

Class X Session 2024-25
Subject - Science
Sample Question Paper - 3

Time Allowed: 3 hours

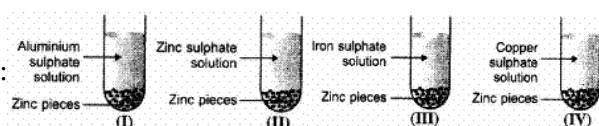
Maximum Marks: 80

General Instructions:

1. This question paper consists of 39 questions in 5 sections.
2. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.
3. Section A consists of 20 objective-type questions carrying 1 mark each.
4. Section B consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should be in the range of 30 to 50 words.
5. Section C consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should be in the range of 50 to 80 words.
6. Section D consists of 3 Long Answer type questions carrying 05 marks each. Answers to these questions should be in the range of 80 to 120 words.
7. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

Section A

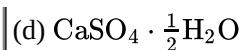
1. Zinc pieces were placed in each of the four test tubes containing different salt solutions as shown below [1]



A colour change would be observed in solutions:

- a) II and IV b) III and IV
- c) II and III d) I and IV
2. In the reaction: $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$, the reducing agent is: [1]
- a) H_2O b) H_2
- c) CuO d) Cu
3. Match column 1 with column II and mark the correct option from the given codes. [1]

| Column I | Column II |
|------------------------------|--|
| (a) Na_2CO_3 | (i) Used for disinfecting water. |
| (b) Na_2CO_3 | (ii) Used for soda-acid fire extinguishers. |
| (c) CaOCl_2 | (iii) Used for removing permanent hardness of water. |
| | |



(iv) Used for making toys, materials for decoration.

a) (a) - (ii), (b) - (iii), (c) - (i), (d) - (iv)

b) (a) - (iii), (b) - (ii), (c) - (i), (d) - (iv)

c) (a) - (i), (b) - (ii), (c) - (iv), (d) - (iii)

d) (a) - (iii), (b) - (i), (c) - (iv), (d) - (ii)

4. Two compounds X and Y have the same molecular formula, $\text{C}_3\text{H}_6\text{O}_2$. Identify the functional groups and structural formulae of X and Y. [1]

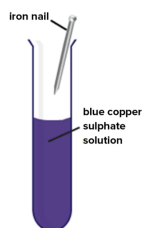
a) -CHO and -CO, X = $\text{CH}_3\text{CH}_2\text{CHO}$, Y = CH_3COCH_3

b) -CO and -COOH, X = CH_3COCH_3 , Y = $\text{CH}_3\text{CH}_2\text{COOH}$

c) -CHO and -COOH, X = $\text{CH}_3\text{CH}_2\text{CHO}$, Y = $\text{CH}_3\text{CH}_2\text{COOH}$

d) -COOH and -COOR, X = $\text{CH}_3\text{CH}_2\text{COOH}$, Y = $\text{CH}_3\text{COOCH}_3$

5. An iron nail is suspended in CuSO_4 solution and kept for a while. The solution: [1]



a) Turns green and no coating will be formed on the nail.

b) Turns green and a coating will be formed on the nail

c) Remains blue and a coating is found on the nail

d) Remain blue and no coating will be formed on the nail.

6. Alloys are homogeneous mixtures of a metal with a metal or nonmetal. Which among the following alloys contain non-metal as one of its constituents? [1]

a) Brass

b) Steel

c) Amalgam

d) Bronze

7. Which one of the following is not in a liquid state at 10°C ? [1]

a) H_2O

b) Glacial acetic acid

c) $\text{C}_2\text{H}_5\text{OH}$

d) Acetone

8. The energy-rich compound produced through respiration is [1]

a) ADP

b) Pyruvic acid

c) AMP

d) ATP

9. In an experiment with pea plants, a pure tall plant (TT) is crossed with a pure short plant (tt). The ratio of pure tall plant to pure short plants in F_2 generation will be [1]

a) 1 : 3

b) 3 : 1

c) 2 : 1

d) 1 : 1

10. _____ is a product of meiosis. [1]

a) Microspore mother cell

b) Megaspore

c) Primary endosperm nucleus

d) Megaspore mother cell

11. Who is called the father of genetics? [1]

a) Stanley and miller

b) Gregor Mendel

c) Lamarck

d) Darwin

12. In which part of the alimentary canal food is finally digested? [1]

a) Stomach

b) Mouth cavity

c) Small intestine

d) Large intestine

13. Which rule determines the direction of flow of current in the conductor? [1]

a) Fleming's left hand rule

b) Fleming's right hand rule

c) Maxwell's right hand grip rule

d) Left hand thumb rule

14. The resistance of the conductor is R. If the length is doubled by stretching the wire, then its new resistance will be: [1]

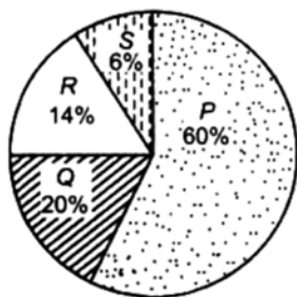
a) R

b) 4R

c) 8R

d) 2R

15. Refer to the given pie chart regarding contribution of different greenhouse gases and select the incorrect statement regarding it. [1]



a) S is used in aerosol cans, jet fuel, air conditioners and refrigerators.

b) Q is also produced by incomplete decomposition mostly by anaerobic methanogens.

c) R are synthetic gaseous compounds of carbon and halogen.

d) Excessive use of fossil fuel is adding more P to atmosphere.

16. In the following groups of materials, which group (s) contains only non-biodegradable items? [1]

i. Wood, paper, leather

ii. Polythene, detergent, PVC

iii. Plastic, detergent, grass

iv. Plastic, bakelite, DDT

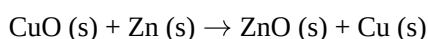
a) (iv)

b) (ii) and (iv)

c) (i) and (iii)

d) (iii)

17. **Assertion (A):** In the following chemical equation, [1]



Zinc is getting oxidised and copper oxide is getting reduced.

Reason (R): The process in which oxygen is added to a substance is called oxidation whereas the process in which oxygen is removed from a substance is called reduction.

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false but R is true.

18. **Assertion (A) :** XX chromosome give rise to female child whereas XY give rise to male child. [1]

Reason (R) : The Y chromosome in males is small than X chromosome.

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false but R is true.

19. **Assertion (A):** The strength of the magnetic field produced at the centre of a current-carrying circular coil increases on increasing the number of turns of the circular coil. [1]

Reason (R): Magnetic field strength is directly proportional to the number of turns of the circular coil.

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false but R is true.

20. **Assertion (A):** CFCs deplete the ozone layer. [1]

Reason (R): CFCs are used as refrigerants and in fire extinguishers.

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) A is false but R is true.

Section B

21. The molecular formulae of two alkynes, A and B are C_xH_2 and C_3H_y respectively. [2]

- a. Find the values of x and y.
- b. Write the names of A and B.

22. a. Differentiate between binary fission in Amoeba and binary fission in Leishmania. [2]

- b. How does reproduction take place in malarial parasite?

23. i. What is double circulation? [2]

- ii. Why is the separation of the right side and the left side of the heart useful? How does it help birds and mammals?

OR

When and where does anaerobic respiration occur in man and yeast?

24. Draw ray diagram showing the image formation by a convex lens when an object is placed between optical centre and focus of the lens. [2]

25. Rearrange the following according to their ascending trophic levels in a food chain. [2]

Hawk, grass, snake, frog, grasshopper.



OR

Give reason to justify the following:

- i. The existence of decomposers is essential in a biosphere.
- ii. Flow of energy in a food chain is unidirectional.

26. A person is unable to see clearly a poster fixed on a distant wall. He however sees it clearly when standing at a distance of about 2 m from the wall. [2]
- a. Draw ray diagram to show the formation of image by his eye lens when he is far away from the wall.
 - b. List two possible reasons of this defect of vision.
 - c. Draw ray diagram to show the correction of this defect using appropriate lens.

Section C

27. P, Q and R are 3 elements which undergo chemical reactions according to the following equations: [3]
- a. $P_2O_3 + 2Q \rightarrow Q_2O_3 + 2P$
 - b. $3RSO_4 + 2Q \rightarrow Q_2(SO_4)_3 + 3R$
 - c. $3RO + 2P \rightarrow P_2O_3 + 3R$

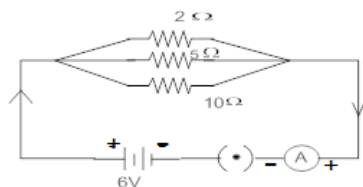
Answer the following questions:

- i. Which element is most reactive?
 - ii. Which element is least reactive?
 - iii. State the type of reaction listed above.
28. An ore on treatment with dilute hydrochloric acid gives a smell like that of rotten eggs. What type of ore is this? [3]
How can it be concentrated? How can the metal be obtained from the concentrated ore?

OR

- (i) Name the metal which does not stick to glass?
- (ii) Name the non-metal which is a good conductor of electricity?
- (iii) Name the metal which is commonly used in thermit welding?
- (iv) What gets deposited at the cathode, a pure or impure metal?
- (v) What is the nature of Zinc oxide?

29. a. Draw a diagram of human excretory system and label on it the following parts: [3]
- i. Kidney
 - ii. Ureter
 - iii. Urinary bladder
 - iv. Urethra
- b. Write one main function each of the labelled parts.
30. A child questioned his teacher that why do organisms resemble their parents more as compared to grandparents. [3]
In which way will the teacher explain to the child?
31. "A concave mirror of focal length f can form a magnified, erect as well as an inverted image of an object placed in front of it." Justify this statement stating the position of object with respect to the mirror in each case for obtaining these images. [3]
32. In the circuit diagram given here, calculate- [3]

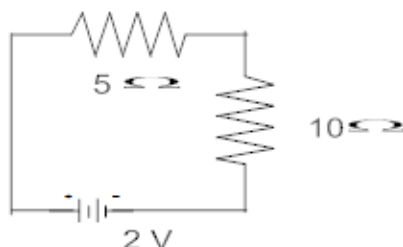


- i. The total effective resistance and the total current
- ii. The current through each resistor

33. Calculate:

[3]

- i. the effective resistance of the circuit and the current in the circuit
- ii. Potential difference across $10\ \Omega$ resistor of a circuit shown in the figure.



Section D

34. i. What is saponification? Differentiate between soaps and detergents on the basis of the following:
 1. Their chemical composition
 2. Their mechanism in hard water
- ii. Explain the formation of micelles between oily dirt and soap molecules. Also draw its diagram.

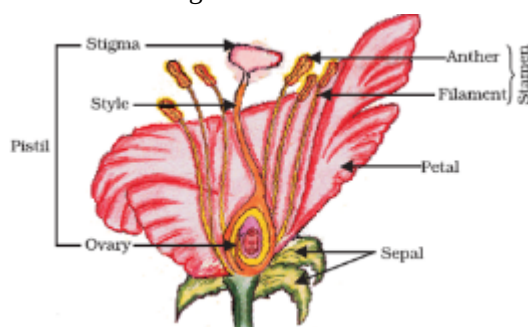
[5]

OR

What are carboxylic acids? Give the common names, IUPAC names and structural formula of first four members of the homologous series.

35. The labelled diagram of a flower is shown below:

[5]



Using the above diagram, answer the following questions:

- i. Where is the egg cell present in a flower?
- ii. Which part of the flower produces pollen grains?
- iii. What is the difference between a uni-sexual and a bisexual flower?
- iv. What happens when a pollen grain falls on the stigma of the carpel?
- v. How a zygote is formed in a flower?

OR

- i. List three points of difference between nervous and hormonal mechanisms for control and coordination in animals.
- ii. How are auxins related with the bending of plant shoot towards unidirectional light? Explain.

36. A student focussed the image of a candle flame on a white screen using a convex lens. He noted down the

[5]

position of the candle screen and the lens as under Position of candle = 12.0 cm Position of convex lens = 50.0 cm Position of the screen = 88.0 cm

- What is the focal length of the convex lens?
- Where will the image be formed if he shifts the candle towards the lens at a position of 31.0 cm?
- What will be the nature of the image formed if he further shifts the candle towards the lens?
- Draw a ray diagram to show the formation of the image in case (iii) as said above.

OR

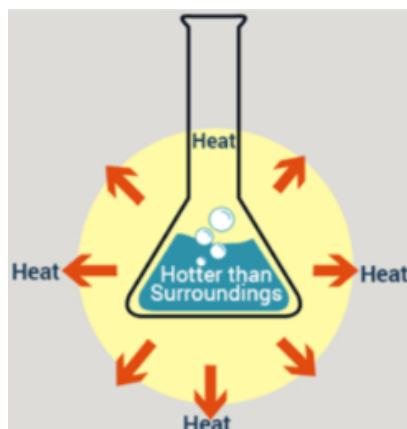
- Draw a labelled ray diagram to show the path of a ray of light incident obliquely on one face of a glass slab.
- Calculate the refractive index of the material of a glass slab. Given that the speed of light through the glass slab is 2×10^8 m/s and in air is 3×10^8 m/s.
- Calculate the focal length of a lens, if its power is - 2.5 D.

Section E

37. **Read the text carefully and answer the questions:**

[4]

The dissolving of an acid or a base in water is a highly exothermic reaction. Care must be taken while mixing concentrated nitric acid or sulphuric acid with water. The acid must always be added slowly to water with constant stirring. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns. The glass container may also break due to excessive local heating. Look out for the warning sign on the can of concentrated sulphuric acid and on the bottle of sodium hydroxide pellets.



- What is the exothermic reaction?
- Write an example of an exothermic reaction.

OR

How will you obtain sulphuric acid from an acidic oxide?

38. **Read the text carefully and answer the questions:**

[4]

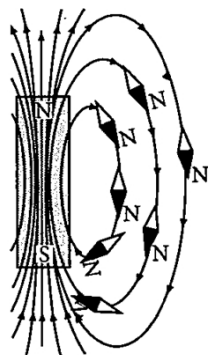
You must have noticed many dramatic changes in your appearance as well as that of your friends as you approached 10-12 years of age. These changes associated with puberty are because of the secretion of testosterone in males and oestrogen in females. Do you know anyone in your family or friends who has been advised by the doctor to take less sugar in their diet because they are suffering from diabetes? As a treatment, they might be taking injections of insulin. This is a hormone that is produced by the pancreas.

- Why is pancreas a dual gland?
- Name the hormone which is secreted by males and females during adolescence.
- What happens if Insulin is not secreted in the proper amount?

OR

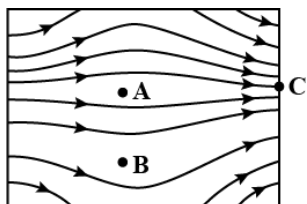
From which cells of pancreatic islets insulin and glucagon hormone are secreted?

A magnetic field is described by drawing the magnetic field lines. When a small north magnetic pole is placed in the magnetic field created by a magnet, it will experience a force. And if the north pole is free, it will move under the influence of the magnetic field. The path traced by a north magnetic pole free to move under the influence of a magnetic field is called a magnetic field line.



Since the direction of the magnetic field line is the direction of the force on a north pole, so the magnetic field lines always begin from the N-pole of a magnet and end on the S-pole of the magnet. Inside the magnet, however, the direction of magnetic field lines is from the S-pole of the magnet to the N-pole of the magnet. Thus, the magnetic field lines are closed curves. When a small compass is moved along a magnetic field line, the compass needle always sets itself along the line tangential to it. So, a line drawn from the south pole of the compass needle to its north pole indicates the direction of the magnetic field at that point.

- (a) Do the magnetic field lines intersect? if not why?
- (b) A strong bar magnet is placed vertically above a horizontal wooden board. What would be the magnetic lines of force?
- (c) The figure shows the magnetic field lines in a magnetic field. A, B., and C are three points in this field. At what point is the magnetic field strength?



OR

Draw the pattern of magnetic field lines for a bar magnet.

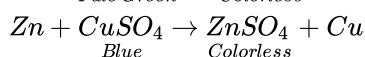
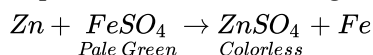
Solution

Section A

1.

(b) III and IV

Explanation: The colour change will take place in III and IV as zinc is more reactive than iron as well as copper.



2.

(b) H₂

Explanation: CuO + H₂ → Cu + H₂O

Compounds or elements which can cause reduction are called reducing agents.

A reducing agent is a substance that gives Hydrogen.

So, H₂ is a reducing agent.

3. (a) (a) - (ii), (b) - (iii), (c) - (i), (d) - (iv)

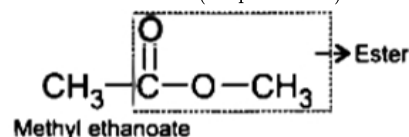
Explanation: (a) - (ii), (b) - (iii), (c) - (i), (d) - (iv)

| Column I | Column II |
|--|--|
| (a) Na ₂ CO ₃ | (i) Used for soda-acid fire extinguishers. |
| (b) Na ₂ CO ₃ | (ii) Used for removing permanent hardness of water. |
| (c) CaOCl ₂ | (iii) Used for disinfecting water |
| (d) CaSO ₄ · $\frac{1}{2}$ H ₂ O | (iv) Used for making toys, materials for decoration. |

4.

(d) -COOH and -COOR, X = CH₃CH₂COOH, Y = CH₃COOCH₃

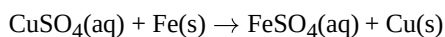
Explanation: CH₃CH₂COOH → Carboxylic acid
X(Propanoic acid)



5.

(b) Turns green and a coating will be formed on the nail

Explanation: The solution will turn green due to the formation of iron sulphate. A coating of copper is formed on the nail. Iron is more reactive than copper and displaces it from its solution.



6.

(b) Steel

Explanation: Steel is an alloy of metal iron and non metal carbon which makes it widely used in making utensils, pipes, conduits and various other purposes.

7.

(b) Glacial acetic acid

Explanation: The freezing point of pure ethanoic acid is 16.6° C (61.9° F). The freezing point of pure water is 0° C. The freezing point of pure ethyl alcohol (C₂H₅OH) is -114.1° C. The freezing point of pure acetone is -95° C. When ethanoic acid (acetic acid) is cooled below 10° C, it freezes to form a colourless, ice-like solid. The solid looks like a glacier and hence pure ethanoic acid are called glacial ethanoic acid (or glacial acetic acid).

8.

(d) ATP

Explanation: In cellular respiration, an organism oxidizes glucose (i.e., combines it with oxygen) so as to form the energy-rich compound known as Adenosine Triphosphate (ATP). ATP, critical to metabolism (the breakdown of nutrients to provide energy or form new material), is the compound used by cells to carry out most of their ordinary functions. Among those functions are the production of new cell parts and chemicals, the movement of compounds through cells and the body as a whole, and growth.

9.

(d) 1 : 1

Explanation: A cross between (TT) and (tt) would produce progenies with following genotypes-
In F₂ generation - selfing of F₁ progeny-

| Gametes Tt | T | t |
|------------|----|----|
| T | TT | Tt |
| t | Tt | tt |

Pure tall (TT), Mixed tall (Tt) and Short (tt). The ratio of pure tall and pure short plant is 1 : 1.

10.

(b) Megaspore

Explanation: Megaspore is a haploid cell that is formed by meiosis in the megaspore mother cell. It is the first cell of female gametophyte.

11.

(b) Gregor Mendel

Explanation: Gregor Mendel is called the father of genetics because he was the first person in the world to observe the fact that characteristics were passed on from the parents to the children.

12.

(c) Small intestine

Explanation: Although the primary digestion process is conducted in the mouth and stomach. Most of the digestion process occurs in the small intestine and in large intestine digestion process will not take place.

13.

(b) Fleming's right hand rule

Explanation: The direction of induced current in a straight conductor is given by Fleming's right-hand rule. It states that if we stretch the thumb, forefinger and the middle finger of the right hand at right angles to one another in such a way that the forefinger points in the direction of the magnetic field. Then, thumb gives the direction of motion of conductor (force), forefinger indicates the direction of magnetic field, and the middle finger points the direction of induced current.

14.

(b) 4R

Explanation: The resistance of a uniform metallic conductor is directly proportional to its length (l) and inversely proportional to the area of its cross-section (A). $R = \rho \frac{l}{A}$ where ρ is a constant of proportionality and is called the electrical resistivity of the material of the conductor.

$$R_1 = \rho \frac{l_1}{A_1} \text{ and } R_2 = \rho \frac{l_2}{A_2} \text{ and } l_2 = 2l_1$$

The volume of the wire remains unchanged.

$$\therefore \pi r_1^2 l_1 = \pi r_2^2 l_2$$

$$\Rightarrow (\pi r_1^2)(l_1) = (\pi r_2^2)(l_2)$$

$$\Rightarrow (A_1)(l_1) = (A_2)(2 \times l_1)$$

$$\Rightarrow A_2 = \frac{A_1}{2}$$

Thus, when the wire is stretched to double its length, the area of cross-section becomes half.

$$\therefore R_2 = \rho \frac{l_2}{A_2}$$

$$\Rightarrow R_2 = \rho \frac{2 \times 2 \times l_1}{A_1}$$

$$\Rightarrow R_2 = 4 \times R_1$$

Thus, the new resistance becomes four times of the original resistance.

15. (a) S is used in aerosol cans, jet fuel, air conditioners and refrigerators.

Explanation: In the given pie chart, P, Q, R and S are CO_2 , CH_4 , CFCs and N_2O respectively. Chlorofluorocarbons(R) are used in aerosol cans, jet fuel, air conditioners and refrigerators.

16.

- (b) (ii) and (iv)

Explanation: Group (i) has wood and leather which are biodegradable. Group (iii) has grass that is biodegradable hence the answer is (ii) and (iv) in which the given materials in the options cannot be degraded by micro-organisms and hence are non-biodegradable.

17. (a) Both A and R are true and R is the correct explanation of A.

Explanation: Both A and R are true and R is the correct explanation of A.

18.

- (b) Both A and R are true but R is not the correct explanation of A.

Explanation: Smaller Y chromosome, does not decide the gender of the child. Its presence is important not the size. Thus both assertion and reason are true, but reason is not the correct explanation of the assertion.

19. (a) Both A and R are true and R is the correct explanation of A.

Explanation: Both A and R are true and R is the correct explanation of A.

20. (a) Both A and R are true and R is the correct explanation of A.

Explanation: The ozone layer is getting depleted at the higher levels of the atmosphere due to the effect of chlorofluorocarbons (CFCs) which are used as refrigerants and in fire extinguishers.

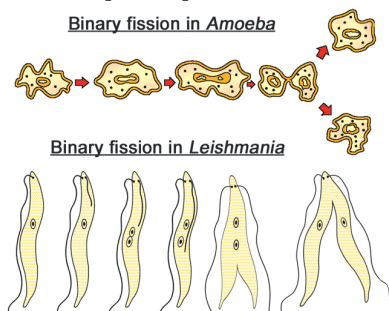
Section B

21. a. x is 2 and y is 4

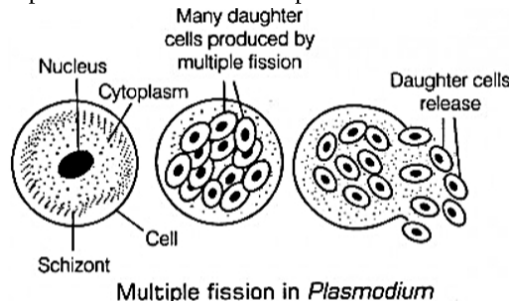
b. A is Ethyne and B is propyne

22. a. Amoeba reproduces through simple binary fission. Amoeba reproduces asexually through binary fission. In this process of reproduction, a single Amoeba is divided into two similar daughter cells. It grows larger and one nucleus in the Amoeba splits and forms two nuclei. The amoeba is produced by the single parent.

In Leishmania, binary fission occurs in a definite orientation due to the presence of flagellum at the end of the cell. Hence, there is a specific plane in which the fission occurs, while Amoeba can undergo binary fission in any plane.



- b. Malarial parasite or Plasmodium reproduces by multiple fission. Each Plasmodium cell divides its nucleus into many small nuclei followed by the division of the cell body to form many daughter cells with each cell obtaining one nucleus. This type of reproduction is called multiple fission.

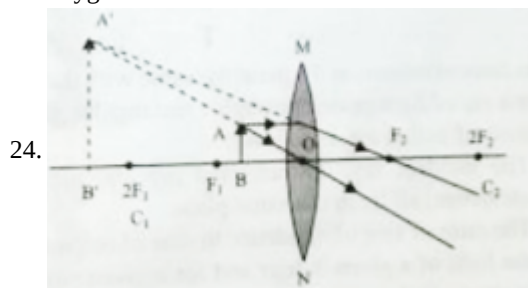


23. i. A circulatory system in which the blood travels twice through the heart in one complete cycle is known as double circulation. It is commonly seen in amphibians, reptiles, birds, and mammals.

- ii. The separation of the right side and the left side of the heart is useful to keep oxygenated and deoxygenated blood from mixing. This type of separation allows a highly efficient supply of oxygen to the body. This is useful in animals that have high energy needs, such as birds and mammals, which constantly use energy to maintain their body temperature. In animals that do not use energy their body temperature depends on the temperature in the environment. Animals, like amphibians and reptiles have three-chambered hearts, and tolerate some mixing of the oxygenated and de-oxygenated blood streams.

OR

Anaerobic respiration occurs in man when there is deficiency of oxygen during cellular respiration. In such situation, pyruvic acid is reduced to lactic acid by the lactate dehydrogenase. In yeast also, anaerobic respiration occurs in the condition of absence of oxygen.



25. Grass → grasshopper → frog → snake → hawk.

A food chain always start with producers and ends with top consumers.

OR

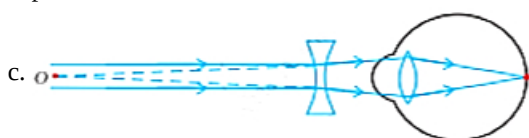
- i. Decomposers are essential in a biosphere as they return nutrients back to the environment by breaking down dead complex organic matter into recyclable simpler compounds.
- ii. The flow of energy through different steps in the food chain is unidirectional as the food chain progress the energy passes from lower trophic level to upper but never vice versa.

26. a. Ray diagram of the defect



Myopic eye

- b. In a myopic eye, rather than at the retina itself, the image of a distant object is created in front of the retina. This flaw may result from (i) an excessively curved eye lens or (ii) an elongated eyeball. With the use of a concave lens of the appropriate power, this flaw can be fixed. The flaw is fixed by returning the picture to the retina with a concave lens of the proper power.



Correction for myopic

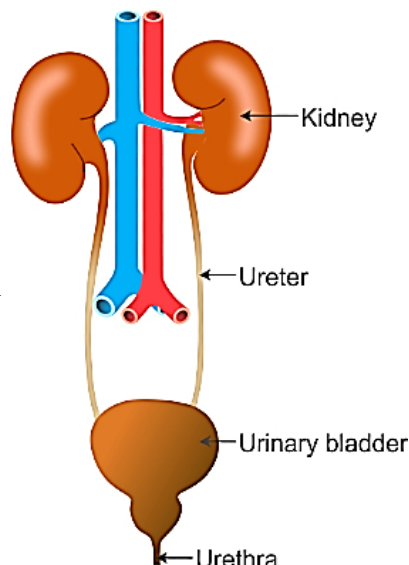
Section C

27. i. Q is the most reactive metal out of P, R and Q as it has replaced both P and R from their compounds.
- ii. R is the least reactive element as it has been displaced by both P and Q.
- iii. The type of reaction is Displacement reaction.
28. The gas which smells like that of rotten eggs is H_2S . Hence, the ore is a sulphide ore. It is concentrated by froth-floatation process. The metal is obtained from the concentrated ore in the following two steps:
- i. Roasting: Heating the ore strongly in the presence of air. The metal sulphide is converted into metal oxide along with evolution of sulphur dioxide gas.
- $$\text{Metal sulphate} + O_2 \xrightarrow{\text{Roasting}} \text{Metal oxide} + SO_2$$
- ii. Reduction with carbon: On heating the metal oxide with carbon, it is reduced to free metal.
- $$\text{Metal oxide} + \text{Carbon} \xrightarrow{\text{Reduction}} \text{Metal} + \text{Carbon monoxide}$$

OR

- (i) Mercury
(ii) Graphite
(iii) Aluminum

- (iv) A pure metal is always deposited at the cathode
 (v) Zinc oxide (ZnO) is an amphoteric oxide.



29. a. Diagram of human excretory system

b. Functions:

Kidney → Filtration of blood

Ureter → Transports urine from kidney to bladder

Urinary Bladder → Stores Urine

Urethra → Throws out urine/Excrete Urin

30. The two parents involved in sexual reproduction produce gametes which fuse together forming a zygote. It gradually develops into a young child showing certain similarities with the parents.

Since, a child inherits its characters from both the parents the resemblance with them is very close. The grandparents and the child resemble less closely because a gap of gene pool is created by the parents of the child. Since the child is immediate generation next to his parent thus to carry more similar genes as that of parents. Variations are more with grandparents.

31. When an object is placed between Focus and Pole of concave mirror, the image formed is virtual, magnified, erect and behind the mirror. When an object is placed between Curvature and Focus of concave mirror, the image formed is real, magnified, inverted at the same side of mirror.

32. i. since resistances are in parallel

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

$$\frac{1}{R} = \frac{1}{2} + \frac{1}{5} + \frac{1}{10} = \frac{8}{10}$$

$$R = \frac{10}{8} \Omega$$

ii. Total current $I = \frac{V}{R} = \frac{6V}{10/8\Omega}$
 $= 4.8 \text{ A}$

iii. If I_1 , I_2 and I_3 be the current through 2Ω , 5Ω and 10Ω respectively.

Therefore, $I_1 = \frac{V}{R_1} = \frac{6}{2}$
 $= 3 \text{ A}$
 $I_2 = \frac{V}{R_2} = \frac{6}{5}$
 $= 1.2 \text{ A}$
 $I_3 = \frac{V}{R_3} = \frac{6}{10}$
 $= 0.6 \text{ A}$

33. i. $R = R_1 + R_2$
 $= 5 + 10 = 15 \Omega$
 $I = \frac{V}{R} = \frac{2}{15}$
 $= 0.133 \text{ A}$

ii. Potential difference across 10Ω
 $V = IR$
 $= \frac{2}{15} \times 10$
 $= 1.33 \text{ V}$

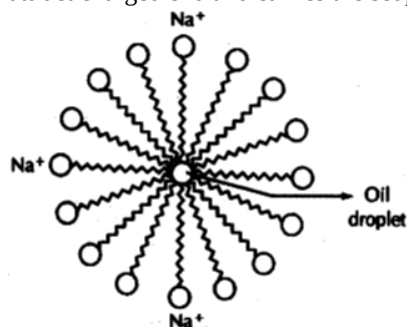
Section D

34. i. Saponification is the hydrolysis of an ester to form an alcohol and the salt of a carboxylic acid in acidic or essential conditions.

| | Soap | Detergent |
|-------------------------|--|---|
| Chemical composition | Soaps are sodium salts of long chain fatty acids | detergents are sodium salts of alkyl benzene sulphonic acids. |
| mechanism in hard water | Soaps form scum in hard water. | Detergents do not form any scum. |

- ii. Soap molecule has two ends, the charged end that gets attracted towards water is called hydrophilic and the long carbon chain that repels water is called hydrophobic end. When soap is dissolved in water, the carbon chain i.e, hydrophobic end gets attracted towards the oil, dirt and grease. The hydrophilic end which is attracted by water molecules points outwards thus, the micelle formation takes place.

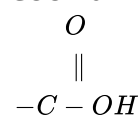
The tail entangles dirt, oil or grease, if required the agitation is done. Lot of rinsing is done with water so that water molecules attract charged end and carries the soap molecules with to it attached to it and clean the clothes, utensils, etc.



OR

Carboxylic acids are organic compounds containing carboxylic acid group:

COOH or



Their general formula is $C_nH_{2n+1}COOH$ or it may be written as $RCOOH$, where R is an alkyl group.

Members of the homologous series of carboxylic acids. The first four members of the homologous series of carboxylic acids are given ahead:

| Molecular Formula | Structural Formula | Common name | IUPAC name |
|------------------------------------|--|----------------|----------------|
| HCOOH | $H - \overset{\overset{O}{ }}{C} - OH$ | Formic acid | Methanoic acid |
| CH ₃ COOH | $\begin{array}{c} H \\ \\ H - C - \overset{\overset{O}{ }}{C} - OH \\ \\ H \end{array}$ | Acetic acid | Ethanoic acid |
| C ₂ H ₅ COOH | $\begin{array}{c} H & H & O \\ & & \\ H - C - C - C - OH \\ & & \\ H & H & \end{array}$ | Propionic acid | Propanoic acid |
| C ₃ H ₇ COOH | $\begin{array}{c} H & H & H & O \\ & & & \\ H - C - C - C - C - OH \\ & & & \\ H & H & H & \end{array}$ | n-Butyric acid | Butanoic acid |

35. i. The ovary contains ovules and each ovule has an egg cell.
 ii. Stamen produces pollen grains that are yellowish in the colour.
 iii. The unisexual flower contains either stamens or carpels whereas the bisexual flower contains both stamens and carpels.
 iv. When a pollen grain falls on the stigma of the carpel, it bursts open and grows into a pollen tube downwards through the style towards the female gamete in the ovary.

- v. The tip of the pollen tube bursts open and the male gamete comes out of the pollen tube that combines with the nucleus of the female gamete present in the ovule to form a fertilized egg called a zygote.

OR

| i. Nervous mechanism | Hormonal mechanism |
|--|--|
| Transmits information through electrical impulses. | Transmits information through blood cells. |
| Affects only a particular part of the body. | Affect different organs of the body |
| Signal transmission is fast | Signal transmission is slow |

- ii. When light is coming from one side of the plant, auxin diffuses towards the shaded side of the shoot. This concentration of auxin stimulates the cells to grow longer on the side of the shoot which is away from light. Thus, the plant appears to bend towards the light.

36. Position of the candle flame = 12.0 cm

Position of the lens = 50.0 cm

Position of the screen = 88.0 cm

i. $u = 50 - 12 = 38 \text{ cm}$

Image distance $v = 88 - 50 = 38 \text{ cm}$

Focal length $= \frac{1}{v} - \frac{1}{u} = \frac{1}{t}$

$f = 19 \text{ cm}$

ii. Object distance $u = 50 - 31 = 19 \text{ cm}$

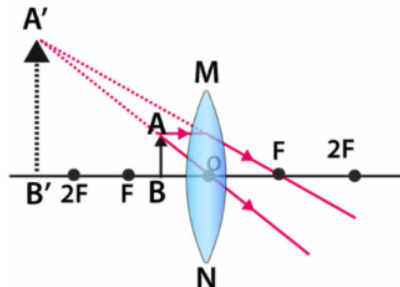
Here

Object distance = focal length

Hence the image is formed at infinity.

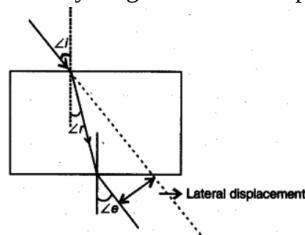
- iii. If he further shifts the candle towards the lens. The object comes between F and O. In this case. The image is virtual, enlarged and erect and is formed on the same side of the lens.

iv.



OR

- i. The ray diagram shows the path of a ray of light incident obliquely on one face of a glass slab:



- ii. The glass refractive index is defined as the ratio between the speed of light in the vacuum and the speed of light in the glass.
Refractive index of glass (n_g) = Speed of light in vacuum/speed of light in the glass.

$$n_g = \frac{3 \times 10^8}{2 \times 10^8}$$

$$n_g = 1.5$$

iii. $P = \frac{1}{f(\text{in meter})}$

$$f = \frac{1}{P} = \frac{1}{2.5} = -\frac{1}{25}$$

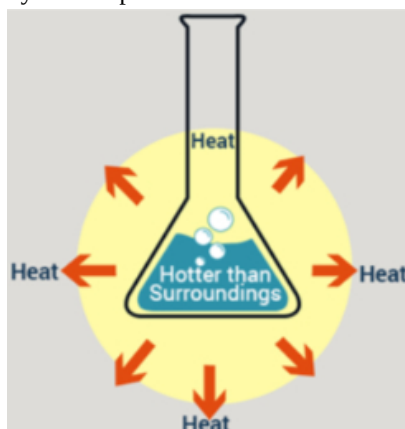
$$\Rightarrow f = \frac{-1000}{25} \text{ cm} = -40 \text{ cm}$$

The focal length (f) of a concave lens is always negative.

Section E

37. Read the text carefully and answer the questions:

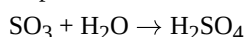
The dissolving of an acid or a base in water is a highly exothermic reaction. Care must be taken while mixing concentrated nitric acid or sulphuric acid with water. The acid must always be added slowly to water with constant stirring. If water is added to a concentrated acid, the heat generated may cause the mixture to splash out and cause burns. The glass container may also break due to excessive local heating. Look out for the warning sign on the can of concentrated sulphuric acid and on the bottle of sodium hydroxide pellets.



- (i) An exothermic reaction is a chemical reaction that releases energy through light or heat.
- (ii) Mixing of acid with water is a highly exothermic reaction.

OR

When sulphur trioxide (acidic oxide) is dissolved in water, an exothermic reaction takes place with the formation of sulphuric acid.



38. Read the text carefully and answer the questions:

You must have noticed many dramatic changes in your appearance as well as that of your friends as you approached 10-12 years of age. These changes associated with puberty are because of the secretion of testosterone in males and oestrogen in females. Do you know anyone in your family or friends who has been advised by the doctor to take less sugar in their diet because they are suffering from diabetes? As a treatment, they might be taking injections of insulin. This is a hormone that is produced by the pancreas.

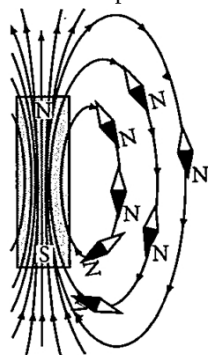
- (i) Pancreas is a dual gland because it acts as both an endocrine and exocrine gland. As endocrine, it secretes hormones like insulin, glucagon. As an exocrine gland, it releases enzymes like trypsin, lipase, amylase etc.
- (ii) Testosterone in males and oestrogen in females is the hormone that is secreted during adolescence.
- (iii) If Insulin is not secreted in the proper amount then it causes diabetes.

OR

Glucagon and Insulin are secreted from alpha and beta cells of islets of the pancreas respectively.

39. Read the text carefully and answer the questions:

A magnetic field is described by drawing the magnetic field lines. When a small north magnetic pole is placed in the magnetic field created by a magnet, it will experience a force. And if the north pole is free, it will move under the influence of the magnetic field. The path traced by a north magnetic pole free to move under the influence of a magnetic field is called a magnetic field line.



Since the direction of the magnetic field line is the direction of the force on a north pole, so the magnetic field lines always begin from the N-pole of a magnet and end on the S-pole of the magnet. Inside the magnet, however, the direction of magnetic field lines is from the S-pole of the magnet to the N-pole of the magnet. Thus, the magnetic field lines are closed curves. When a small compass is moved along a magnetic field line, the compass needle always sets itself along the line tangential to it. So, a line drawn from the south pole of the compass needle to its north pole indicates the direction of the magnetic field at that point.

- (i) No two magnetic field lines are found to cross each other. If two field lines crossed each other, it would mean that at the point of intersection, the compass needle would point in two directions at the same time, which is not possible.
- (ii) The magnetic field and hence the magnetic line of force exist in all the planes all around the magnet.
- (iii) The magnetic lines of force are uniform and strong at point C and they diverge as they move towards points A and B and the distance between the lines increases. Eventually, the strength of the magnetic field is strong where the lines are closer and they weaken as the closeness decreases i.e., at point C.

OR

