the axis.

Ratio of size of image to object = $-\frac{8}{4} = -2$
So image is enlarged beyond $2F_2$.



Object between F_1 and $2F_1$.

Image is formed beyond $2F_2$, real, inverted.

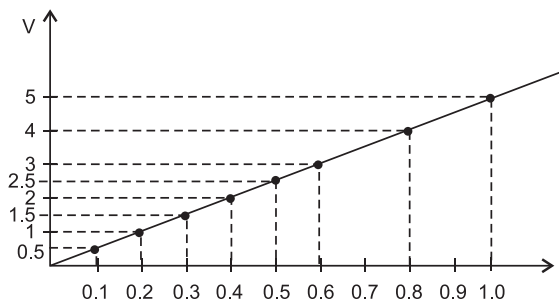
27. The values of current (I) flowing through a given resistor of resistance (R), for the corresponding values of potential difference (V) across the resistor are given below : [2]

V (volts)	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0
I (amperes)	0.1	0.2	0.3	0.4	0.5	0.6	0.8	1.0

Plot a graph between current (I) and potential difference (V) and determine the resistance (R) of the resistor.

Answer :

We know that, $V = IR$



From the graph, $V = 0.5$
 $I = 0.1$
 $0.5 = 0.1 \times R$
 $\frac{0.5}{0.1} = R$
 $R = 5 \Omega$

Science 2017 (Outside Delhi) Term II

SET I

Time allowed : 3 hours

Maximum marks : 90

SECTION – A

1. Write the molecular formula of the 2nd and the 3rd member of the homologous series whose first member is methane. [1]

Answer : Ethane C₂H₆

Propane C₃H₈

2. When a cell reproduces, what happens to its DNA ? [1]

Answer: During the process of reproduction, transmission of DNA from parents to offspring takes place. Before reproduction, DNA is replicated, which means two copies of DNA are produced. When the cell divides, the two copies are distributed equally between the two daughter cells so that similar amount and type of DNA is transferred from the parent cell to the daughter cells. It maintains the consistency in the amount and type of DNA in the living organism of a particular species.

3. In the following food chain, 100 J of energy is available to the lion. How much energy was available to the producer ? [1]

Plant → Deer → Lion

Answer : Plant → Deer → Lion

According to 10% law,

$$10\% \text{ of } x = 100$$

$$x = 1000 \text{ J in deer.}$$

$$10\% \text{ of } y = 1000$$

$$y = 10,000 \text{ J in Plant.}$$

4. An object is placed at a distance of 30 cm from a concave lens of focal length 15 cm. List four characteristics (nature, position, etc.) of the image formed by the lens. [2]

Answer : Given : $u = -30 \text{ cm}$, $f = -15 \text{ cm}$. (for concave lens)

We know that,

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{v} - \frac{1}{(-30)} = \frac{1}{(-15)}$$

$$\frac{1}{v} = \frac{-1}{15} - \frac{1}{30}$$

$$\frac{1}{v} = \frac{-2-1}{30} = \frac{-3}{30} = \frac{-1}{10}$$

$$v = -10 \text{ cm}$$

Characteristics of image :

- The image is formed at a distance of 10 cm from the concave lens on the left side.
- Image formed is virtual.
- Image formed is erect.
- The size of the image formed is diminished.

5. State two advantages of conserving

(i) forests, and (ii) wildlife. [2]

Answer : (i) Advantages of conserving forest :

- It supports life, purifies air.
- Holds the soils and thus prevents the soil erosion.

(ii) Advantage of conserving wildlife :

- Balances ecology and biodiversity.
- Provides important things to sustain life.

6. Explain two main advantages associated with water harvesting at the community level. [2]

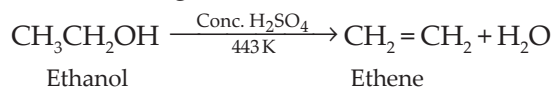
Answer : Two advantages associated with water harvesting at community level are :

- Water harvesting is an ideal solution to water problems in areas having inadequate water resources.
 - It improves the quality of water and helps in raising the ground water level.
7. Write the structural formula of ethanol. What happens when it is heated with excess of conc. H₂SO₄ at 443 K, ? Write the chemical equation for the reaction stating the role of conc. H₂SO₄ in this reaction. [3]

Answer : Structural formula of ethanol is :



When ethanol is heated with excess of conc. H₂SO₄ at 443 K it results in the dehydration of ethanol to give ethene.



Role of conc. H_2SO_4 : Conc. H_2SO_4 acts as a dehydrating agent which removes water from the ethanol.

8. **Distinguish between esterification and saponification reaction with the help of the chemical equations for each. State one use of each (i) esters, and (ii) saponification process.** [3]

Answer : Esterification is opposite of saponification. In esterification :



Whereas in saponification :



- (i) **Uses of Esters :** Esters are used in making perfumes.
 (ii) **Uses of saponification reaction :** Used in making soaps and soap products on a large scale.

9. **Write the number of periods and groups in the Modern Periodic Table. How does the metallic character of elements vary on moving (i) from left to right in a period, and (ii) down a group ? Give reason to justify your answer.** [3]

Answer : In the modern periodic table, there are 18 vertical columns known as **Groups** and 7 horizontal rows known as **Periods**.

Metallic character : It is defined as the tendency of an atom to lose electrons.

- (i) Across the period *i.e.*, from left to right, metallic character decreases.
 (ii) Down the group *i.e.*, from top to bottom, metallic character increases.

Reason : Across the period, the effective nuclear charge increases, thus decreasing its atomic radius. This favours the electronegativity and therefore the tendency to lose electrons is low. This accounts for the decrease in the metallic character. As we move down the group, the number of shells keep on increasing and therefore the atomic size increases and electronegativity decreases. This enhances the ability to lose electrons and therefore the metallic character increases.

10. Na, Mg and Al are the elements of the 3rd period of the Modern Periodic Table having group number 1, 2 and 13 respectively. Which one of these elements has the (a) highest valency, (b) largest atomic radius, and (c) maximum chemical reactivity ? Justify your answer stating the reason for each. [3]

Answer :

Sodium (Na), At. number 11, 2, 8, 1
 Magnesium (Mg), At. number 12, 2, 8, 2
 Aluminium (Al), At. number 13, 2, 8, 3

- (a) The element having the highest valency is Al, as it has 3 valence electrons.
 (b) The element with the largest atomic radius is Na as left to right atomic radius decreases.
 (c) The element with maximum chemical reactivity is Na as metallic character decreases left to right.

11. **Reproduction is one of the most important characteristics of living beings. Give three reasons in support of the statement.** [3]

Answer : Reproduction is an energy consuming process which is not essential for the survival of an individual. But it is highly essential for all the living beings because of the following reasons :

1. Reproduction helps in increasing the number of members of a population.
2. By replacing the dead members with the new ones, it minimizes the risk of extinction of a species.
3. It brings about variations in species, thus, leading to their evolution.

12. **What is vegetative propagation ? State two advantages and two disadvantages of this method.** [3]

Answer : Vegetative propagation is a mode of asexual reproduction in which new plants are obtained from vegetative parts of the plants such as shoots or stem for the propagation of new plants.

Two advantages of vegetative propagation are :

1. Plants which do not produce seeds are propagated by this method.
2. Vegetative propagation is a cheaper, easier and rapid method of propagation in plants than growing plants from their seeds. Plants grow very slowly and take 4 to 7 years to develop flowers when grown with their seeds.

Two disadvantages of vegetative propagation are :

1. As there is no genetic variation, there is no chance of development of new and better varieties.

2. The vegetatively propagated plants are more prone to diseases that are specific to the species.
13. List three techniques that have been developed to prevent pregnancy. Which one of these techniques is not meant for males? How does the use of these techniques have a direct impact on the health and prosperity of a family? [3]

Answer : Three techniques that have been developed to prevent pregnancy are :

- Mechanical Methods :** Include condoms, diaphragm, IUCDs, etc.
- Chemical Methods :** Include oral contraceptive pills, spermicide.
- Surgical Method :** Includes vasectomy and tubectomy.

The chemical methods are not meant for males.

The use of such contraceptive methods have various benefits, such as :

- Large size of families have a negative impact on the economic status of the family.
 - Having pregnancies at quick successions reduces mother's health and vitality. Use of contraceptive devices thus, effects the maternal health status.
 - Some contraceptive devices (such as condoms) are also helpful in preventing sexually transmitted diseases.
14. How did Mendel explain that it is possible that a trait is inherited but not expressed in an organism? [3]

Answer : Some traits that are inherited may not express themselves. Such hidden traits are known as recessive traits. Mendel explained this phenomenon with the help of monohybrid cross. In a monohybrid cross performed by Mendel, tall plant was crossed with a dwarf plant which produced all tall plants in F_1 progeny.

However, when these F_1 tall plants were crossed with each other, both tall and dwarf pea plants were obtained in F_2 generation. Reappearance of the dwarf pea plants in F_2 generation proves that the dwarf trait was inherited but not expressed in F_1 generation.

Parent	Tall (TT)	×	dwarf (tt)
		↓	
F_1 generation	Tt		Tt
		selfing	
F_2 generation	TT	Tt	Tt tt

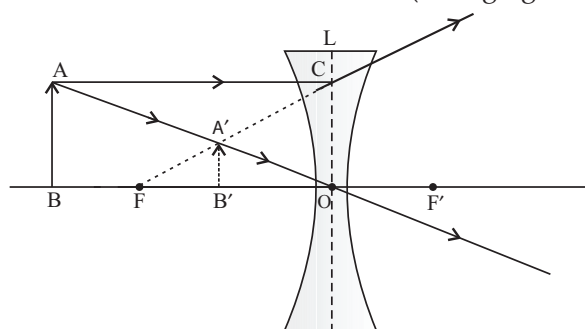
So, dwarfness traits of plants (pea plant) were not lost but are suppressed in the F_1 generation and thus reappears in F_2 generation.

15. "Evolution and classification of organisms are interlinked". Give reasons to justify this statement. [3]

Answer : Classification refers to the grouping and naming of organisms based on the similarities and difference in their characters. Classification is done on the basis of ancestral characteristics and derived characteristics. So as we move from simple life forms to the complex organisms, we are actually tracing the path of evolution. All life forms on earth have progressively changed during evolution. So the hierarchy develops during classification which throws the light on the evolutionary relationship among organisms. Common ancestors can also be predicted with the help of classification.

16. If the image formed by a lens for all positions of an object placed in front of it is always erect and diminished, what is the nature of this lens? Draw a ray diagram to justify your answer. If the numerical value of the power of this lens is 10 D, what is its focal length in the Cartesian system? [3]

Answer : It is a concave lens (diverging lens).



Power of a lens is given by the relation

$$P = \frac{1}{f(\text{in metre})}$$

$$\therefore P = 10 \text{ D}$$

$$\therefore f = \frac{1}{P} = \frac{1}{10} = 0.1 \text{ m}$$

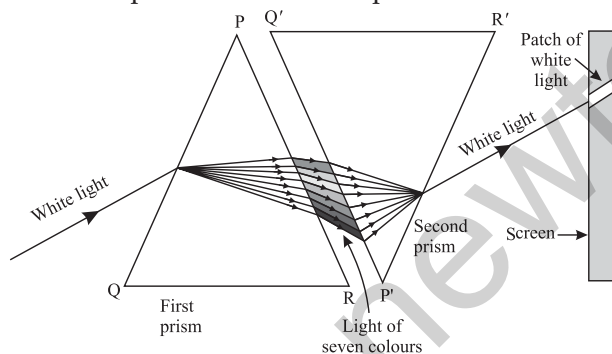
or - 10 cm, as lens is concave lens.

17. State the cause of dispersion of white light by a glass prism. How did Newton, using two identical glass prisms show that white light is made of seven colours? Draw a ray

diagram to show the path of a narrow beam of white light, through a combination of two identical prisms arranged together in inverted position with respect to each other, when it is allowed to fall obliquely on one of the faces of the first prism of the combination. [3]

Answer : When a beam of white light enters a prism, it gets refracted at point and splits into its seven constituent colours. This splitting of the white light occurs because of different angles of bending for each colour and this different angles of bending occurs because different components of light have different refractive indices when passing through the glass prism.

Firstly, Newton made white light to fall on a prism, this cause dispersion of white light into seven colours. Newton then placed an inverted prism in the path of a colour band of seven colours. Only a beam of white light comes out from the second prism. So, Newton concluded that white light comprises of seven component colours.



18. (a) Water is an elixir of life, a very important natural resource. Your science teacher wants you to prepare a plan for a formative assessment activity, "How to save water, the vital natural resource". Write any two ways that you will suggest to bring awareness in your neighbourhood, on how to save water.

(b) Name and explain any one way by which the underground water table does not go down further. [3]

Answer : (a) Water is one of the most precious natural resources that has varied importance in our lives. It is an essential component of the human body, and is used almost everywhere in our day to day activities such as cooking, washing, farming etc. It is an indispensable part of

our lives, without which the life on earth is not possible. However, the amount of fresh water available for sustaining life is very less, so it is very important to save water by the following ways :

1. Turning off the taps during brushing, washing clothes/utensils etc., and use of buckets instead of showers for bathing.
2. Reusing of water by storing water after washing fruits and vegetables for watering plants and cleaning cars.

(b) Underground water table can be recharged through rainwater harvesting. **Rainwater harvesting** is a process by which rain water is collected and stored for the purpose of recharging the ground water or for future use like for irrigation and agriculture. In India, rainwater harvesting is an old tradition which is followed till now in many parts of India. For example, bawris are traditional architectural rainwater harvesters that were built for collecting water in the state of Rajasthan.

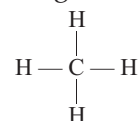
There are two ways of rainwater harvesting :

1. **Surface run off harvesting :** In urban areas, rain water that flows away from the surface can be collected and used for various purposes.
2. **Rooftop rainwater harvesting :** The rainwater on the roofs of the buildings is collected through canals that drains the water into ground reservoirs. This stored water is later utilised.

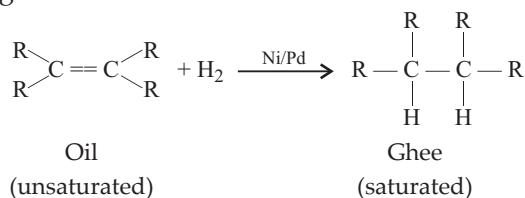
19. Why are certain compounds called hydrocarbons ? Write the general formula for homologous series of alkanes, alkenes and alkynes and also draw the structure of the first member of each series. Write the name of the reaction that converts alkenes into alkanes and also write a chemical equation to show the necessary conditions for the reaction to occur. [5]

Answer : Compounds consisting of carbon and hydrogen are known as hydrocarbons.

1. **Saturated hydrocarbons :** Alkanes (C_nH_{2n+2}) are the compounds of carbon which have single bond.



2. **Unsaturated hydrocarbons** : The compounds of carbon having double bonds are alkene (C_nH_{2n}) and those having triple bonds are alkyne (C_nH_{2n-2}). The reaction which converts unsaturated hydrocarbons to saturated hydrocarbons *i.e.*, alkenes to alkane is known as **hydrogenation reaction**. It is used to obtain ghee from oil.



20. (a) **Write the functions of each of the following parts in a human female reproductive system :**
 (i) Ovary (ii) Uterus (iii) Fallopian tube
 (b) **Write the structure and functions of placenta in a human female.** [5]

Answer :

(a) (i) **Functions of the Ovary :**

1. It produces female gametes (ova).
2. It secretes female sex hormones.

(ii) **Functions of Uterus :**

1. It supports and nourishes the developing foetus.
2. It expands according to the growth of the baby.

(iii) **Functions of Fallopian tubes :**

1. They carry eggs from the ovary to the uterus.
2. They act as the site for fertilisation.

(b) Placenta is the connecting link between the mother's body and the baby. It is a disc embedded in the uterine wall. This special tissue contains villi on the embryo's side of the tissue. The mother's end of placenta has blood spaces, which surrounds the villi. Placenta functions as a site of exchange of materials between the blood of mother to the baby. The developing embryo generates certain waste substances that are also removed through placenta. Thus, the placenta serves as the nutritive, respiratory and excretory organ of the foetus.

21. **With the help of one example for each, distinguish between the acquired traits and the inherited traits. Why are the traits/experiences acquired during the entire lifetime of an individual not inherited in the next generation ? Explain the reason of this fact with an example.** [5]

Answer :

S. No.	Acquired traits	Inherited traits
1.	Those traits that are developed by the individual during his lifetime.	Those traits which are present in an individual since birth.
2.	They are a result of changes in non-reproductive issues.	They are a result of changes in the DNA.
3.	They cannot be passed on to the progeny, <i>e.g.</i> , pierced ear, large muscle size etc.	They are transmitted in the progeny, <i>e.g.</i> , colour of eyes, skin or hair.

Traits can be passed on to the next generation only when they have some direct effect on the genes. The traits acquired during the lifetime of an individual cannot be inherited as they do not affect the genetic make up of an organism. In fact, these traits develop due to use and disuse of organs or due to direct effect of environment. Thus, they are not passed on to the next generation. For example, a wrestler develops large muscles because of his training programme, it does not mean that his offspring will necessarily have large muscles. Similarly, if a lady pierces her nose, the children produced to her will not have pierced nose by birth.

22. **Analyse the following observation table showing variation of image-distance (v) with object-distance (u) in case of a convex lens and answer the questions that follow without doing any calculations :**

S. No.	Object-Distance u (cm)	Image-Distance v (cm)
1.	- 100	+ 25
2.	- 60	+ 30
3.	- 40	+ 40
4.	- 30	+ 60
5.	- 25	+ 100
6.	- 15	+ 120

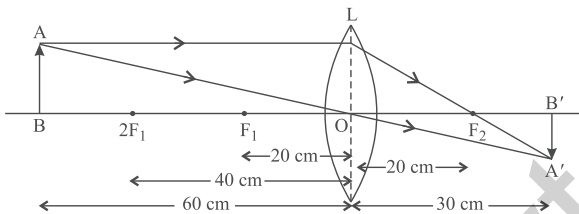
- (a) What is the focal length of the convex lens? Give reason to justify your answer.
 (b) Write the serial number of the observation which is not correct. On what basis have you arrived at this conclusion?
 (c) Select an appropriate scale and draw a ray diagram for the observation at S. No. 2. Also find the approximate value of magnification. [5]

Answer : (a) From the observation 3, the radius of curvature of the lens is 40 cm as distance of object and the distance of the image is same.

$$\therefore \text{Focal length, } f = \frac{R}{2} = \frac{40}{2} = 20 \text{ cm.}$$

- (b) S. No. 6 is not correct, as for this observation the object distance is between focus and pole and in such cases, the image formed is always virtual, but in this case real image is forming as the image distance is positive. hence, v should be negative

(c)

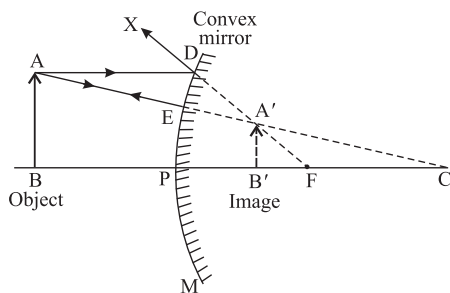


$$\text{Magnification} = \frac{v}{u} = \frac{+30 \text{ cm}}{-60 \text{ cm}} = -0.5$$

23. (a) If the image formed by a mirror for all positions of the object placed in front of it is always diminished, erect and virtual, state the type of the mirror and also draw a ray diagram to justify your answer. Write one use such mirrors are put to and why.
 (b) Define the radius of curvature of spherical mirrors. Find the nature and focal length of a spherical mirror whose radius of curvature is + 24 cm. [5]

Answer : (a) The type of the mirror is convex mirror. (diverging mirror)

The ray diagram is shown below :



Use of convex mirror : Convex mirror is used as rear view mirror in vehicles as it always produces virtual, erect and diminished image of an object. So, images of vehicles over a wide area can be seen easily in it.

- (b) **Radius of curvature :** The distance between the centre of curvature and pole of a spherical mirror is called radius of curvature.

Given : $R = + 24 \text{ cm}$

$$f = \frac{R}{2} = \frac{24}{2} = + 12 \text{ cm}$$

The mirror is convex mirror.

24. (a) A student suffering from myopia is not able to see distinctly the objects placed beyond 5 m. List two possible reasons due to which this defect of vision may have arisen. With the help of ray diagrams, explain

(i) Why the student is unable to see distinctly the objects placed beyond 5 m from his eyes.

(ii) The type of the corrective lens used to restore proper vision and how this defect is corrected by the use of this lens.

- (b) If, in this case, the numerical value of the focal length of the corrective lens is 5 m, find the power of the lens as per the new Cartesian sign convention. [5]

Answer : (a) Two possible reasons due to which this defect of vision may have arisen are :

1. Increase in curvature of the lens.
2. Elongation of the eyeball.

(i) A myopic eye has its far point nearer than infinity. It forms the image of a distant object in front of the retina as shown below :

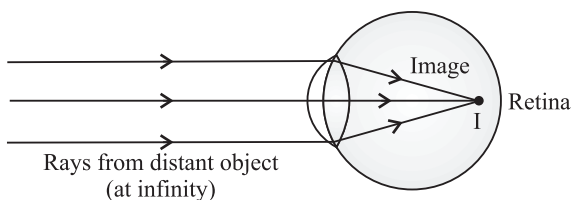


Image is formed in front of Retina

In the given case, student's far point is 5 m. So, image of the object placed beyond 5 m from his eyes is formed in front of the retina and object appears blurred. That is why the student is unable to see distinctly the objects placed beyond 5 m from his eye.

- (ii) Since a concave lens has an ability to diverge the incoming rays. Therefore, it is used to correct this defect of vision. The image is formed at the retina by the use of a concave lens of suitable power as shown.

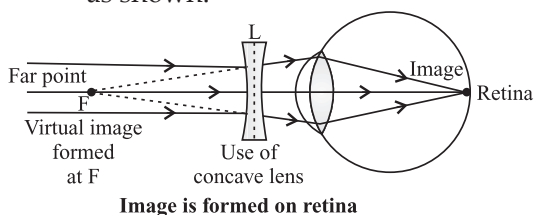


Image is formed on retina

(b) Power, $P = \frac{1}{f(m)}$
 $P = -\frac{1}{5} = -0.2 \text{ D.}$

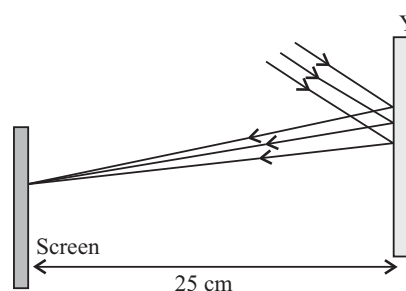
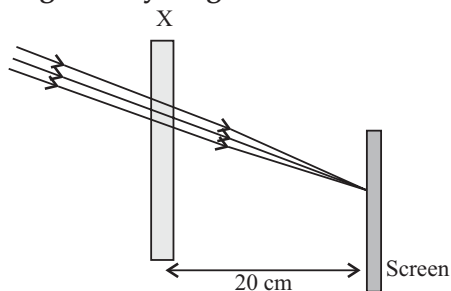
SECTION – B

25. When you add a few drops of acetic acid to a test-tube containing sodium bicarbonate powder, which one of the following is your observation? [1]
- No reaction takes place.
 - A colourless gas with pungent smell is released with brisk effervescence.
 - A brown coloured gas is released with brisk effervescence.
 - Formation of bubbles of a colourless and odourless gas.

Answer :

- (d) Formation of bubbles of a colourless and odourless gas.
26. While studying the saponification reaction, what do you observe when you mix an equal amount of colourless vegetable oil and 20% aqueous solution of NaOH in a beaker? [1]
- The colour of the mixture has become dark brown.
 - A brisk effervescence is taking place in the beaker.
 - The outer surface of the beaker has become hot.
 - The outer surface of the beaker has become cold.

30. Study the given ray diagrams and select the correct statement from the following : [1]



Answer :

- (c) The outer surface of the beaker has become hot.
27. A student requires hard water for an experiment in his laboratory which is not available in the neighbouring area. In the laboratory there are some salts, which when dissolved in distilled water can convert it into hard water. Select from the following groups of salts, a group, each salt of which when dissolved in distilled water will make it hard. [1]
- Sodium chloride, Potassium chloride
 - Sodium sulphate, Potassium sulphate
 - Sodium sulphate, Calcium sulphate
 - Calcium sulphate, Calcium chloride

Answer :

- (d) Calcium sulphate, Calcium chloride
28. To perform an experiment to identify the different parts of an embryo of a dicot seed, first of all you require a dicot seed. Select dicot seeds from the following group. [1]
- Wheat, Gram, Maize, Pea, Barley, Ground-nut
- Wheat, Gram and Pea
 - Gram, Pea and Ground-nut
 - Maize, Pea and Barley
 - Gram, Maize and Ground-nut

Answer :

- (b) Gram, Pea and Ground-nut
29. The following vegetables are kept in a basket :
 Potato, Tomato, Radish, Brinjal, Carrot, Bottle-gourd
- Which two of these vegetables correctly represent the homologous structures? [1]
- Carrot and Tomato
 - Potato and Brinjal
 - Radish and Carrot
 - Radish and Bottle-gourd

Answer :

- (c) Radish and Carrot

- (a) Device X is a concave mirror and device Y is a convex lens, whose focal lengths are 20 cm and 25 cm respectively.
- (b) Device X is a convex lens and device Y is a concave mirror, whose focal lengths are 10 cm and 25 cm respectively.
- (c) Device X is a concave lens and device Y is a convex mirror, whose focal lengths are 20 cm and 25 cm respectively.
- (d) Device X is a convex lens and device Y is a concave mirror, whose focal lengths are 20 cm and 25 cm respectively.

Answer :

- (d) Device X is a convex lens and device Y is a concave mirror, whose focal lengths are 20 cm and 25 cm respectively.
31. A student obtains a blurred image of a distant object on a screen using a convex lens. To obtain a distinct image on the screen he should move the lens [1]
- (a) away from the screen
 - (b) towards the screen
 - (c) to a position very far away from the screen.
 - (d) either towards or away from the screen depending upon the position of the object.

Answer :

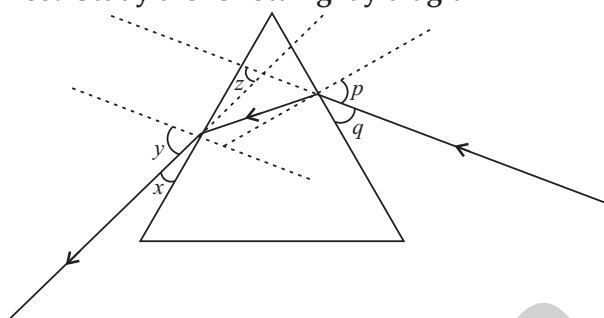
- (d) either towards or away from the screen depending upon the position of the object.
32. A student very cautiously traces the path of a ray through a glass slab for different values of the angle of incidence ($\angle i$). He then measures the corresponding values of the angle of refraction ($\angle r$) and the angle of emergence ($\angle e$) for every value of the angle of incidence. On analysing these measurements of angles, his conclusion would be : [1]

- (a) $\angle i > \angle r > \angle e$
- (b) $\angle i = \angle e > \angle r$
- (c) $\angle i < \angle r < \angle e$
- (d) $\angle i = \angle e < \angle r$

Answer :

- (b) $\angle i = \angle e > \angle r$

33. Study the following ray diagram



In this diagram, the angle of incidence, the angle of emergence and the angle of deviation respectively have been represented by [1]

- (a) y, p, z
- (b) x, q, z
- (c) p, y, z
- (d) p, z, y

Answer :

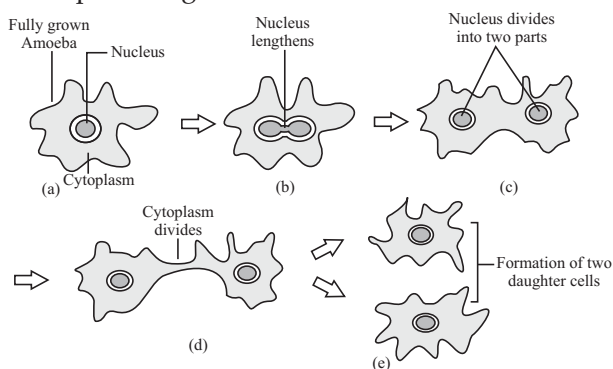
- (c) p, y, z

34. Mention the essential material (chemicals) to prepare soap in the laboratory. Describe in brief the test of determining the nature (acidic/alkaline) of the reaction mixture of saponification reaction. [2]

Answer : The essential chemicals required to prepare soap in the laboratory are oil and sodium hydroxide solution. In order to determine the nature of the reaction mixture of saponification reaction, we dip red litmus paper into it which will turn blue after a while indicating that it is a basic mixture.

35. Draw in sequence (showing the four stages), the process of binary fission in Amoeba. [2]

Answer : Binary Fission in Amoeba is asexual type of reproduction in which the organism splits directly into two equal-sized offsprings, each with a copy of the parent's genetic material.



36. A student focuses the image of a candle flame, placed at about 2 m from a convex

lens of focal length 10 cm, on a screen. After that he moves gradually the flame towards the lens and each time focuses its image on the screen. [2]

- In which direction does he move the lens to focus the flame on the screen ?
- What happens to the size of the image of the flame formed on the screen ?
- What difference is seen in the intensity (brightness) of the image of the flame on the screen ?

(d) What is seen on the screen when the flame is very close (at about 5 cm) to the lens ?

Answer :

- He moves the lens away from the screen to focus the image.
- Size of the image increases.
- The intensity of image decreases as the flame moves towards the lens.
- Nothing can be seen as the image formed is virtual.

Science 2017 (Outside Delhi) Term II

SET II

Note : Except for the following questions, all the remaining questions have been asked in previous set.

- Write the molecular formula of the 2nd and 3rd member of the homologous series whose first member is ethene. [1]

Answer : 1. Propene : C₃H₆
 2. Butene : C₄H₈

- Newly formed DNA copies may not be identical at times. Give one reason. [1]

Answer : During the process of replication of DNA, most of the base sequences in the new copies are identical to those in the parent DNA. However, some changes can occur either due to mutation or due to minor errors during replication process. Thus, the newly formed DNA copies may not be identical at times.

- In the following food chain, plants provide 500 J of energy to rats. How much energy will be available to hawks from snakes ?
 Plants → Rats → Snakes → Hawks [1]

Answer : 500 J of energy is available to the rats thus according to 10% law, 50 J energy will be available to snakes and 5 J energy will be available to hawk.

- An object is placed at a distance of 15 cm from a convex lens of focal length 20 cm. List four characteristics (nature, position, etc.) of the image formed by the lens. [2]

Answer : Given, $u = -15$ cm, $f = 20$ cm

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{20} = \frac{1}{v} + \frac{1}{15}$$

$$\frac{1}{v} = \frac{1}{20} - \frac{1}{15}$$

$$v = -60 \text{ cm.}$$

Four characteristics of the image formed by the lens are :

- Virtual, 2. Erect, 3. At a distance of 60 cm on the same side of the lens as the object, 4. Enlarged or magnified image.
- Why is an equitable distribution of resources essential in a society ? List two forces which are against such distribution. [2]

Answer : Equitable distribution of resources is when every individual gets an equal right to access all the available resources and is benefited directly or indirectly. It also avoids the division of society to an extent.

The main forces which work against equitable distribution :

- Lack of natural resources.
- Excessive consumption by the rich.
- Profit motive of people exploiting resources.
- Corruption. (Any two)
- Why must we conserve our forests ? List two factors responsible for causing deforestation. [2]

Answer : We must conserve forests because we derive countless benefits such as food, timber etc. from them and they are an important component of our ecosystem.

Factors that contribute to deforestation are as follows :

- Large scale development projects have contributed to the loss of forests.

2. Forests are cleared on a large scale to meet the growing needs of industrialisation, especially fuel wood and for other forest products and minerals.
3. Mining has also contributed to deforestation.
4. With the increase in population and growing demand for commercial crops and the need for more and more land for agriculture, has lead to deforestation.
5. Growing urbanisation, trees are cut to establish cities, to lay down infrastructure.

9. What happens when

(write chemical equation in each case)

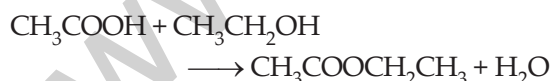
- (a) ethanol is burnt in air ?
- (b) ethanol is heated with excess conc. H_2SO_4 at 443 K ?
- (c) a piece of sodium is dropped into ethanol ? [3]

Answer :

- (a) $CH_3CH_2OH + 3O_2 \xrightarrow{\text{Air}} 2CO_2 + 3H_2O + \text{Heat} + \text{light}$
- (b) $CH_3CH_2OH \xrightarrow[\Delta, 443k]{\text{Conc. } H_2SO_4} CH_2 = CH_2 + H_2O$
- (c) $2 CH_3CH_2OH + 2Na \longrightarrow 2 CH_3CH_2ONa + H_2 \uparrow$

10. Explain esterification reaction with the help of a chemical equation. Describe an activity to show esterification. [3]

Answer : The reaction of carboxylic acid with alcohol forms an ester. This process of formation of ester is called esterification.



Activity :

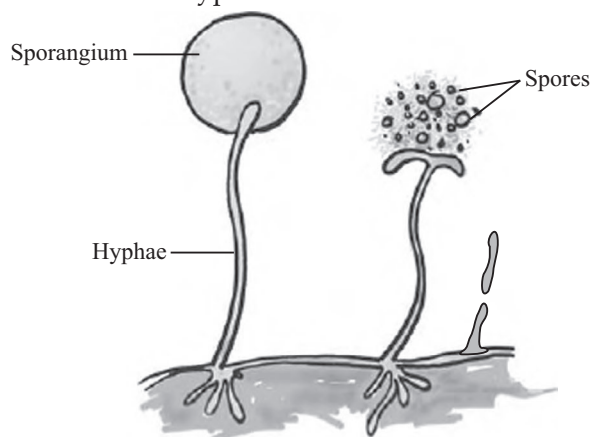
1. Take 1 ml of ethanol and 1 ml of glacial acetic acid in a boiling tube and mix the contents well.
2. Add few drops of conc. H_2SO_4 to it.
3. Warm the contents on a water bath for a few minutes.
4. Now pour the solution in a beaker containing 20-50 mL of water.
5. A sweet fruity smell indicating formation of an ester is observed.

11. With the help of two suitable examples, explain why certain experiences and traits earned by people during their lifetime are not passed on to their next generations. When can such traits be passed on ? [3]

Answer : The experiences and qualifications that a person earns during their lifetime are examples of acquired traits. These traits are not inherited, they do not affect the genetic makeup. They are developed due to direct affect of the environment. Thus they are not passed to the next generation. Piercing of ears or large sized muscles of the wrestler are not carried by the next generation. Traits can only be passed on to the next generation only when they have some direct effect on the genes. For example, mutation is caused in the germ cells of a person due to exposure to some harmful radiations, it is likely that the mutation will be passed on to the subsequent generations.

14. Describe reproduction by spores in Rhizopus. [3]

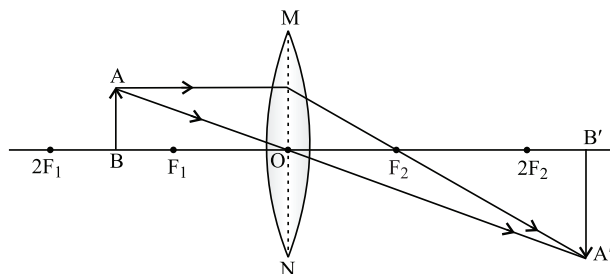
Answer : Rhizopus is a fungus that reproduces by spore formation. The fungal hyphae gives rise to a globular structure known as sporangium. The sporangium gives rise to several spores by repetitive division of its nucleus. Each nucleus gets surrounded by a part of cytoplasm and thus develops into a spore. These spores then mature inside the sporangium. Once they are fully mature, the sporangium bursts to release these spores in the environment. Since the spores disperse through air, they can land on various sites. These sites may be favourable or unfavourable. During unfavourable conditions, these spores are protected by a tough coat. Once favourable conditions return, they germinate and grow into new hyphae.



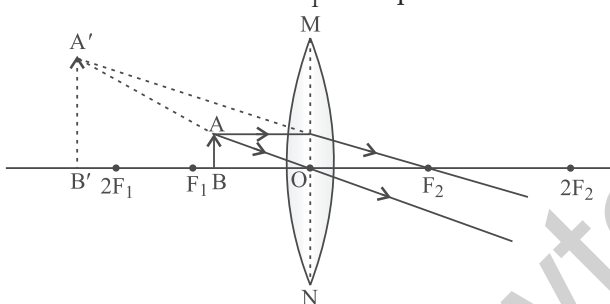
Spore formation in Rhizopus

16. Draw ray diagrams to show the formation of three times magnified (a) real, and (b) virtual image of an object by a converging lens. Mark the positions of O, F and 2F in each diagram. [3]

Answer : (a) For real image : To get three times magnified image, the object is placed between F_1 & $2F_1$

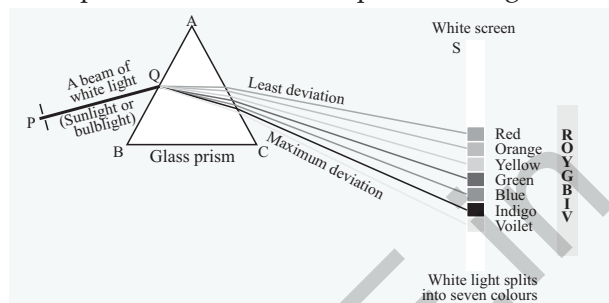


(b) For virtual image : To get three times magnified image, the object is placed between the F_1 and optical centre O.



17. What is 'dispersion of white light' ? State its cause. Draw a ray diagram to show the dispersion of white light by a glass prism.

Answer : The phenomenon of splitting of white light into its seven constituent colours, when it passes through a glass prism, is called the dispersion of light. [3]



When a beam of white light enters a prism, it gets refracted at point and splits into its seven constituent colours *i.e.*, violet, indigo, blue, green, yellow, orange and red *i.e.*, VIBGYOR. This splitting of light rays occurs because of the different angles of bending for each colour and this different angles of bending occurs because different components of light have different refractive indices or speed of different colours is different in glass when passing through the glass prism. When a beam of sunlight is allowed to fall on one of the rectangular surfaces of the glass prism, we obtain a coloured spectrum with red and violet colour at its extremes.

Science 2017 (Outside Delhi) Term II SET III

Note : Except for the following questions, all the remaining questions have been asked in previous sets.

- Write the molecular formula of the 2nd and 3rd member of the homologous series where the first member is ethyne. [1]
Answer : 1. $CH_3C \equiv CH$ (propyne), $n = 3$
 2. $CH_3CH_2C \equiv CH$ (Butyne), $n = 4$
- Why is variation important for a species? [1]

Answer : Variation is necessary for the survival of species as variation makes species more adapted to survive with the changing environmental conditions. The variant species are more adapted to changing environment. Therefore, they can

survive better and reproduce to pass the genes to the offsprings.

- In the following food chain, 20,000 J of energy was available to the plants. How much energy would be available to man in this chain ?

Plants → Sheep → Man [1]

Answer : In the given food chain, according to 10% law,

Plants → Sheep → Man
 20,000 J 2000 J 200 J

Amount of energy available to the man is 200 J.

- You being an environmentalist are interested in contributing towards the conservation of natural resources. List four activities that you can do on your own. [2]

Answer : We can bring following activities in practice to conserve the natural resources :

1. We can reuse and recycle the paper products, so that cutting of trees could be reduced.
 2. We can reduce the consumption of water by avoiding its wastage in our day to day activities.
 3. We can also adopt water harvesting like rain water harvesting.
 4. We can reduce the consumption of fossil fuels by using public transport, carpool and switching off vehicles at signals.
6. **Why are coal and petroleum categorised as natural resources ? Give a reason as to why they should be used judiciously. [2]**

Answer : Natural resources are those living and non-living sources available in our environment which are exploited to meet the human requirements. Since coal and petroleum are actually the fossils of the dead plants and animals respectively, hence considered as natural resources.

Both coal and petroleum are used as important sources of energy since long time. Both these fossil fuels were formed millions of years ago from the degradation of biomass. Since these fossil fuels are non-renewable in nature and they have limited reserves, therefore they must be used judiciously, otherwise they will get exhausted very soon.

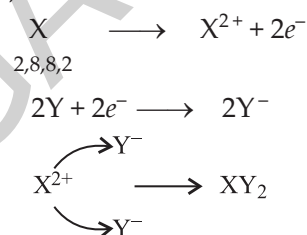
9. **What is periodicity in properties of elements with reference to the Modern Periodic Table ? Why do all the elements of the same group have similar properties ? How does the tendency of elements to gain electrons change as we move from left to right in a period ? State the reason of this change. [3]**

Answer : The occurrence of the elements with similar properties after certain regular intervals when they are arranged in increasing order of atomic number is called **periodicity**. The periodic repetition of the properties is due to the recurrence of similar valence shell configuration after regular interval.

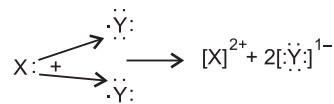
The elements in a group have same valence electrons thus similar chemical properties. In a period, tendency to gain electrons increases from left to right. This tendency increases because the hold of nucleus on the outermost electrons becomes weak thus it becomes easy to eject the electron.

10. **Write the electronic configuration of two elements X and Y whose atomic numbers are 20 and 17 respectively. Write the molecular formula of the compound formed when element X reacts with element Y. Draw electron-dot structure of the product and also state the nature of the bond formed between both the elements. [3]**

Answer : X = 20; 2, 8, 8, 2
Y = 17; 2, 8, 7



Electron-dot structure :



The nature of bond will be ionic.

12. **What is an organic evolution ? It cannot be equated with progress. Explain with the help of a suitable example. [3]**

Answer : Organic evolution refers to the gradual changes that occur in living organisms over time. It is the result of change in the genetic makeup of the organism due to mutation and other sources of variations. The favourable mutations are accepted by nature and provide the organism an adaptive advantage, leading to its evolution. Evolution cannot always be equated to progress because it does not always lead to the formation of a new species. In fact, most of the times, it leads to the generation of diversity. One species does not necessarily get eliminated to give rise to a new ones in prevailing environments. Also, the newly formed species may have complex organisation because of evolution but it cannot be considered better than the earlier

species. Many older and simpler designs still survive in the nature. For example, bacteria are one of the simplest life forms on earth and still they can survive in the most adverse conditions, such as hot springs, deep sea thermal vents etc. Therefore, having more complex body designs does not make any species superior to others.

13. List the two types of reproduction. Which one of the two is responsible for bringing in more variations in its progeny and how? [3]

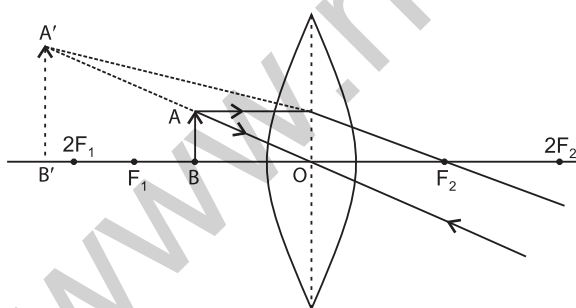
Answer : Reproduction methods are of two types : Sexual and Asexual. Out of these, sexual reproduction brings more variation in organisms. In sexual reproduction fusion of male and female gametes from different organisms occurs. Since the fusion of gametes come from two different individuals, the offsprings exhibit more diversity of characters. Also during gamete formation, meiosis occurs which brings new combinations of genes. Both these factors lead to more variations in the progeny.

16. "A lens can form a magnified erect image as well as magnified inverted image of an object placed in front of it." State the nature of this lens and draw ray diagrams to justify the above statement. Mark the positions of O, F and 2F in the diagram.

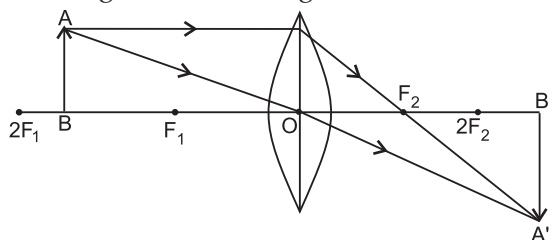
Answer : Convex/Converging lens.

Two ray diagrams are drawn to show it—

- (a) When object is placed between O and F_1 , the image formed is magnified, Virtual and erect.

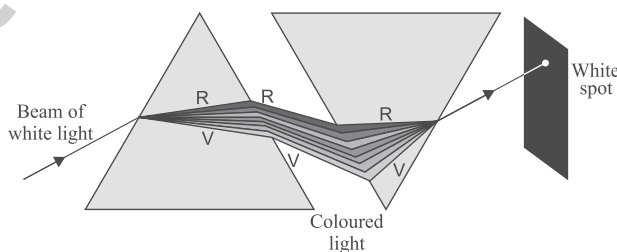


- (b) When object is placed between F and 2F, the image formed is magnified and inverted.



17. What is "dispersion of white light" ? Draw a labelled diagram to illustrate the recombination of the spectrum of white light. Why is it essential that the two prisms used for the purpose should be identical and placed in an inverted position with respect to each other ? [3]

Answer : The phenomenon of splitting of white light into its constituent colours on passing through a prism is known as the dispersion of white light. This splitting of the light rays occurs because of the different angles of bending for each colour and this different angles of bending occurs because different component of light faces different refractive index (or speed of different colours is different) when passing through the glass prism.



It is essential that the two prisms used for the purpose should be identical and placed in an inverted position with respect to each other so that the second prism completely nullifies the dispersion caused by the first prism and we get pure white light.

SECTION – A

1. Write the molecular formula of first two members of homologous series having functional group-Cl. [1]

Answer : The general formula for the homologous series of functional group -Cl is $C_nH_{2n+1}Cl$.

1. CH_3Cl
 2. CH_3CH_2Cl
 2. Name the method by which spirogyra reproduces under favourable conditions. Is this method sexual or asexual ? [1]

Answer : Under favourable conditions, spirogyra reproduces by fragmentation. This is an asexual method of reproduction.

3. What is an ecosystem ? [1]

Answer : An ecosystem is a self sustaining system where biotic and abiotic organisms of various communities interact with each other. Ponds, forests, grasslands etc., are a few examples of ecosystem.

4. An object is placed at a distance of 30 cm in front of a convex mirror of focal length 15 cm. Write four characteristics of the image formed by the mirror. [2]

Answer : Given : $u = -30$ cm, $f = 15$ cm.

We know that, $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

$$\frac{1}{v} = \frac{1}{15} + \frac{1}{30} = \frac{2+1}{30} = \frac{3}{30}$$

$$v = 10 \text{ cm}$$

Characteristics of image :

1. Image formed is erect.
 2. Image formed is small in size.
 3. Image formed is virtual.
 4. Image is formed at a distance of 10 cm behind the mirror between focus and pole.
5. What is sustainable management ? Why is reuse considered better in comparison to recycle ? [2]

Answer : Sustainable management is a resource management technique which aims to conserve the resource, use them efficiently and avoid their misuse for individual purpose such that they are conserved for the future.

Reuse is better than recycle because of following reasons :

1. Recycling needs some processes to use the same material again.
 2. Reuse saves energy by using same material again without any changes.
 3. Reuse prevents environmental pollution by not creating any waste.
 4. Reuse saves cost as material is used again without any process.
6. Management of forest and wildlife resources is a very challenging task. Why ? Give any two reasons. [2]

Answer : Management of the forest and wildlife resources is considered as a challenging task because :

1. There are many stakeholders of forest. They are those people who are directly or indirectly involved in forest. Management of forest and wildlife has

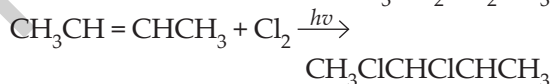
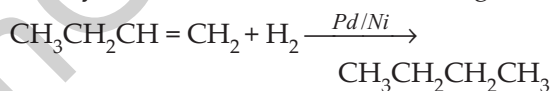
to take into account the interests of all these stakeholders which becomes a challenging task.

2. Industries would consider the forest as merely a source of raw material for its factories and huge interest groups lobby the government for access to these raw materials at artificially low rates which further poses a challenge to manage the forest and wildlife resources.
7. Two carbon compounds X and Y have the molecular formula C_4H_8 and C_5H_{12} respectively. Which one of these is most likely to show addition reaction ? Justify your answer. Also give the chemical equation to explain the process of addition reaction in this case. [3]

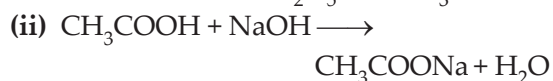
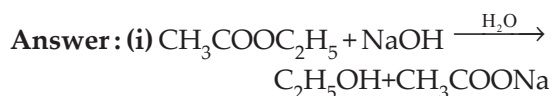
Answer : $X = C_4H_8$ is an alkene.

$Y = C_5H_{12}$ is an alkane.

X being an alkene *i.e.*, butene is unsaturated compound and will show addition reaction as they have free electrons for bonding.



8. Complete the following chemical equations : [3]



9. Write the names given to the vertical columns and horizontal rows in the Modern Periodic Table. How does the metallic character of elements vary on moving down a vertical column ? How does the size of atomic radius vary on moving left to right in a horizontal row ? Give reason in support of your answer in the above two cases. [3]

Answer : Vertical columns in Modern periodic table are called **groups** and

horizontal rows are called **periods**. As we move down the group metallic character increases as the atomic size increases, force of attraction between nucleus and outermost shell decreases so tendency to lose ions increases. When we move left to right in period, the number of electrons in the same shell increases leading to greater electrostatic attraction between nucleus and outermost electron. This increased attraction pulls the outermost electron closer to the nucleus, thereby decreasing the atomic size.

10. An element P (atomic number 20) reacts with an element Q (atomic number 17) to form a compound. Answer the following questions giving reason :

Write the position of P and Q in the Modern Periodic Table and the molecular formula of the compound formed when P reacts with Q. [3]

Answer : P = 20 : 2, 8, 8, 2

Q = 17 : 2, 8, 7

P = Period 4 and Group 2

Q = Period 3 and Group 17

Hence formula of the compound formed between P and Q is PQ_2 .

11. What happens when : [3]

(a) Accidentally, Planaria gets cut into many pieces ?

(b) Bryophyllum leaf falls on the wet soil ?

(c) On maturation sporangia of Rhizopus bursts ?

Answer :

(a) When planaria gets cut into many pieces, it will undergo a process known as regeneration due to which each piece will grow into a new Planaria organism.

(b) When Bryophyllum leaf falls on the wet soil, the buds that are produced in the notches along the leaf will develop into new plants by the process known as vegetative propagation.

(c) When the sporangia of Rhizopus bursts on maturation, the spores present inside it spread in the open environment. Then, with the help of different agents, they are carried to different places and

when they land on a favourable surface, they start growing and produce new organism.

12. State the basic requirement for sexual reproduction. Write the importance of such reproduction in nature. [3]

Answer : The basic requirements for sexual reproduction to take place is the involvement of two parents and fusion of their haploid gametes. In the sexual reproduction, a new individual is formed which is diploid in nature, the gametes, one from the male parent and the other from the female parent. Since the new individual formed is diploid in nature, the gametes must be formed by meiosis, so that chromosome number can be reduced to half. When fusion of gametes occurs, the nuclei of these two gametes fuse and the chromosome number is then restored to normal. The zygote, thus, formed is diploid in nature.

Importance of sexual reproduction :

1. Sexual reproduction involves fusion of male and female gametes from both the parents, thus results in genetic variations in the offsprings.
2. Sexual reproduction promotes diversity of characters in offsprings by providing genetic variations.
3. These genetic variations, thus lead to evolution of species as well as allow the organisms to become better adapted in the changing environment.

13. State the changes that take place in the uterus when :

(a) Implantation of embryo has occurred.

(b) Female gamete/egg is not fertilised. [3]

Answer :

(a) When implantation has occurred in uterus of the mother, the inner lining of the uterus thickens and is richly supplied with the blood vessels to provide nourishment to the growing embryo.

(b) If the egg is not fertilised, it lives for about one day. Since, the thickened uterus lining is no more required, it will slowly breakdown and comes out through the vagina as blood and mucus known as menstruation which lasts for about two to eight days.

14. Distinguish between the acquired traits and the inherited traits in tabular form, giving one example for each. [3]

Answer :

S. No.	Acquired traits	Inherited traits
1.	Acquired traits are those that are developed by an individual during his/her life time.	Inherited traits are the qualities or characteristics present in an individual since birth.
2.	They are the result of changes in non-reproductive tissues.	They are the result of changes in the DNA.
3.	They cannot be passed on to the progeny, e.g., Pierced ear, large muscle size etc.	They are transmitted to the progeny. e.g., Colour of eyes, skin or hair colour etc.

15. Explain with the help of an example each, how the following provide evidences in favour of evolution : [3]

- (a) Homologous organs
(b) Analogous organs
(c) Fossils

Answer :

- (a) **Homologous organs** : These organs are similar in form but perform different functions in different organisms. These organs provide strong evidences in favour of evolution. For example : the bone structure observed in the fore limbs of birds and bats, flippers of dolphins and arms of human beings are similar and have same pentadactyl plan but they perform different functions.
- (b) **Analogous organs** : These organs have different origin and different basic structure but perform same functions. For example, wings of birds and wings of bat have different structures but perform same function of flying. Thus, these organs provide evidences for evolution that they are different in origin but evolved to perform same function to survive in hostile environmental conditions.
- (c) **Fossils** : Fossils are the preserved remains or traces of animals, plants and other organisms from the remote

past. For example, Archaeopteryx is a connecting link between birds and reptiles and it suggests that the present animals have evolved from the existing ones through the process of continuous evolution.

16. An object 4 cm in height, is placed at 15 cm in front of a concave mirror of focal length 10 cm. At what distance from the mirror should a screen be placed to obtain a sharp image of the object. Calculate the height of the image. [3]

Answer : Given : $u = -15$ cm, $f = -10$ cm, $h_o = 4$ cm

Using the mirror formula

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{v} - \frac{1}{15} = \frac{-1}{10}$$

$$\frac{1}{v} = \frac{-1}{10} + \frac{1}{15}$$

$$\frac{1}{v} = \frac{-15+10}{150} = \frac{-5}{150}$$

$$v = -30 \text{ cm}$$

Thus, to obtain a sharp image of the object, the screen should be placed in front of the mirror at a distance of 30 cm.

Now, $m = \frac{-v}{u} = \frac{\text{height of image}}{\text{height of object}}$

$$m = -\left(\frac{-30}{-15}\right) \Rightarrow m = -2$$

or $-2 = \frac{h_i}{4} \Rightarrow h_i = -8 \text{ cm}$

∴ Height of the image is 8 cm. (inverted)

17. Due to gradual weakening of ciliary muscles and diminishing flexibility of the eye lens a certain defect of vision arises. Write the name of this defect. Name the type of lens required by such persons to improve the vision. Explain the structure and function of such a lens. [3]

Answer : The defect caused due to gradual weakening of ciliary muscles and diminishing flexibility of the eye lens is **presbyopia**. Presbyopia is the defect of eye in which a person cannot see nearby

objects comfortably and distinctly without corrective eye glasses. A presbyopic eye has its near point greater than 25 cm and gradually increases as the eye becomes older. The type of lens required by such person to improve the vision is bifocal lens. A bifocal lens consists of both convex and concave lenses. The convex lens used in bifocal lens is used to correct hypermetropia (far sightedness) and concave lens is used to correct myopia (near sightedness).

18. You have been selected to talk on "Ozone layer and its protection" in the school assembly on 'Environment Day.' [3]

- (a) Why should ozone layer be protected to save the environment ?
- (b) List any two ways that you would stress in your talk to bring in awareness amongst your fellow friends that would also help in protection of ozone layer as well as the environment.

Answer :

- (a) Ozone layer is a rich zone of ozone found in upper atmosphere. It helps in shielding the earth from the harmful UV radiations. If ozone layer gets depleted, UV radiations can directly reach the earth's surface and drastically affect the life on earth. For instance, UV radiations coming from sun cause skin cancer. So, it is very important to protect the ozone layer so as to save our environment.
- (b) Some of the ways to protect and stop the depletion of the ozone layer include not buying products in aerosol cans, maintaining air-conditioning filters and units. In order to halt the depletion of the ozone layer, countries around the world have banned the use of chlorofluorocarbons and other ozone depleting substances. These compounds produce chlorine and bromine atoms high in the atmosphere, and these atoms react with ozone and destroy it. By reducing the use of fluorescent lights, by minimising the use of vehicles to limit the emission of harmful gases that cause damage to the ozone layer, we can contribute to its protection.

19. Soaps and detergents are both types of salts. State the difference between the two. Write the mechanism of the cleansing action of soaps. Why do soaps not form lather (foam) with hard water ? Mention any two problems that arise due to the use of detergents instead of soaps. [5]

Answer :

S. No.	Soap	Detergents
1.	Soaps are sodium salts of long chain carboxylic acids.	Detergents are sodium salt of long chain benzene sulphonic acids.
2.	The ionic group in soap is COONa^+	The ionic groups in detergents is SO_3^- , Na^+
3.	Soaps are not useful when water is hard.	Detergent can be used for washing purpose even when water is hard.
4.	Soaps are biodegradable.	Some of the detergents are non-biodegradable.
5.	Soaps have relatively weak cleansing action.	Detergents have strong cleansing action.

Mechanism of the cleansing action of soaps :

The dirt present on clothes is organic matter and insoluble in water. Therefore it cannot be removed by only washing with water. When soap is dissolved in water, its hydrophobic ends attach themselves to the dirt and remove it from the cloth. Then, the molecules of soap arrange themselves in micelles form and trap the dirt at the centre of the cluster. These micelles remain suspended in the water. Hence, the dust particles are easily rinsed away by water.

Soaps do not form lather with hard water :

Soap is a sodium or potassium salt of long chain fatty acids. Hard water contains salts of calcium and magnesium. When soap is added to hard water, calcium and magnesium ions present in water displace sodium or potassium ion present in soap forming insoluble substance called scum. A lot of soap is wasted in this process.

Problems that arise due to the use of detergents instead of soap :

1. Detergents being non-biodegradable, they accumulate in the environment causing pollution. In soil, the presence of detergents leads to pH changes making soil infertile.
 2. The entry of detergents into food chain leads to bio-accumulation in living beings and tends towards serious health issues.
20. (a) Name the organ that produces sperms as well as secretes a hormone in human males. Name the hormone it secretes and write its functions.
- (b) Name the parts of the human female reproductive system where fertilisation occurs.
- (c) Explain how the developing embryo gets nourishment inside the mother's body. [5]

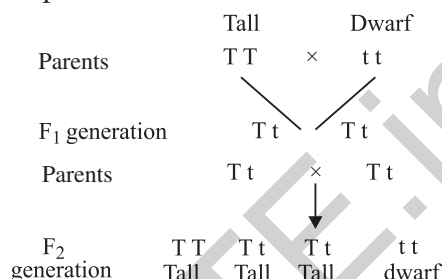
Answer :

- (a) The organ that produces sperms as well as secretes male hormones is testis. The hormone secreted by it is testosterone. Its important functions are as follows :
1. It stimulates sperm production.
 2. It stimulates the development of secondary sexual characters in males like growth of facial hairs, low pitch voice, etc.
 3. It involves the development, maturation and functioning of male accessory sex organs like vas deferens and seminal vesicles.
- (b) In human females reproductive system, the process of fertilisation takes place in one of the fallopian tubes.
- (c) The embryo gets nutrition from the mother's blood with the help of a special tissue called placenta. Placenta is a vascular membranous organ that connects the developing foetus to the uterine wall of the mother. It contains villi on the embryo's side of the tissue. This provides a large surface area for glucose and oxygen to pass from mother to the embryo. The placenta draws nourishment and oxygen, which it supplies to the foetus, from the maternal circulation. In turn, the placenta receives carbon dioxide and wastes of fetal metabolism and discharges them into the maternal circulation for disposal.
21. How do Mendel's experiments show that
- (a) Traits may be dominant or recessive ?

(b) Inheritance of two traits is independent of each other ? [5]

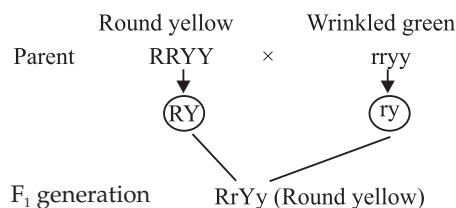
Answer :

- (a) Mendel demonstrated that traits can be either dominant or recessive through his monohybrid cross. He crossed true breeding, tall (TT) and dwarf (tt) pea plants.



In this experiment Mendel concluded that the F₁ tall plants were not true breeding, they were carrying both short and tall height traits. They appeared tall only because the tall traits were dominant over the dwarf trait. This shows that traits may be dominant or recessive.

- (b) Mendel demonstrated that traits are inherited independently through his dihybrid cross. He considered two traits at a time, seed colour and seed shape in which yellow colour (YY) and round shape (RR) are dominant over green colour (yy) and wrinkled (rr).



Ry	RYRY	RYry	RYRy	Ryry
	Round yellow	Round yellow	Round yellow	Round yellow
ry	RYry	rrYY	RrYr	rrYy
		wrinkled		
Ry	RyRY	RyRy	RyRy	Ryry
ry	ryRy	ryry	Ryry	ryry
		wrinkled		wrinkled

Mendel observed that the F₂ progeny of dihybrid cross had a phenotypic ratio of 9 : 3 : 3 : 1 and produces 9 plants with round yellow seeds, three plants

with round green seed, 3 plants with wrinkled yellow and one plant with wrinkled green seeds.

In this experiment, he found that round yellow and wrinkled green are parental combination whereas round green and wrinkled yellow are new combination. In a dihybrid cross between two plants having round yellow (RRYY) and wrinkled green seeds (rryy), four types of gametes are produced (RY, Ry, ry, rY). Each of these gametes segregates independently of each other and each has a frequency of 25% of the total gametes produced.

From this experiment, he concluded that when two pairs of traits are combined together in a hybrid, one pair of character segregates independent of the other pairs of character. This is known as the law of independent assortment.

22. Analyse the following observation table showing variation of image distance (v) with object distance (u) in case of a convex lens and answer the questions that follow, without doing any calculations :

S. No.	Object distance u (cm)	Image distance v (cm)
1.	- 90	+ 18
2.	- 60	+ 20
3.	- 30	+ 30
4.	- 20	+ 60
5.	- 18	+ 90
6.	- 10	+ 100

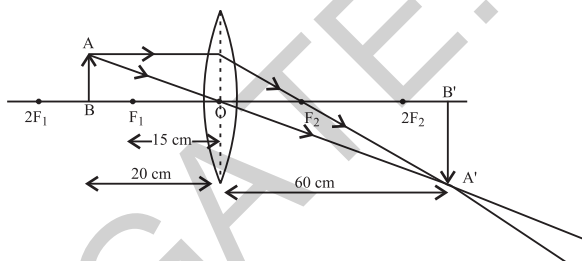
- What is the focal length of the convex lens ? Give reason in support of your answer.
- Write the serial number of that observation which is not correct. How did you arrive at this conclusion ?
- Take an appropriate scale to draw ray diagram for the observation at S. No. 4 and find the approximate value of magnification. [5]

Answer :

- From S. No. 3, we can say that the radius of curvature is 30 cm because when an object is placed at the centre of curvature of a convex lens, its image

is formed on the other side of the lens at the same distance from the lens. And, we also know that focal length is half of the radius of curvature. Therefore, focal length of the lens is + 15 cm.

- S. No. 6 is not correct as the object distance is between focus and optical centre, and in such cases, the image formed is always virtual. But in this case, a real image is formed as the image distance is positive. Therefore, v should be negative.
- Approximate value of magnification for object distance - 20 cm and image distance + 60 cm is - 3.

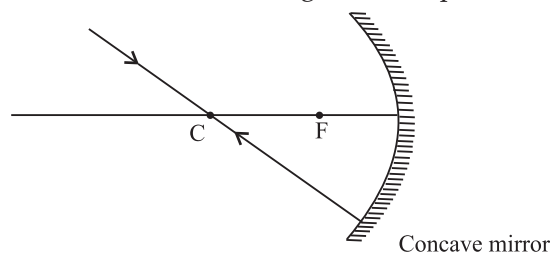


- To construct a ray diagram we use two rays which are so chosen that it is easy to know their directions after reflection from the mirror. List two such rays and state the path of these rays after reflection in case of concave mirrors. Use these two rays and draw ray diagram to locate the image of an object placed between pole and focus of a concave mirror.
 - A concave mirror produces three times magnified image on a screen. If the object is placed 20 cm in front of the mirror, how far is the screen from the object ? [5]

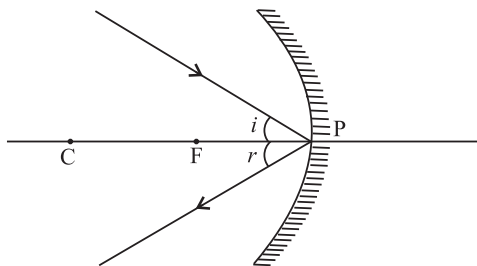
Answer :

- The following rays of light are usually used to locate the images formed by a concave mirror :

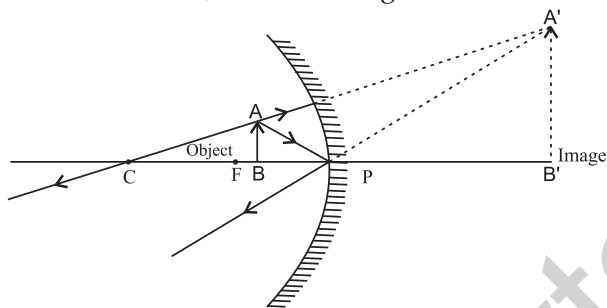
The incident ray pass through the centre of curvature : In this case, light after reflecting from the concave mirror moves back along the same path.



The ray incident obliquely to the principal axis : In this case, the incident ray will be reflected back by the reflecting surface of the concave mirror obliquely, making equal angles with the principal axis.



When the object is placed between pole and focus of the concave mirror, image is formed behind the mirror which is virtual, erect and magnified.



- (b) Given : $m = -3$ (As image is real)
 $u = -20$ cm
 $v = ?$

We have, $m = -\frac{v}{u}$

$$-3 = -\left(\frac{v}{-20}\right) \Rightarrow v = -60 \text{ cm}$$

The image is located at a distance of 60 cm in front of the mirror.

$$= -60 \text{ cm} - (-20 \text{ cm})$$

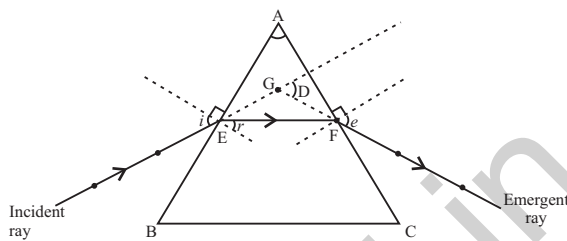
$$= -40 \text{ cm}$$

Thus, distance between the object and the screen is 40 cm

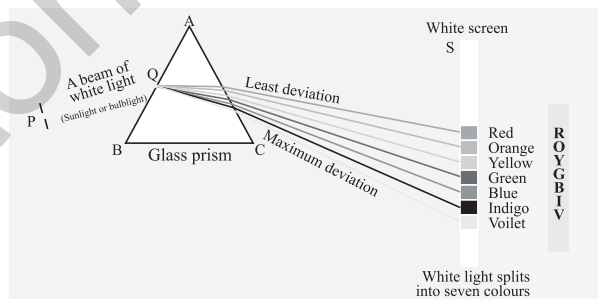
24. (a) Draw a ray diagram to explain the term angle of deviation.
 (b) Why do the component colours of incident white light split into a spectrum while passing through a glass prism, explain.
 (c) Draw a labelled ray diagram to show the formation of a rainbow. [5]

Answer :

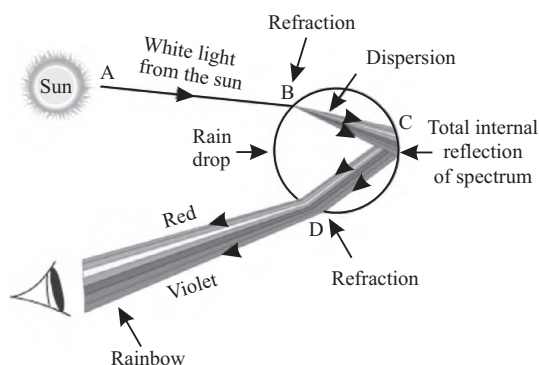
- (a) The angle between incident ray, produced forward and emergent ray, produced backward is called angle of deviation D.



- (b) The splitting up of white light into its constituent colours on passing through a refracting medium like a glass prism is called dispersion of light. The dispersion of white light occurs because different colours of light bend through different angles with respect to the incident ray, as they travel with different speeds in a prism. The red light bends the least while the violet light the most as shown below



- (c) The given diagram shows the formation of rainbow in the sky.



SECTION – B

25. You have four test tubes, A, B, C and D containing sodium carbonate, sodium chloride, lime water and blue litmus solutions respectively. Out of these the material of which test tube/test tubes

would be suitable for the correct test of acetic/ethanoic acid ? [1]

- (a) Only A (b) A and B
 (c) B and C (d) A and D

Answer :

(d) A and D

26. For demonstrating the preparation of soap in the laboratory which of the following combination of an oil and a base would be most suitable ? [1]

- (a) Mustard oil and calcium hydroxide
 (b) Castor oil and calcium hydroxide
 (c) Turpentine oil and sodium hydroxide
 (d) Mustard oil and sodium hydroxide.

Answer :

(d) Mustard oil and sodium hydroxide.

27. A student took four test tubes P, Q, R and S and filled about 8 ml. of distilled water in each. After that he dissolved an equal amount of Na_2SO_4 in P, K_2SO_4 in Q, CaSO_4 in R and MgSO_4 in S. On adding an equal amount of soap solution and shaking each test tube well, a good amount of lather will be obtained in the test tubes : [1]

- (a) P and Q (b) P and R
 (c) P, Q and S (d) Q, R and S

Answer :

(a) P and Q

28. A student while observing an embryo of a gram seed listed various parts of the embryo as listed below :

Testa, Micropyle, Cotyledon, Tegmen, Plumule, Radicle. On examining the list the teacher commented that only three parts are correct. Select these three correct parts : [1]

- (a) Cotyledon, Testa, Plumule
 (b) Cotyledon, Plumule, Radicle
 (c) Cotyledon, Tegmen, Radicle
 (d) Cotyledon, Micropyle, Plumule

Answer :

(b) Cotyledon, Plumule, Radicle.

29. Select the set of homologous organs from the following : [1]

- (a) Wings of pigeon and a butterfly
 (b) Wings of bat and a pigeon
 (c) Forelimbs of cow, a duck and a lizard
 (d) Wings of butterfly and a bat

Answer :

(c) Forelimbs of cow, a duck and a lizard.

30. Three students A, B and C focussed a distant building on a screen with the help of a concave mirror. To determine focal length of the concave mirror they measured the distances as given below :

Student A : From mirror to the screen

Student B : From building to the screen

Student C : From building to the mirror

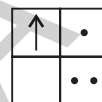
Who measured the focal length correctly ? [1]

- (a) Only A (b) Only B
 (c) A and B (d) B and C

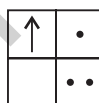
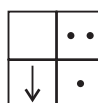
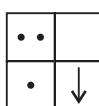
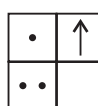
Answer :

(a) Only A

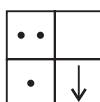
31. If you focus the image of a distant object, whose shape is given below, on a screen using a convex lens.



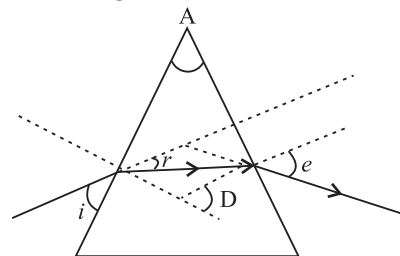
The shape of the image of this object on the screen would be : [1]

- (a)  (b) 
 (c)  (d) 

Answer :

(c) 

32. In the following diagram the correctly marked angles are : [1]

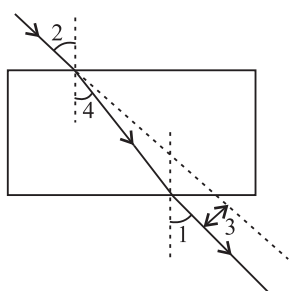


- (a) $\angle A$ and $\angle e$
 (b) $\angle i$, $\angle A$ and $\angle D$
 (c) $\angle A$, $\angle i$ and $\angle e$
 (d) $\angle A$, $\angle r$ and $\angle D$

Answer :

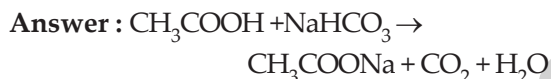
(a) $\angle A$ and $\angle e$

33. The correct sequencing of angle of incidence, angle of emergence, angle of refraction and lateral displacement shown in the following diagram by digits 1, 2, 3 and 4 is : [1]



- (a) 2, 4, 1, 3 (b) 2, 1, 4, 3
 (c) 1, 2, 1, 4, 3 (d) 2, 1, 3, 4
 Answer :
 (b) 2, 1, 4, 3

34. A gas is liberated immediately with a brisk effervescence, when you add acetic acid to sodium hydrogen carbonate powder in a test tube. Name the gas and describe the test that confirms the identity of the gas. [2]



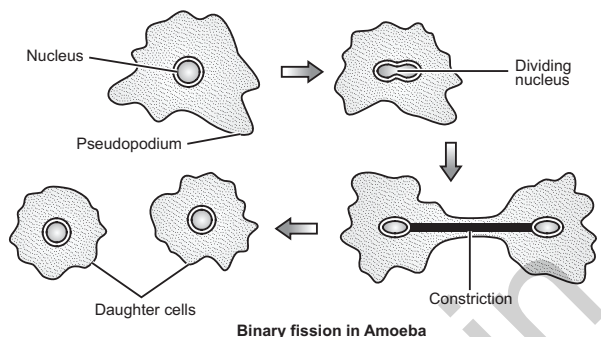
Gas evolved is CO_2 . It is tested by passing CO_2 in lime water which turns milky due to formation of insoluble CaCO_3 .



35. Name the type of asexual reproduction in which two individuals are formed from a single parent and the parental identity is lost. Write the first step from where such a type of reproduction begins. Draw first two stages of this reproduction. [2]

Answer : Binary fission is the type of asexual reproduction in which two individuals are formed from a single parent and the parental

identity is lost. This reproduction starts from division of nucleus *i.e.* karyokinesis.



36. A student places a candle flame at a distance of about 60 cm from a convex lens of focal length 10 cm and focuses the image of the flame on a screen. After that he gradually moves the flame towards the lens and each time focuses the image on the screen.

- (a) In which direction-toward or away from the lens, does he move the screen to focus the image ?
 (b) How does the size of the image change ?
 (c) How does the intensity of the image change as the flame moves towards the lens ?
 (d) Approximately for what distance between the flame and the lens, the image formed on the screen is inverted and of the same size ? [2]

Answer :

- (a) He should move the screen away from the convex lens to focus the image.
 (b) The size of the image increases.
 (c) The intensity of the image decreases as the flame moves towards the lens.
 (d) The flame should be placed at a distance of 20 cm from the convex lens. (*i.e.*, at radius of curvature, $R = 2f$)

Science 2017 (Delhi) Term II

SET II

Note : Except for the following questions, all the remaining questions have been asked in previous set.

1. Write the molecular formula of first two members of homologous series having functional group -Br [1]

Answer : General formula for the homologous series of Br group is $\text{C}_n\text{H}_{2n+1}\text{Br}$

- (i) CH_3Br (Bromomethane)
 (ii) $\text{CH}_3\text{CH}_2\text{Br}$ (Bromoethane)

2. How does Planaria reproduce ? Is this method sexual or asexual ? [1]

Answer : Planaria reproduces by the process of regeneration. It is a type of asexual reproduction in which planaria is cut into any number of pieces each piece grows into a new organism.

3. Why is forest considered a natural ecosystem? [1]

Answer : Forests are considered as natural ecosystem because of the following reasons :

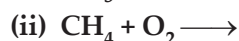
1. They have species of plants and animals that grow without human intervention.
2. All these species interact with each other and are interdependent on each other.
3. These are naturally sustainable.

6. Explain how would the involvement of local people be useful for successful management of forests. [2]

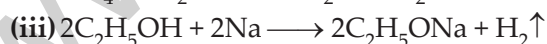
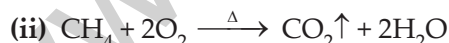
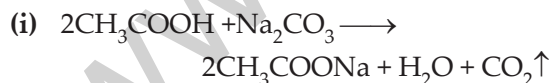
Answer : The involvement of local people will be useful for the successful management of forests in the following ways :

1. They should be aware of the fact that decrease in forest cover would disturb the ecological balance. If they show their objection against any such illegal activity that would destroy the forests, it can lead to a massive effect that will help in management of forests more effectively.
2. Phenomena's like forest fires must be reported immediately so that necessary action can be taken soon and more area can be protected.

7. Complete the following chemical equations: [3]



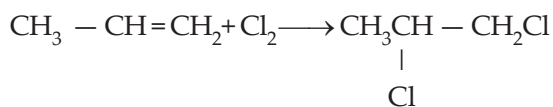
Answer :



8. Two carbon compounds X and Y have the molecular formula C_3H_6 and C_4H_{10} respectively. Which one of the two is most likely to show addition reaction? Justify your answer. Also give the chemical equation to explain the process of addition reaction in this case. [3]

Answer : C_3H_6 is propene *i.e.*, unsaturated hydrocarbon. C_4H_{10} is butane *i.e.*, saturated hydrocarbon. Thus propene being

unsaturated shows addition reaction.



11. Mention the total number of chromosomes along with the sex chromosomes that are present in a human female and a human male. Explain how in sexually producing organisms the number of chromosomes in the progeny remains the same as that of the parents. [3]

Answer : The total number of chromosomes present in both human male and female is 46. Out of these, two chromosomes are the sex chromosomes. In human males, the two sex chromosomes present are X and Y, while in human female, both sex chromosomes are X. During sexual reproduction, the new individual is formed by the fusion of gametes from both the parents. These gametes are haploid in nature *i.e.*, they contain only one set of the chromosomes. They are formed by the meiosis half. When these haploid gametes fuse during fertilization the nuclei of these two gametes fuse and the chromosome number is then restored to normal. Hence the progeny formed has the same number of chromosomes as that of the parents.

14. "Natural selection and speciation leads to evolution". Justify this statement. [3]

Answer : Natural selection is the phenomenon by which the nature selects those species which possess survival advantage over the other species. According to theory of natural selection, there is "Struggle for existence" within the species of a population for the environmental resources and this struggle leads to survival of certain organisms and elimination of the less competent species. Thus, in this competition, some organisms might undergo genetic changes which help them in their survival. The better adapted organism would, thus, survive and pass on their traits to next generations, gradually leading to evolution. Speciation is a process of formation of new species from the existing one due to reproductive isolation of a part of its population. This reproduction and isolation can occur due to geographical isolation of a part of population with time,

the genetic drift will accumulate different variations in each of the geographically separated, sub-population, ultimately, all the individuals of these two groups will isolate reproductively thus, leading to formation and evolution of new species. Thus, we can say that both natural selection and speciation lead to the evolution of species on earth.

16. A 3 cm tall object is placed 18 cm in front of a concave mirror of focal length 12 cm. At what distance from the mirror should a screen be placed to see a sharp image of the object on the screen. Also calculate the height of the image formed. [3]

Answer : Using mirror equation :

$$u = -18 \text{ cm}, f = -12 \text{ cm}, v = ?, h_1 = +3 \text{ cm}, h_2 = ?$$

$$\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$$

$$\Rightarrow \frac{1}{v} - \frac{1}{18} = -\frac{1}{12}$$

$$\frac{1}{v} = -\frac{1}{12} + \frac{1}{18}$$

$$\Rightarrow \frac{1}{v} = \frac{-3+2}{36} = \frac{-1}{36}$$

$$v = -36 \text{ cm}$$

Thus, to obtain a sharp image of the object, the screen should be placed at a distance of 36 cm, in front of the mirror.

Now, $m = \frac{-v}{u} = \frac{h_2}{h_1}$

$$m = -\left(\frac{-36}{-18}\right) = -2$$

or $-2 = \frac{h_2}{3}$

$$h_2 = -6 \text{ cm}$$

Science 2017 (Delhi) Term II

SET III

Note : Except for the following questions, all the remaining questions have been asked in previous sets.

1. Write the molecular formula of first two members of homologous series having functional group - OH. [1]

Answer : The general formula for the homologous series of functional group -OH is $C_nH_{2n+1}OH$

1. CH_3OH (Methanol)
2. CH_3CH_2OH (Ethanol)

2. How does Plasmodium reproduce. Is this method sexual or asexual? [1]

Answer : Plasmodium reproduces by a process known as **multiple fission**. Multiple fission is a type of asexual reproduction in which a single parent cell divides into several daughter individuals. In this process, the parent nucleus divides several times into a number of daughter nuclei. Later the cytoplasm divides into as many pieces as the number of nuclei and each piece surrounds each nucleus. Each uninucleated piece develops an outer membrane and finally the parent cell divides into several uninucleated individuals.

3. Why is lake considered to be a natural ecosystem? [1]

Answer : A lake is considered as a natural ecosystem as it consists of both biotic and abiotic components, both these components in a lake are interdependent and do not require any human interference for their sustenance.

4. An object is placed at a distance of 12 cm in front of a concave mirror of radius of curvature 30 cm. List four characteristics of the image formed by the mirror. [2]

Answer : The characteristics of the image formed by the concave mirror will be virtual, erect, enlarged and laterally inverted.

5. How do advantages of exploiting natural resources with short term gains in mind differs from the advantages of managing our resources with a long term perspective? [2]

Answer : Exploitation of natural resources with short-term gains aims at providing all the benefits to the current generation for their growth and development without any consideration for the future. To obtain these gains, a large number of exhaustible

resources are being used extensively which has detrimental effects on our environment. In case of long term perspective, the resources are utilised in a more judicious manner so that they are also conserved for future generations. It ensures uniform distribution among the people. Also, the resources are utilised in a more eco-friendly manner which is advantageous for environment.

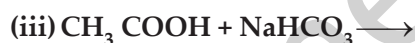
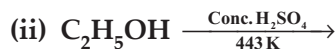
6. What is meant by wildlife ? How is it important for us ? [2]

Answer : Wildlife refers to all the naturally occurring plants, animals, birds and other life forms which are found in the forests and are not domesticated.

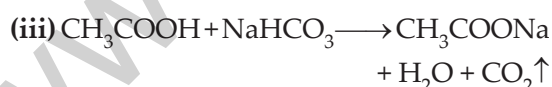
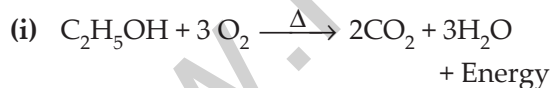
Importance of wildlife :

1. It is essential to maintain the ecological balance of the nature.
2. It provides a great biological diversity in an area.
3. It serves as a source of various valuable products, such as drugs, honey lac, coory decorative leather, etc.

7. Complete the following chemical equations : [3]



Answer :



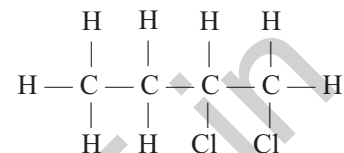
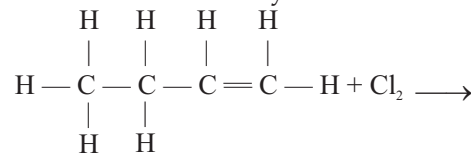
8. The molecular formula of two carbon compounds are C_4H_8 and C_3H_8 . Which one of the two is most likely to show addition reaction ? Justify your answer. Also give the chemical equation to explain the process of addition reaction in this case. [3]

Answer :

1. C_4H_8 : Butene- alkene (unsaturated hydrocarbon)

2. C_3H_8 : propane-alkane (saturated hydrocarbon)

C_4H_8 i.e., butene shows addition reaction as it is unsaturated hydrocarbon



14. List any four steps involved in sexual reproduction and write its two advantages ? [3]

Answer : The steps involved in sexual reproduction are as follows :

1. Formation of gametes through meiosis.
2. Transfer of male gametes into the female body.
3. Fertilisation (fusion of male and female gametes).
4. Post fertilisation changes.

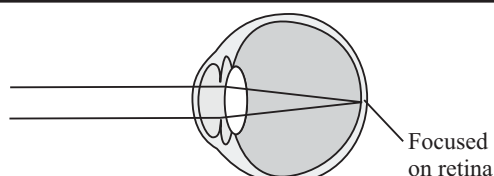
Advantages of sexual reproduction :

1. It is a source of genetic variation among individuals of a population.
2. It gives rise to individuals that are more adapted to the environment.

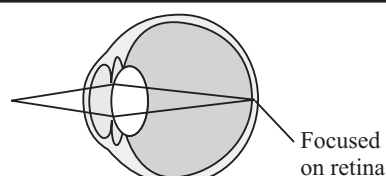
17. Write about power of accommodation of human eye. Explain why the image distance in the eye does not change when we change the distance of an object from the eye ? [3]

Answer : The ability of the eye to see object, at varying distances, clearly by adjusting the focal length of its lens is called power of accommodation.

The focal length of the human eye can change i.e. increase or decrease, depending on the distance of objects and due to this the image distance in the eye does not change. When the distance of an object is changed from the eye, it is the ciliary muscles that modify the curvature of the lens to change its focal length.



Distant object



Near object

Science 2016 Term I

SET I

Time allowed : 3 hours

Maximum marks : 90

SECTION – A

1. List two body functions that will be affected if cerebellum gets damaged. [1]

Answer : Two body functions that will be affected if cerebellum gets damaged are equilibrium and posture.

2. Name the type of current used in household supply. [1]

Answer : Alternating current (AC).

3. Write any two applications of biogas. [1]

Answer :

1. It is used as a fuel for heating purpose like cooking.
2. It can also be used in production of electricity.

4. Two solutions A and B have pH values of 3.0 and 10.5 respectively. Which of these will turn :

- (i) Blue litmus solution to red and
- (ii) Phenolphthalein from colourless to pink ?

Justify your answer in each case. [2]

Answer :

- (i) Solution A will turn blue litmus red as it has pH 3 which is acidic in nature.
- (ii) Solution B will turn phenolphthalein from colourless to pink as it is basic in nature having pH 10.5.

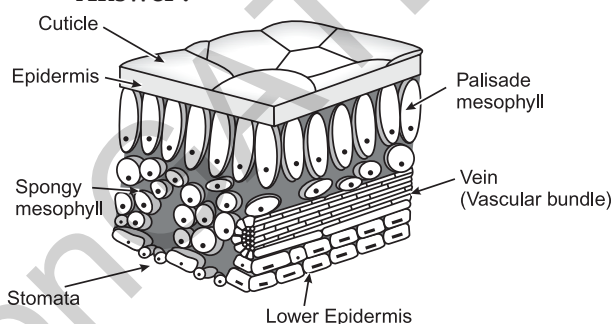
5. Rahul has been collecting copper coins and silver coins. One day he observed a green coating on copper coins and a black coating on silver coins. State the chemical phenomenon responsible for these coating and also write chemical names of each coating. [2]

Answer : The chemical phenomenon responsible for the coatings is corrosion. Copper and silver metals in presence of moist air gets oxidised forming protective layer over them. Silver turns black due to the formation of silver sulphide (Ag_2S) while

copper turns green due to the formation of a mixture of copper carbonate and copper hydroxide [$\text{CuCO}_3 \cdot \text{Cu}(\text{OH})_2$].

6. Draw a labelled diagram of cross section of a leaf. [2]

Answer :



Cross Section of Leaf

7. Write one point of difference between each of the following :

- (i) A hydrated salt and an anhydrous salt
- (ii) Washing soda and soda ash
- (ii) Baking soda and Baking powder [3]

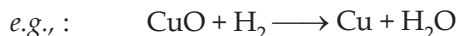
Answer :

- (i) Hydrated salt is a salt with water as water of crystallisation whereas Anhydrous salt is the salt which gives away its water of crystallisation.
- (ii) Washing soda is sodium carbonate having ten molecules of water of crystallisation ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$) whereas soda ash is sodium carbonate decahydrate ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$) when it loses its 9 units of crystallisation it is called soda ash ($\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$).
- (iii) Baking soda is sodium bicarbonate (NaHCO_3) whereas baking powder is a mixture of baking soda (NaHCO_3) and tartaric acid ($\text{C}_4\text{H}_6\text{O}_6$).

8. State the relationship between oxidation and oxidising agent in a redox reaction. Give an example of redox reaction showing

the relationship between oxidation and oxidising agent. [3]

Answer : Oxidation is addition of oxygen or removal of hydrogen. The oxidising agent causes oxidation of other compound by getting reduced itself.



CuO is getting reduced to Cu so it is an oxidising agent. It oxidises H_2 to H_2O .

9. (a) Name any one metal each which can be extracted by : [3]
- reduction with carbon
 - electrolytic reduction
 - reduction with aluminium
 - reduction with heat alone
- (b) Write a chemical equation for any of the above four parts.

Answer :

- (a) (i) Zinc (ii) Aluminium
(iii) Magnesium (iv) Mercury
- (b) (i) $\text{ZnO} + \text{C} \longrightarrow \text{Zn} + \text{CO}$
(ii) $3\text{MgO} + 2\text{Al} \longrightarrow 3\text{Mg} + \text{Al}_2\text{O}_3$

10. State which of the following chemical reactions will take place or not, giving suitable reason for each : [3]

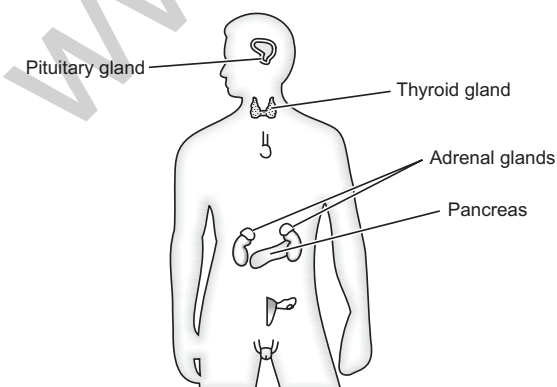
- (a) $\text{Zn}_{(s)} + \text{CuSO}_{4(aq)} \longrightarrow \text{ZnSO}_{4(aq)} + \text{Cu}_{(s)}$
(b) $\text{Fe}_{(s)} + \text{ZnSO}_{4(aq)} \longrightarrow \text{FeSO}_{4(aq)} + \text{Zn}_{(s)}$
(c) $\text{Zn}_{(s)} + \text{FeSO}_{4(aq)} \longrightarrow \text{ZnSO}_{4(aq)} + \text{Fe}_{(s)}$

Answer :

- (b) $\text{Fe}_{(s)} + \text{ZnSO}_{4(aq)} \longrightarrow \text{FeSO}_{4(aq)} + \text{Zn}_{(s)}$
is not possible, because Zn is more reactive than Fe so it cannot be replaced.

11. Draw a diagram showing the correct positions of pancreas, thyroid gland, pituitary gland, Adrenal gland in human being. [3]

Answer :



12. Write one function of each of the following components of the transport system in human beings : [3]

- (a) Blood vessels (b) Lymph
(c) Heart

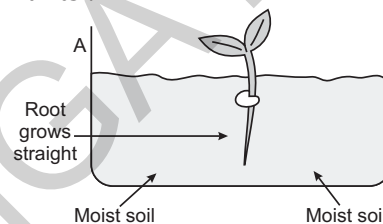
Answer :

- (a) **Blood vessels :** They carry blood throughout the body.
(b) **Lymph :** It is a clear fluid that travels through the tissues to dense them and keep them firm.
(c) **Heart :** It pumps oxygenated blood to the body and deoxygenated blood to the lungs for purification.

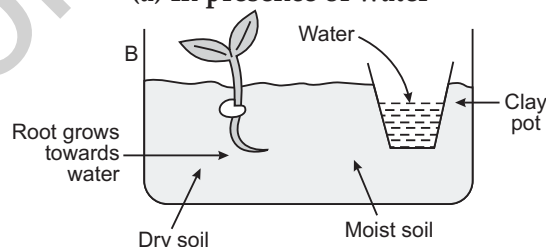
13. Design an experiment to demonstrate hydrotropism. [3]

Answer :

Experiment to Demonstrate Hydrotropism in Plants :



(a) In presence of water



(b) In absence of water

14. Give reason for the following :

- Why are copper and aluminium wires used as connecting wires ?
- Why is tungsten used for filaments of electric lamps ?
- Why is lead-tin alloy used for fuse wires ? [3]

Answer :

- Copper and aluminium wires are used as connecting wires because they have low resistivity and are good conductors of electricity.
- Tungsten has highest melting point and greatest tensile strength and lowest vapour pressure. So it is used as light bulb filament in electric lamps.

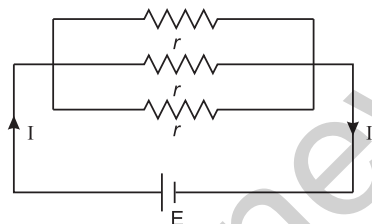
(iii) Lead-tin alloy is used for fuse wires because they have low melting point.

15. Explain the use of an electric fuse. What type of material is used for fuse wire and why? [3]

Answer : A fuse is a safety device made of wire which melts and breaks an electric circuit, if current exceeds a safe level. It is inserted in the electric circuit, if current in the circuit exceeds the maximum value, the fuse wire gets overheated and melts, thus breaks the circuit connection, which would otherwise may cause short circuit. It is made of special material like alloy of lead & tin, as it has low melting point.

16. You have three resistors of $R \Omega$ each and a battery of E volts. How would you connect these resistors with the battery to obtain maximum current? Draw a circuit diagram to illustrate your answer and also calculate the current drawn from the battery. [3]

Answer : These resistances should be connected in parallel with the battery to obtain the maximum current.



Let its equivalent resistance be $R \Omega$.

$$\therefore \frac{1}{R} = \frac{1}{r} + \frac{1}{r} + \frac{1}{r}$$

$$\frac{1}{R} = \frac{1+1+1}{r} = \frac{3}{r}$$

$$\Rightarrow R = \frac{r}{3}$$

By Ohm's law,

$$V = IR$$

$$\Rightarrow \text{Current (I)} = \frac{V}{R} = \frac{E}{r/3}$$

$$= \frac{3E}{r}$$

17. You have been appointed as the 'eco club incharge' of your school. You have to take

care of the maintenance and conservation of the environment. [3]

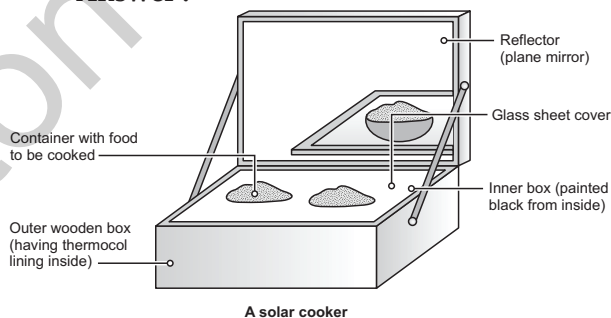
- (i) Suggest any three ways by which you will carry on your duties.
 (ii) Write any three qualities that you would like your school mates to develop for environment conservation.

Answer :

- (i) Three ways towards conservation of environment are :
1. Reduce the use of fossil fuels.
 2. Reuse non-biodegradable things.
 3. Recycle the resources to avoid wastage.
- (ii) 1. Awareness
 2. Empathy
 3. Concern for environment

18. Draw a well labelled diagram of a solar cooker. Identify two components in its structure that helps in maximizing heat absorption in it. [3]

Answer :



Two components that help in maximizing the heat absorption in solar cooker are :

1. **Focused Mirror :** It reflects the solar energy onto the food.
 2. **Black point or Inner Box :** It absorbs more heat.
19. (a) Define corrosion. What name is given to the corrosion of iron?
 (b) Name the colour of coating formed on silver and copper articles, when exposed to air?
 (c) List two damages caused by corrosion and suggest how corrosion can be prevented. [5]

Answer :

- (a) Corrosion is a process by which an oxide layer is formed on a metal surface due to oxidation. The corrosion on iron is called rusting.

- (b) Silver on exposure to air develops black coating and copper on exposure to air develops greenish coating.
- (c) Damages caused by corrosion are :
1. It reduces the strength of the metal.
 2. It eats up the metal.

Prevention: Corrosion can be prevented by painting, galvanising, alloying or greasing.

20. (a) Define indicator. Name two indicators obtained from plants.
- (b) Write balanced chemical equation for the reaction that takes place when sodium oxide reacts with water. How will this solution behave towards phenolphthalein and red litmus paper ?
- (c) State what happens when sodium hydroxide solution reacts with dilute hydrochloric acid. What is this reaction called ? [5]

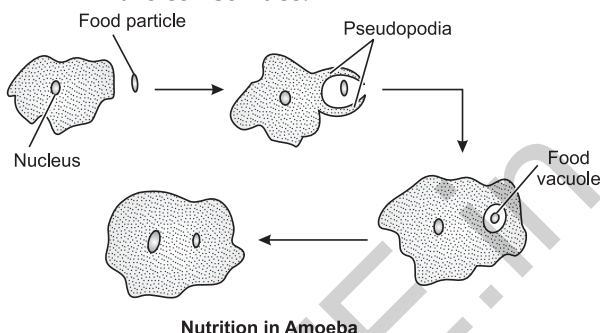
Answer :

- (a) Indicator is any substance that gives visible sign, usually by colour change, of the presence or absence of a chemical species. Two indicators are litmus and turmeric.
- (b) $\text{Na}_2\text{O} + \text{H}_2\text{O} \longrightarrow 2\text{NaOH}$
NaOH in phenolphthalein shows pink colour and turns red litmus blue.
- (c) $\text{NaOH} + \text{HCl} (\text{dil.}) \longrightarrow \text{NaCl} + \text{H}_2\text{O}$.
This is a neutralisation reaction where acid and base react to give salt and water.
21. (a) State the form in which the following are stored :
- (i) Unused carbohydrates in plants.
 - (ii) The energy derived from food in humans.
- (b) Describe the process of nutrition in amoeba with the help of diagram. [5]

Answer :

- (a) (i) The form of starch.
(ii) In the form of ATP or ADP.
- (b) **Nutrition in Amoeba :** Amoeba consumes food with the help of pseudopodia. Pseudopodia are temporary finger like projections of the cell surface, which fuse over the food particles. This results in the formation of food vacuole.

Inside this food vacuole complex substances are broken down into simple ones. These are then diffused into the cell cytoplasm. The remaining undigested material is thrown out of the cell surface.



22. (a) Write two points of difference between electric energy and electric power.
- (b) Out of 60 W and 40 W lamps, which one has a higher electrical resistance when in use.
- (c) What is commercial unit of electric energy ? Convert it into Joules. [5]

Answer : (a)

S. No.	Electric energy	Electric power
1.	Electrical energy consumed by an electrical appliance is given by the product of its power rating and time for which it is used.	It is the rate at which electrical energy is consumed.
2.	It is measured in kWh.	It is measured in watt or kilowatt.

(b)
$$\text{Power (P)} = \frac{V^2}{R}$$

i.e., At same voltage, power (P) is inversely proportional to resistance (R).
 \therefore 40 W lamp has higher resistance.

- (c) The commercial unit of electrical energy is kWh.

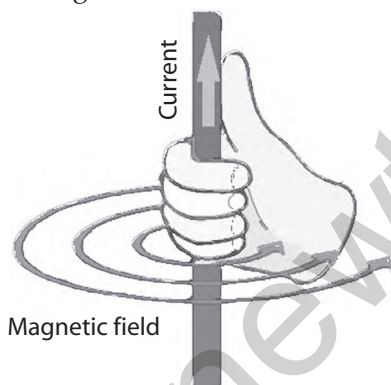
$$\begin{aligned} 1 \text{ kWh} &= 1000 \text{ W} \times 1 \text{ hr} \\ &= 1000 \text{ W} \times 3600\text{s} \\ &= 36 \times 10^5 \text{ Ws} \\ &= 3.6 \times 10^6 \text{ J.} \end{aligned}$$

23. (a) How is the strength of the magnetic field at a point near a straight conductor related to the strength of the electric current flowing in the conductor ?

- (b) With the help of a diagram describe an activity to show that a straight conductor carrying current produces a magnetic field around it. State the rule which may be used to determine the direction of magnetic field thus produced.
- (c) Why do two magnetic field lines never intersect each other? Explain. [5]

Answer :

- (a) The magnetic field produced around a straight current carrying conductor increases on increasing the strength of current in the conductor or vice-versa.
- (b) Maxwell's right hand thumb rule indicates the direction of magnetic field for a known direction of current. If the thumb of the right hand points along the direction of current then the curled fingers of that hand gives the direction of the magnetic field due to the current.



When thumb is upwards, the curled fingers are anti-clockwise. So, magnetic field is anti-clockwise.

When thumb is downwards, the curled fingers are clockwise. So, magnetic field is clockwise.

- (c) The two magnetic field lines can never intersect each other because if it does so, then two tangents can be drawn at the point of their intersection which will give two directions of the field from the same point, which is impossible.
24. (a) What is meant by heating effect of electric current? Give two applications of heating effect of current.
- (b) State the law relating heat dissipated in an electric circuit with the current, potential difference and time.

- (c) 50 J of heat is produced each second in a 2Ω resistor. Find this potential difference across the resistor. [5]

Answer :

- (a) When conductor offers resistance to the flow of current, then the work done by the electric current in overcoming this resistance is converted into heat energy. This is called heating effect of current.

Application of heat energy :

- This effect is used in electric fuse wire for protecting household wiring.
 - It is also used in electric iron, water heaters etc.
- (b) Joule's law of heating states that the heat produced in a wire is directly proportional to the square of the current, resistance of wire and time for which current is passed.

$$H \propto i^2 RT$$

(c) We have, $P = \frac{V^2}{R}$

$$\frac{H}{T} = \frac{V^2}{R}$$

$$V^2 = \frac{H}{T} \times R$$

$$[\because H = 50 \text{ J}, R = 2 \Omega, T = 1 \text{ sec}]$$

$$= \frac{50}{1} \times 2 = 100 \text{ V}$$

$$V = 10 \text{ V.}$$

SECTION – B

25. The two colours seen at the extreme ends of the pH chart are : [1]
- Red and blue
 - Red and green
 - Green and blue
 - Orange and green

Answer : (a) Red and blue

26. Four students A, B, C and D determine the pH of water, lemon juice and dil. sodium bicarbonate solution. They recorded their observations and arranged them in descending order of pH values as follows : [1]

Student	Solutions
(A)	water, lemon juice, sodium bicarbonate solution
(B)	water, sodium bicarbonate solution, lemon juice
(C)	lemon juice, water, sodium bicarbonate solution
(D)	sodium bicarbonate solution, water, lemon juice

The correct sequence is of the student :

- (a) (A) (b) (B)
(c) (C) (d) (D)





Answer : (d) D.

27. Zinc metal is added to dilute hydrochloric acid. The gas evolved is : [1]

- (a) Oxygen
(b) Hydrogen
(c) Chlorine
(d) Carbon dioxide

Answer : (b) Hydrogen.

28. Four metal rods labelled as P, Q, R and S along with their corresponding colours are shown below. Which of these rods could be made up of aluminium ? [1]

			
Reddish brown (P)	Blackish grey (Q)	Dark grey (R)	Silvery white (S)

- (a) P (b) Q
(c) R (d) S

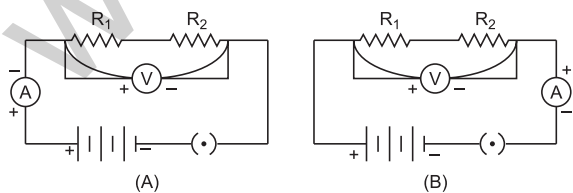
Answer : (d) S.

29. A solution of $FeSO_4$ in water is : [1]

- (a) colourless (b) blue
(c) light green (d) brown

Answer : (c) Light green

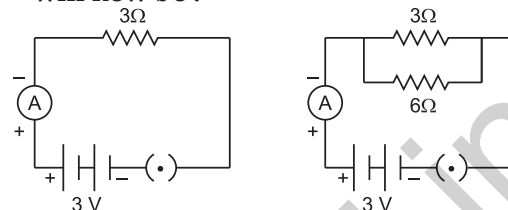
30. To find the equivalent resistance of two resistors connected in series, the connection of ammeter is correct in the circuit : [1]



- (a) Circuit A
(b) Circuit B
(c) Both the circuits
(d) Neither of the two circuits

Answer : (c) Both the circuits

31. A student found that when a resistance of 3Ω was joined with 3 V battery as per figure shown below, the current flowing through it was 1 A. He then joined another resistance of 6Ω in parallel with 3Ω resistance. The reading in the ammeter will now be : [1]



- (a) 9 A (b) 1.5 A
(c) 1 A (d) 6 A

Answer : (b) 1.5 A

[As resistance will be decreased]

32. A student covered a leaf from a de-starched plant with a black paper strip and kept it in the garden outside his house in fresh air. In the evening, he tested the covered portion of the leaf for the presence of starch. By doing so the student was trying to show that : [1]

- (a) CO_2 is given out during respiration
(b) CO_2 is necessary for photosynthesis
(c) Chlorophyll is necessary for photosynthesis
(d) Light is necessary for photosynthesis

Answer :

- (d) Light is necessary for photosynthesis

33. In the experiment to show that ' CO_2 is released during respiration', the small test tube of KOH solution is suspended inside the conical flask to absorb the : [1]

- (a) air of the flask
(b) moisture of the flask
(c) O_2 of the flask
(d) CO_2 of the flask released by the seeds

Answer :

- (d) CO_2 of the flask released by the seeds

34. While demonstrating decomposition reaction in laboratory the teacher heated ferrous sulphate crystals in a hard glass dry boiling tube. [2]

- (i) What change in the colour of ferrous sulphate crystals you will observe ?
(ii) What type of smell of the gases coming out of the boiling tube would you feel ?

Answer :

- (i) Light green crystal will become white.
 (ii) No smell.

35. Find the least count of a millimeter in which there are 20 divisions between 400 mA and 500 mA marks. [2]

Answer : Least count = $\frac{\text{Range}}{\text{No. of division}}$

$$= \frac{500 - 400}{20}$$

$$= \frac{100}{20} = 5 \text{ mA}$$

36. State where are stomata ideally located. Are they cellular structures ? [2]

Answer : Stomata are located generally at lower epidermis. Yes, stomata are cellular structures.

Science 2016 (Outside Delhi) Term II SET I

Time allowed : 3 hours

Maximum marks : 90

SECTION – A

1. Write the name and structure of an alcohol with three carbon atoms in its molecule. [1]

Answer : The compound is propanol $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$.

2. What happens when a mature spirogyra filament attains considerable length ? [1]

Answer : Filament of spirogyra breaks into smaller fragments when it matures and each filament grows into a new filament or individual.

3. The depletion of ozone layer is a cause of concern. Why ? [1]

Answer : Ozone layer prevents UV rays from the sun to penetrate down the earth, due to ozone depletion UV rays strike the earth surface and cause health hazards like skin cancer.

4. Name the type of mirrors used in the design of solar furnaces. Explain how high temperature is achieved by this device. [2]

Answer : Concave mirror. They are the only type of mirror that reflects light towards a single focal point. When a solar furnace is placed at the focus of a large concave mirror called reflectors, it focuses a parallel beam of light coming from the sun on the furnace.

5. "What was Chipko Andolan" ? How did this Andolan ultimately benefit the local people and the environment ? [2]

Answer : Chipko movement means "hug the tree", it is one of the movements in India to conserve biodiversity. It was started by Sunderlal Bahuguna. This movement originated in Reni Village of Garhwal. To

stop the contractor from cutting down of trees women of the village clasped to the trunk of the tree. Its benefits were :

- Existing forest cover was protected, reducing landslides and soil erosion. It actually protected environment and maintained ecological balance.
 - Forest wealth could be utilized for food, fodder, fuel, fertilizers and fibres.
6. "Burning of fossil fuels results in global warming". Give reasons to justify this statement. [2]

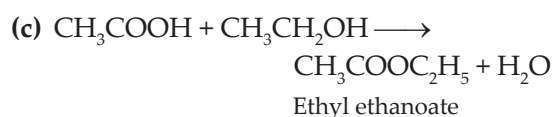
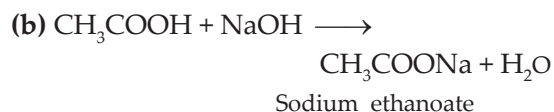
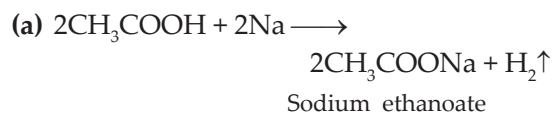
Answer : Burning of fossil fuels produces green house gases like CO , CO_2 etc. High concentration of these gases in the atmosphere causes insulation, creates green house effect and causes global warming.

7. Write chemical equation of the reaction of ethanoic acid with the following :

- Sodium;
- Sodium hydroxide;
- Ethanol.

Write the name of one main product of each reaction. [3]

Answer :



8. An aldehyde as well as a ketone can be represented by the same molecular formula, say $\text{C}_3\text{H}_6\text{O}$. Write their structures

and name them. State the relation between the two in the language of science. [3]

Answer : C_3H_6O



They are isomers *i.e.*, they have same molecular formula and different structural formula.

9. An element 'X' belongs to 3rd period and group 16 of the Modern Periodic Table.

(a) Determine the number of valence electrons and the valency of 'X'.

(b) Molecular formula of the compound when 'X' reacts with hydrogen and write its electron dot structure.

(c) Name the element 'X' and state whether it is metallic or non-metallic. [3]

Answer : X = 2, 8, 6

(a) Valence electrons are 6

Valency = 8 - 6 = 2

(b) Formula = H_2X



(c) X is sulphur, it is a non-metal.

10. An element 'X' has mass number 35 and number of neutrons 18. Write atomic number and electronic configuration of 'X'. Also write group number, period number and valency of 'X'. [3]

Answer : Atomic no. of X = mass Number - Number of neutrons = 35 - 18 = 17

Electronic configuration = 2, 8, 7

Group number = 17

Period number = 3

Valency = 1

11. Define reproduction. How does it help in providing stability to the population of species? [3]

Answer : Reproduction is a biological process in which new individuals of same species are produced by the existing species. Every species has to constantly struggle for its survival. Natural predators and vagaries

of nature keep on removing a large section of the population of a particular species. Moreover, the natural cycle of life and death also removes the sections of the population.

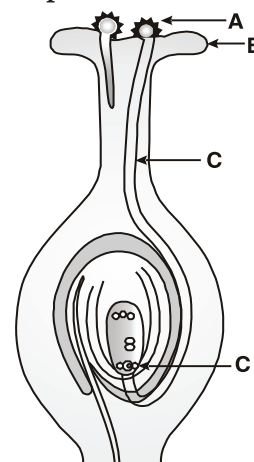
12. Explain the term "Regeneration" as used in relation to reproduction of organisms. Describe briefly how regeneration is carried out in multicellular organisms like Hydra. [3]

Answer : Regeneration is the ability of an organism to give rise to a new organism or individual from their body parts.

If the body of Hydra is cut into pieces, then each body piece of Hydra can grow into a complete Hydra *i.e.*, on cutting into pieces, the cells of the cut parts divide rapidly to make 'ball of cells'. The cells present in the 'ball of cells' move to their proper places within the ball where they have to form various organs and body parts of the organisms.

13. (a) List two reasons for the appearance of variations among the progeny formed by sexual reproduction.

(b)



(i) Name the part marked 'A' in the diagram.

(ii) How does 'A' reaches part 'B'?

(iii) State the importance of the part 'C'.

(iv) What happens to the part marked 'D' after fertilisation is over? [3]

Answer :

(a) Variation is seen among progeny formed by sexual reproduction because.

1. Involvement of two different individuals.

2. Creation of new combination of variants.

- (b) (i) A = pollen grains
- (ii) B = Pollen grain reaches Stigma by pollination
- (iii) C = Pollentube helps male gamete to reach the egg (ovule)
- (iv) After fertilisation it converts into embryo.

14. How do Mendel's experiment show that traits are inherited independently? [3]

Answer : Mendel performed an experiment in which he took a tall plant with round seeds and short plant with wrinkled seeds. In F_1 progeny all tall with round seeds were produced. Tallness and roundness were thus dominant traits. When he used these F_1 progeny to generate F_2 progeny by self-pollination, he found that some F_2 progeny were tall plants with round seeds, while others were short, but had round seeds. Thus Mendel's experiment shows that tall or short traits and round or wrinkled seed traits are independently inherited.

15. "Two areas of study namely 'evolution' and 'classification' are interlinked". Justify this statement. [3]

Answer : Modern classification system is based on the phylogenetic resemblances and evolutionary relationships between the species. Systematic deals with the classification of living beings on the basis of evolution. Thus, evolution of organisms gives a hint about its position in classification system and vice versa. Hence, we can say that evolution and classification are two interlinked areas of study.

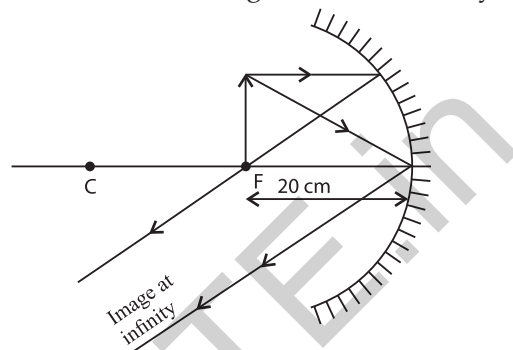
16. The image of an object formed by a mirror is real, inverted and is of magnification - 1. If the image is at a distance of 40 cm from the mirror, where is the object placed? Where would the image be if the object is moved 20 cm towards the mirror? State reason and also draw ray diagram for the new position of the object to justify your answer. [3]

Answer : Magnification is - 1, it means distance of the image from the mirror is same as distance of object from the mirror and it happens only when the object is placed at centre of curvature of the mirror.

\therefore Object position is At C (centre of curvature)
Object distance = 40 cm.

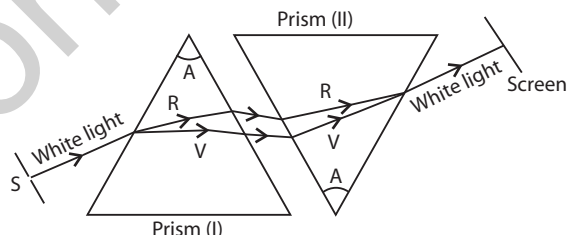
If the object is moved 20 cm towards the mirror then its new position would be at the focus of the mirror.

\therefore Position of the image will be at infinity,



17. Describe an activity to show that the colours of white light splitted by a glass prism can be recombined to get white light by another identical glass prism. Also draw ray diagram to show the recombination of the spectrum of white light. [3]

Answer :



Two prisms (I) and (II) of same material are used with same refracting angle (A). They are arranged as shown in the above figure. Sunlight from a narrow slit 'S' falls on the first prism and gets dispersed into constituent colours (VIBGYOR). Now this dispersed light falls on the second prism so that it deviates the light upwards. It is found that the light coming out from the second prism is almost white and is in direction parallel to the direction of light incident on the first prism. Thus prism (I) and prism (II) combined together effectively act like a parallel sided glass slab. This shows that prism (I) disperses the white light into its constituent colours so it is called dispersing prism and prism (II) recombines these colours to form white light so it is called recombination prism.

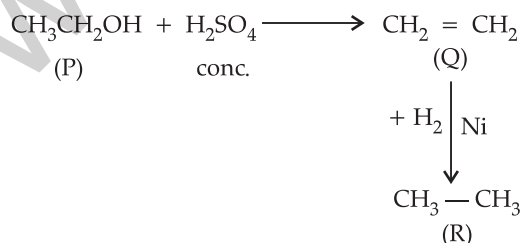
18. The activities of man had adverse effects on all forms of living organisms in the biosphere. Unlimited exploitation of nature by man disturbed the delicate ecological balance between the living and non-living components of the biosphere. The unfavourable conditions created by man himself threatened the survival not only of himself but also of the entire living organisms on the mother earth. One of your classmates is an active member of 'Eco club' of your school which is creating environmental awareness amongst the school students, spreading the same in the society and also working hard for preventing environmental degradation of the surroundings. [3]

- Why is it necessary to conserve our environment?
- State the importance of green and blue dustbins in the safe disposal of the household waste.
- List two values exhibited by your classmate who is an active member of Eco club of your school.**

Answer :

- It is necessary to conserve environment for protecting atmosphere and living habitat from degradation.
 - Green dustbin is used for biodegradable wastes and blue dustbin is used for non-biodegradable waste.
19. A carbon compound 'P' on heating with excess conc. H_2SO_4 forms another carbon compound 'Q' which on addition of hydrogen in the presence of nickel catalyst forms a saturated carbon compound 'R'. One molecule of 'R' on combustion forms two molecules of carbon dioxide and three molecules of water. Identify P, Q and R and write chemical equations for the reactions involved. [5]

Answer :



P = Ethyl alcohol ($\text{C}_2\text{H}_5\text{OH}$)

**Answer is not given due to change in the present syllabus.

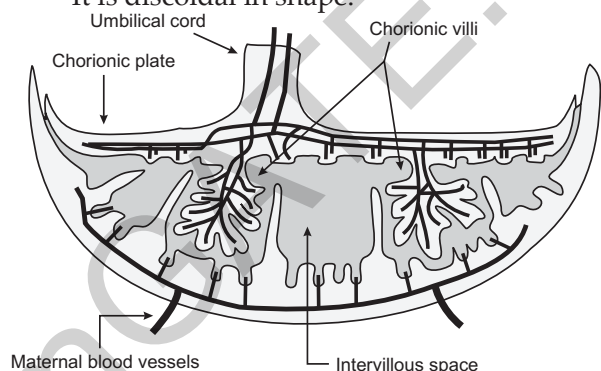
Q = Ethene ($\text{CH}_2 = \text{CH}_2$)

R = Ethane (C_2H_6)

20. What is placenta? Describe its structure. State its functions in case of a pregnant human female. [5]

Answer : Placenta : It is physical barrier connecting the embryo from the mother womb to the uterine wall to allow nutrient uptake, waste removal etc.

Structure : In human placenta is 22 cm in length, 2-2.5 cm in thickness, weighs 500 g. It has a dark reddish-blue or crimson colour. It is discoidal in shape.



Structure of Placenta

Functions : This provides a large surface area for glucose and oxygen to pass from the mother to the embryo, and the developing embryo will also generate waste substances which can be removed by transferring them into the mothers blood through the placenta. Thus it provides nourishment to the embryo, helps in the excretion and provides immunity to the foetus.

21. Define evolution. How does it occur? Describe how fossils provide us evidences in support of evolution. [5]

Answer : Evolution is change in the heritable traits of biological populations over successive generation. It occurs due to continued mutation of natural selection.

They provide gradual change in phenotype with respect to shape and size of organism which also indicates adaptation with respect to changing environmental conditions.

Fossils are the remains or impressions of prehistoric plants or animals embedded in rock and preserved in petrified form. Fossils provide the evidence that present animals and plants have originated from previously existed ones through the process of continuous evolution.

e. g., : Fossils of Archaeopteryx shows characteristics of both reptiles and birds. It shows that aves have emerged from reptiles.

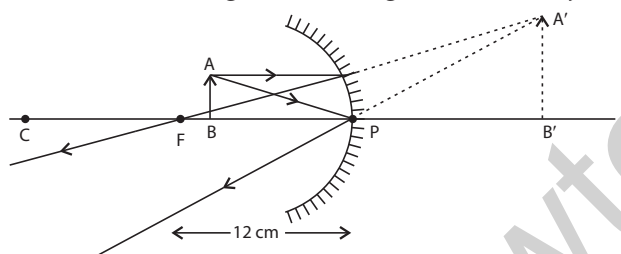
22. It is desired to obtain an erect image of an object, using concave mirror of focal length of 12 cm.

- (i) What should be the range of distance of an object placed in front of the mirror ?
- (ii) Will the image be smaller or larger than the object. Draw ray diagram to show the formation of image in this case.
- (iii) Where will the image of this object be, if it is placed 24 cm in front of the mirror ? Draw ray diagram for this situation also to justify your answer.

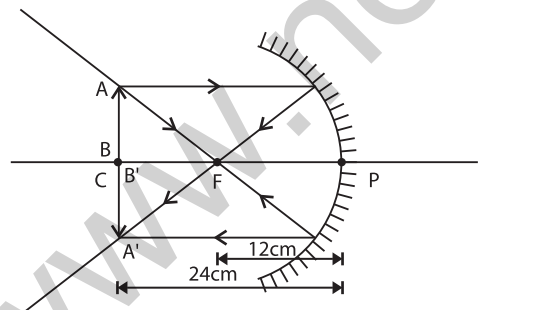
Show the positions of pole, principal focus and the centre of curvature in the above ray diagrams. [5]

Answer : (i) The range of distance should be 0 cm to less than 12 cm from the mirror.

(ii) The image will be larger than the object.



(iii) Image will be formed at a distance of 24 cm in front of the mirror of the same size and inverted.



23. (a) Define optical centre of a spherical lens.

- (b) A divergent lens has a focal length of 20 cm. At what distance should an object of height 4 cm from the optical centre of the lens be placed so that its image is formed 10 cm away from the lens. Find the size of the image also.
- (c) Draw a ray diagram to show the formation of image in above situation.

[5]

Answer :

(a) Optical centre is a point on a lens through which ray of light passes undeviated, without suffering any refraction.

(b) Given : $f = -20$ cm, $h_o = 4$ cm, $v = -10$ cm

We know that,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$-\frac{1}{20} = -\frac{1}{10} - \frac{1}{u}$$

$$\frac{1}{u} = -\frac{1}{10} + \frac{1}{20}$$

$$\frac{1}{u} = \frac{-2+1}{20} = \frac{-1}{20}$$

$$u = -20 \text{ cm}$$

$$m = \frac{h_i}{h_o} = \frac{v}{u}$$

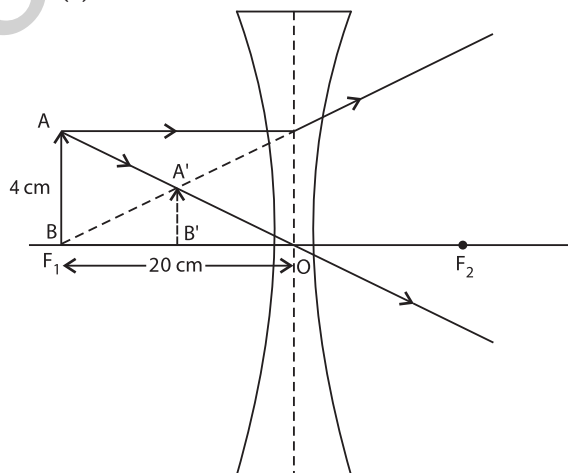
$$\frac{h_i}{4} = \frac{-10}{-20}$$

$$2 h_i = 4$$

$$h_i = 2 \text{ cm}$$

Now,

(c)



24. What is atmospheric refraction ? Use this phenomenon to explain the following natural events.

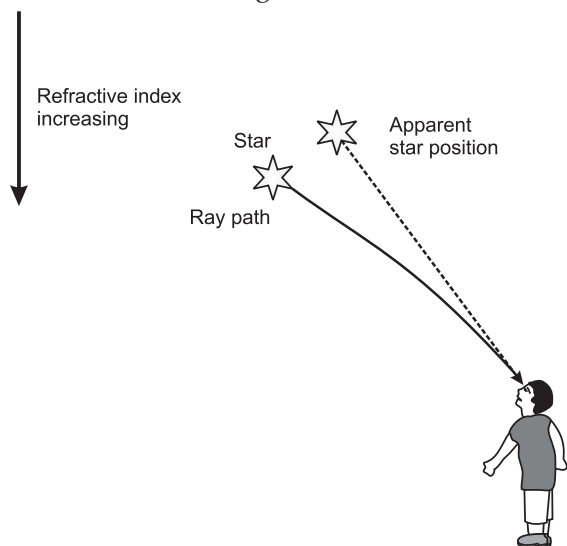
- (a) Twinkling of stars
- (b) Advanced sun-rise and delayed sun-set.

Draw diagrams to illustrate your answers.

[5]

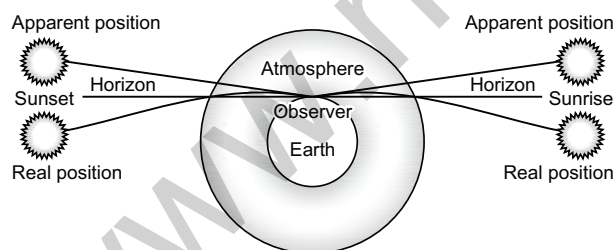
Answer : Atmospheric refraction : Refraction of light caused by the earth's atmosphere due to change in the refractive indices of different layers.

(a) **Twinkling of Stars** : Stars are distant point sized source of light. The path of the rays of light coming from the star goes on varying due to atmospheric refraction. Thus apparent position of the stars fluctuates and the amount of star light entering the eye flickers giving the twinkling effect.



(b) **Advanced sunrise** : When the sun is slightly below the horizon, light rays coming from the sun travel from the rarer to denser layers of air. Because of atmospheric refraction of light, light appears to come from a higher position above the horizon. Thus, sun appears to rise earlier than actual sunrise.

Delayed sunset : A similar phenomenon occurs at the time of sunset.



SECTION – B

25. A student puts a drop of reaction mixture of a saponification reaction first on a blue litmus paper and then on a red litmus paper. He may observe that: [1]

- (a) There is no change in the blue litmus paper and the red litmus paper turns white.
- (b) There is no change in the red litmus paper and the blue litmus paper turns red.

- (c) There is no change in the blue litmus paper and the red litmus paper turns blue.
- (d) No change in colour is observed in both the litmus papers.

Answer :

- (c) There is no change in the blue litmus paper and the red litmus paper turns blue.

26. For preparing soap in the laboratory we require an oil and a base. Which of the following combinations of an oil and a base would be best suited for the preparation of soap? [1]

- (a) Castor oil and calcium hydroxide
- (b) Turpentine oil and sodium hydroxide
- (c) Castor oil and sodium hydroxide
- (d) Mustard oil and calcium hydroxide

Answer :

- (c) Castor oil and sodium hydroxide

27. In the neighbourhood of your school, hard water required for an experiment is not available. Select from the following groups of salts available in your school, a group each member of which, if dissolved in distilled water, will make it hard: [1]

- (a) Sodium chloride, calcium chloride
- (b) Potassium chloride, sodium chloride
- (c) Sodium chloride, magnesium chloride
- (d) Calcium chloride, magnesium chloride

Answer :

- (d) Calcium chloride, magnesium chloride

28. A student while observing an embryo of a pea seed in the laboratory listed various parts of the embryo as given below :

Testa, Tegmen, Radicle, Plumule, Micropyle, Cotyledon.

On examining the list the teacher remarked that only three parts are correct.

Select three correct parts from the above list: [1]

- (a) Testa, Radicle, Cotyledon
- (b) Tegmen, Radicle, Micropyle
- (c) Cotyledon, Plumule, Testa
- (d) Radicle, Cotyledon, Plumule

Answer :

- (d) Radicle, Cotyledon, Plumule

29. If you are asked to select a group of two vegetables, out of the following, having homologous structures which one would you select? [1]

- (a) Carrot and radish
- (b) Potato and sweet potato
- (c) Potato and tomato
- (d) Lady finger and potato

Answer :

- (a) Carrot and radish

30. To determine the approximate value of the focal length of a given concave mirror, you focus the image of a distant object formed by the mirror on a screen. The image obtained on the screen, as compared to the object is always : [1]

- (a) Laterally inverted and diminished
- (b) Inverted and diminished
- (c) Erect and diminished
- (d) Erect and highly diminished

Answer :

- (b) Inverted and diminished

31. Suppose you have focused on a screen the image of candle flame placed at the farthest end of the laboratory table using a convex lens. If your teacher suggests you to focus the parallel rays of the sun, reaching your laboratory table, on the same screen, what you are expected to do is to move the : [1]

- (a) lens slightly towards the screen
- (b) lens slightly away from the screen
- (c) lens slightly towards the sun
- (d) lens and screen both towards the sun

Answer :

- (a) lens slightly towards the screen

32. In your laboratory you trace the path of light rays through a glass slab for different values of angle of incidence ($\angle i$) and in each case measure the values of the corresponding angle of refraction ($\angle r$) and angle of emergence ($\angle e$).

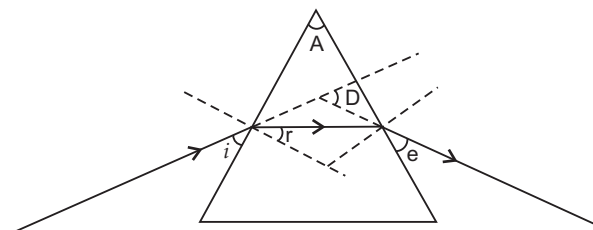
On the basis of your observations your correct conclusion is : [1]

- (a) $\angle i$ is more than $\angle r$, but nearly equal to $\angle e$
- (b) $\angle i$ is less than $\angle r$, but nearly equal to $\angle e$
- (c) $\angle i$ is more than $\angle e$, but nearly equal to $\angle r$
- (d) $\angle i$ is less than $\angle e$, but nearly equal to $\angle r$

Answer :

- (a) $\angle i$ is more than $\angle r$, but nearly equal to $\angle e$

33. In the following ray diagram the correctly marked angle are : [1]



- (a) $\angle i$ and $\angle e$
- (b) $\angle A$ and $\angle D$
- (c) $\angle i, \angle e$ and $\angle D$
- (d) $\angle r, \angle A$ and $\angle D$

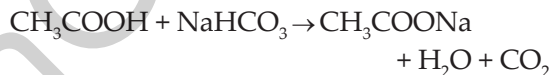
Answer :

- (d) $\angle r, \angle A$ and $\angle D$

34. A student adds a spoon full of powdered sodium hydrogen carbonate to a flask containing ethanoic acid. List two main observations, he must note in his note book, about the reaction that takes place. Also write chemical equation for the reaction. [2]

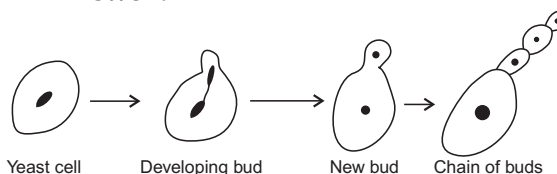
Answer : The two main observations are :

1. Brisk effervescence.
2. Evolution of colourless and odourless gas.



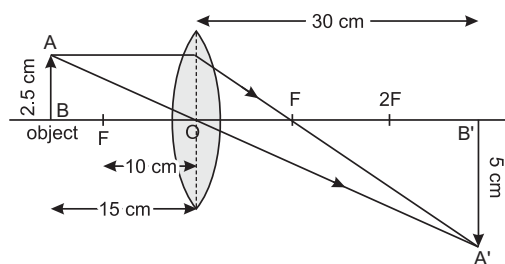
35. A student is observing a permanent slide showing sequentially the different stages of a sexual reproduction taking place in yeast. Name this process and draw diagrams, of what he observes, in a proper sequence. [2]

Answer :



36. An object of height 2.5 cm is placed at a distance of 15 cm from the optical centre 'O' of a convex lens of focal length 10 cm. Draw a ray diagram to find the position and size of the image formed. Mark optical centre 'O', principal focus F and height of the image on the diagram. [2]

Answer : The required ray diagram is drawn as follows :



Science 2016 (Outside Delhi) Term II

SET II

Note : Except for the following questions, all the remaining questions have been asked in previous set.

SECTION – A

1. Write the name and structure of an alcohol with four carbon atoms in its molecule.

Answer : Butanol, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$.

2. What are those organisms called which bear both the sex organs in the same individual. Give one example of such organism. [1]

Answer : Those organisms which bear both the sex organs in the same individual are called bisexual organisms. Example : Hydra.

3. Write one negative effect, on the environment, of affluent life style of few persons of a society. [1]

Answer : Affluent lifestyle results in :

1. Generation of excessive waste materials.
2. Excessive use of natural resources like coal and petroleum which causes pollution.
3. Use of excessive non-biodegradable material in packaging.

4. "The magnification produced by a spherical mirror is - 3". List four informations you obtain from this statement about the mirror/image. [2]

Answer : Real, inverted and magnified image is formed beyond centre of curvature by a concave mirror.

5. Forests are "biodiversity hot spots." Justify this statement. [2]

Answer : The measure of bio-diversity of an area is the number of species found there. Since, in a forest we can find a range of different life forms of plants and animals, thus the forests are the biodiversity hot spots.

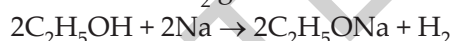
6. What is water harvesting ? How can this technique help in the conservation of water ? [2]

Answer : Water harvesting is a technique of capturing rain water when it falls and taking measures to keep the water clean. This water is stored underground that remains unpolluted, it recharges wells and provides moisture for vegetation over a wide area.

7. On dropping a small piece of sodium in a test-tube containing carbon compound 'X' with molecular formula $\text{C}_2\text{H}_6\text{O}$, a brisk effervescence is observed and a gas 'Y' is produced. On bringing a burning splinter at the mouth of the test-tube the gas evolved burns with a pop sound. Identify 'X' and 'Y'. Also write the chemical equation for the reaction. Write the name and structure of the product formed, when you heat 'X' with excess conc. sulphuric acid. [3]

Answer : X = Ethanol $\text{C}_2\text{H}_5\text{OH}$

Y = H_2 gas



10. Three elements 'X', 'Y' and 'Z' have atomic numbers 7, 8 and 9 respectively.

(a) State their positions (Group number and period number both) in the Modern Periodic Table.

(b) Arrange these elements in the decreasing order of their atomic radii.

(c) Write the formula of the compound formed when 'X' combines with 'Z'. [3]

Answer :

(a) X (7) = 2, 5 Group 15, Period 2

Y (8) = 2, 6 Group 16, Period 2

Z (9) = 2, 7 Group 17, Period 2.

(b) $X > Y > Z$

(c) XZ_3

12. In the context of reproduction of species state the main difference between fission and fragmentation. Also give one example of each. [3]

Answer : Fission is the method of asexual reproduction in unicellular form of life. In this process the parent organism splits to form two or more daughter cells. Example : Plasmodium and Amoeba. While in fragmentation, the filament of multicellular organisms break into many pieces which grows individually to a new individual. Example : Spirogyra.

15. With the help of an example justify the following statement :

"A trait may be inherited, but may not be expressed." [3]

Answer : Characters are inherited by parents. But not all the characters are

expressed. Some characters are recessive and they are suppressed by dominant genes.

E.g., In one of the Mendel's experiments when pure tall pea plants are crossed with pure dwarf pea plants in F_1 generation all tall pea plants are obtained. On selfing F_1 generation pea plants both tall and dwarf pea plants were obtained in F_2 generation.

16. The image of an object formed by a lens is of magnification - 1. If the distance between the object and its image is 60 cm, what is the focal length of the lens? If the object is moved 20 cm towards the lens, where would the image be formed? State reason and also draw a ray diagram in support of your answer. [3]

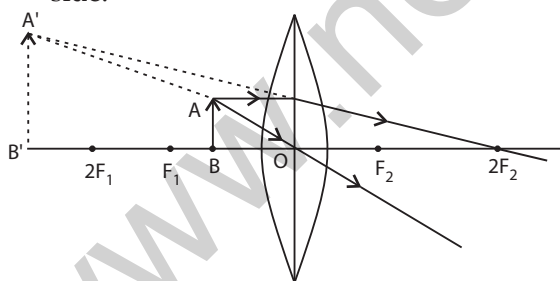
Answer : Magnification = -1 i.e., image is inverted and of same size. It means, object is at $2F$ and image is also at $2F$.

Therefore, distance between u and $v = 4F = 60$ cm.

$$\therefore F = 60/4 = 15 \text{ cm}$$

Object will be at $= 2F = 30$ cm.

If the object is shifted towards the lens by 20 cm, the new object distance will be at 10 cm from the lens. This distance is less than the focal length, so the image formed in this case would be virtual, erect and on the same side.



19. (a) Define focal length of a spherical lens.
 (b) A divergent lens has a focal length of 30 cm. At what distance should an

object of height 5 cm from the optical centre of the lens be placed so that its image is formed 15 cm away from the lens? Find the size of the image also.

- (c) Draw a ray diagram to show the formation of image in the above situation. [5]

Answer :

- (a) The distance between the optical centre and focus of a spherical lens is called focal length.

- (b) Given : $f = -30$ cm, $h_o = 5$ cm, $h_i = ?$,
 $v = -15$ cm, $u = ?$

We know that,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

or

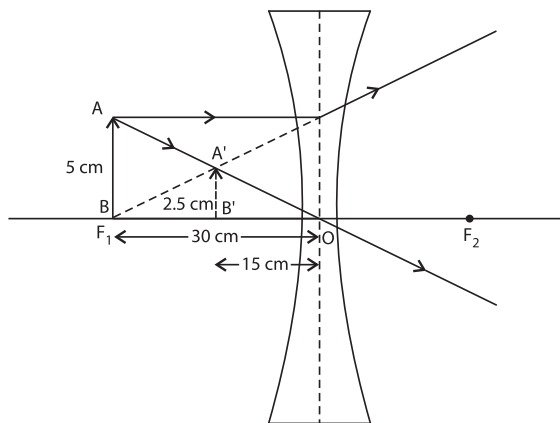
$$\Rightarrow u = \frac{vf}{f-v}$$

$$= \frac{-15 \times -30}{-30 + 15} = -30 \text{ cm.}$$

Now, $m = \frac{v}{u} = \frac{h_i}{h_o}$

$$\Rightarrow h_i = \frac{v}{u} \times h_o = \frac{-15}{-30} \times 5 = 2.5 \text{ cm.}$$

- (c)



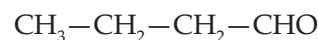
Science 2016 (Outside Delhi) Term II

SET III

Note : Except for the following questions, all the remaining questions have been asked in previous sets.

1. Write the name and structure of an aldehyde with four carbon atoms in its molecule. [1]

Answer : Butanal



2. List two functions of ovary of human female reproductive system. [1]

Answer : 1. To produce female gamete.
 2. To secrete female hormones.

3. In a food chain of frog, grass, insect and snake, assign trophic level to frog. [1]

Answer : Grass—Insect—Frog—Snake.
 Frog will be at 3rd trophic level.

4. The refractive indices of glass and water with respect to air are $\frac{3}{2}$ and $\frac{4}{3}$ respectively. If speed of light in glass is 2×10^8 m/s, find the speed of light in water. [2]

Answer : Refractive index of a medium

$$= \frac{\text{Speed of light in air}}{\text{Speed of light in the medium}}$$

For glass,

$$\frac{3}{2} = \frac{\text{Speed of light in air}}{2 \times 10^8}$$

Speed of light in air = $\frac{3}{2} \times 2 \times 10^8 = 3 \times 10^8$ m/s.

For water,

$$\frac{4}{3} = \frac{\text{Speed of light in air}}{\text{Speed of light in water}}$$

Speed of light in water

$$= 3 \times 10^8 \times \frac{3}{4} = 2.25 \times 10^8 \text{ m/s}$$

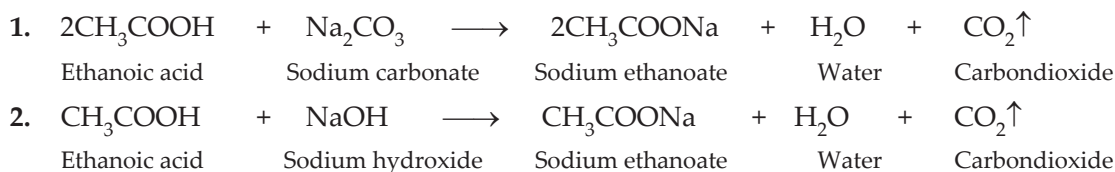
5. List four stakeholders which may be helpful in the conservation of forests. [2]

Answer : The four stakeholders are :

- Local people, living in villages near the forest.
- Industrialists who use forest produce as raw materials.
- Wild life and nature enthusiasts.
- Forest department of the government.

8. Write three different chemical reactions showing the conversion of ethanoic acid to sodium ethanoate. Write balanced chemical equation in each case. Write the name of the reactants and the products other than ethanoic acid and sodium ethanoate in each case. [3]

Answer :



6. The construction of large dams leads to social and environmental problems. List two problems of each category. [2]

Answer : Social problems are :

- Many people are rendered homeless.
- Displacement of large number of tribals without due compensation.
- Migration into the cities for settlements.

Environmental problems are :

- Deforestation and loss of biodiversity.
- Soil erosion and ecological imbalance.

7. The position of eight elements in the Modern Periodic Table is given below where atomic numbers of elements are given in the parenthesis.

Period No.		
2	Li (3)	Be (4)
3	Na (11)	Mg (12)
4	K (19)	Ca (20)
5	Rb (37)	Sr (38)

- Write the electronic configuration of Ca.
- Predict the number of valence electrons in Rb.
- What is the number of shells in Sr ?
- Predict whether K is a metal or a non-metal.
- Which one of these elements has the largest atom in size ?
- Arrange Be, Ca, Mg and Rb in the increasing order of the size of their respective atoms. [3]

Answer :

- Electronic configuration of Ca = 2, 8, 8, 2
- Number of valence electrons in Rb = 1
- Number of shells in Sr = 5
- K is a metal
- Rb is bigger in size
- Be < Mg < Ca < Rb



9. An element 'X' belong to 3rd period and group 13 of the Modern Periodic Table. [3]
- (a) Determine the valence electrons and the valency of 'X'.
- (b) Molecular formula of the compound formed when 'X' reacts with an element 'Y' (atomic number = 8).
- (c) Write the name and formula of the compound formed when 'X' combines with chlorine.

Answer : X = 13 = 2, 8, 3

(a) Valence electron and valency = 3

(b) Y = 8 = 2, 6 valency 2.



(c) XCl_3

17. The image formed by a spherical mirror is real, inverted and is of magnification - 2. If the image is at a distance of 30 cm from the mirror, where is the object placed? Find the focal length of the mirror. List two characteristics of the image formed if the object is moved 10 cm towards the mirror. [3]

Answer : Given, $m = -2$, $v = -30$ cm

We know that,

$$m = \frac{-v}{u}$$

$$-2 = \frac{30}{u}$$

$$u = -15 \text{ cm}$$

$$\text{Now, } f = \frac{uv}{u+v} = \frac{-15 \times -30}{-15 - 30} = \frac{450}{-45} = -10 \text{ cm.}$$

If the object is shifted 10 cm towards the mirror then, $u = -5$ cm, i.e., object is between pole and focus, thus image formed will be virtual, erect and magnified.

24. (a) Define focal length of a divergent lens.
- (b) A divergent lens of focal length 30 cm forms the image of an object of size 6 cm on the same side as the object

at a distance of 15 cm from its optical centre. Use lens formula to determine the distance of the object from the lens and the size of the image formed.

- (c) Draw a ray diagram to show the formation of image in the above situation. [5]

Answer :

(a) The point from which ray of light parallel to principal axis after refraction, appear to diverge is called principal focus of a divergent lens and the distance between optical centre and this focus is called focal length of a divergent lens.

(b) Given, $f = -30$ cm, $u = ?$, $v = -15$ cm, $h_o = 6$ cm, $h_i = ?$

We know that,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

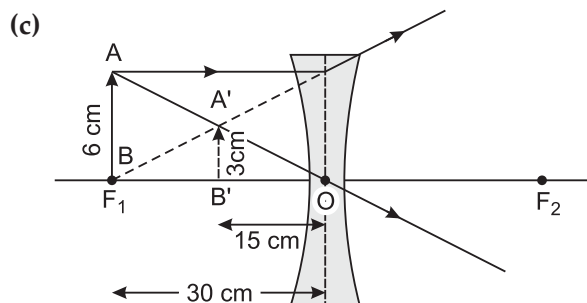
or
$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$$

$$\Rightarrow u = \frac{vf}{f-v} = \frac{-15 \times -30}{-30 + 15}$$

$$= \frac{450}{-15} = -30 \text{ cm.}$$

Now,
$$m = \frac{h_i}{h_o} = \frac{v}{u}$$

$$\Rightarrow h_i = \frac{v}{u} \times h_o = \frac{-15}{-30} \times 6 = 3 \text{ cm.}$$



Science 2016 (Delhi) Term II

SET I

SECTION - A

1. Write the next homologue of each of the following :



[1]

Answer : (i) C_3H_6 (ii) C_5H_8

2. Name the part of Bryophyllum where the buds are produced for vegetative propagation. [1]

Answer : In Bryophyllum the buds are produced in leaf notches.

3. List two natural ecosystems. [1]

Answer : Forest, Pond.

4. State two positions in which a concave mirror produces a magnified image of a given object. List two differences between the two images. [2]

Answer : A concave mirror produces a magnified image when the object is placed in the following positions :

- Between its pole and focus : Virtual and erect image is formed.
- Between the focus and centre of curvature : Real and inverted image is formed.

5. List four advantages of properly managed watershed management. [2]

Answer : Advantage of watershed management are :

- Mitigates drought and floods.
- Increases the life of the dams and reservoirs downstreams.
- Increases the biomass production and thereby the income of the watershed community.
- Helps in maintaining ecological balance by scientific conservation of soil and water.

6. Explain giving example where active involvement of local people leads to efficient management of forest. [2]

Answer : Chipko Andolan is one of the example where active involvement of local people leads to management of forest. In this movement villagers especially women wrapped their arms around the trees to prevent the workers from destroying the forest.

7. What are covalent compounds ? Why are they different from ionic compounds ? List their three characteristic properties. [3]

Answer : Covalent compounds are formed by sharing of electrons. They are different from ionic compounds as ionic compounds are formed by transfer of electrons.

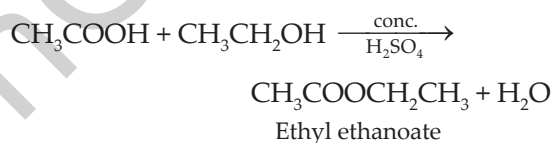
Characteristics of covalent compounds are :

- They generally have low melting and boiling points.
 - They are generally insoluble or sparingly soluble in water but soluble in organic solvents.
 - They do not conduct electricity.
8. When ethanol reacts with ethanoic acid in the presence of conc. H_2SO_4 , a substance with fruity smell is produced. Answer the following : [3]

- (i) State the class of compounds to which the fruity smelling compounds belong. Write the chemical equation for the reaction and write the chemical name of the product formed.

- (ii) State the role of conc. H_2SO_4 in this reaction.

Answer : (i) Ester



- (ii) Conc. H_2SO_4 acts as a dehydrating agent.

9. Calcium is an element with atomic number 20. Stating reason answer each of the following questions : [3]

- Is calcium a metal or non-metal ?
- Will its atomic radius be larger or smaller than that of potassium with atomic number 19 ?
- Write the formula of its oxide.

Answer :

- Calcium is a metal, since it loses electrons.
- Radius of calcium is smaller than potassium as atomic size decreases in a period.
- CaO .

10. An element 'M' with electronic configuration (2, 8, 2) combines separately with $(NO_3)^-$, $(SO_4)^{2-}$ and $(PO_4)^{3-}$ radicals. Write the formula of the three compounds so formed. To which group and period of the Modern Periodic Table does the elements 'M' belong ? Will 'M' form covalent or ionic compounds ? Give reason to justify your answer. [3]

Answer :

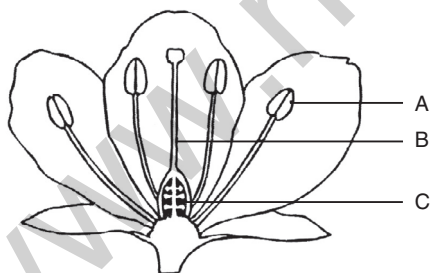
1. (a) $M(NO_3)_2$, (b) MSO_4 , (c) $M_3(PO_4)_2$.
2. M belongs to second group.
3. M will form ionic bond as it loses electrons.

11. How do organisms, whether reproduced asexually or sexually maintain a constant chromosome number through several generations ? Explain with the help of suitable example. [3]

Answer : During asexual reproduction organisms undergo only mitotic divisions. The DNA of the cells involved are copied and then equally divided among the two daughter cells formed. Thus, chromosome number remains unchanged. In sexual reproduction, organisms produce gametes through meiosis, in which the original number of chromosomes becomes half. These two gametes combine to form the zygote and the original number of chromosome is restored.

For example, in humans, the parents each have 46 or 23 pairs of chromosomes. In the gametes, the sperm has half the number of chromosomes, i.e., 23 and the egg also has 23 chromosomes. When the sperm and the egg fuse, the zygote has 46 or 23 pairs of chromosomes.

12. Name the parts A, B and C shown in the following diagram and state one function of each. [3]



Answer : A – Anther – It produces pollen grains.

B – Style – It provides the path through which the pollen tube grows and reaches the ovary.

C – Ovary – It contains ovules and each ovule has an egg cell. It develops into fruit after fertilization.

13. Suggest three contraceptive methods to control the size of human population

which is essential for the health and prosperity of a country. State the basic principle involved in each. [3]

Answer : The methods of contraception are :

1. **Barrier method or mechanical method :** Prevents the meeting of sperms and ova.
2. **Chemical method (Oral pills) :** Changes the hormonal balance of the female partner so that the eggs are not released.
3. **Surgical method :** The vas deferens in male is blocked (vasectomy) or the fallopian tube (oviduct) in females (tubectomy) is blocked to prevent the transfer of sperms or eggs and hence no fertilisation takes place.
4. **IUCD's, Loop or the copper T :** It is placed in the uterus to prevent pregnancy.

14. In one of his experiments with pea plants Mendel observed that when a pure tall pea plant is crossed with a pure dwarf pea plant, in the first generation, F_1 only tall plants appear. [3]

- (a) What happens to the traits of the dwarf plants in this case ?
- (b) When the F_1 generation plants were self-fertilised, he observed that in the plants of second generation, F_2 both tall plants and dwarf plants were present. Why it happened ? Explain briefly.

Answer :

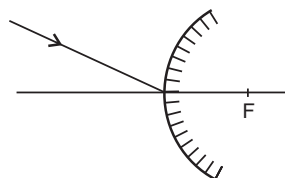
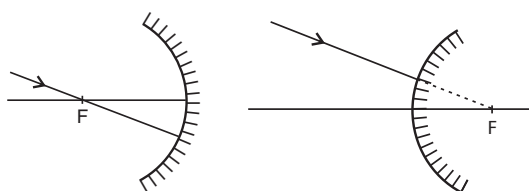
- (a) The dwarf traits of the plants is not expressed in the presence of the dominant tall traits.
- (b) In F_2 generation all tall and dwarf traits are present in the ratio of 3:1, this showed that both tallness and dwarfness traits were present in F_1 generation but only tallness trait appeared being dominant trait.

15. List three distinguishing features, in tabular form, between acquired traits and the inherited traits. [3]

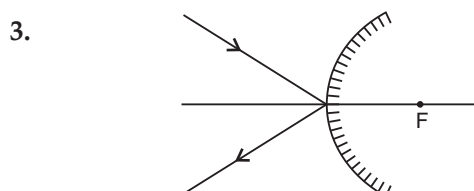
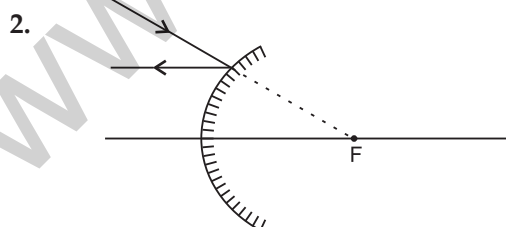
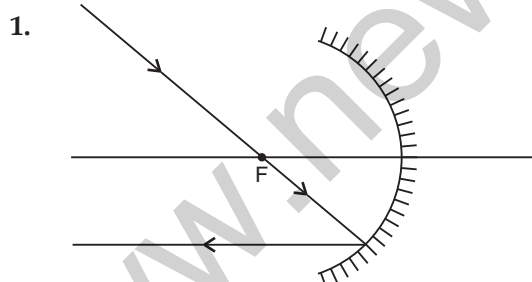
Answer :

S. No.	Aquired traits	Inherited traits
1.	Do not bring changes in the DNA of germ cells.	Bring changes in the DNA of germ cells.
2.	Cannot direct evolution.	Can direct evolution.
3.	Cannot be passed on to the Progeny.	Can be passed on to the Progeny.

16. Draw the following diagram, in which a ray of light is incident on a concave/convex mirror, on your answer sheet. Show the path of this ray, after reflection, in each case. [3]



Answer :



17. Why does the sun appear reddish early in the morning ? Will this phenomenon be observed by an observer on the moon ? Justify your answer with a reason. [3]

Answer : Early in the morning, the sun is near the horizon, sunlight reaches us after travelling a longer distance through thick layers of atmosphere. Thus, most of the blue light and shorter wavelength light are scattered away by the particles in the atmosphere. The light that reaches us is of longer wavelength giving reddish appearance.

No, because of absence of atmosphere this phenomenon will not be observed on moon.

18. Give reason to justify the following : [3]

- The existence of decomposers is essential in a biosphere.
- Flow of energy in a food chain is unidirectional.

Answer :

(a) The existence of decomposers is essential in a biosphere because they breakdown complex organic substances into simple inorganic substance that can be absorbed by the plants. Thus, decomposers:

- Replenish the soil naturally.
- Helps in reusing the biodegradable waste.

(b) In a food chain the energy moves progressively through the various trophic levels, it is no longer available to the previous level and the energy trapped by the autotropes does not flows back. Thus flow of energy is unidirectional.

19. (a) Give a chemical test to distinguish between saturated and unsaturated hydrocarbon.

(b) Name the products formed when ethane burns in air. Write the balanced chemical equation for the reaction showing the types of energies liberated.

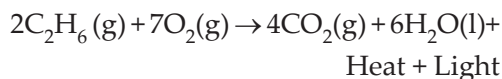
(c) Why is reaction between methane and chlorine in the presence of sunlight considered a substitution reaction ? [5]

Answer :

(a) Pass the vapours of the given samples of saturated and unsaturated

hydrocarbons into bromine water, in unsaturated hydrocarbons colour changes while in saturated it does not.

- (b) On burning ethane in air, the products obtained are CO_2 and H_2O with heat and light.



- (c) It is a substitution reaction as chlorine atom displaces hydrogen atoms of methane.

20. (a) Write the functions of the following parts in human female reproductive system :

(i) Ovary, (ii) Oviduct, (iii) Uterus

- (b) Describe the structure and function of placenta. [5]

Answer :

- (a) (i) **Ovary** : Production of female gametes.

(ii) **Oviduct** : Transfer of female gametes from the ovary and it is the site of fertilisation.

(iii) **Uterus** : Implantation of the zygote, nourishment of the developing embryo.

- (b) Placenta is a disc like structure in the uterine wall connected to the embryo. It has villi on the embryo's side of the tissue and on the mother side, it has blood spaces, which surround the villi. It provides space for food and oxygen to pass from the mother to the embryo and waste from the embryo to mother's blood.

21. What is meant by speciation ? List four factors that could lead to speciation. Which of these cannot be a major factor in the speciation of a self-pollinating plant species. Give reason to justify your answer. [5]

Answer :

Speciation is the process of formation of a new species from a pre-existing one. Factors leading to Speciation are :

1. Genetic drift
2. Mutation
3. Natural selection
4. Geographical isolation

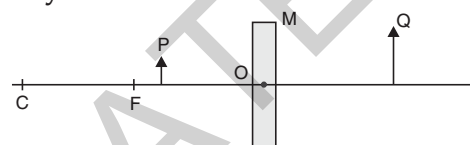
22. (a) Define the following terms in the context of spherical mirrors :

- (i) Pole
- (ii) Centre of curvature
- (iii) Principal axis
- (iv) Principal focus

- (b) Draw ray diagrams to show the principal focus of a :

- (i) Concave mirror
- (ii) Convex mirror

- (c) Consider the following diagram in which M is a mirror and P is an object and Q is its magnified image formed by the mirror.



State the type of the mirror M and one characteristic property of the image Q. [5]

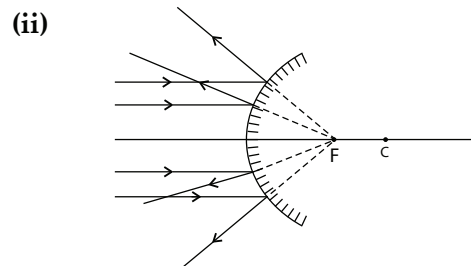
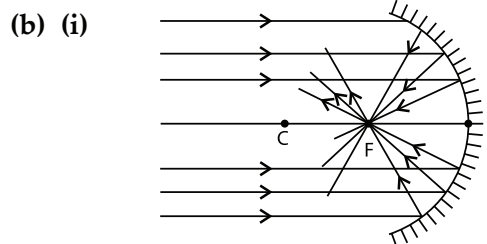
Answer :

- (a) (i) **Pole** is the centre of the reflecting surface of the mirror.

(ii) **Centre of curvature** is the centre of the hollow sphere of which the reflecting surface of mirror is a part.

(iii) **Principal axis** is the straight line passing through the pole and the centre of curvature of a spherical mirror.

(iv) **Principal focus** : Incident rays parallel to principal axis, after reflection, either converge to or appear to diverge from a fixed point on the principal axis called principal focus of a spherical mirror.

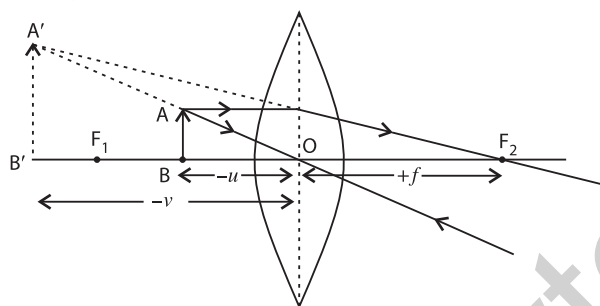


- (c) M is a concave mirror and the image is virtual.

23. (a) Draw a ray diagram to show the formation of image by a convex lens when an object is placed in front of the lens between its optical centre and principal focus.
- (b) In the above ray diagram mark the object-distance (u) and the image-distance (v) with their proper signs (+ve or -ve as per the new Cartesian sign convention) and state how these distances are related to the focal length (f) of the convex lens in this case.
- (c) Find the power of a convex lens which forms a real, and inverted image of magnification -1 of an object placed at a distance of 20 cm from its optical centre. [5]

Answer :

(a)



- (b) The object distance and image distance are marked in the diagram of part (a).

The relation between v , u and f is given by the formula,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

- (c) Given, $m = -1$; $u = -20$ cm; $v = ?$, $f = ?$

We know that, $m = \frac{v}{u}$

$$-1 = \frac{v}{-20}$$

$$\therefore v = +20 \text{ cm}$$

Thus, object is at 2F.

$$\text{i.e., } 2f = 20 \text{ cm}$$

$$\therefore f = \frac{20}{2} = 10 \text{ cm} = 0.1 \text{ m}$$

$$P = \frac{1}{f} = \frac{1}{0.1} = +10\text{D}$$

The power of convex lens is + 10 D.

24. (a) Write the function of each of the following parts of human eye : Cornea; iris; crystalline lens; ciliary muscles.

- (b) Millions of people of the developing countries of world are suffering from corneal blindness. These persons can be cured by replacing the defective cornea with the cornea of a donated eye. A charitable society of your city has organised a campaign in your neighbourhood in order to create awareness about this fact. If you are asked to participate in this mission how would you contribute in this noble cause ? [5]

- (i) State the objective of organising such campaigns.

- (ii) List two arguments which you would give to motivate the people to donate their eyes after death.

- (iii) List two values which are developed in the persons who actively participate and contribute in such programmes.**

Answer :

- (a) **Cornea** : Refracts the rays of light falling on the eye.

Iris : Controls the size of the pupil and thus the amount of light reaching the retina.

Crystalline lens : Focuses the image of the object on the retina.

Ciliary muscles : Holds the eye lens and adjusts its focal length.

- (b) (i) These campaigns are organised to make people aware and realise their duties towards society.

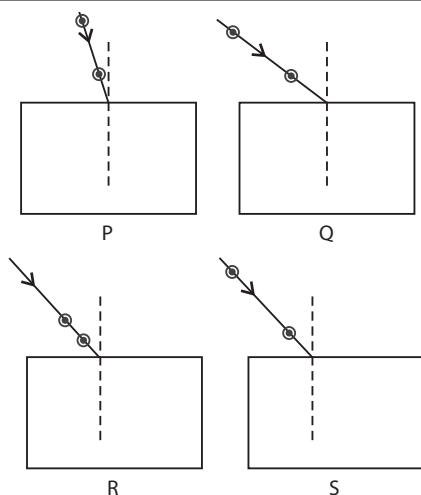
(ii) Following arguments can be given :

1. One person can give sight to two people.
2. Our eyes can live even after our death.

**Answer is not given due to change in the present syllabus.

SECTION – B

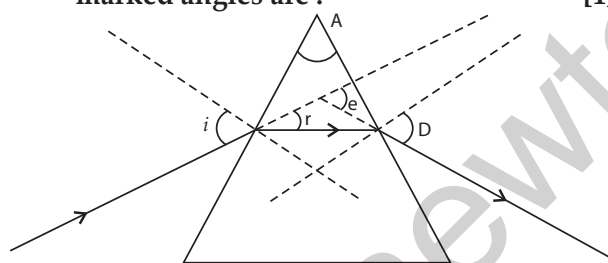
25. Which of the following sets of materials can be used for conducting a saponification reaction for the preparation of soap ? [1]
 (a) $\text{Ca}(\text{OH})_2$ and neem oil
 (b) NaOH and neem oil
 (c) NaOH and mineral oil
 (d) $\text{Ca}(\text{OH})_2$ and mineral oil
 Answer :
 (b) NaOH and neem oil
26. A student takes four test tubes marked P, Q, R and S of 25 mL capacity and fill 10 mL of distilled water in each. He dissolves one spoon full of four different salts in each as – KCl in P, NaCl in Q, CaCl_2 in R and MgCl_2 in S. He then adds about 2 mL of a sample of soap solution to each of the above test-tubes. On shaking the contents of each of the test-tubes, he is likely to observe a good amount of lather (foam) in the test tubes marked : [1]
 (a) P and Q (b) R and S
 (c) P, Q and R (d) P, Q and S
 Answer :
 (a) P and Q
27. Consider the following comments about saponification reactions :
 I Heat is evolved in these reactions
 II For quick precipitation of soap sodium chloride is added to the reaction mixture
 III Saponification reactions are special kind of neutralisation reactions
 IV Soaps are basic salts of long chain fatty acids
 The correct comments are : [1]
 (a) I, II and III (b) II, III and IV
 (c) I, II and IV (d) Only I and IV
 Answer :
 (c) I, II and IV
28. A student has to perform the experiment "To identify the different parts of an embryo of a dicot seed." Select from the following an appropriate group of seeds : [1]
 (a) pea, gram, wheat
 (b) red kidney bean, maize, gram
 (c) maize, wheat, red kidney bean
 (d) red kidney bean, pea, gram
 Answer :
 (d) red kidney bean, pea, gram
29. Which of the following is a correct set of homologous organs ? [1]
 (a) Forelimbs of frog, bird and lizard
 (b) Spine of cactus and thorn of bougainvillea
 (c) Wings of bat and wings of butterfly
 (d) Wings of a bird and wings of a bat
 Answer :
 (a) Forelimbs of frog, bird and lizard
30. A student obtained a sharp image of a candle flame placed at the distant end of the laboratory table on a screen using a concave mirror to determine its focal length. The teacher suggested him to focus a distant building about 1 km far from the laboratory, for getting more correct value of the focal length. In order to focus the distant building on the same screen the student should slightly move the : [1]
 (a) mirror away from the screen
 (b) screen away from the mirror
 (c) screen towards the mirror
 (d) screen towards the building
 Answer :
 (c) screen towards the mirror
31. To determine the approximate focal length of the given convex lens by focussing a distant object (say, a sign board), you try to focus the image of the object on a screen. The image you obtain on the screen is always : [1]
 (a) erect and laterally inverted
 (b) erect and diminished
 (c) inverted and diminished
 (d) virtual, inverted and diminished
 Answer :
 (c) inverted and diminished
32. Select from the following the best experimental set-up for tracing the path of a ray of light passing through a rectangular glass slab : [1]



- (a) P (b) Q
 (c) R (d) S

Answer :
 (d) S

33. Study the following figure in which a student has marked the angle of incidence ($\angle i$), angle of refraction ($\angle r$), angle of emergence ($\angle e$), angle of prism ($\angle A$) and the angle of deviation ($\angle D$). The correctly marked angles are : [1]



- (a) $\angle A$ and $\angle i$
 (b) $\angle A$, $\angle i$ and $\angle r$
 (c) $\angle A$, $\angle i$, $\angle e$ and $\angle D$
 (d) $\angle A$, $\angle i$, $\angle r$ and $\angle D$

Answer :
 (a) $\angle A$ and $\angle i$

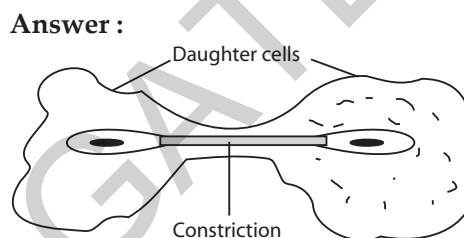
34. What do you observe when you drop a few drops of acetic acid to a test-tube containing :

- (i) phenolphthalein
 (ii) distilled water
 (iii) universal indicator
 (iv) sodium hydrogen carbonate powder [2]

Answer :

- (i) No colour change
 (ii) No change
 (iii) Turns pink
 (iv) Colourless, odourless gas with brisk effervescence is evolved.

35. Draw a labelled diagram to show that particular stage of binary fission in amoeba in which its nucleus elongates and divides into two and a constriction appears in its cell membrane. [2]



36. A student focuses the image of a well illuminated distant object on a screen using a convex lens. After that he gradually moves the object towards the lens and each time focuses its image on the screen by adjusting the lens. [2]

- (i) In which direction-towards the screen or away from the screen, does he move the lens ?
 (ii) What happens to the size of the image-does it decrease or increase ?
 (iii) What happens to the image on the screen when he moves the object very close to the lens ?

Answer :

- (i) The student moves the lens towards the screen.
 (ii) The size of image increases.
 (iii) No image will be formed on screen.

Science 2016 (Delhi) Term II

SET II

Note : Except for the following questions, all the remaining questions have been asked in previous set.

1. Name the following compounds : [2]
 (a) $\text{CH}_3-\text{CH}_2-\text{OH}$;



Answer : (a) Ethanol
 (b) Ethanal

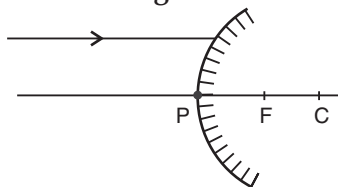
2. What is DNA ? [1]

Answer : DNA is the carrier of hereditary information from parents to the next generation.

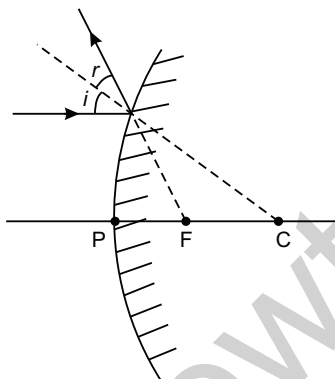
3. List two biotic components of a biosphere. [1]

Answer : Producers, consumers and decomposers are the biotic components of biosphere.

4. A ray of light is incident on a convex mirror as shown. Redraw the diagram and complete the path of this ray after reflection from the mirror. Mark angle of incidence and angle of reflection on it. [2]



Answer :



7. What is an oxidising agent ? What happens when an oxidising agent is added to propanol ? Explain with the help of a chemical equation. [3]

Answer : Oxidising agent is a substance which can give oxygen to other substance. When an oxidising agent is added to propanol it is oxidised to propanoic acid.



10. Name any two elements of group one and write their electronic configurations. What similarity do you observe in their electronic configurations ? Write the formula of oxide of any of the aforesaid element. [3]

Answer : Two elements of group are sodium (Na) and potassium (K) their electronic configuration ;

Na = 2, 8, 1

K = 2, 8, 8, 1

Similarity : Both have one valence electron, formula of their oxide : Na_2O , K_2O

11. What are the functions of testis in the human male reproductive system ? Why are these located outside the abdominal cavity ? Who is responsible for bringing about changes in appearance seen in boys at the time of puberty ? [3]

Answer : Functions of testis are :

1. Produces sperms.
2. Produces male hormone; testosterone.

Testis are located outside the human body, as sperms need lower temperature than the normal body temperature to mature.

Testosterone is responsible for bringing change at the time of puberty in boys.

13. What is multiple fission ? How does it occur in an organism ? Explain briefly. Name one organism which exhibits this type of reproduction. [3]

Answer : Multiple fission is the process of reproduction in which many individuals are formed or produced from the parent cell. In this process, the nucleus divides repeatedly to produce large number of nuclei. Each nucleus gathers a bit of cytoplasm around itself and develops a membrane around each structure. Many daughter cells develop which on liberation grows into adult organism. Plasmodium exhibits this type of fission.

14. How did Mendel interpret his result to show that traits may be dominant or recessive ? Describe briefly. [3]

Answer : Mendel conducted breeding experiments on pea plants :

He selected pure breed tall and dwarf plants. He cross pollinated these plants. In the F_1 generation obtained only tall plants, tallness is the dominant trait.

Then, he produced F_2 generation by selfing of hybrids of F_1 generation. He found that $3/4$ th of the plants were tall and $1/4$ th were dwarf. The trait which remains hidden in F_1 generation plants is the recessive trait.

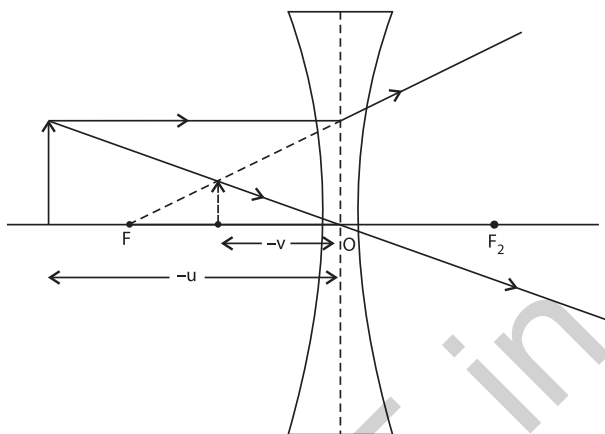
16. What is meant by scattering of light ? The sky appears blue and the sun appears reddish at sunrise and sunset. Explain these phenomena with reason. [3]

Answer : Scattering of light is the phenomenon of spreading of light in all directions by minute particles in a medium. The sky appears blue because the blue colour of sunlight due to its shorter wavelength scatters much more strongly. Than the other colour by particles in the atmosphere.

At sunrise and sunset, most of the blue light and other shorter wavelength light is scattered away by the particles in the atmosphere as the light from the sun has to travel comparatively larger distance during sunrise and sunset. Therefore, light of longer wavelength reaches us. Thus, giving a reddish appearance.

22. (a) Draw a ray diagram to show the formation of image by a concave lens when an object is placed in front of it.
- (b) In the above diagram mark the object-distance (u) and the image-distance (v) with their proper signs (+ve or -ve as per the new Cartesian sign convention) and state how these distances are related to the focal length (f) of the concave lens in this case.
- (c) Find the nature and power of a lens which forms a real and inverted image of magnification -1 at a distance of 40 cm from its optical centre. [5]

Answer : (a)



- (b) The object distance (u) and image distance (v) are marked in the diagram of part (a).

$$\text{Relation : } \frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

- (c) As, $m = -1$; hence, the lens is convex

$$\text{Now, } m = \frac{v}{u}$$

$$\therefore v = -u$$

Thus, object is at $2f$.

$$\therefore v = 40 \text{ cm (Given)}$$

$$\therefore 2f = 40 \text{ cm}$$

$$f = 20 \text{ cm} = 0.2 \text{ m.}$$

$$P = \frac{1}{f} = \frac{1}{0.2} = +5 \text{ D (convex lens)}$$

Science 2016 (Delhi) Term II

SET III

Note : Except for the following questions, all the remaining questions have been asked in previous sets.

1. Select saturated hydrocarbons from the following :



Answer : C_4H_{10} and C_6H_{14} are the saturated hydrocarbons.

2. What happens when a Planaria gets cut into two pieces ? [1]

Answer : Each piece regenerates into a new planaria.

3. Why are green plants called producers ? [1]

Answer : Green plants are called producers because they prepare their own food by photosynthesis using solar energy.

4. What is meant by power of a lens ? What does its sign (+ve or -ve) indicate ? State its S.I. unit. How is this unit related to focal length of a lens ? [2]

Answer : The ability of lens to converge or diverge the light rays is called its power.

The positive sign is for converging lens or a convex lens. The negative sign is for diverging lens or a concave lens. The S.I. unit of power is dioptre.

$$\text{Power} = \frac{1}{\text{Focal length (in metres)}}$$

6. "Reuse is better than recycling of materials". Give reason to justify this statement. [2]

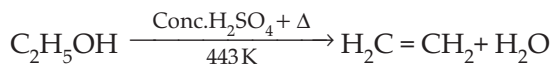
Answer : Reuse refers to the use of the same material again and again.

1. In reuse of materials no energy is consumed and the resources are saved.
2. In recycling certain used materials are converted into other useful material.
3. In recycling of materials, energy is consumed and the resources may be wasted.

Thus, it can be said that reuse is better than recycling.

7. Name the compound formed when ethanol is heated in excess of conc. sulphuric acid at 443 K. Also write the chemical equation of the reaction stating the role of conc. sulphuric acid in it. What would happen if hydrogen is added to the product of this reaction in the presence of catalysts such as palladium or nickel ? [3]

Answer : Ethene is formed



Conc. H_2SO_4 acts as a dehydrating agent. If hydrogen is added to the product in presence of a catalyst, ethane is formed



9. Two elements 'A' and 'B' belong to the 3rd period of Modern periodic table and are in group 2 and 13 respectively. Compare their following characteristics in tabular form : [3]
- (a) Number of electrons in their atoms
 - (b) Size of their atoms
 - (c) Their tendencies to lose electrons
 - (d) The formula of their oxides
 - (e) Their metallic character
 - (f) The formula of their chlorides

Answer :

	A	B
(a) Number of electrons in their atoms	4,12 & 20	5,13 & 21
(b) Size of their atoms	Bigger	Smaller
(c) Their tendencies to lose electron	More	Less
(d) The formula of their oxides	AO	B_2O_3

(e)	Their metallic character	More metallic	Less metallic
(f)	The formula of their chlorides	ACl_2	BCl_3

11. What is meant by pollination ? Name and differentiate between the two modes of pollination in flowering plants. [3]

Answer : Pollination is the transfer of pollen grains from the anther to the stigma.

Two types of pollination are :

1. **Self Pollination :** When the pollen grain from the stamens of a flower falls on the stigma of the same flower, then self pollination occurs.
2. **Cross Pollination :** When pollen grains from the stamens of a flower falls on the stigma of another flower, of the same plant or different plant, then cross pollination occurs.

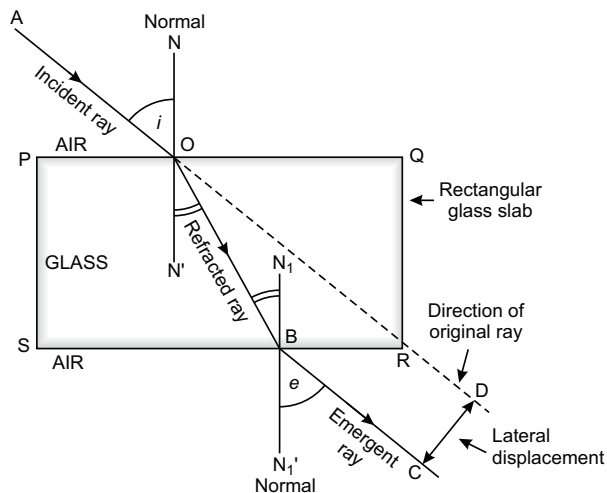
14. In a monohybrid cross between tall pea plants (TT) and short pea plants (tt) a scientist obtained only tall pea plants (Tt) in the F_1 generation. However, on selfing the F_1 generation pea plants, he obtained both tall and short plants in F_2 generation. On the basis of above observations with other angiosperms also, can the scientist arrive at a law ? If yes, explain the law. If not, give justification for your answer. [3]

Answer : Yes, the scientist may arrive at the law of dominance according to which the trait that is expressed in the F_1 generation is the dominant trait, although both the dominant and recessive traits are present in the F_1 generation. In F_2 generation recessive trait is expressed alongwith dominant trait.

16. (a) Draw a ray diagram to show the refraction of light through a glass slab and mark angle of refraction and the lateral shift suffered by the ray of light while passing through the slab.
- (b) If the refractive index of glass for light going from air to glass is $3/2$, find the refractive index of air for light going from glass to air. [3]

Answer :

(a)



(b) Given : ${}_a n_g = \frac{3}{2}$

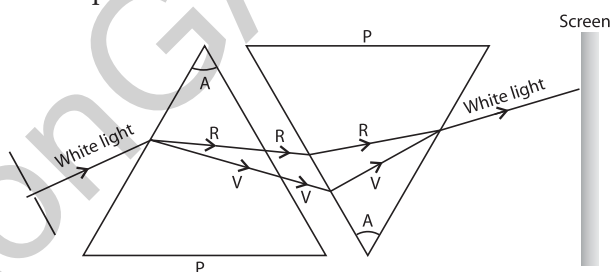
$$\therefore {}_g n_a = \frac{1}{{}_a n_g} = \frac{1}{\frac{3}{2}} = \frac{2}{3}$$

17. State the cause of dispersion of white light passing through a glass prism. How did Newton show that white light of sun contains seven colours using two identical glass prisms. Draw a ray diagram to show the path of light when two identical glass

prisms are arranged together in inverted position with respect to each other and a narrow beam of white light is allowed to fall obliquely on one of the focus of the first prism.

Answer : Different colours of white light bend through different angles with respect to the incident ray as they pass through a prism. Because speed of different colours are different in glass, as different colours have different wavelengths. Violet light bends the most and red the least. Thus, the each colour emerges along different paths and white light gets dispersed.

Newton used two glass prisms, with one prism in inverted position to show that white light contains seven colours. The set up is shown below.



Science 2015 Term I

SET I

Time allowed : 3 hours

Maximum marks : 90

SECTION – A

1. Define photosynthesis. [1]

Answer : The process by which plants make their own food using chlorophyll, carbon dioxide and water in the presence of sunlight is known as photosynthesis.



2. Out of the three wires live, neutral or earth, which one goes through ON/OFF switch ? [1]

Answer : The live wire goes through ON/OFF switch.

3. Define the process of nuclear fission. [1]

Answer : The splitting of nucleus of a heavy atom when bombarded with low-energy neutrons into lighter nuclei along with the

release of large amount of energy, is known as nuclear fission.

4. List four important properties of aluminium which are responsible for its great demand in industry. [2]

Answer: Important properties of aluminium are :

1. It is a light metal.
2. It does not corrode as it forms a protective layer of oxide which prevents it from further oxidation.
3. It is a good conductor of heat and electricity.
4. It is used as a reducing agent in the extraction of metals from the oxide.

5. Reverse of the following chemical reaction is not possible : [2]



Justify this statement with reason.

Answer : Most reactive metal displaces less reactive metals since Cu is less reactive than Zn so it will not displace Zn from ZnSO₄.
 $ZnSO_4(aq) + Cu(s) \longrightarrow$ No reaction

6. Name the plant hormones responsible for the following functions : [2]

- (i) growth of the stem
- (ii) promotes cell division
- (iii) wilting of leaves
- (iv) inhibits growth

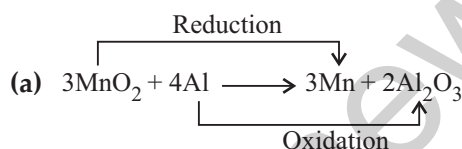
Answer :

Function	Hormone responsible
(i) Growth of the stem	Auxin or Gibberellin
(ii) Promotes cell division	Cytokinin
(iii) Wilting of leaves	Absciscic acid
(iv) Inhibits growth	Absciscic acid

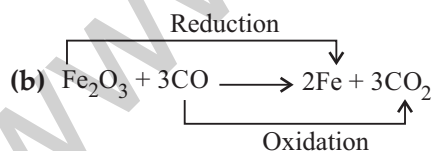
7. Name the substance oxidised and the substance reduced, and also identify the oxidising agent and reducing agents in the following reaction : [3]

- (a) $3MnO_2 + 4Al \rightarrow 3Mn + 2Al_2O_3$
- (b) $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
- (c) $SO_2 + 2H_2S \rightarrow 3S + 2H_2O$

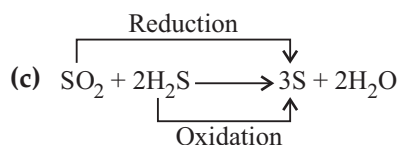
Answer :



Substance oxidised = Al
 Substance reduced = MnO₂
 Oxidising agent = MnO₂
 Reducing agent = Al



Substance oxidised = CO
 Substance reduced = Fe₂O₃
 Oxidising agent = Fe₂O₃
 Reducing agent = CO



Substance oxidised = H₂S

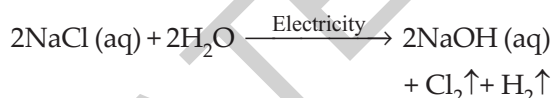
Substance reduced = SO₂

Oxidising agent = SO₂

Reducing agent = H₂S

8. Which three chemical substances are obtained when electricity is passed through an aqueous solution of brine? Write one industrial use of each. [3]

Answer : When electricity is passed through a concentrated solution of sodium chloride (called brine), it decomposes to form sodium hydroxide, chlorine and hydrogen gas.



- (i) **Use of Sodium hydroxide (NaOH) :** It is used for making soaps and detergents.
- (ii) **Use of Chlorine (Cl₂) :** It is used in the production of bleaching powder.
- (iii) **Use of hydrogen gas (H₂) :** It is used to make ammonia for fertilisers; used as a fuel or margarine.

9. Differentiate between the following with suitable examples : [3]

- (i) Mineral and ore
- (ii) Corrosion and rancidity
- (iii) Malleability and ductility

Answer : (i) Difference between Mineral and Ore

S. No.	Mineral	Ore
1.	Naturally occurring substances of metals present in the earth's crust are called minerals.	Minerals which can be used to obtain the metal profitably are called ores.
2.	All minerals are not ores.	All ores are essentially minerals.

(ii) Difference between Corrosion and Rancidity

S. No.	Corrosion	Rancidity
1.	The tarnishing of the metals by the attack of moisture and acids in the air is called corrosion.	When fats and oils present in the food gets oxidized, the smell and taste of the food changes. This is called Rancidity.

(iii) Difference between Malleability and Ductility

S. No.	Malleability	Ductility
1.	The property which allows the metals to be hammered into thin sheets is called malleability.	The property which allows the metals to be drawn into thin wires is called ductility.

10. When soap is scrubbed on a stain of curry on a white cloth, why does it become reddish brown, and turns yellow again when the cloth is washed with plenty of water? [3]

Answer : The curry might contain turmeric powder which is the indicator of acids and bases. Soap being basic in nature turns the colour of the turmeric from yellow to reddish brown. After washing with lot of water the soap is removed and the turmeric returns to its yellow colour.

11. Name any three glands associated with digestion in humans. Write the names of enzymes secreted by them. [3]

Answer : Salivary glands, Pancreas and in gastric glands are associated with digestion in humans.

S. No.	Glands	Enzymes
1.	Salivary glands	Salivary amylase
2.	Pancreas	Pancreatic amylase Trypsin Lipase
3.	Gastric glands	Pepsin

12. Name the system which facilitates communication between central nervous

system and the other parts of the body. Mention two types of nerves it consists of along with their organs of origin. [3]

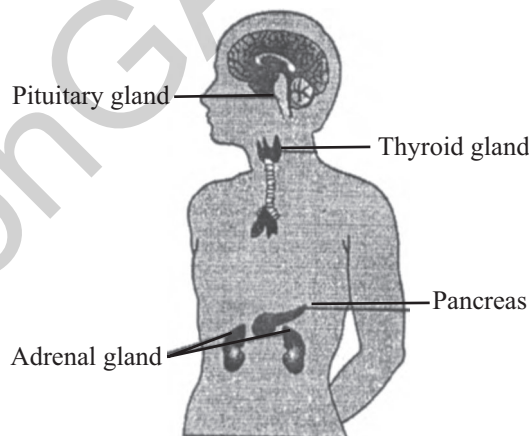
Answer : Peripheral nervous system facilitates communication between central nervous system and the other parts of the body.

Two types of nerves :

1. Cranial nerves which arise from the brain and spread throughout the head.
2. Spinal nerves which arise from the spinal cord along most of the length and spreads throughout the body except the head.

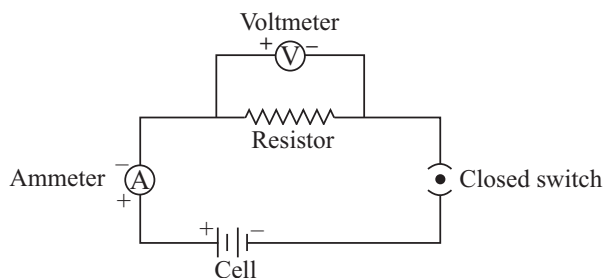
13. Draw a diagram showing the correct positions of pancreas, thyroid gland, pituitary gland and adrenal gland in human being. [3]

Answer :



14. Define an electric circuit. Draw a labelled, schematic diagram of an electric circuit comprising of a cell, a resistor, an ammeter, a voltmeter and a closed switch. [3]

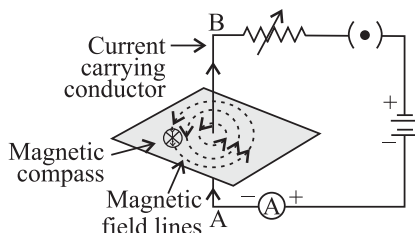
Answer : Electric circuit : A continuous conduction path consisting of wires and other resistances (like bulb, fan, etc.) and a switch between the two terminals of a cell or a battery along which an electric current flows, is called an electric circuit.



15. Draw the pattern of magnetic field lines around a current carrying straight conductor. How does the strength of the magnetic field produced change :

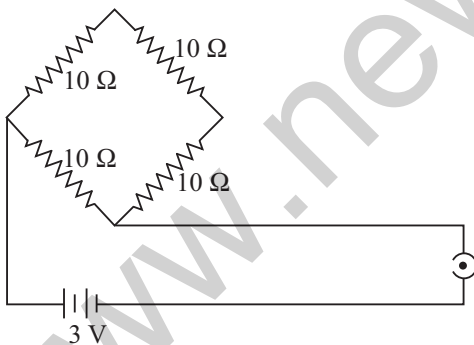
- (i) with the distance from the conductor ?
- (ii) with an increase in current in a conductor ? [3]

Answer :

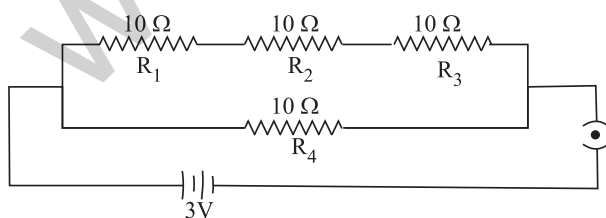


- (i) The strength of a magnetic field is inversely proportional to the square of the distance from the conductor *i.e.*, strength of an electric field decreases with increase in distance.
- (ii) The strength of the magnetic field is directly proportional to the current passing in the wire *i.e.*, strength of the magnetic field increases with the increase in current.

16. Find the current drawn from the battery by the network of four resistors shown in the figure. [3]



Answer :



Resultant resistance of R_1, R_2 and R_3 :

$$R' = R_1 + R_2 + R_3$$

$$= 10 + 10 + 10 = 30 \Omega$$

**Answer is not given due to change in the present syllabus.

Resultant resistance of the circuit :

$$\frac{1}{R} = \frac{1}{R'} + \frac{1}{R_4}$$

$$= \frac{1}{30} + \frac{1}{10} = \frac{1+3}{30} = \frac{4}{30}$$

$$R = \frac{30}{4} = \frac{15}{2} = 7.5 \Omega$$

Here, $V = 3 \text{ V}$, $I = ?$

By Ohm's law,

$$V = IR$$

$$\Rightarrow I = \frac{V}{R} = \frac{3}{7.5} = \frac{30}{75} = 0.4 \text{ A}$$

17. Anita visited her village during summer vacation and saw her grandmother burning firewood to cook food. This caused lots of smoke and resulted in the bad health of Anita's grandmother. Anita suggested some alternatives to her family in the village and offered to help them. Now answer the following questions : [3]

- (i) List any two alternatives that Anita must have suggested to her grandmother.
- (ii) How will Anita's grandmother benefit herself and the community by not burning the firewood ? Give one reason each.
- (iii) Which qualities of Anita are reflected in her way of thinking ?**

Answer :

- (i) Two alternatives suggested by Anita are :
 1. Use of biogas
 2. Use of charcoal
- (ii) Disadvantages of burning firewood are :
 1. Burning of firewood causes lot of smoke which harms the person who is cooking the food and causes air pollution which is harmful for the environment and harms the society as a whole.
 2. Use of firewood causes deforestation and is not eco-friendly.

18. Explain how is geothermal energy harnessed to produce electricity ? [3]

Answer : Geothermal energy is produced by the heat of earth's molten interior. The extremely hot rocks present below the

surface of the earth heat the water and convert it into steam. So, two holes can be drilled into the earth in the region of hot rocks and two pipes can be put into them. From one pipe, water is supplied into the earth. Hot rocks convert the water into steam. The steam so formed comes up through the second pipe and run turbines to generate electricity.

19. (a) In column I different methods of extraction are given. Name the methods used for the extraction of metals given in Column II :

Column-I	Column-II
(i) Reduction with carbon	Al, Zn, Na, Fe, Mn, Pb
(ii) Electrolytic reduction	
(iii) Reduction with aluminium	

- (b) Differentiate between roasting and calcination processes giving one example of each. [5]

Answer : (a)

Column-I	Column-II
(i) Reduction with carbon	Zn, Fe, Pb
(ii) Electrolytic reduction	Al, Na
(iii) Reduction with aluminium	Mn

- (b) Difference between roasting and calcination.

S. No.	Roasting	Calcination
1.	Roasting is done in case of sulphide ores.	Calcination is done in case of carbonate ores.
2.	In this, the ore is heated in the presence of excess air to convert it into its oxide compound.	The carbonate ore is heated in the absence of air (limited supply of air) to convert into its oxide.
3.	The gas given out is SO ₂ (sulphur dioxide) gas. Example : $2\text{ZnS} + 3\text{O}_2 \xrightarrow[\text{(Air)}]{\text{Heat}} 2\text{ZnO} + 2\text{SO}_2 \uparrow$	The gas given out is CO ₂ (carbon dioxide) gas. Example : $\text{ZnCO}_3 \xrightarrow{\text{Heat}} \text{ZnO} + \text{CO}_2 \uparrow$

20. (a) Define a universal indicator. Mention its one use.
- (b) Solution A gives pink colour when a drop of phenolphthalein indicator is added to it. Solution B gives red colour when a drop of methyl orange is added to it. What type of solutions are A and B and which one of the solutions A and B will have a higher pH value ?
- (c) Name one salt whose solution has pH more than 7 and one salt whose solution has pH less than 7. [5]

Answer :

- (a) Universal indicator is a mixture of many different indicators which gives different colours at different pH values of the entire pH scale.

It shows different colours at different concentrations of hydrogen ions in a solution.

- (b) Solution A gives pink colour when a drop of phenolphthalein indicator is added, therefore A is a base.

Solution B gives red colour when a drop of methyl orange is added to it, therefore B is an acid.

Hence, solution A will have less concentration of hydrogen ion than B.

Thus, A will have pH more than 7 because pH value of

- an acid solution < 7
- a base solution > 7
- a neutral solution = 7

- (c) 1. The salts of strong acids and weak bases give acidic solution having pH less than 7. Example, NH₄Cl, Ammonium Chloride will have pH less than 7.
2. The salts of weak acids and strong bases give basic solution having pH more than 7. Example, Na₂CO₃ Sodium Carbonate will have pH more than 7.

21. (a) Explain how the separation of oxygenated and deoxygenated blood is useful in humans ?

- (b) Why is double circulation of blood necessary in humans ? [5]

Answer :

- (a) Humans have four chambered heart which consists of two atria and two ventricles. In a four chambered heart, the left side and right side of the heart are completely separated to prevent the oxygenated blood from mixing with deoxygenated blood. Such a separation allows a highly efficient supply of oxygen to the body cells which is necessary for producing a lot of energy. This energy is useful for warm blooded animals (like humans) which have high energy needs to maintain their body temperature.
- (b) All the animals which have four chambered heart have double circulation in which the blood passes through the heart 'twice' in one complete cycle of the body. This ensures the separation of oxygenated blood from deoxygenated blood.

Explanation :

Double circulation. The blood travels twice through the heart in one complete cycle of the body and is called double circulation. It involves two circulations :

- Pulmonary circulation :** The pathway of the blood from the heart to the lungs and back to the heart is called pulmonary circulation. It is small circulation. Deoxygenated blood in the right ventricle flows into the vascular system of the lungs, becomes oxygenated and returns to the heart left atrium through pulmonary veins.
- Systemic circulation :** The pathway of the blood from the heart to the rest of the body and back to the heart is called systemic circulation. It is at large circulation. Left ventricle sends the blood into the aorta. Aorta divides into arteries, arterioles and capillaries and supplies oxygenated blood to various parts of the body. From there the deoxygenated blood is collected by venules, which join to form veins and finally vena cava pours blood back into right atrium.

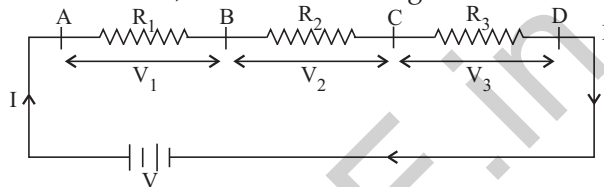
22. For the series combination of three resistors establish the relation :

$$R = R_1 + R_2 + R_3$$

where the symbols have their usual meanings.

Calculate the equivalent resistance of the combination of three resistors of 6Ω , 9Ω and 18Ω joined in parallel. [5]

Answer : Same current (I) flows through different resistances, when these are joined in series, as shown in the figure.



Let R be the combined resistance, then

$$V = IR$$

Also, $V_1 = IR_1$, $V_2 = IR_2$, $V_3 = IR_3$

$$\therefore V = V_1 + V_2 + V_3$$

$$\therefore IR = IR_1 + IR_2 + IR_3$$

$$\Rightarrow IR = I(R_1 + R_2 + R_3)$$

$$\therefore R = R_1 + R_2 + R_3$$

Now, $R_1 = 6 \Omega$, $R_2 = 9 \Omega$, $R_3 = 18 \Omega$

In parallel combination,

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

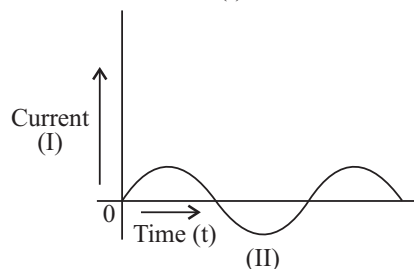
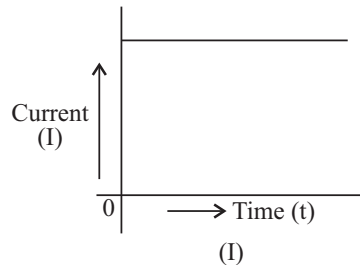
$$\Rightarrow \frac{1}{R} = \frac{1}{6} + \frac{1}{9} + \frac{1}{18} = \frac{3+2+1}{18}$$

$$= \frac{6}{18} = \frac{1}{3}$$

$$\Rightarrow \frac{1}{R} = \frac{1}{3}$$

$$\Rightarrow R = 3 \Omega$$

23. Study the following current-time graphs from two different sources : [5]



- (i) Use above graphs to list two differences between the current in the two cases.
- (ii) Name the type of current in the two cases.
- (iii) Identify one source each for these currents.
- (iv) What is meant by the statement that "the frequency of current in India is 50 Hz"?

Answer : (i)

I	II
Graph (I) shows Direct Current (D.C.)	Graph (II) shows Alternating Current (A.C.)
The current (I) flows in one direction only. It is called a direct current. The magnitude and direction of flow of current remains the same.	The current (II) reverses direction after equal intervals of time. It is called alternating current. The magnitude and direction of current change continuously at definite intervals of time.
The magnitude of current in (I) does not become zero with the passage of time.	The magnitude of (II) becomes zero after a regular time interval.

- (ii) (I) → Direct Current (D.C.)
(II) → Alternating Current (A.C.)
- (iii) Source of D.C. → a cell, battery, solar cell, D.C. generator
Source of A.C. → A.C. generator.
- (iv) 'The frequency of current in India is 50 Hz' means the direction of current in India changes 50 times in 1 second.

24. What is meant by electric circuit? Why does electric current start flowing in a circuit the moment circuit is complete? When do we say that the potential difference across a conductor in a circuit is 1 volt?

Calculate the potential difference between the two terminals of a battery if 12 joules of work is done in transferring 2 coulombs of charge. [5]

Answer :

1. A continuous conducting path consisting of wires and other resistances (like electric bulb, etc.) and a switch, between the two terminals of a cell or a battery along which an electric current flows is called an *electric circuit*.

2. It is the potential difference between the ends of the wire which makes the electric charges (or current) to flow in the wire.
3. The potential difference between two points is said to be 1 volt if 1 joule of work is done in moving 1 coulomb of electric charge from one point to another.

$$\text{Thus, } 1 \text{ volt} = \frac{1 \text{ joule}}{1 \text{ coulomb}}$$

$$\text{or } 1V = \frac{1J}{1C} \text{ or } 1 J C^{-1}$$

$$\text{Given : } W = 12 J, \quad Q = 2 C$$

$$\text{Now, } V = \frac{W}{Q} = \frac{12 J}{2 C} = 6 \text{ volts}$$

SECTION – B

25. The pH value of a sample of hydrochloric acid is 2. pH value of this sample when diluted by adding water will be : [1]

- (a) less than 2 but more than 0
- (b) more than 2 but less than 7
- (c) more than 7
- (d) no change in pH.

Answer :

- (b) more than 2 but less than 7

26. A student added a drop of universal indicator to one ml of the given solution and found that a green colour is produced. pH value of the solution will be in the range of : [1]

- (a) 0-3
- (b) 4-6
- (c) 7-9
- (d) 10-12

Answer :

- (c) 7-9.

27. In which form zinc metal is used from laboratory to prepare hydrogen? [1]

- (a) Rod
- (b) Powder
- (c) Filing
- (d) Granules

Answer :

- (d) Granules.

28. Aqueous solution of which of the following is colourless? [1]

- (a) $FeSO_4$
- (b) $ZnSO_4$
- (c) $Al_2(SO_4)_3$
- (d) Both (b) and (c)

Answer :

- (d) Both (b) and (c)

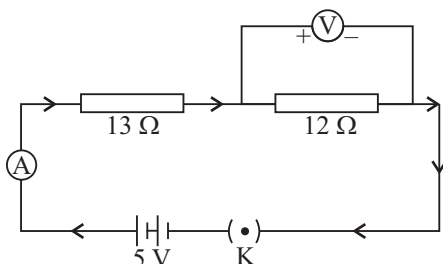
29. Which of the following solution is coloured ? [1]

- (a) $ZnSO_4$ (b) $FeSO_4$
 (c) $Al_2(SO_4)_3$ (d) Na_2SO_4

Answer :

- (b) $FeSO_4$

30. Two resistances are connected in series as shown in the diagram. The potential difference across $12\ \Omega$ resistor will be : [1]



- (a) 6 V (b) 2.4 V
 (c) 2.8 V (d) 12 V

Answer :

- (b) 2.4 V

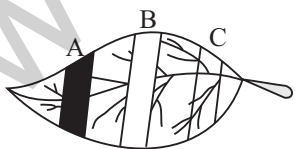
31. Three resistances of $2\ \Omega$, $3\ \Omega$ and $5\ \Omega$ are connected in parallel to a 10 V battery of negligible internal resistance. The potential difference across the three resistances will be : [1]

- (a) 2 V (b) 3 V
 (c) 5 V (d) 10 V

Answer :

- (d) 10 V

32. A destarched leaf on a potted plant was covered with black (A), white (B) and transparent (C) strips of paper as shown in the figure. [1]



After six hours of exposure to sunlight the leaf was removed from the plant and tested for starch.

Which one of the following will be the correct observation?

- (a) Whole leaf turned blue-black.
 (b) Only B and C portions turned blue-black.

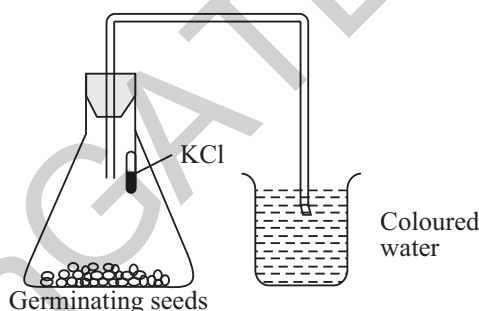
(c) Only A and B portions remained colourless and the rest of the leaf turned blue-black.

(d) A, B and C portions remained colourless and the rest of the leaf turned blue-black.

Answer :

(c) Only A and B portions remained colourless and the rest of the leaf turned blue-black.

33. Rina set up the apparatus for demonstrating that CO_2 is released during respiration of germinating seeds. After 2 hours when she observed the set up she did not find the water to rise in the bent tube from the beaker. The reason could be because : [1]



- (a) the beaker has coloured water.
 (b) The set-up is air tight.
 (c) no oxygen is available to seeds for respiration.

(d) carbon-dioxide is not being absorbed.

Answer :

(d) carbon-dioxide is not being absorbed.

34. While studying the double displacement reaction, the solutions of barium chloride and sodium sulphate are mixed together. [2]

- (i) What do you observe as soon as the two solutions are mixed together ?
 (ii) What will happen in the above observation made by you after ten minutes ?

Answer :

- (i) The reaction mixture becomes white in colour and a precipitate is formed.
 (ii) White precipitate settles down after 10 minutes.

35. In an experiment, to study the dependence of potential difference (V) on the electric current (I) across a conductor (resistor), if the circuit is on for long time, then-select two correct options from the following : [2]

- (i) Zero error of an ammeter will be changed.
- (ii) Zero error of a voltmeter will be changed.
- (iii) Value of a resistance will be changed.
- (iv) Resistor will be heated.

Answer :

- (i) Value of resistance will be changed.
- (ii) Resistor will be heated.

36. Record your observations when a stained and mounted leaf peel is viewed by you under high power (45 ×) microscope. [2]

Answer :

1. The process (stomatal process) in which stomatal pores are clearly seen.
2. Each stomata has two kidney shaped cells (guard cells) having one nucleus and many chloroplasts each.

Science 2015 Term I

SET II

SECTION – A

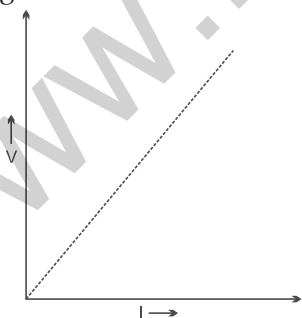
1. Name one plant hormone which inhibits growth. Write its one more function. [1]

Answer : Abscisic acid is a plant hormone which functions mainly as a growth inhibitor.

1. It promotes the dormancy in seeds and buds.
2. It promotes the closing of stomata.
3. It promotes the wilting and falling of leaves.

2. What is the shape of the graph between V and I, where V is the potential difference applied between the ends of a wire and I is the current flowing through it? [1]

Answer : The graph between the potential difference (V) and the corresponding current (I) is a straight line passing through the origin.



3. Name the part of a biogas plant where reactions take place in the absence of oxygen. [1]

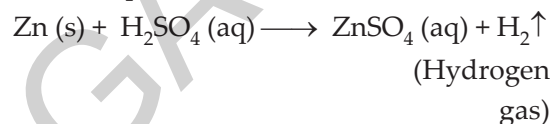
Answer : Digester tank.

4. Name the gas which is usually produced when dil. sulphuric acid reacts with a metal. Illustrate it with an example. How

will you test the evolution of this gas? [2]

Answer : Metals react with dil. sulphuric acid to give metal sulphates and hydrogen gas.

For example,



Test for hydrogen gas : Take about 5ml of dilute sulphuric acid in a test tube and add a few pieces of zinc granules to it. Hydrogen gas is evolved which forms bubbles in the soap solution.

Bring a burning candle near hydrogen gas-filled bubble. It burns with a pop sound.

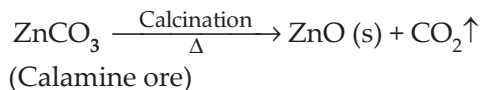
5. A metal 'M' is found in nature as its carbonate. It is used in the galvanization of iron. Identify 'M' and name its ore. How will you convert this ore into free metal? [2]

Answer : 'M' = Zinc metal

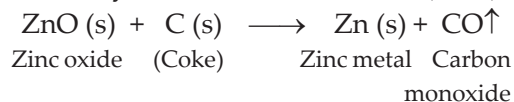
Zinc occurs as Zinc Carbonate in calamine ore, ZnCO₃.

Zinc can be extracted from the ore by :

- (i) Zinc Carbonate is first converted into Zinc Oxide by calcination. When calamine ore (zinc carbonate) is heated strongly in the absence of air, it decomposes to form zinc oxide and carbon dioxide.



- (ii) Zinc metal is then extracted from zinc oxide by reduction with carbon (coke).



6. (i) Name two waste products which are stored in old xylem in plants.
 (ii) Name the process by which plants get rid of excess water. Name the pores through which this process takes place. [2]

Answer :

- (i) Resin and gums are the two wastes which are stored in old xylem in plants.
 (ii) Transpiration is the process by which plants get rid of excess water. Stomatal pores are the pores through which transpiration takes place.
 7. (a) In electrolysis of water, why is the volume of gas collected over one electrode double that of gas collected over the other electrode ?
 (b) (i) What is observed when a solution of potassium iodide is added to a solution of lead nitrate taken in a test tube ?
 (ii) What type of reaction is this ?
 (iii) Write a balanced chemical equation to represent the above reaction. [3]

Answer :

- (a) In electrolysis of water (H₂O), the hydrogen goes to one test tube and oxygen goes to another. The two electrodes collect H and O separately. Since water (H₂O) consists of 2 parts of hydrogen and 1 part of oxygen, so the volume of hydrogen gas (H₂) collected over cathode (negative electrode) is double the volume of oxygen gas (O₂) collected over anode (positive electrode).
 (b) (i) When potassium iodide solution is added to lead nitrate solution, then a yellow precipitate of lead iodide is produced along with potassium nitrate solution.
 (ii) This is double displacement reaction.
 (iii)
$$\text{Pb}(\text{NO}_3)_2 (\text{aq}) + 2\text{KI} (\text{aq}) \longrightarrow$$

Lead nitrate	Potassium iodide	+	2KNO ₃ (aq)
	PbI ₂ (s)	+	
	Lead iodide (yellow ppt)		

8. You are provided with three test tubes A, B and C which contain distilled water, acidic solution and basic solution respectively. If you are given blue litmus paper only, how will you identify the contents of each test tube ? [3]

Answer :

- First take three strips of blue litmus paper and dip one in each test tube.
- The liquid in test tube A turns blue litmus to red. It means test tube A contains acid because (acid turns blue litmus to red).
- If other two test tubes do not change the colour of blue litmus paper, it shows that one of them contains a base and the other contains distilled water.
- Now put the blue litmus paper which is turned red by the acid of test tube A in the remaining two test tubes.
- If the liquid of test tube B turns that red litmus paper to blue again, it shows that it is a base.
- The liquid in test tube C does not turn the colour of either blue litmus or red litmus thus is distilled water.

Step - I : Put blue litmus paper

Test tube A	Test tube B	Test tube C
↓	↓	↓
turns red	remains blue	remains blue
↓	↓	↓
Acid	Either base or distilled water	

Step - II : Put red litmus paper
(red turned by acid)

Test tube B	Test tube C
↓	↓
turns blue	remains red
↓	↓
Base	Distilled water

9. You are given samples of three metals—sodium, magnesium and copper. Suggest any two activities to arrange them in order of their decreasing reactivity. [3]

Answer : Given three metals—sodium (Na), magnesium (Mg), copper (Cu)

Activity I. When the three given metals Na, Mg and Cu are added to magnesium chloride solution separately taken in three different test tubes, we will find that displacement reactions will take place in the following manner :

MgCl ₂ solution	Metals
Displacement reaction	Na
No reaction	Mg
No reaction	Cu

This shows that Na is the most reactive metal as it displaces Mg from MgCl₂ solution.

Activity II. When Na, Mg and Cu metals are taken in three different test tubes and CuSO₄ solution is added in each test tube, we will find that displacement reactions will take place in the following manner :

CuSO ₄ solution	Metals
Displacement reaction	Na
Displacement reaction	Mg
No reaction	Cu

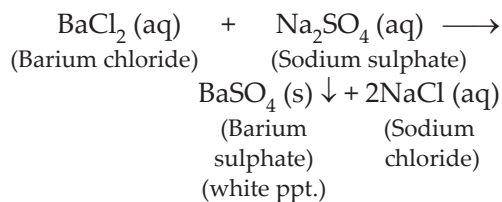
This shows that Cu is the least reactive metal.

Order of decreasing reactivity : Na > Mg > Cu.

10. (a) What happens when an aqueous solution of sodium sulphate reacts with an aqueous solution of barium chloride? State the physical conditions of reactants in which reaction between them will not take place. Write the balanced chemical equation for the reaction and also mention the type of reaction.
- (b) What changes in the colour of iron nails and copper sulphate solution do you observe after keeping the iron nails in copper sulphate solution for about half an hour? [3]

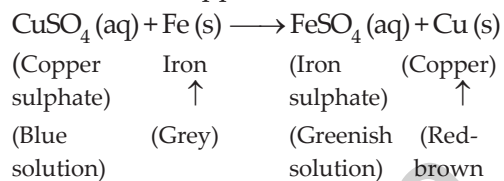
Answer :

- (a) When barium chloride solution is added to sodium sulphate solution, then a white precipitate of barium sulphate is formed along with sodium chloride solution :



Reaction will not take place if the reactants are in a solid state.

- (b) When iron nails are dipped in copper sulphate solution, then iron sulphate solution and copper metal are formed :



This displacement reaction occurs because iron is more reactive than copper. Also a brown substance will be deposited on the iron nail. This substance is nothing but copper metal.

11. **Bile juice does not contain any enzyme but bile salts are important for digestion and absorption of fats. State reason.** [3]

Answer : Bile is a digestive juice secreted by the liver. Although it does not contain any digestive enzymes, it plays an important role in the digestion of fats.

Bile is alkaline and contains salts which helps to emulsify or break the fats (or lipids) present in the food. Thus, bile performs two functions :

- Makes the acidic food coming from the stomach alkaline so that pancreatic enzymes can act on it.
 - Bile salts break the fats present in the food into small globules making it easy for the enzymes to act and digest them.
12. **State the function of receptors in our body. Think of any three situations where receptors in the body do not work properly. Mention the problems which are likely to arise.** [3]

Answer : A receptor is a cell (or a group of cells) in a sense organ which is sensitive to a particular type of stimulus such as light, sound, smell, taste, heat, pressure, etc. The different sense organs contain receptors for detecting different stimuli.

When receptors do not work properly, the environmental stimuli are not able to create nerve impulses and the body does not responds.

When receptors are damaged, the external stimuli transferring signals to the brain are not felt.

For example,

1. During fever, taste buds do not work properly and as a result, taste of the food eaten is not felt properly thus enzyme secretion is also affected.
2. When a person is suffering from a cold, the nostrils are filled with mucus. Then smell of the surrounding is not felt properly. This is due to interruption in reacting to the sense of smell by the olfactory receptor.
3. When skin receptors are damaged, and we accidentally touch a hot object, then our hands might get burnt as the damaged receptor cannot perceive the external stimuli of heat and pain.

13. (a) State reason for the following :

- (i) Rings of cartilage are present in the trachea.
- (ii) Plants look green in colour.

(b) Write other names of the following :

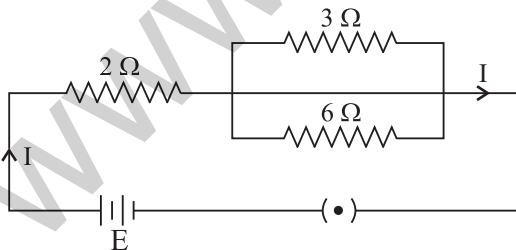
- (i) Alveolar sac
- (ii) Voice box

[3]

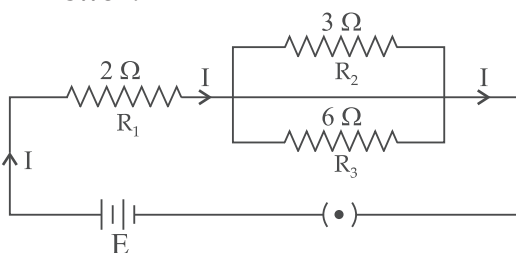
Answer :

- (a) (i) Rings of cartilage are present in the trachea so that trachea does not collapse even when there is no air in it.
- (ii) Plants look green in colour because of the presence of a green pigment called chlorophyll in it.
- (b) (i) Alveolar sac → Alveoli
- (ii) Voice box → Larynx

14. In the given electric circuit if the current flowing through $3\ \Omega$ resistor is $1\ \text{A}$, find the voltage of the battery and the current I drawn from it. [3]



Answer :



$$E = ?$$

$$I = ?$$

$$R_2 = 3\ \Omega$$

$$I_2 = 1\ \text{A} \text{ (Current flowing through } R_2)$$

$$V_2 = I_2 R_2 = 1 \times 3 = 3\ \text{volts}$$

Resultant resistance of R_2 and R_3 is R' .

$$\frac{1}{R'} = \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{3} + \frac{1}{6} = \frac{2+1}{6} = \frac{3}{6} = \frac{1}{2}$$

$$R' = 2\ \Omega$$

$$V' = V_2 = 3\ \text{volts} \text{ (Voltage across } R')$$

$$I' = ?$$

$$I' = \frac{V'}{R'} = \frac{3}{2}\ \text{A} = 1.5\ \text{A}$$

$$I' = I = 1.5\ \text{A}$$

Resultant resistance in the circuit = R

$$R = R_1 + R' = 2 + 2 = 4\ \Omega$$

$$I = \frac{3}{2}\ \text{A}$$

$$V = ?$$

$$V = IR = \frac{3}{2} \times 4 = 6\ \text{volts}$$

$$\Rightarrow E = V = 6\ \text{volts}$$

15. What are magnetic field lines ? List two characteristic properties of these lines. [3]

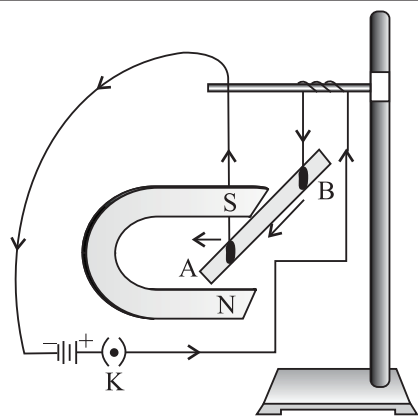
Answer : The lines drawn in a magnetic field along which north magnetic pole moves, are called magnetic field lines. With the help of a small magnetic compass, the direction of a magnetic field at a point is determined. When the compass is moved along the magnetic line, then the line drawn from the south pole to the north pole indicates the direction of the magnetic field.

The characteristic properties of magnetic field lines are :

1. The magnetic lines originate from north pole and ends at south pole.
2. The magnetic lines do not intersect each other.

16. With the help of a diagram of experimental setup describe an activity to show that the force acting on a current carrying conductor placed in a uniform magnetic field increases with increase in the field strength. [3]

Answer : Take a battery, two magnets of different sizes and intensities, small aluminium rod AB, connecting wires and an iron stand and arrange them as shown in the figure.



Now, bring the magnet with lower magnetic intensity closer to the aluminium rod. The rod deflects. Now observe the velocity of the rod. The displacement of the rod in the above activity suggests that a force is exerted on the current carrying conductor, when it is placed in a magnetic field.

Now steady the rod and bring both the magnets closer together to ensure that the magnetic field is stronger than before. The rod moves towards the magnet but faster than before. This is possible only if the force acting on the rod is stronger than before and because the body will be starting with zero velocity, so it will move faster only if its acceleration is more. Since acceleration is more, the force acting on it is more. Thus, the force acting on a current carrying conductor placed in a uniform magnetic field increases with increase in field strength.

17. Anita visited her village during summer vacation and saw her grandmother burning firewood to cook food. This caused lots of smoke and resulted in the bad health of Anita's grandmother. Anita suggested some alternatives to her family in the village and offered to help them. Now answer the following questions : [3]

- (i) List any two alternatives that Anita must have suggested to her grandmother.
- (ii) How will Anita's grandmother benefit herself and the community by not burning the firewood ? Give one reason each.
- (iii) Which qualities of Anita are reflected in her way of thinking ?**

Answer :

- (i) Two alternatives suggested by Anita are :
 1. Use of biogas
 2. Use of charcoal

(ii) Disadvantages of burning firewood are :

1. Burning of firewood causes lots of smoke which harms the person who is cooking the food and causes air pollution which is harmful for the environment and harms the society as a whole.
2. Use of firewood causes deforestation and is not eco-friendly.

18. State the principle of working of ocean thermal conversion plant. Explain how the plant works ? Write one essential condition for it to operate properly. [3]

Answer : The energy available due to the difference in the temperature of water at the surface of the ocean and at deeper levels is called Ocean Thermal Energy (OTE).

Condition for it to operate properly :

Ocean thermal energy plants can operate if the temperature difference between the water at the surface and water at depths upto 2 km is 293 K (20°C) or more.

Working : The devices used to harness ocean thermal energy are called ocean thermal energy conversion power plants (or OTEC power plants). A temperature difference of 20°C (or more) between the surface water of ocean and deeper water is needed for operating OTEC power plants. In one type of OTEC power plant, the warm surface water of ocean is used to boil a volatile liquid like ammonia or a CFC. The high pressure vapours of the liquid are then used to turn the turbine of a generator and produce electricity. The colder water from the deeper ocean is pumped up to cool the used up vapours and convert them again into a liquid. This process is repeated again and again.

19. (a) Explain any two physical properties of ionic compounds giving reason.
- (b) List any two metals found in free state in earth's crust. Where are they located in activity series ?

**Answer is not given due to change in the present syllabus.

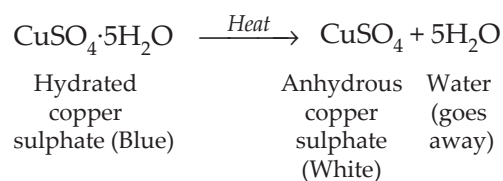
- (c) Metals towards the top of the activity series can not be obtained from their compounds by reducing with carbon. Why? [5]

Answer :

- (a) Physical properties of ionic compounds are :
1. Ionic compounds are usually crystalline solids because their oppositely charged ions attract one another strongly and form a regular crystal structure.
 2. Ionic compounds have high melting and high boiling points. The ionic compounds are made up of positive and negative ions. There is a strong force of attraction between the oppositely charged ions, so a lot of heat energy is required to break this force of attraction and melt or boil the ionic compounds.
- (b) Gold and platinum metals are found in free state in the earth's crust. These metals are located at the bottom in the activity series.
- (c) Metals towards the top of the activity series are highly reactive. The oxides of highly reactive metals are very stable and cannot be reduced by 'carbon' to obtain free metals because these metals have more affinity for oxygen than carbon.
20. (a) The blue colour of crystals of a substance changed on heating in a closed test tube but the colour was regained after sometime on cooling. Name the substance and write its chemical formula. Explain the phenomenon involved.
- (b) Write name and chemical formula of two such compounds whose one formula unit is associated with 10 and 2 water molecules respectively. [5]

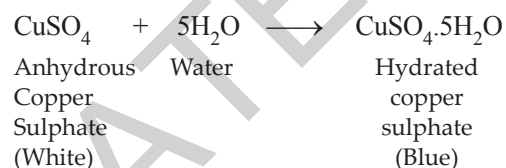
Answer :

- (a) The substance is Copper sulphate crystals ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$) which are blue in colour. When copper sulphate crystals are heated strongly, they lose all the water of crystallisation and forms anhydrous copper sulphate (which is white) :



Thus, on strong heating, blue copper sulphate crystals turn white due to the loss of water of crystallisation.

The dehydration of copper sulphate crystals is a reversible process. So when water is added to anhydrous copper sulphate, it gets hydrated and turns blue due to the formation of hydrated copper sulphate.



- (b) Chemical Formula of two such compounds whose one formula unit is associated with 10 and 2 water molecules respectively are—
1. Washing soda — $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
(Sodium Carbonate Decahydrate)
 2. Gypsum — $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
(Calcium Sulphate Dihydrate)
21. (a) Define reflex action. State its significance.
- (b) How do plants respond to external stimuli? [5]

Answer :

- (a) A reflex action is an automatic response to a stimulus. The simplest form of response in the nervous system is reflex action. This is a rapid, automatic response to a stimulus which is not under the voluntary control of the brain. It is described as an involuntary action. The pathway taken by nerve impulses in a reflex action is called the reflex arc. Reflex actions are the actions which we perform without thinking to protect ourselves. For example, coughing is a reflex action which clears our windpipe. The pupils of our eyes get smaller in bright light. This reflex action protects

the retina of our eyes from damage due to much light. The pupils of our eyes gets bigger in dim light so as to help us see properly even in dim light.

(b) Plants respond to external stimuli such as light, touch, etc. A growth movement of a plant part in response to an external stimulus in which the direction of stimuli determines the direction of response is called tropism.

1. If the growth of a plant part is towards the stimuli, it is called positive tropism.
2. If the growth of a plant part is away from the stimulus, then it is called negative tropism.

Types of tropism :

1. The movement of a plant part in response to light is called phototropism.
2. The movement of a plant part in response to gravity is called geotropism.
3. The movement of a plant part in response to chemicals is called chemotropism.
4. The movement of a plant part in response to water is called hydrotropism.
5. The directional growth movement of a plant part in response to the touch of an object is called thigmotropism. **Nasties (or Nastic Movements).** The movement of a plant part in response to an external stimulus in which the direction of response is not determined by the direction of stimulus is called nastic movement.
6. The folding up of the leaves of a sensitive plant on touching is an example of nastic movement. Here the stimulus is touch.
7. The opening up of the petals of dandelion flowers in morning in bright light and closing in the evening when the light fades is an example of nastic movement. In this case the stimulus is light.

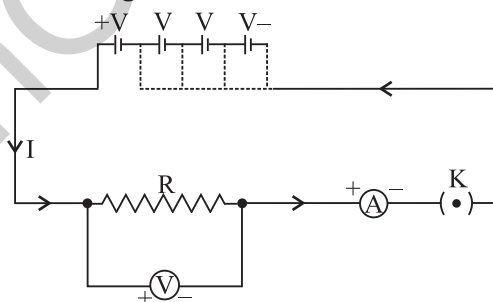
22. State Ohm's law. Draw a labelled circuit diagram to verify this law in the laboratory. If you draw a graph between the potential difference and current flowing through a metallic conductor, what kind of curve will you get? Explain how would you use this graph to determine the resistance of the conductor.

Answer : Ohm's law states that the electric current flowing through a conductor is directly proportional to the potential difference across its two ends, when other physical conditions like temperature etc., remain constant.

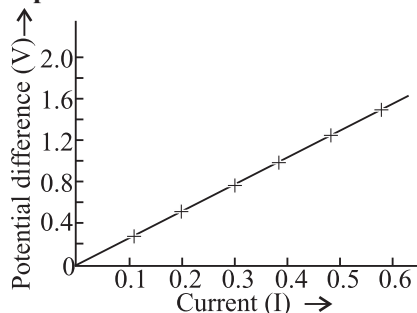
i.e., $V \propto I$
 or $\frac{V}{I} = \text{Constant} = R$
 or $V = IR$

Thus, the ratio $V : I$ is a constant. This constant is called the resistance (R) of the conductor.

Circuit diagram for Ohm's law :



Graph :



Explanation : If a graph is drawn between the potential difference (V) and current (I), the graph is found to be a straight line passing through the origin. This shows that the current is directly proportional to the potential difference. Thus, the ratio $\frac{V}{I}$

remains constant. This constant is called the resistance of the conductor. The gradient of the straight line graph is related to the resistance (R) of the conductor.

23. (a) A coil of insulated wire is connected to a galvanometer. What would be seen if a bar magnet with its south pole towards one face of the coil
- moved quickly toward it
 - moved quickly away from it
 - placed near its one face ?

These activities are then repeated with north pole of the magnet. What will be the observations ?

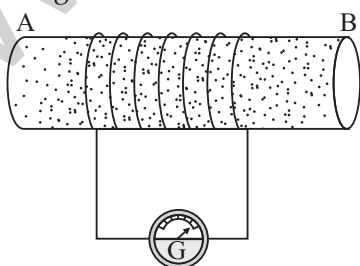
- Name and define the phenomenon involved in above activities.
- Name the rule which can determine the direction of current in each case. [5]

Answer :

- A coil of insulated wire is connected to a galvanometer and if a bar magnet with its south pole, towards one face of the coil, is
 - moved quickly towards it, the galvanometer is deflected towards the left.
 - moved quickly away from it, the galvanometer is deflected towards the right.
 - If the magnet is held stationary inside the coil, the deflection of the galvanometer is zero.

If this activity is repeated with north pole of the magnet :

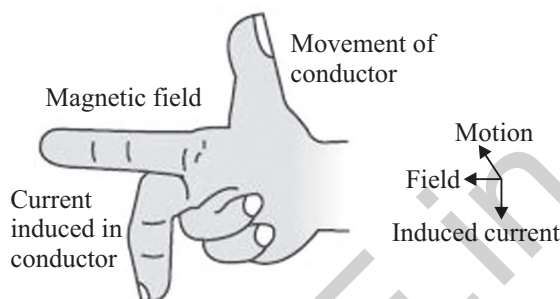
- If the magnet is pushed into the coil, the galvanometer is deflected towards the right.
- If the magnet is withdrawn from the coil, the galvanometer is deflected towards the left.
- If the magnet is held stationary inside the coil, the deflection of the galvanometer is zero.



- The phenomenon involved in this activity is 'Electromagnetic Induction'. The production of electric current by

moving a magnet near a fixed coil of wire is called electromagnetic induction.

- The direction of induced current is determined by 'Fleming's Right Hand Rule'.



- When an electric current flows through a conductor it becomes hot. Why ? List the factor on which the heat produced in a conductor depends. State Joule's law of heating. How will the heat produced in an electric circuit be affected, if the resistance in the circuit is doubled for the same current ? [5]

Answer : When an electric current is passed through a conductor, it becomes hot. This is called heating effect of current. The heating effect of current is obtained by the transformation of electrical energy into heat energy. A battery of a cell is a source of electrical energy. The chemical reaction within the cell generates the potential difference between its two terminals that sets the electrons in motion to make the current flow through a resistor. The source has to keep expending its energy. A part of the source energy in maintaining the current is consumed into useful work and rest of the source energy is wasted in heat.

The heat produced in a wire is directly proportional to :

- square of current (I^2)
- resistance of wire (R)
- time (t), for which current is passed.

Joule's Law of heating states that when a current of ' I ' amperes flows in a wire of resistance ' R ' ohms for time ' t ' seconds, then the heat produced in the conductor is equal to the product of the square of the current, resistance of the wire and time for which current is passed. Joule's Law of heating gives the formula—

$$H = I^2 \times R \times t$$

Since, $H \propto R$, therefore if the resistance in the circuit is doubled then heat produced will also get doubled.

SECTION – B

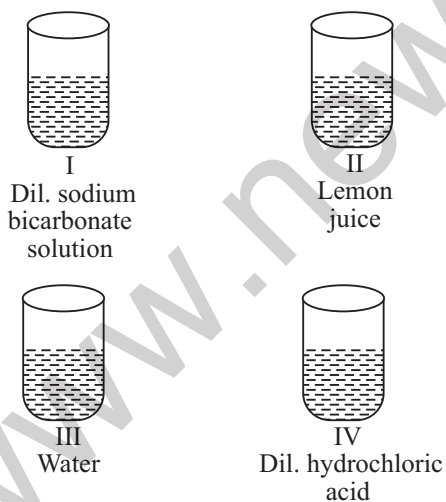
25. A student was given a solution to find its pH. His teacher declared his recorded pH as wrong. Student explained to his teacher, all the steps done by him while finding pH of sample. Mark the step taken by student in which he committed mistake. [1]

- (a) collection of apparatus.
- (b) clearing of all apparatus
- (c) making pH paper wet and then dip it in sample.
- (d) recording observation.

Answer :

- (c) making pH paper wet and then dip it in sample.

26. A student was provided with four samples of solutions as shown in figures (I), (II), (III), and (IV). He determined pH value of each solution by using pH paper. The correct sequence of colour change of pH paper observed by the student will be : [1]



- (a) indigo light red green red
- (b) red indigo green light red
- (c) indigo red green yellow
- (d) green red yellow indigo

Answer :

- (a) indigo light red green red

27. The products of reaction between zinc and sodium hydroxide solution are : [1]

- (a) sodium carbonate and water

- (b) sodium zincate and hydrogen
- (c) zinc hydroxide and hydrogen
- (d) zinc carbonate and hydrogen

Answer :

- (b) sodium zincate and hydrogen

28. A student placed Zn rod in $FeSO_4$ solution. After 10 hours when rod was taken out and it was observed that : [1]

- (a) Zn rod became thinner.
- (b) Zn rod became thicker due to Iron deposition.
- (c) Zn rod remains as it was.
- (d) Zn rod has holes.

Answer :

- (d) Zn rod has holes.

29. Four test tubes marked I, II, III and IV were taken. 20 ml of $Al_2(SO_4)_3$ solution in water was poured in each of the test tubes. A piece of zinc metal was placed in test tube I, an iron nail was put in test tube II, copper turnings were put in test tube III and a clean aluminium strip was placed in test tube IV. No change was observed in any of the test tubes. The correct inference drawn is : [1]

- (a) Copper is more reactive than Aluminium.
- (b) Zinc is more reactive than Aluminium.
- (c) Zinc is more reactive than Copper.
- (d) Zinc, Iron and Copper are less reactive than Aluminium.

Answer :

- (d) Zinc, Iron and Copper are less reactive than Aluminium.

30. A teacher demonstrated the experiment "To find the equivalent resistance of two resistors when connected in series". Rahul and Raghav after observing the experiment concluded that :

Rahul : The current passing through the resistors in series combination is same.

Raghav : The potential difference across the combination of resistors is the sum of potential differences across each of them.

Out of the options given below which one is correct ? [1]

- (a) Rahul is right, Raghav is wrong.
- (b) Raghav is right, Rahul is wrong.

(c) Both Rahul and Raghav are wrong.

(d) Both Rahul and Raghav are right.

Answer :

(d) Both Rahul and Raghav are right.

31. The resistances R_1 and R_2 are connected in parallel. The equivalent resistance of the combination is : [1]

- (a) $R_1 + R_2$
 (b) $R_1 - R_2$
 (c) $R_1 R_2 / R_1 + R_2$
 (d) $R_1 + R_2 / R_1 R_2$

Answer :

(c) $\frac{R_1 R_2}{R_1 + R_2}$

32. In an experiment to show that 'sunlight is necessary for photosynthesis', the leaf is boiled in alcohol for few minutes using a water bath. It is essential because : [1]

- (a) Alcohol is highly volatile.
 (b) Steam from the water bath heats the leaf rapidly.
 (c) Steam from the water dissolves the chlorophyll.
 (d) Alcohol is flammable.

Answer :

- (c) Steam from the water dissolves the chlorophyll.

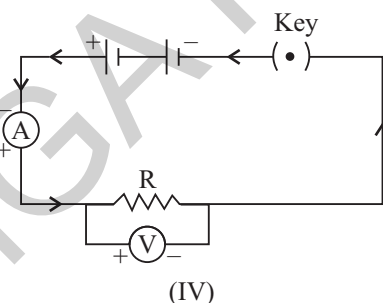
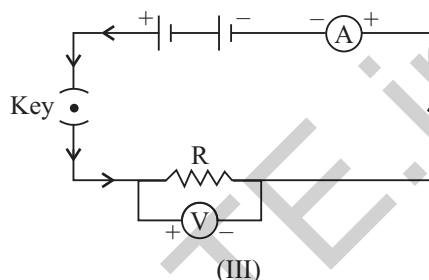
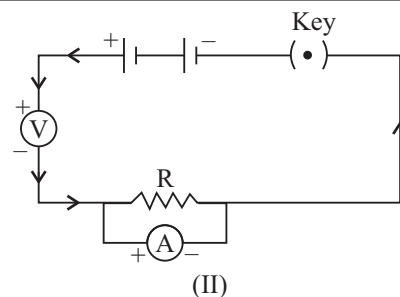
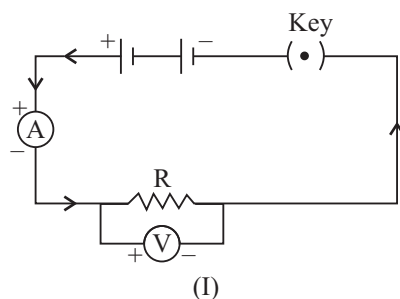
33. In the experiment to show that 'CO₂ is released during respiration', the solution in the test tube is chemically : [1]

- (a) NaOH (b) KOH
 (c) NaCl (d) KCl

Answer :

- (b) KOH

34. To study the dependence of potential difference (V) on current I across Resistor (R), four circuit diagrams are prepared. [2]



- (i) Select the circuit diagrams which are correct.
 (ii) Give reason for the circuit diagrams which are not correct.

Answer :

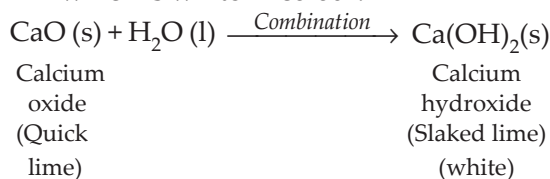
- (i) Circuit diagrams (I) and (III) are correct.
 (ii) Circuit diagram (II) is incorrect because ammeter is always connected in series with the resistor and voltmeter is always connected in parallel to the resistor.

Circuit diagram (IV) is incorrect because the negative (-ve) terminal of the ammeter is connected to the positive (+ve) terminal of the battery.

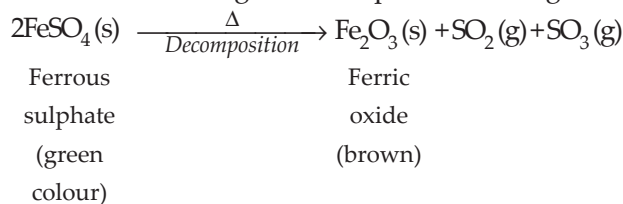
35. (i) While studying the combination reaction on adding water to quick lime, name the product formed and write its colour.
 (ii) While studying the decomposition reaction by heating ferrous sulphate crystals in a test-tube, a product is formed in the test-tube. Name the product and write its colour. [2]

Answer :

- (i) Quicklime (CaO) reacts vigorously with water to form slaked lime [Ca(OH)₂] which is white in colour.



- (ii) When ferrous sulphate is heated strongly, it decomposes to form brown coloured ferric oxide and sulphur dioxide gas and sulphur trioxide gas.



36. Identify the observed various parts of temporary mount of well stained leaf peel, when focussed under the high power of a microscope. [2]

Answer : Parts of temporary mount of well stained leaf peel are :

1. Stomatal aperture (opened) or (closed)
2. Guard cells
3. Chloroplast
4. Nucleus
5. Epidermal cells

Science 2015 (Outside Delhi) Term II

SET I

Time allowed : 3 hours

Maximum marks : 90

SECTION – A

1. Write the number of covalent bonds in the molecule of ethane. [1]

Answer : Molecule of ethane has 7 covalent bonds.

2. Name of the life process of an organism that helps in the growth of its population. [1]

Answer : Reproduction

3. What will be the amount of energy available to the organisms of the 2nd trophic level of a food chain, if the energy available at the first trophic level is 10,000 joules? [1]

Answer : 1000 J.

4. The absolute refractive indices of glass and water are 4/3 and 3/2 respectively. If the speed of light in glass is 2×10^8 m/s, calculate the speed of light in (i) vacuum, (ii) water. [2]

Answer :

- (i) Given : $n_g = \frac{4}{3}$, $n_w = \frac{3}{2}$, $v_g = 2 \times 10^8$ m/s

We know that for glass,

$$n_g = \frac{c}{v_g}$$

\therefore Speed of light in air or vacuum,

$$c = n_g v_g$$

$$= \frac{4}{3} \times 2 \times 10^8 = 2.67 \times 10^8 \text{ m/s}$$

- (ii) Also in water,

$$n_w = \frac{c}{v_w}$$

$$\therefore v_w = \frac{c}{n_w} = \frac{2.67 \times 2 \times 10^8}{3}$$

Speed of light in water

$$= 1.78 \times 10^8 \text{ m/s.}$$

5. List two main causes of the pollution of water of the river Ganga. State how pollution and contamination of river water prove harmful for the health of the people of neighbouring areas. [2]

Answer :

1. Main cause of pollution of water of the river Ganga :
 - (a) Disposal of industrial effluents
 - (b) Human activities like bathing, washing etc.
 - (c) Disposal of unreacted sewage.
2. Harmful effects on health :
 - (a) Spreading of water borne diseases
 - (b) Consumption of contaminated fishes.

6. What is biodiversity ? What will happen if biodiversity of an area is not preserved ? Mention one effect of it. [2]

Answer : Biodiversity refers to number and range of variety of species of life forms in an area. If the biodiversity of an area is not preserved then loss of diversity may lead to a loss of ecological stability.

7. List two tests for experimentally distinguishing between an alcohol and a carboxylic acid and describe how these tests are performed. [3]

Answer :

1. Test I-Litmus test

Take two strips of blue litmus paper. Place a drop each of the alcohol and carboxylic acid on these strips separately. The blue litmus paper turns red in the case of carboxylic acid and remains unaffected in the case of alcohol.

2. Test II-Sodium bicarbonate test

Add a pinch of sodium bicarbonate to both alcohol and carboxylic acid. If brisk effervescence with evolution of colourless, tasteless gas is evolved, then it is carboxylic acid and if no change is observed then alcohol.

8. Draw the electron-dot structure for ethyne. A mixture of ethyne and oxygen is burnt for welding. In your opinion, why cannot we use a mixture of ethyne and air for this purpose ? [3]

Answer : $H \times C \begin{array}{c} \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \\ \cdot \end{array} C \times H$

In pure oxygen, ethyne undergoes complete combustion and high temperature is suitable for welding.

We cannot use air instead of oxygen because air contains less percentage of oxygen which results in incomplete combustion of ethyne and temperature required for welding is not acquired.

9. Two elements 'P' and 'Q' belong to the same period of the modern periodic table and are in Group-1 and Group-2 respectively. Compare their following characteristics in tabular form : [3]

- (a) The number of electrons in their atoms
(b) The sizes of their atoms
(c) Their metallic characters
(d) Their tendencies to lose electrons
(e) The formula of their oxides
(f) The formula of their chlorides

Answer :

	Property	P	Q
(a)	No. of electrons in the atom	3, 11, 19	4, 12, 20
(b)	Size of atom	Bigger	Smaller
(c)	Metallic character	More metallic	Less metallic
(d)	Tendency to lose electrons	More	Less
(e)	Formula of oxide	P ₂ O	QO
(f)	Formula of their chlorides	PCl	QCl ₂

10. Taking the example of an element of atomic number 16, explain how the electronic configuration of the atom of an element relates to its position in the modern periodic table and how valency of an element is calculated on the basis of its atomic number. [3]

Answer : Electronic configuration = 2, 8, 6

Period = 3 since it has 3 shells

Group = 16 Since numbers of valence electrons are 6.

Valency = 8 - 6 = 2

11. List six specific characteristics of sexual reproduction. [3]

Answer : Characteristics of sexual reproduction are :

- Two parents are involved.
- Two dissimilar gametes are formed by meiosis.
- Variations are produced.
- Occurs in all the higher and in some of the lower organisms.
- Fertilisation leads to formation of zygote.
- Slow process.

12. What are chromosomes ? Explain how in sexually reproducing organisms the

number of chromosomes in the progeny is maintained. [3]

Answer : Chromosomes are thread like structures made up of DNA found in the nucleus.

The original number of chromosomes becomes half during gamete formation.

Hence, when the gametes combine, the original number of chromosomes gets restored in the progeny.

13. List four points of significance of reproductive health in a society. Name any two areas related to reproductive health which have improved over the past 50 years in our country. [3]

Answer : Significance

1. Prevents STD's.
2. Advantages of small family.
3. Less mortality among new borns.
4. Reduces the cases of maternal mortality.

Areas improved

1. Family planning
2. Decrease in STD cases.

14. Explain with an example for each, how the following provides evidences in favour of evolution in organisms : [3]

- (a) Homologous organs
- (b) Analogous organs
- (c) Fossils

Answer : (a) **Homologous organs :** Study of homologous organs suggests that the organs having same structures but performing different functions have evolved from a common ancestor.

e.g., Forelimbs of a frog, lizard, birds and man.

(b) **Analogous organs :** shows adoption of organs for common use.

e.g., Wings of butterfly and wings of bat.

(c) **Fossils**—Provides the missing links between two species.

e.g., Archeopteryx

15. Explain the following : [3]

(a) Speciation

(b) Natural Selection

Answer : (a) Speciation is the evolution of new species from pre-existing species. It occurs due to accumulation of variations. By

the processes like genetic drift, barriers like mountains, rivers etc. leading to incapability to reproduce amongst themselves in population.

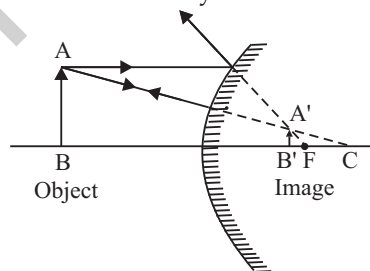
(b) **Natural selection**

Change in frequency of some genes in a population. It gives survival advantages to a species from elimination.

Example : In a population of beetles, a new variation (green colour) get survival benefit and this is the advantage to green beetles whereas other one red perishes.

16. If the image formed by a mirror for all positions of the object placed in front of it is always erect and diminished, what type of mirror is it ? Draw a ray diagram to justify your answer. Where and why do we generally use this type of mirror ? [3]

Answer : The image formed by a convex mirror for all positions of the object placed in front of it is always erect and diminished.



Uses of convex mirror :

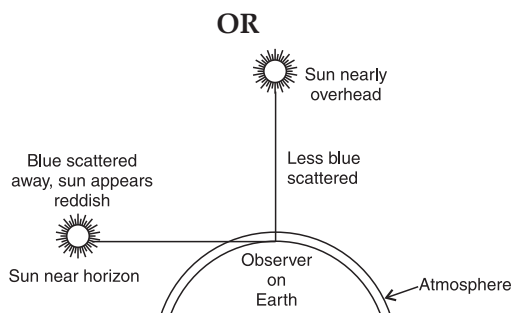
Convex mirrors are used as rear-view mirrors in vehicles and as shop security mirrors in malls and airports because the image formed in these mirrors is much smaller than the object due to which a convex mirror gives a wide field of view.

17. What is meant by scattering of light ? Use this phenomenon to explain why the clear sky appears blue or the sun appears reddish at sunrise. [3]

Answer : Scattering of light is the phenomenon by which a beam of light is redirected in many different directions when it strikes minute particles in the atmosphere.

The light from sun has to travel a long distance of the earth's atmosphere before reaching us. As light travels through the atmosphere, it gets scattered in different

direction by the air molecules present in its path. The blue light due to its short wavelength is scattered more as compared to the red light of long wavelength. Thus the light reaching our eye directly from sun is rich in red colour, while the light reaching our eye from all other directions is the scattered blue light. Therefore the sky in direction, other than the direction of sun, is seen blue.



18. Differentiate between biodegradable and non-biodegradable substances with the help of one example each. List two changes in habit that people must adopt to dispose non-biodegradable waste, for saving the environment. [3]

Answer :

Biodegradable substance	Non-biodegradable substances
Can be broken down into simpler substances by nature <i>e.g.</i> , Vegetable peels.	Cannot be broken down into simpler substances by nature. <i>e.g.</i> , Plastic or Glass.

Changes in habit :

- Use of separate dustbins for biodegradable and non-biodegradable waste.
- Reusing of things such as polybags.
- Recycle of waste.
- Use of carry bags.

19. Both soap and detergent are some type of salts. What is the difference between them? Describe in brief the cleansing action of soap. Why do soaps not form lather in hard water? List two problems that arise due to the use of detergents instead of soaps. [5]

Answer : Soaps are the sodium and potassium salts of long chain carboxylic acids whereas detergents are ammonium or sulphonate salts.

Cleansing action of soap : One part of soap molecules is ionic and dissolves in water. The other part is non-ionic hydrophobic part which dissolves in oil. Thus soap molecules arrange themselves in the form of a micelle. On rinsing with water soap is washed off lifting the oily dirt particles with it. Soap does not form lather in hard water because it forms insoluble precipitate.

Problem due to the use of detergent are :

- Detergent are non-biodegradable.
 - It leads to water or soil pollution.
20. (a) Name the human male reproductive organ that produces sperms and also secretes a hormone. Write the functions of the secreted hormone.
- (b) Name the parts of the human female reproductive system where
- fertilisation takes place,
 - implantation of the fertilised egg occurs.

Explain how the embryo gets nourishment inside the mother's body. [5]

Answer :

- (a) Testis produces sperms and male hormone testosterone. Testosterone helps in formation of sperms and development of secondary sexual characters.
- (b) (i) Fallopian tube
(ii) Uterus.

Embryo in the mother is attached by a disc like tissue called placenta. It provides large surface area for glucose and oxygen to pass from the mother's blood to the foetus.

21. How do Mendel's experiments show that the
- traits may be dominant or recessive,
 - traits are inherited independently? [5]

Answer :

- (a) When Mendel cross pollinated pure tall pea plants with pure dwarf pea plants, only tall plants were obtained in F_1 generation in 3:1 ratio. Thus appearance of tall character in both F_1 and F_2 shows that it is a dominant character. The absence of dwarf in F_1 generation reappears in F_2 shows dwarfness in the recessive character.

(b) When Mendel conducted a dihybrid cross having two sets of characters, he obtained only one set of parental characters in F_1 generation where as in F_2 generation he obtained both the set of parental characters as 9:3:3:1 ratio. Thus appearance of new generation or recombinants in the F_2 generation along with parental type shows that traits are inherited independently.

22. What is meant by power of a lens ? Define its S.I. unit.

You have two lenses A and B of focal lengths +10 cm and -10 cm respectively. State the nature and power of each lens. Which of the two lenses will form a virtual and magnified image of an object placed 8 cm from the lens ? Draw a ray diagram to justify your answer. [5]

Answer : Power of a lens is defined as the ability of lens to converge or to diverge a beam of light. It is also defined as reciprocal of focal length in metres.

For lens A :

$$f_A = +10 \text{ cm} = 0.1 \text{ m}$$

Since the focal length is positive, it is a convex lens.

$$\text{Now, } P_A = \frac{1}{f_A} = \frac{1}{0.1} = +10 \text{ D.}$$

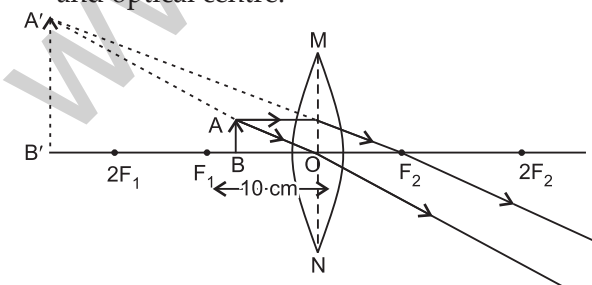
For lens B :

$$f_B = -10 \text{ cm} = -0.1 \text{ m}$$

Since the focal length is negative, it is a concave lens.

$$P_B = \frac{1}{f_B} = \frac{1}{-0.1} = -10 \text{ D.}$$

In case of a convex lens, image is virtual and magnified if object is placed between focus and optical centre.

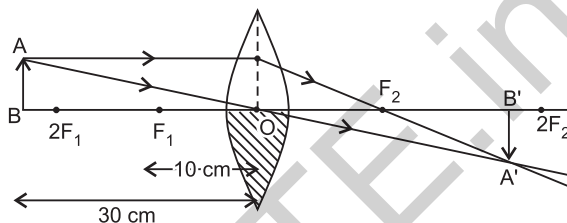


23. One half of a convex lens of focal length 10 cm is covered with a black paper. Can such a lens produce an image of a complete object placed at a distance of 30 cm from

the lens ? Draw a ray diagram to justify your answer.

A 4 cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 20 cm. The distance of the object from the lens is 15 cm. Find the nature, position and size of the image. [5]

Answer : Yes, it can produce an image of a complete object placed at a distance of 30 cm from the lens.



Given : $h_1 = 4 \text{ cm}$, $f = +20 \text{ cm}$, $u = -15 \text{ cm}$

We know that,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{v} = \frac{1}{f} + \frac{1}{u} = \frac{1}{20} - \frac{1}{15} = \frac{3-4}{60} = \frac{-1}{60}$$

\therefore Image distance, $v = -60 \text{ cm}$.

Image will be virtual, erect and placed in the direction of the object.

$$\text{Now, Magnification, } m = \frac{h_2}{h_1} = \frac{v}{u}$$

$$h_2 = \frac{v}{u} \times h_1 = \frac{-60}{-15} \times 4 = +16 \text{ cm.}$$

The size of the image is 16 cm.

24. Write the importance of ciliary muscles in the human eye. Name the defect of vision that arises due to gradual weakening of the ciliary muscles in old age. What type of lenses are required by the persons suffering from this defect to see the objects clearly ?

Akshay, sitting in the last row in his class, could not see clearly the words written on the blackboard. When the teacher noticed it, he announced if any student sitting in the front row could volunteer to exchange his seat with Akshay. Salman immediately agreed to exchange his seat with Akshay. He could now see the words written on the blackboard clearly. The teacher thought it fit to send the message to Akshay's parents advising them to get his eyesight checked.

In the context of the above event, answer the following questions : [5]

- Which defect of vision is Akshay suffering from ? Which type of lens is used to correct this defect ?
- State the values displayed by the teacher and Salman.**
- In your opinion, in what way can Akshay express his gratitude towards the teacher and Salman ?

Answer : Ciliary muscles modify the curvature of the eye lens to enable the eye to focus objects at varying distances.

The defect of vision that arises due to gradual weakening of the ciliary muscles in old age is presbyopia and it can be corrected by using a bi-focal lens of suitable power.

- Akshay is suffering from myopia or near sightedness and it can be corrected by using a concave lens of suitable power.
- By thanking the teacher and Salman.

SECTION – B

25. What do we observe on pouring acetic acid on red blue litmus papers ? [1]

- Red litmus remains red and blue litmus turns red.
- Red litmus turns blue and blue litmus remains blue.
- Red litmus turns blue and blue litmus turns red.
- Red litmus becomes colourless and blue litmus remains blue.

Answer :

- Red litmus remains red and blue litmus turns red.

26. While preparing soap a small quantity of common salt is generally added to the reaction mixture of vegetable oil and sodium hydroxide. Which one of the following may be the purpose of adding common salt ? [1]

- To reduce the basic nature of the soap
- To make the soap neutral
- To enhance the cleansing power of the soap
- To favour the precipitation of the soap

Answer :

- To favour the precipitation of the soap

27. A student takes about 4 mL of distilled water in four test tubes marked P, Q, R and S. He then dissolves in each test tube an equal amount of one salt in one test tube, in namely sodium sulphate in P, potassium sulphate in Q, calcium sulphate in R and magnesium sulphate in S. After that he adds an equal amount of soap solution in each test tube. On shaking each of these test tubes well, he observes a good amount of lather (foam) in the test tubes marked [1]

- P and Q
- Q and R
- P, Q and S
- P, R and S

Answer :

- P and Q

28. A student was asked to observe and identify the various parts of an embryo of a red kidney bean seed. He identified the parts and listed them as under : [1]

- Tegmen
- Testa
- Cotyledon
- Radicle
- Plumule

The correctly identified parts among these are

- I, II and III
- II, III and IV
- III, IV and V
- I, III, IV and V

Answer :

- III, IV and V

29. Given below is the list of vegetables available in the market. Select from these the two vegetables having homologous structures : [1]

Potato, sweet potato, ginger, radish, tomato, carrot, okra (Lady's finger)

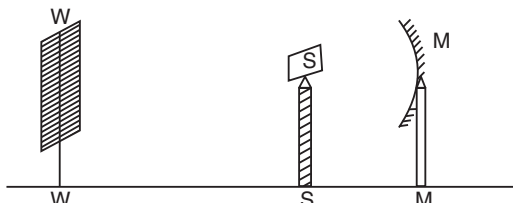
- Potato and sweet potato
- Radish and carrot
- Okra and sweet potato
- Potato and tomato

**Answer is not given due to change in the present syllabus.

Answer :

(b) Radish and carrot

30. A student obtains a sharp image of the distant window (W) of the school laboratory on the screen (S) using the given concave mirror (M) to determine its focal length. Which of the following distance should he measure to get the focal length of the mirror ? [1]

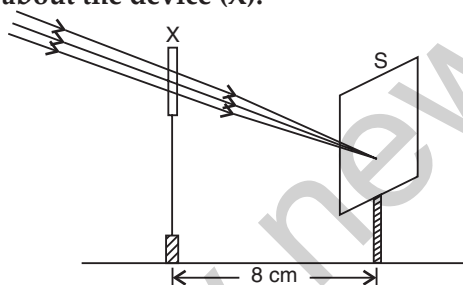


- (a) MW
 (b) MS
 (c) SW
 (d) MW – MS

Answer :

(b) MS

31. A student used a device (X) to obtain/focus the image of a well illuminated distant building on a screen (S) as shown below in the diagram. Select the correct statement about the device (X). [1]



- (a) This device is a concave lens of focal length 8 cm.
 (b) This device is a convex mirror of focal length 8 cm.
 (c) This device is a convex lens of focal length 4 cm.
 (d) This device is a convex lens of focal length 8 cm.

Answer :

(d) This device is a convex lens of focal length 8 cm.

32. A student traces the path of a ray of light through a rectangular glass slab for the different values of angle of incidence. He observes all possible precautions at each step of the experiment. At the

end of the experiment, on analysing the measurements, which of the following conclusions is he likely to draw ? [1]

- (a) $\angle i = \angle e < \angle r$
 (b) $\angle i < \angle e < \angle r$
 (c) $\angle i > \angle e < \angle r$
 (d) $\angle i = \angle e > \angle r$

Answer :

(d) $\angle i = \angle e > \angle r$

33. A student traces the path of a ray of light through a triangular glass prism for different values of angle of incidence. On analysing the ray diagrams, which one of the following conclusions is he likely to draw ? [1]

- (a) The emergent ray is parallel to the incident ray.
 (b) The emergent ray bends at an angle to the direction of the incident ray.
 (c) The emergent ray and the refracted ray are at right angles to each other.
 (d) The emergent ray is perpendicular to the incident ray.

Answer :

(b) The emergent ray bends at an angle to the direction of the incident ray.

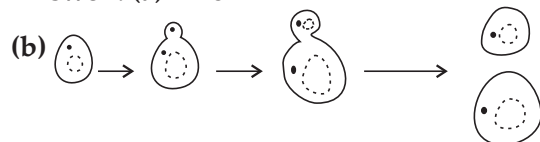
34. When you add sodium hydrogen carbonate to acetic acid in a test tube, a gas liberates immediately with a brisk effervescence. Name this gas. Describe the method of testing this gas. [2]

Answer : Carbon dioxide, turns lime water milky.

35. Students were asked to observe the permanent slides showing different stages of budding in yeast under high power of a microscope. [2]

- (a) Which adjustment screw (coarse/fine) were you asked to move to focus the slides ?
 (b) Draw three diagrams in correct sequence showing budding in yeast.

Answer : (a) Fine



36. A 4 cm tall object is placed on the principal axis of convex lens. The distance of the object from the optical centre of the lens is 12 cm and its sharp image is formed at a distance of 24 cm from it on a screen on the other side of the lens. If the object is now moved a little away from the lens, in

which way (towards the lens or away from the lens) will he have to move the screen to get a sharp image of the object on it again? How will the magnification of the image be affected? [2]

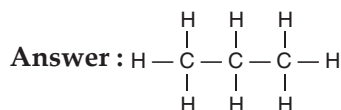
Answer : Towards the lens.
Magnification decreases.

Science 2015 (Outside Delhi) Term II

SET II

Note : Except for the following questions all the remaining questions have been asked in previous set.

1. Write the number of covalent bonds in the molecule of propane, C_3H_8 . [1]



10 Bonds

2. Where is DNA found in a cell? [1]

Answer : DNA is found inside the nucleus in a cell.

3. The first trophic level in a food chain is always a green plant. Why? [1]

Answer : Green plants are the primary producers as they trap the energy from the sunlight.

5. We often observe domestic waste decomposing in the bylanes of our homes. List four ways to make the residents aware that the improper disposal of wastes is harmful to the environment and also for their own health. [2]

Answer : Four ways to make people aware that the improper disposal of waste is harmful.

1. It allows mosquito to breed and spread diseases.
2. On decomposition, it releases harmful green house gases.
3. It will degrade the soil fertility.
4. Pollutes the water affecting the underground water.

6. List any two advantages associated with water stored in the ground. [2]

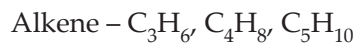
Answer : The advantages of water stored in the ground are :

1. It does not evaporate.
2. It provides moisture to the vegetation over a wide area.

7. What is meant by homologous series of carbon compounds? Classify the following carbon compounds into two homologous series and name them. [3]



Answer : A series of carbon compounds in which the same functional group substitutes for hydrogen in a carbon chain is called homologous series.



9. The elements ${}_4Be$, ${}_{12}Mg$ and ${}_{20}Ca$, each having two valence electrons in their valence shells, are in periods 2, 3 and 4 respectively of the modern periodic table. Answer the following questions associated with these elements, giving reason in each case :

- (a) In which group should they be?
- (b) Which one of them is least reactive?
- (c) Which one of them has the largest atomic size? [3]

Answer : ${}_4Be = 2, 2$

${}_{12}Mg = 2, 8, 2$

${}_{20}Ca = 2, 8, 8, 2$

- (a) Group 2, they have 2 valence electrons.
- (b) Be, reactivity increases in a group.
- (c) Ca, atomic size increases in a group.

11. List three distinguish features between sexual and asexual types of reproduction, in tabular form. [3]

Answer :

S. No.	Asexual Reproduction	Sexual Reproduction
1.	No gametes formation	Male and female gametes are formed
2.	Uniparental	Biparental
3.	Fusion of gametes	No fusion of gametes

12. List four points of significance of reproductive health in a society. Name any two areas related to reproductive health which have improved over the past 50 years in our country. [3]

Answer : Four point of significance of reproductive health in society are :

1. Birth control methods and family planning measures.
2. Sexually transmitted diseases and their methods of prevention.
3. Importance of breast feeding and post-natal care.
4. Equality among sexes.

Areas of improvement :

1. More emphasis on immunisation programmes.
 2. Family planning which will motivate people to have smaller families.
14. A pea plant with blue colour flower denoted by BB is cross-breed with a pea plant with white flower denoted by ww.
 (a) What is the expected colour of the flowers in their F_1 progeny ?
 (b) What will be the percentage of plants bearing white flower in F_2 generation, when the flowers of F_1 plants were selfed ?
 (c) State the expected ratio of the genotype BB and Bw in the F_2 progeny. [3]

Answer :

- (a) F_1 progeny will have blue coloured flowers as blue is dominant.
- (b) On self pollination in F_2 generation white flowers will be 25%.

- (c) Ratio of blue and white in F_2 progeny will be 1 : 2.

18. What is an ecosystem ? List its two main components. We do not clean natural ponds or lakes but an aquarium needs to be cleaned regularly. Why is it so ? Explain. [3]

Answer : All the interacting organisms in an area together with the non-living constituents of the environment form an ecosystem. The two main components of ecosystem are biotic and abiotic. An aquarium needs to be cleaned regularly due to lack of decomposer that can clean naturally by decomposing organic compounds.

19. What are fossils ? How are they formed ? Describe in brief two methods of determining the age of fossils. State any one role of fossils in the study of the process of evolution. [5]

Answer : Fossils may be defined as the remains of the organisms which have been preserved in the form of moulds or casts in rocks etc. since pre-historic ages. When a plant or an animals dies, their remains fall on the ground. Over a period of time their body gets covered by sediments brought by rivers winds. These sediments keep on getting accumulated for over hundreds of years and when that land gets eroded, the fossils can be seen . The age of the fossils can be determined by the following ways.

1. **Radiometric dating** : The age of fossil can be determined by tracing the radioactive elements present in the rocks and examining its traces.
2. **Relative dating** : The fossils found in the sedimentary rocks in the form of layers accumulated over large span of time. So using this fact, age of the fossils can be found by knowing where the fossils were present in the layer. Fossil found at the bottom is older than found above them.

SECTION – A

Note : Except for the following questions all the remaining questions have been asked in previous sets.

1. Write the number of covalent bonds in the molecule of butane, C_4H_{10} . [1]

Answer : Thirteen

2. Name two simple organisms having the ability of regeneration. [1]

Answer : Planaria and hydra

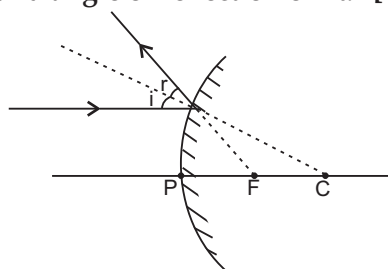
3. Which of the following are always at second trophic level of food chains ? [1]

Carnivores, Autotrophs, Herbivores.

Answer : Herbivores

4. Draw a ray diagram to show the path of the reflected ray corresponding to an incident ray of light parallel to the principal axis of a convex mirror and show the angle of incidence and angle of reflection on it. [2]

Answer :



5. Why is sustainable management of natural resources necessary ? Out of the two-reuse and recycle - which, in your opinion, is better to practice ? Give reason. [2]

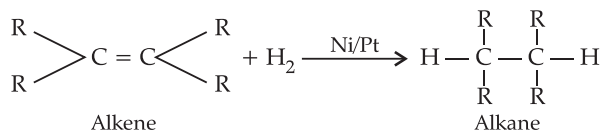
Answer : Sustainable management of natural resources is to manage the resources for future generation and current basic need of the population. Reuse is a better practice because it can be done at household level with no expense of energy, no pollution, ecofriendly.

7. Write the name and general formula of a chain of hydrocarbons in which an addition reaction with hydrogen is possible. State the essential condition for an addition reaction stating this condition, write a chemical equation giving the name of the reactants and the product of the reaction. [3]

Answer : Alkene C_nH_{2n}

Alkyne C_nH_{2n-2}

Presence of Ni, Pd and Pt as catalyst and the compound must be unsaturated in nature.



9. Given below are some elements of the modern periodic table. Atomic number of the element is given in the parentheses :

A(4), B(9), C(14), D(19), E(20) [3]

(a) Select the element that has one electron in the outermost shell. Also write the electronic configuration of this element.

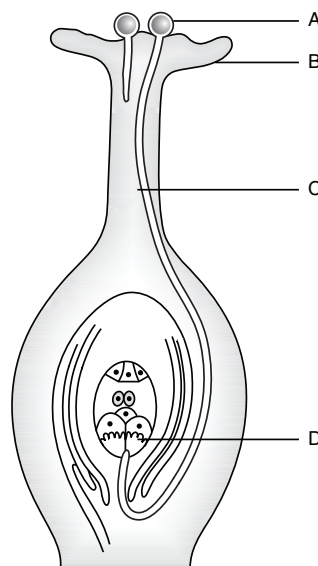
(b) Which two elements amongst these belong to the same group ? Give reason for your answer.

(c) Which two elements amongst these belong to the same period ? Which one of the two has bigger atomic radius ?

Answer :
 A = 2, 2
 B = 2, 7
 C = 2, 8, 4
 D = 2, 8, 8, 1
 E = 2, 8, 8, 2

(a) D = 2, 8, 8, 1
 (b) A and E, as they have same number of valence electrons
 (c) A and B, D and E as their number of shells are same, A is bigger than B and D is bigger than E.

11. Identify A, B and C in the given diagram and write one function of each. [3]



Answer : A = Stigma
 B = Pollen tube
 C = Ovule

1. **Stigma** : It plays role in reproduction by trapping pollen grains.

2. **Pollen tube** : It transfers pollen grains from male gamete cells to ovules.
3. **Ovule** : It acts as the site of fertilization and develops into the seed.
12. **List four categories of contraceptive methods. State in brief two advantages of adopting such preventive methods.** [3]
Answer : Four categories of contraceptive methods :
1. Barrier method
 2. Surgical method (Vasectomy or tubectomy)
 3. Withdrawal method
 4. IUCD or Copper T
- Two advantages :**
1. Helps in maintaining health of women.
 2. Helps in birth control.
17. **An object of height 5 cm is placed perpendicular to the principal axis of a concave lens of focal length 10 cm. If the distance of the object from the optical**

centre of the lens is 20 cm, determine the position, nature and size of the image formed using the lens formula. [3]

Answer :

Given : $h_1 = +5$ cm, $f = -10$ cm, $u = -20$ cm

We know that,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\text{or } \frac{1}{v} = \frac{1}{f} + \frac{1}{u} = \frac{1}{-10} - \frac{1}{20} = \frac{-3}{20}$$

$$\text{Image distance, } v = -\frac{20}{3} \text{ cm.}$$

The nature of the image is virtual and erect.

$$\text{Now, magnification, } m = \frac{h_2}{h_1} = \frac{v}{u}$$

$$\Rightarrow h_2 = \frac{v}{u} \times h_1 = \frac{-20}{3} \times \frac{1}{-20} \times 5 = \frac{+5}{3} \text{ cm}$$

\therefore The size of the image is 1.67 cm.

Science 2015 (Delhi) Term II

SET I

SECTION—A

1. **Write the name and formula of the 2nd member of homologous series having general formula C_nH_{2n} .** [1]
Answer : Propene C_3H_6
2. **List two functions performed by the testis in human beings.** [1]
Answer : 1. To produce sperms
 2. To produce male sex hormone, testosterone
3. **What is the function of ozone in the upper atmosphere ?** [1]
Answer : It protects the earth from the harmful ultraviolet rays (UV) of the sun.
4. **List four characteristics of the images formed by plane mirrors.** [1]
Answer : The four characteristics of the images formed by plane mirrors :
1. Virtual.
 2. Erect.
 3. Same size as the object.
 4. Same distance behind the mirror as the object, in front of the mirror.
 5. Laterally inverted. (left-right reversed)

5. **Why are forests considered "biodiversity hot spots" ? List two ways in which an individual can contribute effectively to the management of forests and wildlife.** [2]

Answer :

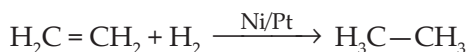
1. Forests are considered as biodiversity hot spots because large number of life forms are found there.
2. Two ways :
 (a) Not allowing cutting of trees.
 (b) To make people aware about the importance of forests and wildlife.

6. **What is meant by "sustainable management" ? Why is reuse considered better than recycling ?** [2]

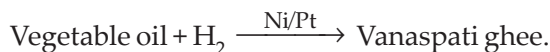
Answer : A type of management which encourages utilisation of resources that meet current basic human needs while preserving the resources for the needs of future generation. Reuse is better as it does not consumes energy.

7. **With the help of an example, explain the process of hydrogenation. Mention the essential conditions for the reaction and state the change in physical property with the formation of the product.** [3]

Answer :



OR



Essential condition for hydrogenation is the presence of a catalyst like Ni, Pt or Pd. Change observed in the physical property during hydrogenation is the change of the unsaturated compound from the liquid state to the corresponding saturated compound in the solid state.

8. What is the difference between the molecules of soaps and detergents, chemically ? Explain the cleansing action of soaps. [3]

Answer : Soaps are sodium or potassium salts of long chain carboxylic acid whereas detergents are ammonium or sulphonate salt.

Cleansing action of soap—The ionic part of soap molecule dissolves in water and the non-ionic part dissolves in oil. Thus soap molecules arrange themselves in the form of micelles, pulling the dirt or grease from the cloth. On rinsing with water, soap is washed off, lifting the only dirt particles with it.

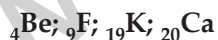
9. How many groups and periods are there in the modern periodic table ? How do the atomic size and metallic character of elements vary as we move :

- (a) down a group and
(b) from left to right in a period [3]

Answer : 18 groups and 7 periods

- (a) Atomic size increases and metallic character increases.
(b) Atomic size decreases and metallic character decreases.

10. From the following elements :



- (i) Select the element having one electron in the outermost shell.
(ii) Two elements of the same group.

Write the formula of and mention the nature of the compound formed by the union of ${}_{19}\text{K}$ and element X(2, 8, 7). [3]

Answer : (i) Potassium K

(ii) Be and Ca

KX and the compound is ionic in nature.

11. What is DNA copying ? State its importance. [3]

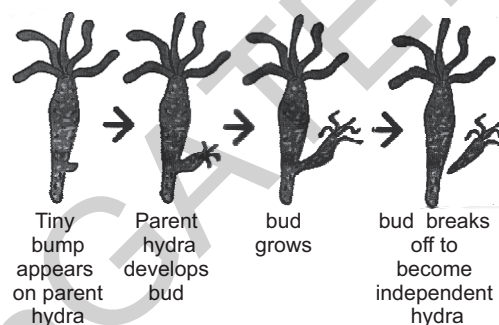
Answer : A process where a DNA molecule produces two similar copies of itself in a reproducing cell is known as DNA copying.

Importance :

1. It makes possible the transmission of characters from parents to the next generation.
2. It causes variation in the population.

12. Explain budding in hydra with the help of labelled diagrams only. [3]

Answer :



13. List any four methods of contraception used by humans. How does their use have a direct effect on the health and prosperity of a family. [3]

Answer :

1. Four Methods of Contraceptions :

- (a) Barrier method
- (b) Oral pills
- (c) Use of loop or copper T
- (d) Surgical method

2. Effect on health and prosperity :

- (a) Health of women is maintained.
- (b) Parents can give more attention to children.
- (c) More resources can be made available.

14. "We cannot pass on to our progeny the experiences and qualifications earned during our life time". Justify the statement giving reason and examples. [3]

Answer : Acquired knowledge or skills like dancing, music etc. do not bring any change in the DNA of the reproducing cell or germ cell. Only germ cells are responsible for passing on the characters from the parents to the progeny. Thus due to this fact the characters which we inherit during our life time are not passed to our progeny.

15. (i) 'Planaria, insects, octopus and vertebrates all have eyes. Can we group eyes of these animals together to establish a common evolutionary origin? Justify your answer.

(ii) "Birds have evolved from reptiles". State evidence to prove the statement. [3]

Answer :

(i) The eyes seen in each of these organisms vary differently in their structure but all of them perform the same function of vision. Thus a common evolutionary origin can be established on the basis of eyes.

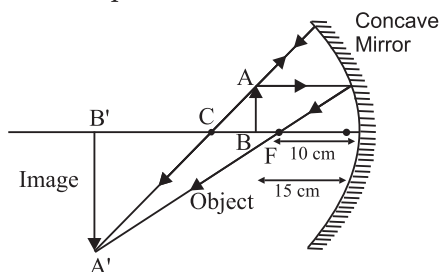
(ii) "Birds have evolved from reptile", this can be justified as follows :

1. Fossils of certain dinosaurs or reptiles show imprints of feather along with their bones but they could not fly presumably using the feathers for insulation.
2. Later, they developed and adapted feathers for flight, thus becoming the ancestors of present day birds.

16. To construct a ray diagram we use two rays of light which are so chosen that it is easy to determine their directions after reflection from the mirror. Choose these two rays and state the path of these rays after reflection from a concave mirror. Use these two rays to find the nature and position of the image of an object placed at a distance of 15 cm from a concave mirror of focal length 10 cm. [3]

Answer :

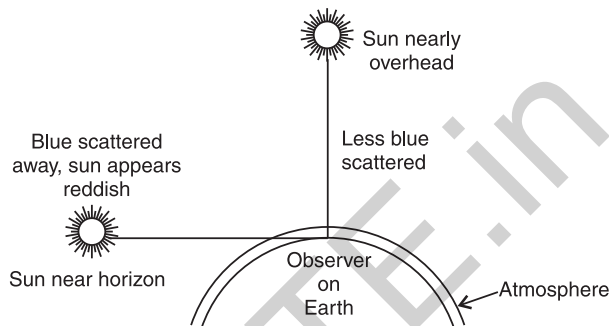
1. A ray parallel to the principal axis, after reflection will pass through the principal focus of a concave mirror.
2. A ray passing through the centre of curvature of a concave mirror, after reflection is reflected back along the same path.



The nature of the image is real and inverted and the position of the image is beyond C.

17. With the help of a labelled diagram, explain why the sun appears reddish at the sun-rise and the sun-set. [3]

Answer :



At the time of sunrise and sunset, when the sun is near the horizon, the sunlight has to travel the greatest distance through the atmosphere to reach us. During this long journey of sunlight, most of the shorter wavelength blue-colour present in it is scattered out and away from our line of sight. So, the light reaching us directly from the rising sun or setting sun consists mainly of longer wavelength red colour. Due to which the sun appears red during sun-rise and sun-set.

18. After the examinations Rakesh with his friends went on a picnic to a nearby park. All friends carried cooked food packed in plastic bags or plastic cans. After eating the food some friends collected the leftover food and plastic bags etc., planned to dispose them off by burning. Rakesh immediately checked them and suggested to segregate the leftover food and peels of fruits from the plastic materials and respectively dispose them off separately in the green and red dustbins placed in the corner of the park. [3]

(a) In your opinion, is burning plastic an eco-friendly method of waste disposal? Why? State the advantage of method suggested by Rakesh.

(b) How can we contribute in maintaining the parks and roads neat and clean?

Answer :

- (a) No, it causes pollution. Segregation of wastes into biodegradable and non-biodegradable wastes at the initial stage of disposal saves time and energy.
- (b) Parks and roads can be maintained neat and clean by using dustbin for putting wastes.

19. Explain why carbon forms compounds mainly by covalent bond. Explain in brief two main reasons for carbon forming a large number of compounds. Why does carbon form strong bonds with most other elements ? [5]

Answer :

Carbon forms covalent bonds due to tetravalency *i.e.*, have 4 electrons in the outer most shell. Losing and gaining 4 electrons is not possible due to effective nuclear charge, thus electrons are shared to form covalent bond.

Two reasons for large number of carbon compounds :

1. **Catenation** : Ability of a carbon atom to form bonds with itself giving rise to long chains.
2. **Tetravalency** : Since carbon has a valency of 4, it is capable of bonding with four other atoms of carbon or atoms of element like oxygen, hydrogen, nitrogen, sulphur, chlorine etc.

Carbon forms strong bond with other elements because it is small in size due to which nucleus holds shared pair of electrons strongly.

20. Write the functions of the following in human female reproductive system :

Ovary, oviduct, uterus

How does the embryo get nourishment inside the mother's body ? Explain in brief. [5]

Answer :

Functions of the following human female reproductive parts :

1. **Ovary** : Production of female hormones; oestrogen and progesterone and production of female gametes.

2. **Oviduct** : Transfer of female gametes from the ovary to the site of fertilisation.

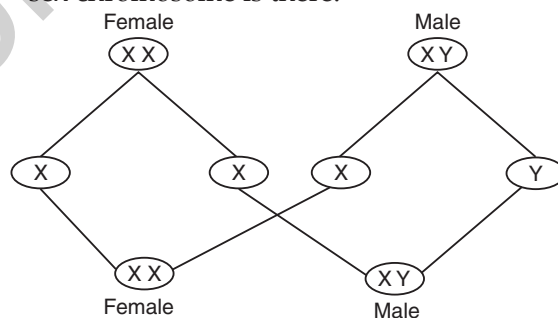
3. **Uterus** : Implantation of zygote and nourishment of developing embryo.

Placenta is a disc like tissue embedded in the mother's uterine wall. It is connected to the foetus by umbilical cord. Through placenta glucose, oxygen etc. are passed from mother's blood to the foetus.

21. How many pairs of chromosomes are present in human beings ? Out of these how many are sex chromosomes ? How many types of sex chromosomes are found in human beings ?

"The sex of a newborn child is a matter of chance and none of the parents may be considered responsible for it." Draw a flow chart showing determination of sex of a newborn to justify this statement. [5]

Answer : There are 23 pairs of chromosomes in human beings, out of these one pair of sex chromosome is there.



Female has one type of chromosome *i.e.*, X and male has two types of chromosomes *i.e.*, X and Y. Thus, sex of the child depends on the sex chromosomes of the father.

22. (a) State the laws of refraction of light. Explain the term absolute refractive index of a medium and write an expression to relate it with the speed of light in vacuum.

(b) The absolute refractive indices of two media 'A' and 'B' are 2.0 and 1.5 respectively. If the speed of light in medium 'B' is 2×10^8 m/s, calculate the speed of light in : [5]

- (i) vacuum,
- (ii) medium 'A'.

Answer :

(a) Laws of refraction of light :

- Incident ray travelling from one medium to another, bend in such a way that the incident ray, refracted ray and the normal ray, at the point of incidence, all lie in the same plane.
- The ratio of sine of angle of incidence (i) to the sine of angle of refraction (r) is constant for a given pair of media.

i.e. $\frac{\sin i}{\sin r} = \text{constant}$

Absolute refractive index of a medium is the ratio of $\sin i$ to $\sin r$.

$$\text{Absolute refractive index} = \frac{\text{Speed of light in vacuum}}{\text{Speed of light in medium}}$$

- (b)** Given : $n_A = 2.0$, $n_B = 1.5$, speed of light in medium B (v_B) = 2×10^8 m/s, speed of light in medium $v_A = ?$

$$1. \quad n_B = \frac{c}{\text{Speed of light in a medium } (v_B)}$$

$$= \frac{c}{v_B}$$

$$c = n_B \times v_B = 1.5 \times 2 \times 10^8 = 3 \times 10^8 \text{ m/s.}$$

$$2. \quad n_A = \frac{c}{v_A}$$

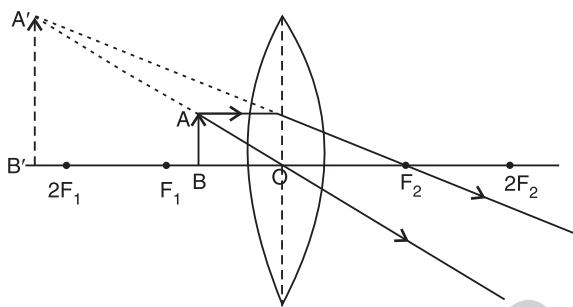
$$v_A = \frac{c}{n_A} = \frac{3 \times 10^8}{2} = 1.5 \times 10^8 \text{ m/s}$$

23. "A convex lens can form a magnified erect as well as magnified inverted image of an object placed in front of it." Draw ray diagram to justify this statement stating the position of the object with respect to the lens in each case.

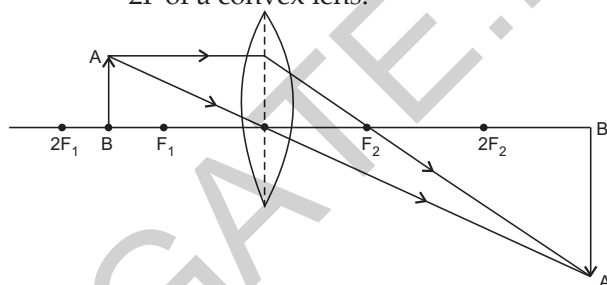
An object of height 4 cm is placed at a distance of 20 cm from a concave lens of focal length 10 cm. Use lens formula to determine the position of the image formed. [5]

Answer :

- Image formed is magnified and erect when object is placed between optical centre and focus of a convex lens.



- Image formed is magnified and inverted when the object is placed between F and 2F of a convex lens.



Given : $u = -20$ cm, $f = -10$ cm, $v = ?$

We know that,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\frac{1}{v} = \frac{1}{f} + \frac{1}{u}$$

or

$$\frac{1}{v} = -\frac{1}{10} - \frac{1}{20}$$

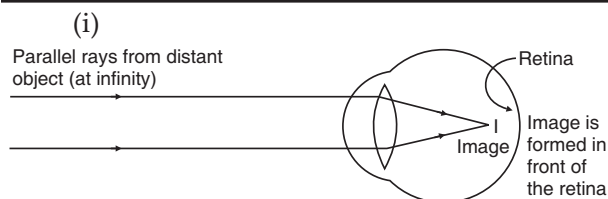
$$\frac{1}{v} = \frac{-2-1}{20} = \frac{-3}{20}$$

$$\therefore v = \frac{-20}{3} \text{ cm.}$$

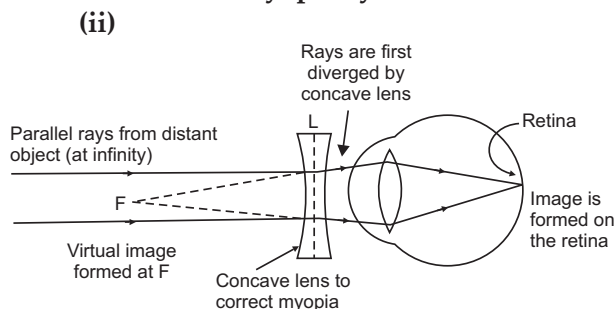
24. A student is unable to see clearly the words written on the blackboard placed at a distance of approximately 4 m from him. Name the defect of vision the boy is suffering from. Explain the method of correcting this defect. Draw ray diagram for the : [5]

- defect of vision and also
- for its correction.

Answer : The boy is suffering from myopia or near sightedness and it can be corrected by using a concave lens of suitable power. The required ray diagrams are given below :



Myopic Eye



Correction of Myopia

SECTION – B

25. A student adds 2 mL of acetic acid to a test tube containing 2 mL of distilled water. He then shakes the test tube well and leaves it to settle for some time. After about 5 minutes he observes that in the test tube there is : [1]

- (a) a clear transparent colourless solution
- (b) a clear transparent pink solution
- (c) a precipitate settling at the bottom of the test tube
- (d) a layer of water over the layer of acetic acid.

Answer :

(a) a clear transparent colourless solution

26. A student prepared 20% sodium hydroxide solution in a beaker to study saponification reaction. Some observations related to this are given below : [1]

- (I) Sodium hydroxide solution turns red litmus blue
- (II) Sodium hydroxide readily dissolves in water
- (III) The beaker containing solution appears cold when touched from outside.
- (IV) The blue litmus paper turns red when dipped into the solution

The correct observations are :

- (a) I, II and IV
- (b) I, II, and III
- (c) only III and IV
- (d) only I and II

Answer :

(d) only I and II

27. Hard water is not available for an experiment. Some salts are given below : [1]

- (I) Sodium chloride
- (II) Sodium sulphate
- (III) Calcium chloride
- (IV) Calcium sulphate
- (V) Potassium chloride
- (VI) Magnesium sulphate

Select from the following a group of these salts, each member of which may be dissolved in water to make it hard.

- (a) I, II, V
- (b) I, III, V
- (c) III, IV, VI
- (d) II, IV, VI

Answer :

(c) III, IV, VI

28. A student identified the various parts of an embryo of a gram seed and listed them as given below : [1]

- (I) Testa
- (II) Plumule
- (III) Radicle
- (IV) Cotyledon
- (V) Tegman

Out of these the actual parts of the embryo are :

- (a) I, II, III
- (b) II, III, IV
- (c) III, IV, V
- (d) II, IV, V

Answer :

(b) II, III, IV

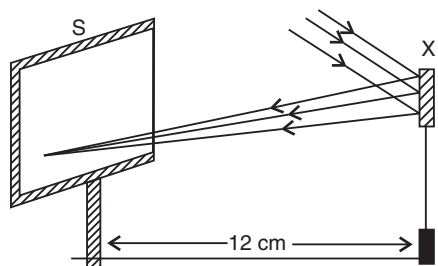
29. Four students A, B, C and D reported the following set of organs to be homologous. Who is correct ? [1]

- (a) Wings of a bat and a butterfly
- (b) Wings of a pigeon and a bat
- (c) Wings of a pigeon and a butterfly
- (d) Forelimbs of cow, a duck and a lizard

Answer :

(d) Forelimbs of cow, a duck and a lizard

30. Study the following diagram and select the correct statement about the device 'X' : [1]



- (a) Device 'X' is a concave mirror of radius of curvature 12 cm.
- (b) Device 'X' is a concave mirror of focal length 6 cm.
- (c) Device 'X' is a concave mirror of focal length 12 cm.
- (d) Device 'X' is a convex mirror of focal length 12 cm.

Answer :

- (c) Device 'X' is a concave mirror of focal length 12 cm.
31. A student has obtained a point image of a distant object using the given convex lens. To find the focal length of the lens he should measure the distance between the : [1]

- (a) lens and the object only
- (b) lens and the screen only
- (c) object and the image only
- (d) lens and the object and also between the object and the image

Answer :

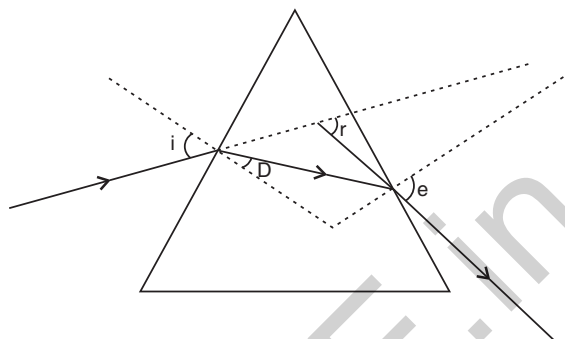
- (b) lens and the screen only
32. Four students P, Q, R and S traced the path of a ray of light passing through a glass slab for an angle of incidence 40° and measured the angle of refraction. The values as measured them were 18° ; 22° ; 25° and 30° respectively. The student who has performed the experiment methodically is [1]

- (a) P
- (b) Q
- (c) R
- (d) S

Answer :

- (c) R
33. After tracing the path of a ray of light through a glass prism a student marked the angle of incidence ($\angle i$), angle of refraction

($\angle r$), angle of emergence ($\angle e$) and the angle of deviation ($\angle D$) as shown in the diagram. The correctly marked angles are : [1]



- (a) $\angle i$ and $\angle r$
- (b) $\angle i$ and $\angle e$
- (c) $\angle i$, $\angle e$ and $\angle D$
- (d) $\angle i$, $\angle r$ and $\angle e$

Answer :

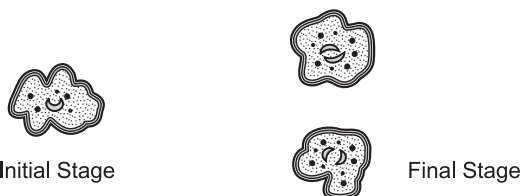
- (b) $\angle i$ and $\angle e$
34. List two observations which you make when you add a pinch of sodium hydrogen carbonate to acetic acid in a test tube. Write chemical equation for the reaction that occurs. [2]

Answer : Two observations observed are :

1. Brisk effervescence are evolved.
 2. Evolution of a colourless and odourless gas.
- $$\text{CH}_3\text{COOH} + \text{NaHCO}_3 \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O} + \text{CO}_2$$

35. Name the type of asexual reproduction in which two individuals are formed from a single parent and the parental identity is lost. Draw the initial and the final stages of this type of reproduction. State the event with which this reproduction starts. [2]

Answer : Binary fission



36. To find the image-distance for varying object-distances in case of a convex lens, a student obtains on a screen a sharp image of a bright object placed very far from the lens. After that he gradually moves

the object towards the lens and each time focuses its image on the screen. [2]

(a) In which direction- towards or away from the lens, does he move the screen to focus the object ?

(b) What happens to the size of image- does it increase or decrease ?

(c) What happen when he moves the object very close to the lens ?

Answer : (a) Away from the lens.

(b) Size of the image increases.

(c) No clear image is formed on the screen.

Science 2015 (Delhi) Term II

SET II

Note : Except for the following questions all the remaining questions have been asked in previous set.

SECTION – A

1. Write the name and formula of the 2nd member of homologous series having general formula C_nH_{2n+2} . [1]

Answer : Ethane C_2H_6 .

2. What is the magnification of the images formed by plane mirrors and why ? [1]

Answer : Magnification of the images formed by plane mirrors is 1 because the size of image is equal to the size of object.

3. What is meant by power of a lens ? [1]

Answer : Power of a lens is the degree of convergence or divergence of light rays achieved by the lens. It can also be defined as the reciprocal of the focal length of a lens in metres.

4. Write two differences between binary fission and multiple fission in a tabular form. [2]

S. No.	Binary fission	Multiple fission
1.	Parent nucleus divides into two and moves to two daughter cells.	Parent nucleus divides into multiple daughter nuclei, each surrounded by cytoplasm.
2.	No protective covering is formed.	A protective cyst is formed.

5. (a) Why do we need to manage our resources carefully ?

(b) Why management of natural resources requires a long term perspective ? [2]

Answer :

(a) Since the resources are limited and with the increase in population demand for resources is increasing tremendously.

(b) Long term prospective is required to meet the needs of the present as well as for the generations to come.

6. List four measures that can be taken to conserve forests. [2]

Answer : Four measures :

1. Planting trees at the deforested areas.
2. Ban on the indiscriminate felling of trees.
3. Use of wood for fuel should be avoided.
4. Overgrazing in forests should be discouraged.

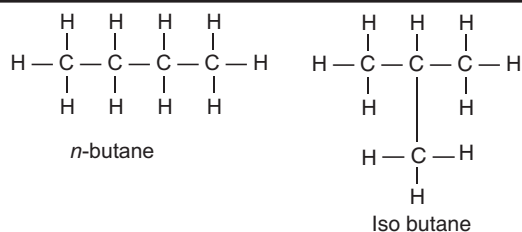
7. Na, Mg and Al are the elements of the same period of Modern Periodic Table having one, two and three valence electrons respectively. Which of these elements (i) has the largest atomic radius, (ii) is least reactive ? Justify your answer stating reason for each case. [3]

Answer : Na—atomic size decreases from left to right due to increase in the nuclear charge.

Al—The tendency to lose electron decreases left to right.

9. What is meant by isomers ? Draw the structures of two isomers of butane, C_4H_{10} . Explain why we cannot have isomers of first three members of alkane series. [3]

Answer : Isomers are compounds which have the same molecular formula but different structures.



Since branching is not possible in first 3 members thus isomers of these first members of alkane series is not possible.

11. What are sexually transmitted diseases. List two example of each diseases caused due to (i) bacterial infection and (ii) viral infection. Which device or devices may be used to prevent the spread of such diseases? [3]

Answer : Diseases which are transmitted from an infected person to a healthy person are called Sexually Transmitted Diseases.

Two examples of STDs are :

1. Bacterial diseases – Gonorrhoea and syphilis
 2. Viral diseases – Warts and AIDS
14. What is speciation ? List four factors responsible for speciation. [3]

Answer : Speciation : Formation of new species from the pre-existing population.

Four factors responsible for speciation are :

1. Genetic drift
2. Natural selection
3. Geographical isolation
4. Change in genes.

19. The image of a candle flame placed at a distance of 30 cm from a spherical lens is formed on a screen placed on the other side of the lens at a distance of 60 cm from the optical centre of the lens. Identify the type of lens and calculate its focal length. If the height of the flame is 3 cm, find the height of its image. [5]

Answer :

Given : $h_1 = +3\text{cm}, u = -30\text{cm}$
 $v = +60\text{cm}, f = ?, h' = ?$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$= \frac{1}{60} - \frac{1}{-30}$$

$$\frac{1}{f} = \frac{+3}{60}$$

$\therefore f = +20\text{cm}$

Therefore, the lens is convex.

$$h' = \frac{v}{u} \times h$$

$$= \frac{+60\text{cm}}{-30\text{cm}} \times 3\text{cm}$$

$$h' = -6\text{cm}$$

Here, negative sign indicates that the image formed is inverted. Therefore, height of image of candle flame is 6 cm.

Science 2015 (Delhi) Term II

SET III

Note : Except for the following questions all the remaining questions have been asked in previous sets.

SECTION – A

1. Write the name and formula of the 2nd member of homologous series having general formula C_nH_{2n-2} . [1]
Answer : Propyne C_3H_4
2. What is speciation ? [1]
Answer : Speciation is the formation of new species from the pre-existing population.
3. Why should biodegradable and non-biodegradable wastes be discarded in two separate dustbins ? [1]

Answer : So that the time and energy required in segregation may be saved and waste may be disposed off quickly.

4. List four specific characteristics of the images of the objects formed by convex mirrors. [2]

Answer : The specific characteristics of the images of the objects formed by the convex mirrors are :

1. Virtual
2. Erect
3. Diminished
4. Object distance more than image distance.

5. List two advantages associated with water harvesting at the community level. [2]

Answer : Two advantages of water harvesting at the community level are :

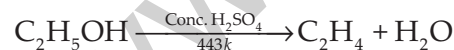
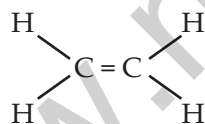
1. Recharges ground water
 2. Mitigates floods and rivers.
6. Everyone of us can do something to reduce our personal consumption of various natural resources. List four such activities based on 3-R approach. [2]

Answer :

1. Reduce excessive use of natural resources like water, fossil fuels, etc.
 2. Reuse of some resources instead of wasting them.
 3. Recycle materials like paper to reduce the pressure on existing natural resources.
 4. Changes in life styles, personal attitudes and practices.
7. Write the name and structural formula of the compound obtained when ethanol is heated at 443 K with excess of conc. H_2SO_4 . Also write the chemical equation for the reaction starting the role of conc. H_2SO_4 in it.

Answer :

Ethene (C_2H_4)



Conc. H_2SO_4 acts as dehydrating agent.

12. (a) Name the following :

- (i) Thread like non-reproductive structures present in Rhizopus.
- (ii) 'Blobs' that develop at the tips of the non-reproductive threads in Rhizopus.

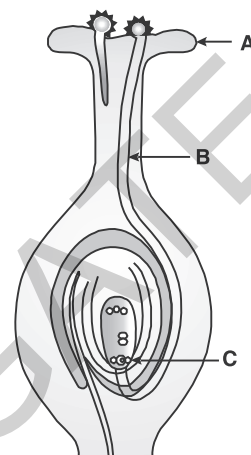
- (b) Explain how these structures protect themselves and what is the function of the structures released from the 'blobs' in Rhizopus. [3]

Answer :

- (a) (i) Hyphae or mycelium
(ii) Sporangia
- (b) These structures are protected by thick walls.

Functions : They germinate into new individuals under favourable conditions.

13. Name the parts A, B and C shown in the diagram and write their functions.



Answer :

- A → Stigma – Receives Pollen grains.
B → Pollen tube – Carries male gametes.
C → Female germ cell or egg – Forms the zygote.

15. List in tabular form, two distinguishing features between the acquired traits and the inherited traits with one example of each. [3]

Answer :

S. No.	Acquired traits	Inherited traits
1.	Does not bring about change in the DNA of the germ cell.	Brings about change in the DNA of the germ cell.
2.	Can not be passed on to the progeny.	Can be passed on to the progeny.
3.	Cannot direct evolution. <i>e.g.,</i> Acquired knowledge, loss of weight.	Can direct evolution. <i>e.g.,</i> Skin colour, colour of the eye.

16. To construct ray diagrams, two rays of light are generally so chosen that it is easy to

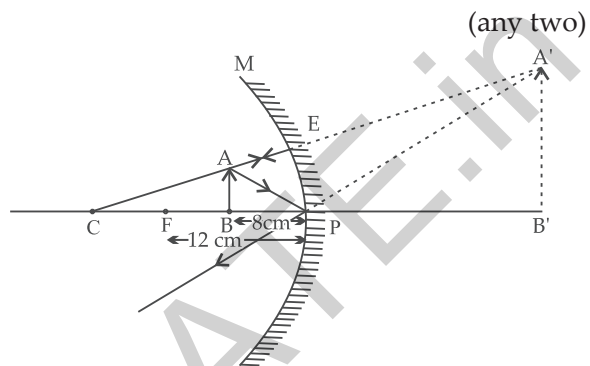
determine their directions after reflection from a mirror. Choose two such rays and state the path/direction of these rays after reflection from a concave mirror. Use these two rays to find the position and nature of the image of an object placed at a distance of 8 cm from a concave mirror of focal length 12 cm. [3]

Answer :

The candidate may choose any two of the following rays :

- (i) A ray parallel to the principal axis, after reflection, will pass through the principal focus of a concave mirror.
- (ii) A ray passing through the principal focus of a concave mirror after reflection will emerge parallel to the principal axis.

- (iii) A ray passing through the centre of curvature of a concave mirror after reflection is reflected back along the same path.
- (iv) A ray incident obliquely to the principal axis towards the pole of a concave mirror is reflected obliquely, making equal angles with the principal axis.



Position of image is behind the mirror, image is virtual, erect and magnified.

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Science 2014 Term I

Time allowed : 3 hours

Maximum marks : 90

SECTION—A

1. Name the two components of peripheral nervous system. [1]

Answer : Two components of peripheral nervous system are:

- Autonomic nervous system.
 - Voluntary nervous system.
2. A charge of 150 coulomb flows through a wire in one minute. Find the electric current flowing through it. [1]

Answer : Charge, $Q = 150 \text{ C}$

Time, $t = 1 \text{ min} = 60 \text{ s}$

$$\text{Current, } I = \frac{Q}{t} = \frac{150}{60} = 2.5 \text{ A}$$

3. What are hot spots inside earth's crust ? [1]

Answer : Due to geological changes, molten rocks formed in the deeper hot regions of earth's crust are pushed upward and trapped in certain regions. These are called 'hot spots'.

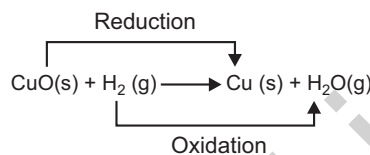
4. Explain why, an aqueous solution of sodium sulphate is neutral while an aqueous solution of sodium carbonate is basic in nature. [2]

Answer : Aqueous solution of sodium sulphate gets hydrolysed to form sodium hydroxide and sulphuric acid which are strong base and strong acid respectively. So, its aqueous solution is neutral. When sodium carbonate is dissolved in water, it gets hydrolysed to some extent and forms sodium hydroxide and carbonic acid. Now sodium hydroxide is a strong base which is fully ionised and gives a large amount of hydroxide ions $[\text{OH}^-(\text{aq})]$. On the other hand, carbonic acid is a weak acid which is only slightly ionised and hence gives a small amount of hydrogen ions $[\text{H}^+(\text{aq})]$. The mixture contains more of hydroxide ions than hydrogen ions, so it is basic in nature.

5. When hydrogen gas is passed over heated copper (II) oxide, copper and steam are formed. Write the balanced chemical

equation for this reaction and state (i) the substance oxidized and (ii) the substance reduced in the reaction. [2]

Answer :



- (i) Substance oxidized = H_2 (Hydrogen gas)
 (ii) Substance reduced = CuO (Copper oxide)
6. Why do herbivores have longer, small intestine than carnivores ? [2]

Answer : The length of the small intestine differs in various animals depending on the type of food they eat. Cellulose is a carbohydrate food which is digested with difficulty. So the herbivorous animals like cows which eat grass need a longer small intestine to allow the cellulose present in grass to be digested completely.

7. State reason for the following : [3]

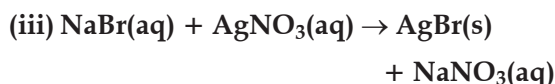
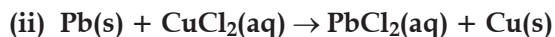
- (i) Lemon is used for restoring the shine of tarnished copper vessels.
 (ii) A metal sulphide is converted into its oxide to extract the metal from the sulphide ore.
 (iii) Copper wires are used in electrical connections.

Answer : (i) When a copper object remains in damp air for a considerable time, then copper reacts slowly with carbon dioxide and water in air to form a green coating of basic copper carbonate on its surface. If corroded copper vessels are treated with lemon which is acidic in nature, the acid solution dissolves green coloured basic copper carbonate and makes them look shiny.

- (ii) It is easier to obtain metals from their oxides (by reduction) than from sulphides. So before reduction, the metal sulphide ore is converted into metal oxide.
 (iii) Copper metal is the next best conductor of electricity after silver metal. So electric

wires are made up of copper (as silver being a costly metal can not be used for making electric wires).

8. Select (i) combination reaction, (ii) decomposition reaction and (iii) displacement reaction from the following chemical equations : [3]



Answer : (i) Decomposition reaction

(ii) Displacement reaction

(iii) Double displacement reaction

(iv) Combination reaction

(v) Displacement reaction

(vi) Combination reaction

(vii) Decomposition reaction

9. State reason for the following : [3]

(i) dry HCl gas does not change the colour of the dry blue litmus paper.

(ii) alcohol and glucose also contain hydrogen, but do not conduct electricity.

(iii) Conc. of H_3O^+ ion is affected when a solution of an acid is diluted.

Answer : (i) Dry HCl gas does not contain any hydrogen ions in it, so it does not show acidic behaviour. Dry HCl gas does not change the colour of dry blue litmus paper because it has no hydrogen ions $[\text{H}^+(\text{aq})]$ in it. However, when HCl gas dissolves in water, it forms hydrogen ions and hence shows acidic behaviour.

(ii) The aqueous solutions of glucose and alcohol do not show acidic character because their hydrogen does not separate out as hydrogen ions $[\text{H}^+(\text{aq})]$ ions] on dissolving in water. Hence, they do not conduct electricity.

(iii) An acid is substance which dissociates on dissolving in water to produce hydrogen ions $[\text{H}^+(\text{aq})]$ ions]. Hydrogen ions do not

exist as H^+ ions in a solution, they attach themselves to the polar water molecules to form hydronium ions, H_3O^+ .



When a solution of an acid is diluted, the number of $[\text{H}_3\text{O}^+]$ ions per unit volume decreases. Thus, pH of the solution increases.

10. State the kind of chemical reactions in the following examples : [3]

(i) Digestion of food in stomach

(ii) Combustion of coal in air

(iii) Heating of limestone

Answer : (i) Digestion of food in stomach : During digestion, the complex food is broken into simpler form. Therefore, it is a type of decomposition reaction.

(ii) Combustion of coal in air : During combustion the coal burns in air to form CO_2 , H_2O along with the evolution of heat. Thus, it is a type of exothermic decomposition reaction.

(iii) Heating of limestone : When limestone is heated strongly, it breaks into CO_2 and lime. Thus, it is a type of thermal decomposition reaction.

11. The rate of breathing in aquatic organisms is much faster than that seen in terrestrial organisms. Give reason. State the pathway of air from nostrils to the lungs in human beings. [3]

Answer : The animals which live in water (aquatic animals) use the oxygen dissolved in water to carry out respiration. Since the amount of dissolved oxygen in water is low as compared to the amount of oxygen in the air, therefore, the rate of breathing in aquatic animals is much faster than in terrestrial animals. A faster rate of breathing provides more oxygen to aquatic animals.

Pathway of air in human beings :

Nostrils \rightarrow Pharynx \rightarrow Larynx \rightarrow Trachea \rightarrow Lungs

12. Mention three characteristic features of hormonal secretions in human beings. [3]

Answer : 1. A group of endocrine glands which produces various hormones is called

endocrine system. The endocrine system is also called hormonal system.

2. The endocrine system also helps in coordinating the activities of the body. The endocrine system in our body consists of a number of glands (or tissues) which store, and release chemicals called hormones.
 3. The working of endocrine glands is controlled by the nervous system. The hormones produced by endocrine glands act as messengers between the nervous system and the organs of the body.
13. (a) State the purpose of formation of urine.
 (b) What will happen if there is no tubular reabsorption in the nephrons of kidney ?

[3]

Answer : (a) Urea is produced as a waste by decomposition of unused proteins in the liver, body must get rid of these waste materials because their accumulation in the body is poisonous and harmful for us. Kidneys are the organs which remove the poisonous substance urea, other salts and excess water from the blood and excrete them in the form of a yellow liquid called urine.

(b) During filtration, the substances like glucose, amino acids, salts, water and urea etc., present in the blood pass into Bowman's capsule and then enter the tubule of nephron. When the filtrate containing useful substances as well as the waste substances passes through the tubule, the useful substances like glucose, amino acids, most salts and water etc., are reabsorbed into blood through blood capillaries surrounding the tubule. Only the waste substance like urea, some unwanted salts and excess water remain behind in the tubule. Therefore, reabsorption in nephrons of kidneys is important.

14. A circuit has a line of 5 A. How many lamps of rating 40 W; 220 V can simultaneously run on this line safely ? [3]

Answer : Given, $I = 5 \text{ A}$,
 Let, No. of lamps be n , and
 Power of each lamp = 40 W
 \therefore Power of n lamps = $40n$ watt

As,

$$P = V \times I$$

$$40n = 220 \times 5$$

$$\Rightarrow n = \frac{220 \times 5}{40} = \frac{55}{2}$$

$$= 27.5 \approx 27$$

\therefore No. of lamps = 27

15. The resistance of a wire of 0.01 cm radius is 10 Ω . If the resistivity of the material of the wire is 50×10^{-8} ohm metre, find the length of the wire. [3]

Answer : Given : Resistance of a wire, $R = 10 \Omega$
 Radius of wire,

$$r = 0.01 \text{ cm} = 0.01 \times 10^{-2} \text{ m}$$

Resistivity, $\rho = 50 \times 10^{-8} \Omega \text{ m}$

Area of cross-section of wire A,

$$= \pi r^2 = 3.14 \times (0.01 \times 10^{-2})^2$$

$$= 3.14 \times 0.01 \times 0.01 \times 10^{-4}$$

$$= 3.14 \times 10^{-8} \text{ m}^2$$

As,

$$R = \rho \frac{l}{A}$$

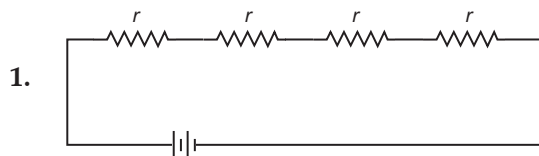
or
$$l = \frac{R \times A}{\rho} = \frac{10 \times 3.14 \times 10^{-8}}{50 \times 10^{-8}}$$

$$= 0.628 \text{ m}$$

16. Show four different ways in which four resistors of r ohm each may be connected in a circuit. In which case is the equivalent resistance of the combination.

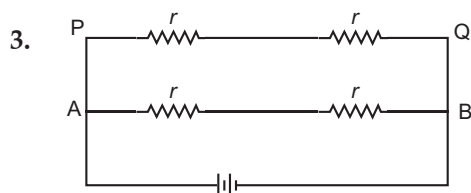
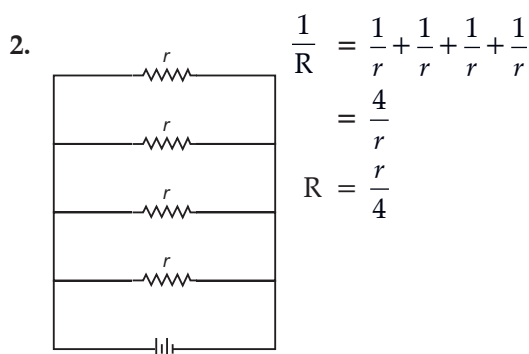
(i) maximum; (ii) minimum ? [3]

Answer :



Resultant resistance, $R = r + r + r + r$

$$R = 4r$$



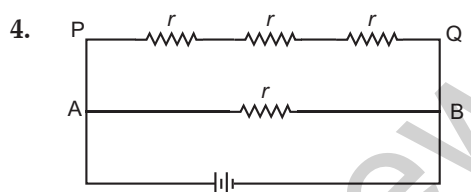
Resistance (AB) = $R_1 = r + r = 2r$

Resistance (PQ) = $R_2 = r + r = 2r$

Resultant resistance, $R = ?$

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{2r} + \frac{1}{2r} = \frac{1+1}{2r} = \frac{2}{2r} = \frac{1}{r}$$

$$R = r$$



Resistance (PQ) = $R_1 = r + r + r = 3r$

Resistance (AB) = $R_2 = r$

Resultant Resistance, $R = ?$

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{3r} + \frac{1}{r} = \frac{1+3}{3r} = \frac{4}{3r}$$

$$R = \frac{3r}{4}$$

- (i) Maximum resistance is in case (1) where all the resistors are combined in series.
- (ii) Minimum resistance is in case (2) where all the resistors are combined in parallel combination.

17. Amit lives in Delhi and is much concerned about the increasing electricity bill of his house. He took some steps to save electricity and succeeded in doing so. [3]

- (i) Mention any two steps that Amit might have taken to save electricity.

(ii) Amit fulfilled his duty towards the environment by saving electricity. How ?

(iii) Which alternative source of energy would you suggest Amit to use ?

Answer : (i) 1. He would use energy efficient electrical appliances to save electricity. This can be done by using LED bulbs and tube lights in place of conventional filament type electric bulbs.

2. Using solar water heater instead of electrical geyser.

(ii) By saving electricity, Amit is contributing towards reducing environmental degradation. Most of the electrical appliances use electrical energy which is generated by burning fossil fuels. The burning of fossil fuels causes air pollution. The production of hydroelectricity causes ecological imbalance. Therefore, by saving electricity he is indirectly causing less pollution.

(iii) He can use solar energy devices like solar cooker, solar water heater and solar cells.

18. List any three qualities of an ideal source of energy. [3]

Answer : Qualities of an ideal source of energy :

1. It should produce large amount of heat per unit volume or mass.
2. It should not produce ash and harmful gases on burning.
3. It should be economical and easily available.

19. (a) Define corrosion.

(b) What is corrosion of iron called ?

(c) How will you recognise the corrosion of silver ?

(d) Why corrosion of iron is a serious problem ?

(e) How can we prevent corrosion ? [5]

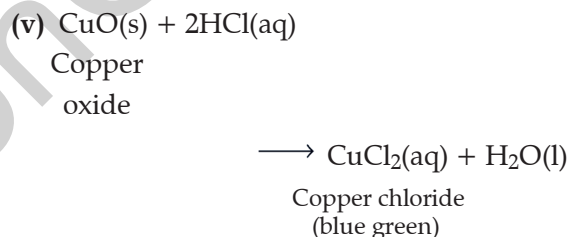
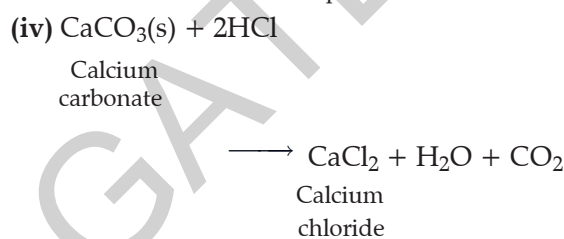
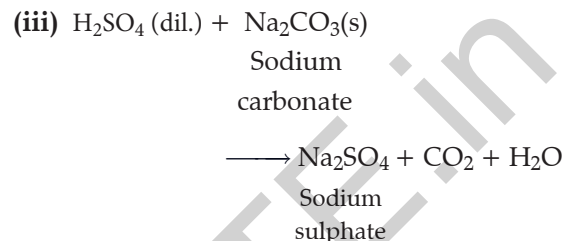
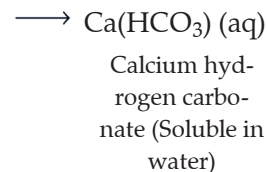
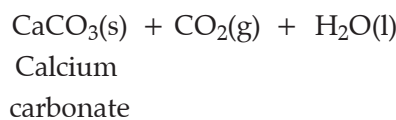
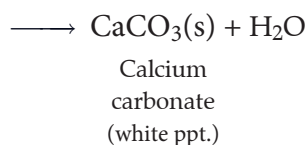
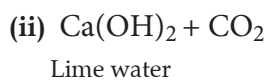
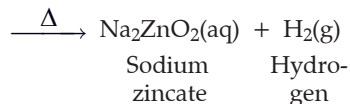
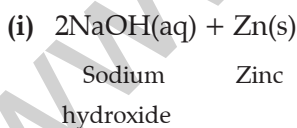
Answer : (a) Corrosion : Corrosion is the process in which metals are eaten up gradually by the action of air, moisture or a chemical on their surface.

- (b) Rusting of iron metal is the most common form of corrosion.
- (c) When silver objects are kept in air, they get tarnished and gradually turn black due to the formation of thin silver sulphide layer on their surface by the action of H₂S of air.
- (d) Corrosion weakens the iron and steel objects and structures such as railings, car bodies, bridges and ships, etc. and cut short their life, therefore, it is a serious problem.
- (e) Methods to prevent corrosion are :
- Galvanisation is a method used to protect steel and iron from rusting.
 - Painting, greasing and oiling of metals is done to prevent corrosion.
 - Cleaning metals regularly and carefully.

20. Write balanced chemical equations for the following statements : [5]

- (i) NaOH solution is heated with zinc granules.
- (ii) Excess of carbon dioxide gas is passed through lime water.
- (iii) Dilute sulphuric acid reacts with sodium carbonate.
- (iv) Egg shells are dropped in hydrochloric acid.
- (v) Copper (II) oxide reacts with dilute hydrochloric acid.

Answer :



21. (a) Write three main functions of the nervous system.
- (b) In the absence of muscle cells, how do plant cells show movement ? [5]

Answer : (a) Main functions of the nervous system are :

- Coordinates the activities of the body.
 - Helps all other systems of the body to work together.
 - The nervous system receives information from the surroundings, processes it, interprets it and then responds accordingly.
- (b) The movement in any part of a plant is usually a growth movement or change in shape of body parts.
- The movements of the plant part are usually caused by an unequal growth in its two regions by the action of plant hormones, under the influence of

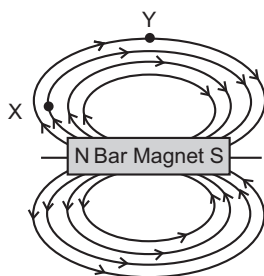
the stimuli like light, force of gravity, chemical substances, water, touch etc.

2. The change in shape occurs by changing the amount of water in the body part. Water causes swelling and shrinking which causes movement.

22. (a) Draw magnetic field lines of a bar magnet. "Two magnetic field lines never intersect each other." Why ?

(b) An electric oven of 1.5 kW is operated in a domestic circuit (220 V) that has a current rating of 5 A. What result do you expect in this case ? Explain. [5]

Answer : (a) Two magnetic field lines never intersect each other. The direction of magnetic field lines is always from north pole to south pole. If two magnetic field lines intersect, then it means that at that point of intersection the compass needle is showing two different directions of magnetic field which is impossible.



(b) Given : Power, (P) = 1.5 kW = 1.5 × 1,000 = 1,500 W

Voltage, (V) = 220 V

We know, $P = V \times I$

$$\Rightarrow I = \frac{P}{V} = \frac{1,500}{220} = 6.8 \text{ A}$$

Now, the current drawn by the oven is 6.8 A which is very high but the fuse in this circuit has only 5 A capacity. When a very high current of 6.8 A flows through 5 A fuse, the fuse wire will get heated too much. As a result the fuse wire will melt and break the circuit thereby cutting off the power supply.

23. What is meant by resistance of a conductor ? Name and define its SI unit. List the factors on which the resistance of a conductor depends. How is the resistance of a wire affected if— [5]

(i) its length is doubled, (ii) its radius is doubled ?

Answer : The property of a conductor which tends to restrict the flow of current through the conductor is called resistance.

SI unit of resistance is ohm (Ω). When a potential difference of 1 V applied across a wire gives rise to 1 A of current through the wire, then the resistance is said to be 1 ohm (1Ω).

The resistance of conductor depends on length, thickness, nature of material and temperature of conductor.

- (i) If the length is doubled, then R is doubled because the resistance of a conductor is directly proportional to length *i.e.*, $R \propto l$.
- (ii) Resistance of a conductor is inversely proportional to the square of its diameter or area of cross-section. So, if the radius of conductor is doubled, its resistance becomes one-fourth.

$$i.e., R \propto \frac{1}{A}$$

and $A = \pi r^2$

If $r' = 2r$, then

$$A' = \pi r'^2 = \pi(2r)^2 = 4\pi r^2 = 4A$$

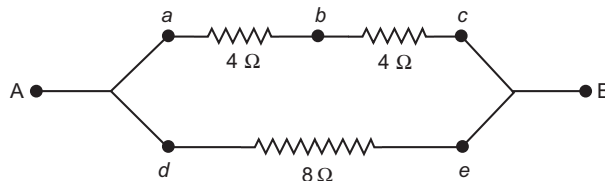
If $A' = 4A$, then

$$R' = \rho \frac{l'}{A'} = \rho \frac{l}{4A} = \frac{1}{4} \left(\rho \frac{l}{A} \right) = \frac{1}{4} R$$

Therefore, if radius is doubled, the resistance becomes one fourth.

24. (i) Establish a relationship to determine the equivalent resistance R of a combination of three resistors having resistances R_1 , R_2 and R_3 connected in parallel.

(ii) Three resistors are connected in an electrical circuit as shown. Calculate the resistance between A and B. [5]

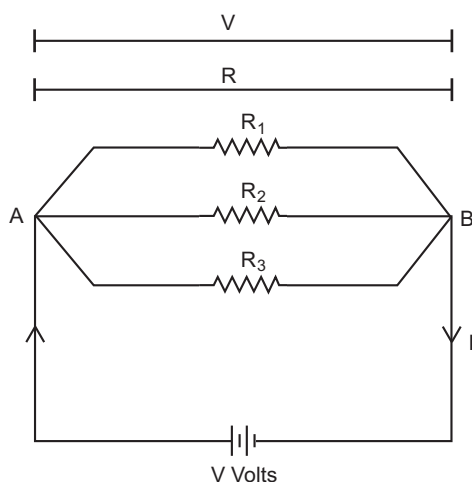


Answer : (i) Three resistances R_1 , R_2 and R_3 are connected in parallel to one another between the same two points. In this case, the potential difference across the ends of all the resistance will be the same.

$$\therefore V = V_1 = V_2 = V_3 \quad \dots(i)$$

If the total current flowing through the circuit is I, then the current passing through

R_1 will be I_1 through R_2 will be I_2 and through R_3 will be I_3 .



$$\frac{1}{R} = \frac{1}{R'} + \frac{1}{R_3}$$

(R' and R_3 are in parallel combination)

$$\frac{1}{R} = \frac{1}{8} + \frac{1}{8} = \frac{2}{8}$$

$$\Rightarrow R = 4 \Omega$$

SECTION—B

25. Four students studied reactions of zinc and sodium carbonate with dilute hydrochloric acid and dilute sodium hydroxide solutions and presented their results as follows. The (\uparrow) shows evolution of gas and ($-$) shows no reaction. The right set is : [1]

	Zn	Na ₂ CO ₃		Zn	Na ₂ CO ₃
HCl	✓	✓	HCl	—	✓
NaOH	✓	✓	NaOH	✓	✓

(a)

(b)

	Zn	Na ₂ CO ₃		Zn	Na ₂ CO ₃
HCl	✓	✓	HCl	✓	—
NaOH	✓	—	NaOH	✓	✓

(c)

(d)

Then $I = I_1 + I_2 + I_3$... (ii)

$$I_1 = \frac{V}{R_1}, I_2 = \frac{V}{R_2}, I_3 = \frac{V}{R_3}$$

If R is the effective resistance of the circuit, connected across a battery of V volts, through which I current flows, then

$$I = \frac{V}{R}$$

Substituting the values in eq. (ii), we get

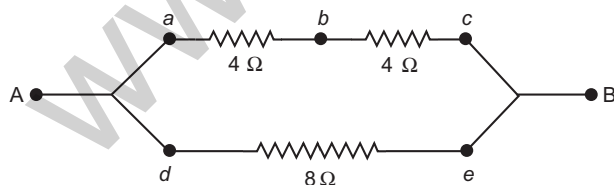
$$\Rightarrow \frac{V}{R} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$$

$$\Rightarrow \frac{V}{R} = V \left[\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \right]$$

$$\Rightarrow \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

(ii) Given : $R_1 = 4 \Omega$, $R_2 = 4 \Omega$, $R_3 = 8 \Omega$

Let, resultant resistance between a and c be R'



Then, $R' = R_1 + R_2$
(Series combination)

$$R' = 4 + 4 = 8 \Omega$$

If R is the effective resistance between A and B , then

Answer : (c)

	Zn	Na ₂ CO ₃
HCl	✓	✓
NaOH	✓	—

26. Dilute NaOH solution and solid sodium carbonate: [1]

(a) react only on heating

(b) react very slowly

(c) do not react

(d) react vigorously

Answer :

(c) do not react

27. The colour of Cu metal is : [1]

(a) reddish brown

(b) blue

(c) green

(d) grey

Answer :

(a) reddish brown

28. Shashank was asked to carry out a displacement reaction which would show the following :

(i) Formation of colourless solution

(ii) Black deposits

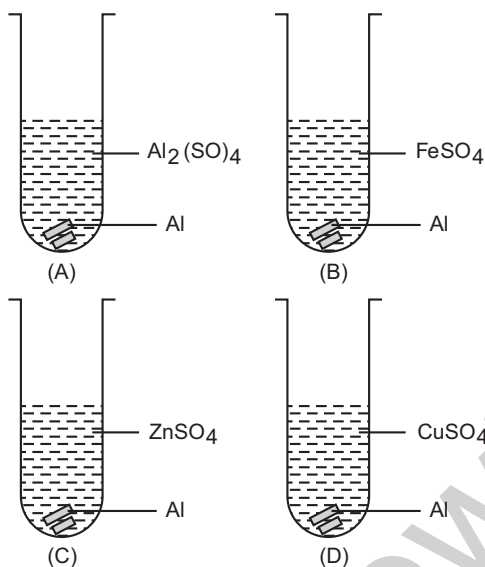
The reactants he should use are : [1]

- (a) Fe(s) and $Al_2(SO_4)_3(aq)$
- (b) Al(s) and $FeSO_4(aq)$
- (c) Zn(s) and $CuSO_4(aq)$
- (d) Fe(s) and $ZnSO_4(aq)$

Answer :

- (b) Al(s) and $FeSO_4(aq)$

29. Mrignayani was doing the experiment of comparing reactivity of metals in the laboratory. She was given aluminium metal and was told to check reactivity by using four solutions as shown below. She would observe that reaction takes place in : [1]

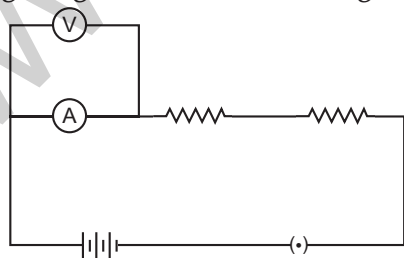


- (a) A and B
- (b) B, C and D
- (c) A, C and D
- (d) C and D

Answer :

- (b) B, C and D

30. In an experiment to find the equivalent resistance of a series combination of two resistance of $3\ \Omega$ and $4\ \Omega$ in the circuit diagram given. The circuit will give : [1]



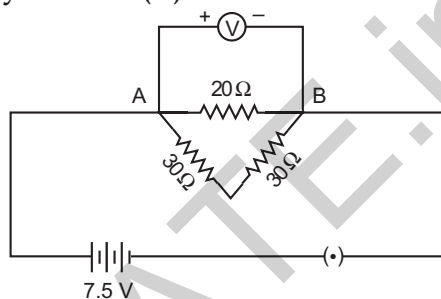
- (a) Incorrect reading for current I and correct reading for voltage V
- (b) Incorrect readings for both current I and voltage V

- (c) Correct reading for current I and incorrect reading for voltage V
- (d) Correct readings for both voltage V and current I

Answer :

- (c) Correct reading for current I and incorrect reading for voltage V.

31. A student joined three resistances as shown in the circuit below. The current recorded by ammeter (A) is : [1]



- (a) 0.25A
- (b) 0.5 A
- (c) 0.75 A
- (d) 1 A

Answer :

- (b) 0.5 A

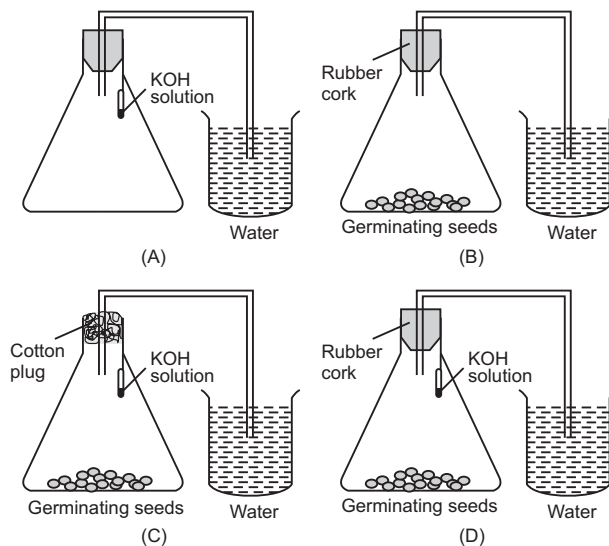
32. The iodine solution is : [1]

- (a) Pure iodine dissolved in water
- (b) Potassium iodide in water
- (c) Iodine dissolved in potassium iodide
- (d) Potassium iodide dissolved in iodide

Answer :

- (a) Pure iodine dissolved in water

33.



Choose the correct set-up to demonstrate that CO_2 is given out during respiration : [1]

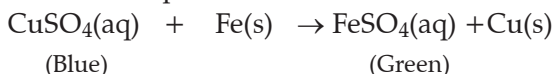
- (a) A
- (b) B
- (c) C
- (d) D

Answer :

(b) B

34. An iron nail is dipped in the solution of copper sulphate for about 30 minutes, state the change in colour observed. Give the reason for the change. [2]

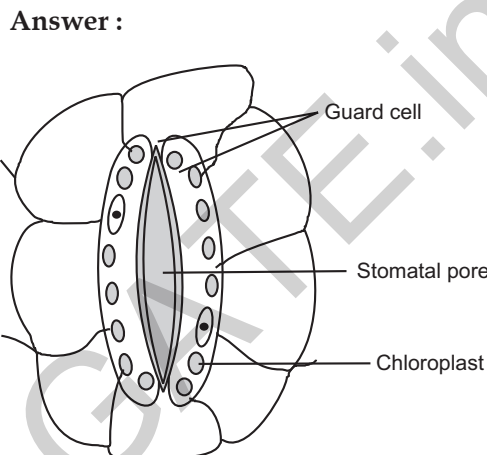
Answer : Iron is more reactive than Cu. So it displaces Cu from copper sulphate solution. Thus, blue colour of the CuSO_4 solution fades and colour of the solution turns green due to the formation of ferrous sulphate solution. This is a displacement reaction.



35. A student while verifying Ohm's law calculated the value of resistance of the resistor for each set of observation. However, the values of resistance were slightly different from the actual value. Is his experiment wrong ? Justify your answer. [2]

Answer : His experiment is correct since some of the current is utilized to overcome the resistance of the wires of the circuit and instruments like ammeter and voltmeter. Thus, the experimental values of resistance will be different from the actual value of resistance.

36. Draw a labelled diagram of stomatal apparatus with closed stomatal pore. [2]



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