NEET (UG)

Sample Question Paper-2

ANSWERS WITH EXPLANATION

PHYSICS

1. **(b)** $\therefore \quad \vec{F} = F.\hat{f} = 30\left(\frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}\right)$

$$\vec{F} = 10\sqrt{3}(\hat{i}+\hat{j}+\hat{k}) \quad ...(i)$$

and $$\vec{S} = \vec{r_2} - \vec{r_1} = 2\hat{i}+\hat{k} \quad ...(ii)$$

$\therefore \quad W = \vec{F}.\vec{S} = 30\sqrt{3}J$

2. **(a)** Diffraction can be observed when the size of obstacle is the order of wavelength due to the wave nature of light.

3. **(d)** To hit a target, the man should aim his rifle at a point higher than the target as the bullet suffers a vertical deflection $\left(y = \frac{1}{2}gt^2\right)$ Due to acceleration due to gravity.

4. **(b)** In the present case, the tangential component of frictional force is responsible for changing the speed of car while the component along the radial direction is providing necessary centripetal force, hence net friction force is neither towards radial nor along tangential direction.

5. **(d)** When a disc rotates with uniform angular velocity, angular acceleration of the disc is zero.

6. **(b)** The mass of a body is always constant and does not change with position.

7. **(b) Given :**

Binding energy per nucleon of $_3Li^7$ and $_2He^4$ nuclei are 5.60 MeV and 7.06 MeV

Energy released $= 7.06 \times 8 - 5.60 \times 7$

$= 17.3$ MeV

8. **(c)** If a small amount of antimony is added to germanium crystal, crystal becomes *n*-type semi-conductor. Hence, there will be more free electrons than holes.

9. **(c)** For the revolving planet the centripetal force is provided by the gravitational force. So we have,

$$\frac{GMm}{R^4} = mR\omega^2$$

$$\omega^2 = \frac{GM}{R^5}$$

$$\frac{4\pi^2}{T^2} = \frac{GM}{R^5}$$

$$T^2 \propto R^5$$

$$T \propto R^{\frac{5}{2}}$$

$\Rightarrow \quad n = \frac{5}{2}$

10. **(b)** Comparing with the standard equation

$$\frac{d^2x}{dt^2} = -\omega^2 x$$

$$-\omega^2 = -k$$

$\Rightarrow \quad \omega = \frac{2\pi}{T} = \sqrt{k}$

$$\frac{T}{2} = \frac{\pi}{\sqrt{k}}$$

11. **(d)** Initially when the pipe is not dipped in water it is an open pipe with the frequency,

$$f = \frac{V}{2l}$$

When one fourth of the pipe is dipped in water, it becomes a closed pipe with length $\frac{3}{4}^{th}$ of original length l. So the new frequency will be

$$f' = \frac{V}{4l} = \frac{V}{4 \times \frac{3l}{4}} = \frac{V}{3l}$$

$$= \frac{2}{3}\left(\frac{V}{2l}\right) = \frac{2}{3}f$$

12. **(a)** At resonance $X_L = X_C$, but each one need not be equal to R. But all the remaining relations are correct.

$Z = R$ because it is purely ohmic at resonance. Also $|V_L| = |V_C|$. The resonance frequency,

$f_r = \frac{1}{2\pi\sqrt{LC}}$ is also correct.

13. (a) Lyman Series, $\lambda_{max} = \frac{4}{3R}$

Balmer Series, $\lambda_{max} = \frac{36}{5R}$

$$\text{Ratio} = \frac{5}{27}$$

14. (c) Let at time 't', the distance between ship A and ship B is minimum.

Distance travelled by ship A at time 't' $= 10t$

Distance travelled by ship B at time 't' $= 100 - 10t$

From the figure, using Pythagoras theorem :

$$h^2 = (10t)^2 + (100 - 10t)^2$$

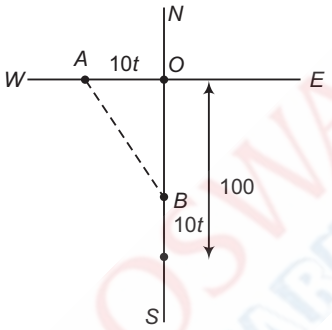
$$h = \sqrt{200t^2 + 10000 - 2000t}$$

For minimum distance :

$$\frac{dh}{dt} = 0$$

So, $$\frac{dh}{dt} = \frac{(400t - 2000)}{2\sqrt{200t^2 + (100)^2 - 2000t}}$$

or, $400t = 2000$



$$t = \frac{2000}{400} = 5\text{h}$$

15. (a) Let k be the spring constant of the spring, so

$$U = \frac{1}{2} \times k \times (2)^2 = 2k$$

Now,

$$U_{final} = \frac{1}{2} \times k \times (10)^2 = 50k$$

Further,

$$\frac{U}{U_{final}} = \frac{2k}{50k} = \frac{1}{25}$$

So, $U_{final} = 25\ U$

16. (b) From the question, it is observed that as orbital velocity is independent of mass, in such case both satellites S_1 and S_2 will move with same speed.

As $$v = R\sqrt{\frac{g}{R+h}}$$

17. (a) Let the wire 1 is of length $= l$

By volume conservation

$$l_2 = \frac{l}{2}$$

Now area of wire 1 = A while area of wire 2 = 3A

When the length of wire 1 is increased by Δx if force F is applied, so $Y = \left(\frac{F}{A}\right)/[\Delta x/l]$

Now for wire 2 : $Y = \left(\frac{F'}{A}\right)/[\Delta x/l/3]$

For wire 2 amount of force needed will be analyzed using above expressions :

$$\frac{F}{A} \times \frac{l}{\Delta x} = \frac{F'}{3A} \times \frac{l}{3\Delta x}$$

Hence, the force $F' = 9F$

18. (d) $PV = nRT$

$$\Rightarrow \quad V = \left(\frac{nR}{P}\right)T$$

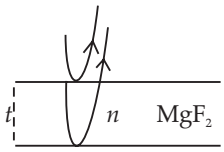
$$\text{Slope} = \frac{nR}{P}$$

Since $\theta_2 > \theta_1$

so, $$\frac{1}{P_2} > \frac{1}{P_1}$$

$$P_1 > P_2$$

19. (a)



$$2t = \left[\frac{2m+1}{2}\right]\frac{\lambda}{n}$$

$$t_{min} = \frac{\lambda}{4n} = \frac{5.5 \times 10^{-7}}{4 \times 1.38} = 99.6\ \text{nm}$$

20. (a) From Kirchoff's current law,

$$i_3 = i_1 + i_2$$

$$= 3\sin\omega t + 4\sin(\omega t + 90°)$$

$$= \sqrt{3^2 + 4^2 + 2(3)(4)\cos 90°}\sin(\omega t + \phi)$$

where $$\tan\phi = \frac{4\sin 90°}{3 + 4\cos 90°} = \frac{4}{3}$$

$\therefore$ $$i_3 = 5\sin(\omega t + 53°)$$

21. **(c)** $\frac{T_2}{T_1}=\left(\frac{R_2}{R_1}\right)^{3/2}=\frac{27T}{T}$

$R_2=(27)^{2/3}R$

$R_2=9R$

22. **(b)** Surface tension becomes zero at boiling point.

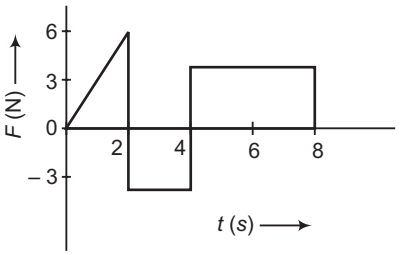
23. **(d)** Change of mass of bob and amplitude have no effect on the time period.

$T\propto\sqrt{l}$

$\frac{T'}{T}=\sqrt{\frac{4l}{l}}$

$\Rightarrow \quad T'=2T$

24. **(a)**



From the figure,

change in momentum = area under curve

$=\frac{1}{2}\times 2\times 6-2\times 3+4\times 3$

$=12\ \text{Ns}$

25. **(a)** If two point masses m_1 and m_2 have position vectors $\vec{r_1}$ and $\vec{r_2}$ their centre of mass has position vector $\vec{R}$ given by :

$\vec{R}=(m_1\vec{r_1}+m_2\vec{r_2})/(m_1+m_2)$

Here,

$m_1=1,\ m_2=3,\ \vec{r_1}=\hat{i}+2\hat{j}+\hat{k}$ and $\vec{r_2}=-3\hat{i}-2\hat{j}+\hat{k}$

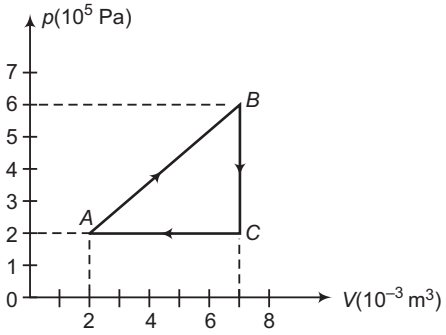
On substituting,

$\vec{R}=[1(\hat{i}+2\hat{j}+\hat{k})+3(-3\hat{i}-2\hat{j}+\hat{k})]/(1+3)$

Or, $\vec{R}=(-8\hat{i}-4\hat{j}+4\hat{k})/4$

$=-2\hat{i}-\hat{j}+\hat{k}$

26. **(c)**



Net work done = Area of triangle ABC

$=\frac{1}{2}\times 5\times 10^{-3}\times 4\times 10^{5}\ \text{J}$

$=10^3\ \text{J}=1000\ \text{J}$

27. **(a)** Let t is the temperature of mixture

Heat gained by CO_2 = Heat lost by O_2

Using $\mu_1 C_{v_1}\Delta T_1=\mu_2 C_{v_2}\Delta T_2$

$\frac{22}{44}(3R)(t-27)=\frac{16}{32}\left(\frac{5}{2}R\right)(37-t)$

$3(t-27)=\frac{5}{2}(37-t)$

$t=32°C$

28. **(c)** Maximum acceleration:

$(a_{max})_1/(a_{max})_2=\omega_1^2 A/\omega_2^2 A$

$=(100/1000)^2=1:10^2$

29. **(d)** Length of the diagonal of a cube having each side b is $b\sqrt{3}$

The distance of centre of cube from each vertex is $\frac{b\sqrt{3}}{2}$

As there are 8 vertices with charge (– q) at each corner, so

$U=8\times\frac{1}{4\pi\varepsilon_0}\times(-q)\times\frac{q}{b\sqrt{3}/2}$

$U=\frac{-4q^2}{\sqrt{3}\pi\varepsilon_0 b}$

30. **(b)** Resistance $R=\rho l/A$

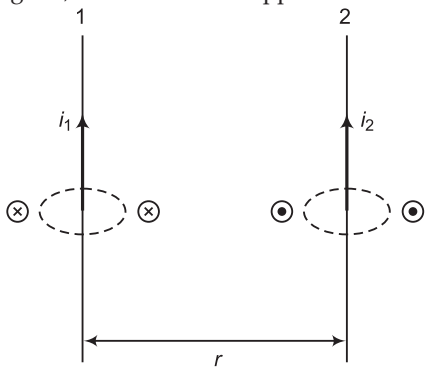
$A'=nl\ \ A'=\frac{A}{n}$

$R'=\frac{\rho l'}{A'}$

$R'=\frac{\rho nl}{A/n}=\frac{\rho l}{A}n^2$

$R'=Rn^2$

31. **(b)** As per Maxwell right hand rule, magnetic field at right hand of wire 1 is perpendicular to paper which is going in shown by X. Also, magnetic field at left hand of wire 2 is perpendicular to paper coming out, so two fields are opposite to each other.



Hence net magnetic field,

$$B = B_1 - B_2$$

$$= \mu_o i_1/2\pi r_1 - \mu_o i_2/2\pi r_2$$

At mid point,

$$r_1 - r_2 = r = 5/2 = 2.5$$

$$B = \mu_o / 2\pi\ (i_1/r - i_2/r)$$

$$= \mu_o / 2\pi\ (5/2.5 - 2.5/2.5)$$

$$= \mu_o / 2\pi\ (2 - 1) = \mu_o / 2\pi\ T$$

32. (d) It is noted that any change in magnetic environment of coil of wire results in voltage (emf) to be induced in the coil, so as per Faraday's Law, emf

$$= -\Delta\Phi/\Delta t = -d\Phi/dt$$

Considering equation $\varphi = 3t^2 + 4t + 9$

Now differentiating above equation, so emf

$$= d(3t^2 + 4t + 9)/dt = 6t + 4$$

Now the induced emf at t = 2s will be, emf

$$= 6 \times 2 + 4 = 16\ V$$

33. (a) Now, $(\mu - 1)A + (\mu' - 1)A' = 0$

Condition for dispersion without deviation,

$$|(\mu - 1)| = |(\mu' - 1)A'$$

$$(1.42 - 1) \times 10° = (1.7 - 1)A'$$

$$4.2 = 0.7A' \text{ or } A' = 6°$$

34. (a) Now $COP = \dfrac{L_Q}{\text{Power}} = \dfrac{T_L}{T_H - T_L}$

or, $$\text{Power} = \frac{L_Q \times (T_H - T_L)}{T_L}$$

$$= (600 \times 4.2) \times 26/277 = 236.53\ W$$

35. (c) $\eta_A = 1 - \dfrac{500}{1000}$; $\eta_B = 1 - \dfrac{400}{1100}$ $= \eta_A < \eta_B$

36. (c) $Q = \Delta U + W$

$W = 0$ since volume is constant

$Q = \Delta U$

$V_{rms} = \sqrt{3RT/M}$

$U_{mix} = U_1 + U_2$

$U_{mix} = n_1 C_{v_1} + n_2 T$

$$= (n_1 + n_2)\ (C_v)_{mix}\ (T_2 - T_1)$$

$$(U_f) - (U_i) = nC_v(T_2 - T_1)$$

$$= (n_1 + n_2)\ (C_v)_{mix}\ (T_2 - T_1)$$

$V'_{rms} = 2V_{rms} \Rightarrow T' = 4T$

$n_1 = \dfrac{8}{4} = 2$; $n_2 = \dfrac{14}{28} = \dfrac{1}{2}$

$$(C_v)_{mix} = \frac{n_1 Cv_1 + n_2 Cv_2}{(n_1 + n_2)}$$

$$U_f - U_i = (n_1 + n_2)\ (T_2 - T_1)$$

$$= \frac{17}{4}\ R\ [1200 - 300] \times R \times 100$$

$$= 3825\ R$$

37. (d) In the option (a), the circuit is open, as a result no current flows through it. So the potential difference across internal resistor is zero and hence, terminal potential difference is same as emf of battery.

For option (b), The terminal potential difference gets zero as battery is shorted although emf remains same.

In option (c), discharging of battery takes place, current has been withdrawn from battery, whose value is depending on the value of resistance, which inturn changes the value of terminal potential difference but emf remains same.

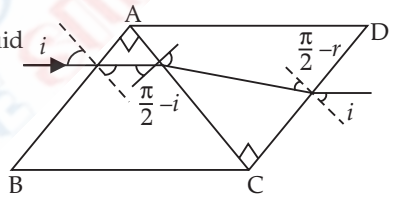
38. (c) It is noted that moment of inertia of disc about its diameter will be $= (1/4)\ MR^2$

By parallel axes theorem

$$I = (1/4)\ MR^2 + MR^2$$

$$I = (5/4)\ MR^2$$

39. (a) Liquid



By Snell's law at the surface AC

$$\sqrt{3}\sin\left(\frac{\pi}{2} - i\right) = \sqrt{2}\sin r \qquad ...(i)$$

By Snell's law at the surface DC,

$$\sqrt{2}\sin\left(\frac{\pi}{2} - r\right) = 1\sin i \qquad ...(2)$$

From equation (i) and (ii),

$$2\cos^2 i + 1 = 2$$

or, $$\cos i = \frac{1}{\sqrt{2}}$$

or, $$i = 45°$$

40. (c) We have $d = 2700$ m, $\rho = 10^3$ kg/m^3, compressibility $= 45.4 \times 10^{-11}$ /pascal

Now the pressure at bottom of ocean is

$$P = \rho g d$$

$$= 10^3 \times 10 \times 2700$$

$$= 27 \times 10^6\ Pa$$

Hence, fractional compression

$$= 45.4 \times 10^{-11} \times 27 \times 10^6$$

$$= 1.2 \times 10^{-2}$$

41. (a) Some devices having negative resistance show the inverse variation between voltage and current as shown in given figure (in problem).

$$V = E - Ir \quad ...(i)$$

Where, r is the internal resistance of battery.

When I = 0 , V = E, Hence E = 10V.

Now, from graph, if V = 5V, I + 1A, therefore

$$5 = 10 - (1)r \quad ... (i)$$

$$r = 5\Omega$$

42. **(d)** Decrease in surface energy = heat required in vaporization

$$\therefore \quad T(dS) = L(dm)$$

$$\therefore \quad T(2)(4\pi r)dr = L(4\pi r^2 dr)\rho$$

$$\therefore \quad r = \frac{2T}{\rho L}$$

43. **(a)** Initially, the momentum of the packet in train A is more than in train B. Where packets are changed, the packet reaching train A being of lower momentum will retard the train A but packet reaching train B, being of higher momentum will accelerate B.

44. **(c)**

Case 1 :

$$(0.95\,u)^2 - u^2 = -2at$$

Where t = thickness of one plank.

So, $0.0975\,u^2 = 2at \quad ...(i)$

Case 2:

$$(0.5\,u)^2 - u^2 = -2nat$$

$$0.075\,u^2 = 2nat \quad ...(ii)$$

Dividing eqn. (ii) by eqn. (i),

$$= 0.075\,u^2/0.0975\,u^2 = n$$

Therefore $n = 7.69$

Approximately $n = 8$.

45. **(b)** $U = 5.5x - 7y$

$$F_x = \frac{\partial U}{\partial x} = -5.5\text{N}$$

$$F_y = \frac{\partial U}{\partial y} = 7\text{N}$$

$$a_x = \frac{F_x}{m} = -11 ms^{-2}$$

$$a_y = \frac{F_y}{m} = 14 ms^{-2}$$

$$v_x = u_x + a_x t$$

$$= 0 + (-11 \times 4) = -44 \text{ ms}^{-1}$$

$$v_y = u_y + a_y t$$

$$= 0 + (14 \times 4) = 56 \text{ ms}^{-1}$$

$$v = \sqrt{v_x^2 + v_y^2} = \sqrt{44^2 + 56^2}$$

$$= \sqrt{44^2 + 56^2}$$

$$v = \sqrt{5072} = 71.2 \text{ ms}^{-1}$$

46. **(c)** If the density of the object is equal to the density of the liquid then the object moves in the liquid with constant velocity.

47. **(d)** Since intensity depends only on the total energy, it will not vary periodically as the total energy is always constant at every instant.

48. **(b)** For copper resistance will decrease and for silicon it will increase. Here silicon is a semiconductor and its resistance will increase when the temperature reduces. Opposite is the eqn. case for copper as it is a conductor.

49. **(c)** Let at time 't', the distance between ship A and ship B is minimum.

Distance travelled by ship A at time 't' = $10t$

Distance travelled by ship B at time 't' = $100 - 10t$

From the figure, using Pythagoras theorem :

$$h^2 = (10t)^2 + (100 - 10t)^2$$

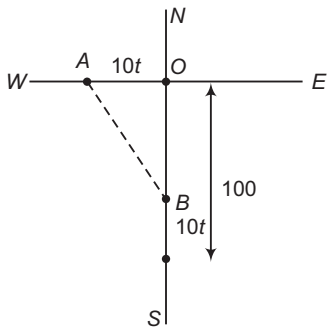
$$h = \sqrt{200t^2 + 10000 - 2000t}$$

For minimum distance :

$$\frac{dh}{dt} = 0$$

So, $$\frac{dh}{dt} = \frac{(400t - 2000)}{2\sqrt{200t^2 + (100)^2 - 2000t}}$$

or, $400t = 2000$



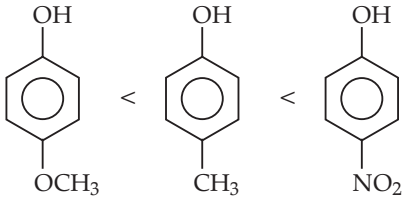
$$t = \frac{2000}{400} = 5\text{h}$$

50. **(d)** At Antinodes, displacement is maximum but pressure change is minimum.

CHEMISTRY

51. **(c)** This reaction is known as Williamson synthesis which is the best method for the preparation of ethers.

52. **(d)** —OCH_3, —CH_3 are electron donating groups and decreases the acidic character of phenols. On other hand NO_2, —CN are electron withdrawing groups which increases the acidic character. Thus, the order of acidic character is :



53. (d) $CH_3CH_2COOH \xrightarrow[-SO_2, -HCl]{SOCl_2}$ (A)

$CH_3CH_2C(=O)Cl \xrightarrow[-HCl]{NH_3}$ (B)

$CH_3CH_2CONH_2 \xrightarrow[-2KBr, -K_2CO_3, -2H_2O]{4KOH + Br_2} CH_3CH_2NH_2$

(C) (Hoffmann bromamide degradation reaction) (D) (Ethyl amine)

54. (d) The balanced chemical equation is represented as follows :

$$PbO + 2HCl \rightarrow PbCl_2 + H_2O$$

Molecular weight of PbO = 207 + 16 = 223 g

Number of moles of 6.5 g of PbO $= \frac{1}{223} \times 6.5$

$= 0.029$ mole

Molecular weight of HCl = 1 + 35.5 = 36.5 g

Number of moles of 3.2 g of HCl $= \frac{1}{36.5} \times 3.2$

$= 0.087$ mol

Thus, PbO is limiting reagent.

As, 1 mole of PbO reacts to give 1 mole of $PbCl_2$

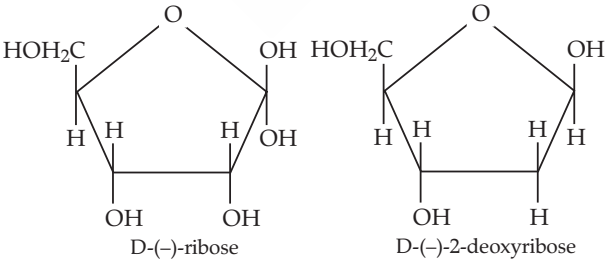
So, 0.029 mole of PbO reacts to give 0.029 mole of $PbCl_2$.

55. (c) DNA contains two types of nitrogenous bases Purine → Adenine (A) and Guanine (G)

Pyrimidine → Cytosine (C) and Thymine (T)

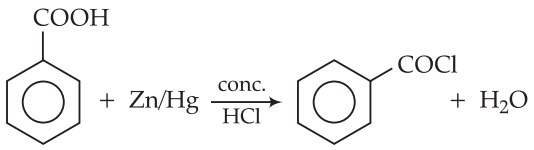
Adenine pairs with thymine and guanine pairs with cytosine.

56. (c) The sugar present in DNA is D-(–)-2 deoxyribose and sugar present in RNA is D-(–)-ribose. Due to these D-(–)-sugar component DNA and RNA molecules are chiral molecules.



D-(–)-ribose D-(–)-2-deoxyribose

57. (d)



58. (d) $(CH_3)_2C{=}O + C_2H_5OH$ (Acetone, 2–propanone)

$\xrightarrow{HCl} (CH_3)_2C(OH)(OC_2H_5)$ Hemiketal

$\xrightarrow{C_2H_5OH \text{ (excess HCl)}} (CH_3)_2C(OC_2H_5)_2$ Ketal

59. (c) $K_p = K_c$ for the reaction $H_{2(g)} + Cl_{2(g)} \rightleftharpoons 2HCl_{(g)}$.

60. (d) For first order reaction

$$k = \frac{2.303}{t} \log \frac{a}{a-x}$$

at $t_{1/2} x = \frac{a}{2}$

$$t_{1/2} = \frac{2.303}{k} \log \frac{a}{a - a/2}$$

$$\Rightarrow \quad t_{1/2} = \frac{\ln 2}{k}$$

61. (b) This reaction is known as Williamson synthesis which is the best method for the preparation of ethers.

62. (b) The complexes $[Co(NH_3)_6Cr(CN)_6]$ and $[Cr(NH_3)_6Co(CN)_6]$ are the examples of coordination isomerism.

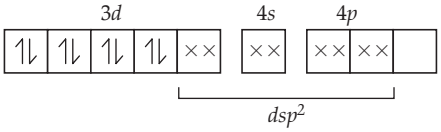
This type of isomerism occurs in those complex in which both cation and anion are in complex form. It occurs due to exchange of ligands between cation and anion.

63. (a) For the absorption of visible light, presence of unpaired *d*-electrons is the necessity.

In $[Ni(CN)_4]^{2-}$

$Ni^{+2} = [Ar]\ 3d^8\ 4s^0$

$\therefore$ $[Ni(CN)_4]^{2-}$ orbitals



64. (c) $\{MnO_4^- + 5e^- + 8H^+ \longrightarrow Mn^{2+} + 4H_2O\}$

$Fe^{2+} \longrightarrow Fe^{3+} + e^-\} \times 5$

$C_2O_4^{2-} \longrightarrow 2CO_2 + 2e^-\} \times 5$

$2MnO_4^- + 5FeC_2O_4 + 24H^+ \rightarrow 3Mn^{2+} + 5Fe^2 + 10CO_2 + 12H_2O$

3 moles of MnO_4^- required to oxidise 5 moles of ferrous oxalate.

$\therefore$ Number of moles of MnO_4^- required to oxidize 1 mole of oxalate $= \frac{3}{5} = 0.6$ mol.

65. (b) The reaction of aqueous $KMnO_4$ with H_2O_2 in acidic condition is as follows :

$3H_2SO_4 + 2KMnO_4 + 5H_2O_2 \longrightarrow 5O_2 + 2MnSO_4 + 8H_2O + K_2SO_4$

Thus, Mn_{2+} and O_2 are produced.

66. **(a)** $\Delta G^\circ = -nFE^\circ$

For reaction, $Cu^{+2} + 2e^- \longrightarrow Cu$

$$\Delta G^\circ = -2 \times F \times 0.337 \quad \ldots(1)$$

For reaction,

$$Cu^+ \longrightarrow Cu^{2+} + e^-$$

$$\Delta G^\circ = -1 \times F \times 0.153 \quad \ldots(2)$$

Adding eq. (1) and (2) we get

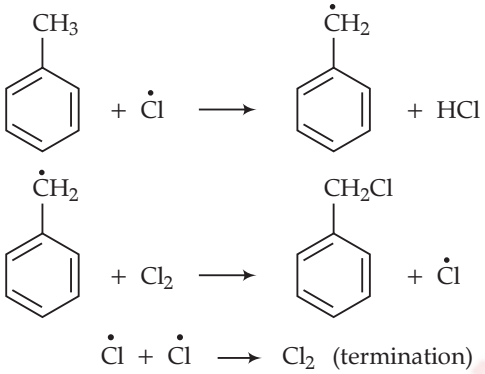
$$Cu^+ + e^- \longrightarrow Cu,\ \Delta G^\circ = -0.521\ F$$

$$\Delta G^\circ = -nFE^\circ = -0.521$$

$$\therefore \quad E^\circ = 0.52\ V$$

67. **(c)** It is an example of free radical substitution

$Cl\overset{\curvearrowright}{-}\overset{\curvearrowleft}{Cl} \longrightarrow \dot{2}Cl$ free radical (initiation)



$\dot{Cl} + \dot{Cl} \longrightarrow Cl_2$ (termination)

68. **(c)** These reactions are purely S_N2 reactions as in reaction (i) and (ii) no rearrangement takes place (rearrangement occurs in S_N1 mechanism). Simple substitution of nucleophile takes place.

69. **(a)** On rising the temperature of aqueous solution of HCl, pH will decrease.

70. **(b)**

	HCl	$\rightarrow$	H^+	+	Cl^-
Initial	10^{-8} M		0		0
Final	0		10^{-8} M		10^{-8} M

$$H_2O \rightleftharpoons H^+ + OH^-$$

At equilibrium 10^{-7} M $\qquad$ 10^{-7} M

As H^+ from HCl has lower concentration then the H^+ ions from self-ionization of H_2O molecule. Thus, H^+ from H_2O is also taken into account while calculating pH of the solution.

$$[H^+] = 10^{-8}\ M + 10^{-7} M$$

$$= 1.1 \times 10^{-7} \approx 1.0525 \times 10^{-7}\ M$$

71. **(a)** Conjugate acid of water is H_3O^+.

72. **(a)** Zirconium and Titanium are purified by van-Arkel method

$$\underset{\text{Impure}}{Zr} + 2I_2 \xrightarrow{600^\circ C} ZrI_4 \xrightarrow{1800^\circ C} \underset{\text{Pure}}{Zr} + 2I_2$$

Pairing occur because CN^- is a strong field ligand. Thus, $[Ni(CN)_4]^{2-}$ does not contain any unpaired electron so it does not absorb visible light.

All other in the option contains pair of electrons thus absorb visible light.

73. **(a)** $HClO_4$ has the highest oxidation number and its conjugate base is resonance stabilized, hence it is most acidic.

74. **(a)** B_2H_6 is electron deficient molecule because boron atom has three half-filled orbitals in excited state.

75. **(d)** Rate of reaction for A + B $\longrightarrow$ Product

$$\text{Rate} = k[A]^x[B]^y \quad \ldots(1)$$

where, x and y are order w.r.t. A and B respectively.

When the concentration of only B is doubled, the rate is doubled, so

$$R' = k[A]^x[2B]^y = 2R \quad \ldots(2)$$

If concentration of both the reactants A and B are doubled then the rate increases by a factor of 8 so

$$R'' = k[2A]^x[2B]^y = 8R \quad \ldots(3)$$

$$= k\,2^x 2^y [A]^x[B]^y = 8R \quad \ldots(4)$$

From equations (1) and (2), we get

$$\frac{2R}{R} = \frac{[A]^x[2B]^y}{[A]^x[B]^y} \Rightarrow 2 = 2^y \Rightarrow y = 1$$

From equations (1) and (4), we get

$$\frac{8R}{R} = \frac{2^x 2^y [A]^x[B]^y}{[A]^x[B]^y} \Rightarrow 8 = 2^x 2^y$$

Substituting the value of y gives

$$8 = 2^x 2^1 \Rightarrow 4 = 2^x \Rightarrow x = 2$$

$\therefore$ Substituting the value of x and y in (1) we get

$$R = k[A]^2[B]$$

76. **(c)** When alkali metals are heated in atmosphere of oxygen the alkali metals ignite and form oxides. On combustion, Li forms Li_2O, sodium gives the peroxide Na_2O_2 while K and Rb give super oxides (MO_2).

77. **(a)** As, Li crystallizes in bcc crystal, $r = \frac{\sqrt{3}a}{4}$

$$r = \frac{\sqrt{3}}{4} \times 351 = 151.8\ \text{pm}$$

78. **(a)** X atoms at the corners $= \frac{1}{8} \times 8 = 1$

Y atoms at the face centres $= \frac{1}{2} \times 6 = 3$

Ratio of atoms, X : Y = 1 : 3

Hence, formula is XY_3

79. **(c)** Raoult's law is valid only when the force of attraction between A and B is equal to the force of attraction between A-A and B-B.

While on the other hand non-ideal solutions exhibit either positive or negative deviation from Raoult's law

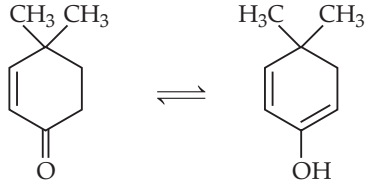
A-B attraction > A-A and B-B attraction

$\Rightarrow$ negative deviation

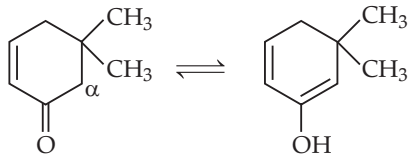
A-B attraction < A-A and B-B attraction

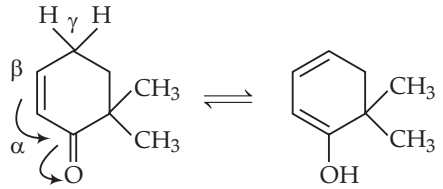
$\Rightarrow$ positive deviation

80. **(d)** In *keto-enol* tautomersim *keto* form should have α-hydrogen (structure I and II).

I. 

(I) (II)

II. 

III. 

81. **(c)** For the given value of *n,* the possible values of *l* are 0 to *n* – 1. For the given value of *l,* the permissible value of $m_l = +l$ to $-l$. Also for each m_l there are two values of *s*, *i.e.*, +½ and –½.

(i) For $n = 3$, possible values of $l = 0, 1, 2$. Now, for $l = 0$, value of $m = 0$ and *s* can be +½ or –½. Therefore, the given set of quantum numbers is correct.

(ii) For $n = 2$, possible values of $l = 0, 1$. Therefore, *l* cannot have value = 2. Thus, this set of quantum numbers is wrong.

(iii) For $n = 4$, possible values of *l* are 0, 1, 2 and 3. For $l = 3$, values of $m = +3, +2, +1, 0, -1, -2, -3$. Also *s* can have value of +½ or –½. Hence, the given set of quantum numbers is possible.

(iv) For $n = 1$, the only possible value of $l = 0$. Also, $m = 0$ is applicable for $l = 0$ and $m = -1$ is not a valid one. Thus, this set of quantum numbers is not valid.

(v) For $n = 3$, the possible values of *l* are 0, 1 and 2. Now for $l = 2$, values of *m* are +2, +1, 0, –1 and –2 only. So $m = +3$ is not valid. Thus, the given set of quantum numbers is not possible.

Hence, the sets (ii), (iv) and (v) are impossible sets of quantum numbers.

82. **(b)** The main assumption of Langmuir adsorption isotherm are :

(i) Adsorption takes place on the surface of the solid only till the whole of the surface is completely covered with a unimolecular layer of the adsorbed gas.

(ii) Adsorption consists of two opposing processes condensation and evaporation.

(iii) The rate of condensation depends upon the uncovered surface of the adsorbent available for condensation.

83. **(b)** Gold number is defined as the minimum amount of lyophilic colloid in milligrams which prevent the flocculation of 10 mL gold sol by the addition of 1 ml 10 NaCl solution.

Lesser the gold number, higher is the protecting power.

84. **(a)** Chemical equation for the formation of $H_2O_{(l)}$ is

$$H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(l)}$$

Because enthalpy of formation of a compound is the heat absorbed or released when one mole of this substance is formed from its constituent elements.

Thus, enthalpy of formation of H_2O is $-x_2$ kJ mol^{-1} where negative sign shows that the reaction is exothermic.

85. **(c)** $H_2O_{(l)} \rightarrow H_2O_{(s)}$

$\Delta H = 1.435$ kcal/mol

$T = 0 + 273K = 273K$

$$\Delta S = \frac{\Delta H}{T}$$

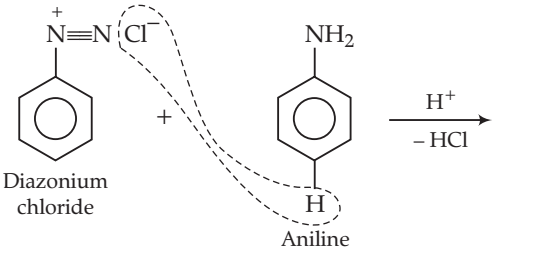
$$\Delta S = \frac{1.435 \text{ kcal / mol}}{273 \text{ K}} = 5.26 \times 10^{-3} \text{ kcal/mol K}$$

$\Delta S = 5.260$ cal/mol K

86. **(b)** Efficiency of a fuel cell (ϕ) $= \frac{\Delta G}{\Delta H} \times 100$

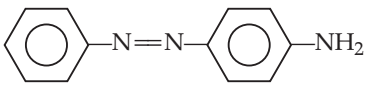
Generally, fuel cells are expected to have an efficiency of 100 percent.

87. **(d)**



Diazonium chloride

Aniline

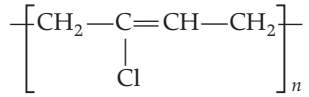


[A]

(Yellow dye)

(*p*-azo benzene compound)

88. **(a)** Neoprene is

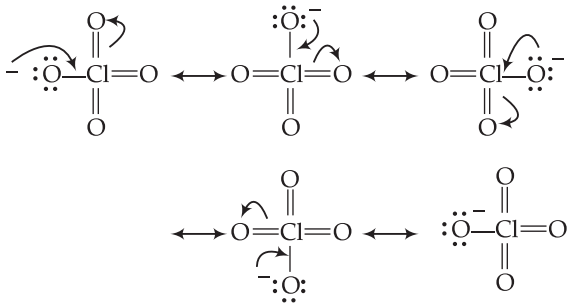


89. **(b)** The order of acidic strength is :

$HOCl < HOClO < HOClO_2, HOClO_3$

It can be explained as

$$HClO_4 \rightleftharpoons H^+ + ClO_4^-$$



Negative charge on the oxygen is stabilized by four resonating structure. Similarly, in Chloric acid the three resonating structures are possible. We know that more the resonating structure, more will be the stability *i.e.*, more acidic. Equilibrium shifts in forward direction and thus, more and more H^+ ions will be formed.

90. **(b)** A solution of acetone in ethanol shows a positive deviation from Raoult's law due to miscibility of these two liquids with difference of polarity and the length of the hydrocarbon chain.

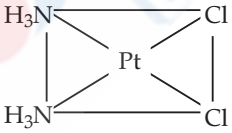
91. **(c)** $CH_3CH_2CH_2CH_2NH_2 \xrightarrow[CHCl_3]{KOH\ (alc.)} CH_3CH_2CH_2CH_2NC + 3KCl + 3H_2O$

$CH_3C \equiv CH + \text{Ammonical } AgNO_3 \longrightarrow CH_3C{\equiv}C^-Ag^+ + HNO_3$

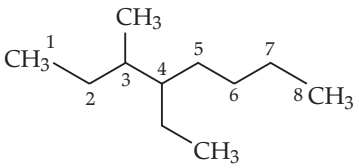
$CH_3CH_2COOCH_3 + NaOH \xrightarrow{heat} CH_3CH_2COONa + CH_3OH$

$CH_3{-}\underset{\underset{OH}{|}}{CH}{-}CH_3 + HCl \xrightarrow{anhy.\ ZnCl_2} CH_3{-}\underset{\underset{Cl}{|}}{CH}{-}CH_3 + H_2O$

92. **(c)** *Cis*-platin is used as an anticancer drug for treating several types of malignant tumours.



93. **(c)**



IUPAC name → 4-ethyl-3-methyl octane.

94. **(d)** During osmosis, flow of water through semipermeable membrane is from solution having lower concentration only.

95. **(a)** Sucrose does not show mutarotation.

Only those sugars which have a free aldehyde (—CHO) or ketone $\left(\rangle C{=}O\right)$ group are capable of showing mutarotation.

96. **(c)** $\rangle C{=}O + H_2NR \longrightarrow \rangle C{=}N{-}R$ (Schiff's base)

97. **(c)** Electronic configuration of rubidium is $[Kr]5s^1$. Thus, the valence electron is in 5*s* orbital. Therefore, the principal quantum number (n) corresponding to 5*s* orbital is 5, azimuthal quantum number (l) is 0 for *s* orbital. The magnetic quantum number (m_l) for this is 0. As the 5*s* orbital contains only one electron thus the spin quantum number for the electron is +½. Hence, the set of quantum numbers for the valence electron of rubidium is 5, 0, 0 +½.

98. **(c)** Moles of 2.5 L of 1 M NaOH = 2.5 × 1 = 2.5

Moles of 3.0 L of 0.5 M NaOH = 3.0 × 0.5 = 1.5

Total moles of NaOH solution = 2.5 + 1.5 = 4.0

(Total volume of solution = 2.5 + 3.0 = 5.5 L)

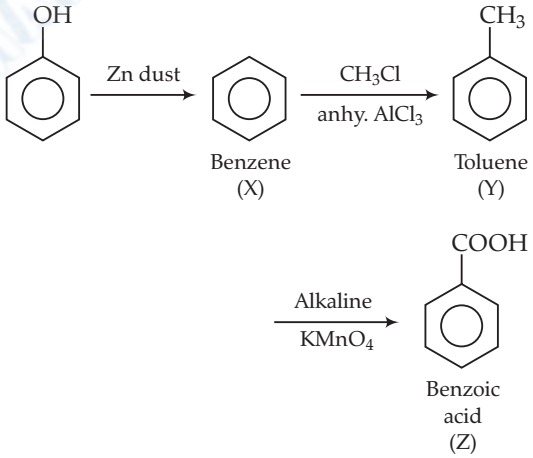
Thus, $M_1V_1 = M_2V_2$

$4 = M_2 \times 5.5$

∴ Molarity of resultant solution,

$$M_2 = \frac{4}{5.5}\ M \approx 0.73\ M$$

99. **(b)**



100. **(d)** CH_3COOH and CH_3COONa constitute to form an acidic buffer.

$$\Rightarrow \quad pH = pK_a + \log\frac{[salt]}{[acid]}$$

$$pH = -\log(1.8 \times 10^{-5}) + \log\frac{(0.20)}{(0.10)}$$

$= 4.74 + \log 2$

$= 4.74 + 0.3010$

$= 5.041$

Now, $pH = -\log[H^+]$

$\Rightarrow \quad 5.041 = -\log[H^+]$

$\Rightarrow \quad [H^+] = 10^{-5.041}$

$= 9.0 \times 10^{-6}\ mol\ L^{-1}$

ZOOLOGY

101. (c) Tight junctions, also known as occluding junctions or zonulae occludentes (singular, zonula occludens) are multiprotein junctional complexes whose general function is to prevent leakage of transported solutes and water and seals the paracellular pathway.

102. (c) Michaelis constants (K_M) value represents the binding or affinity of the substrate for the enzyme.

103. (b) Zn is a cofactor for the proteolytic enzyme carboxy peptidase.

104. (a) FRC is functional residual capacity. Vital capacity (VC) is defined as the maximum volume of air a person can breathe in after a forceful expiration or the maximum volume of air a person can breathe out after a forceful inspiration. Expiratory reserve volume (ERV) is defined as the additional or extra volume of air, a person can expire by forceful expiration. Inspiratory reserve volume is defined as the additional or extra volume of air, a person inspire by forceful inspiration.

105. (c) Eosinophilia *i.e.*, increase in eosinophil count is mostly indicative of a parasitic infection, an allergic reaction or cancer.

106. (c) Many bony fishes, aquatic amphibians and aquatic insects are ammonotelic in nature.

Mammals, terrestrial amphibian and marine fishes are mainly ureotelic.

107. (b) The primary movement at the pivot joint is rotation. Two bones articulate with each other where end of one bone is rounded or pointed which fits into a shallow depression of the other bone. The rounded end of the bone is fixed or stationary whereas the other bone rotates over it *e.g.*, joint between the radius and ulna just below the elbow and between atlas and axis.

Gliding joint - between tarsal and carpals. **Saddle joint -** between carpals and metacarpal of human thumb.

Hinge joint - elbow joint, knee joint.

108. (a) Limbic system is involved in the regulation of sexual behaviour, expression of emotional reactions (*e.g.*, excitement, pleasure, rage and fear) and motivation, etc. The dorsal portion of the midbrain consists mainly of four round swellings or lobes collectively called the corpora quadrigemina.

109. (c) Hypersecretion of GH during childhood results in gigantism.

110. (b) Ambulacral system is water-vascular system in Echinoderms.

111. (a) Aves, mammals are crocodiles have a 4-chambered heart.

112. (b) Mosaic vision has more sensitivity but less resolution.

113. (b) Cells of the inner cell mass or embryonal knob get rearranged to form a flat embryonic or germinal disc. The latter differentiates into two layers, an outer epiblast of larger columnar cells and inner hypoblast of smaller cuboidal cells. The epiblast is the source of all the germ layers in the embryo.

114. (d) In females, oogenesis starts at embryonic age and forms millions of oogonia. These cells start dividing and temporarily arrested at prophase-1 called primary oocyte. These oocyte acquires granulosa cells and forms primary follicles which degenerate from birth to puberty. Further, they form secondary and tertiary follicles. When tertiary follicle grows in size it completes its first meiotic division and releases first polar body and secondary oocyte. Secondary oocyte completes its second meiotic division after the entry of sperms and releases second polar body.

115. (c) If overall the two frame shift mutations lead to a change of 3 or its multiple in the genetic code, the codons will again be in the same frame. This is an internal compensation, so intragenic suppression.

116. (b) Miller created an apparatus of glass tubes and flasks in a laboratory where the ratio of methane, hydrogen and ammonia in the large flask was 2 : 2 : 1.

117. (b) In disruptive selection, the selection does not favour the mean character value, rather favours both the peripheral character values, this kind of selection is called disruptive selection. Two peaks are formed at the two extremes of curve and a kind of depression forms in the centre. In stabilising selection, the peak of bell-shaped graph gets higher and narrower as nature tries to decrease the peripheral character values.

118. (a) Mature cattle (over 3 years of age) should be used for selective breeding.

119. (c) If overall the two frame shift mutations lead to a change of 3 or its multiple in the genetic code, the codons will again be in the same frame. This is an internal compensation, so intragenic suppression.

120. (b) OPV consists of live attenuated polio virus which when administered mimics the pathogen immune response resulting in artificial active immunity.

121. (b) Fact.

122. (d) *E. coli* cloning vector pBR322 showing restriction sites (*Hind III*, *EcoR I*, *BamHI*, *SalI*, *PvuII*, *PstI*, *ClaI*), ori and antibiotic resistance genes (ampR and tetR). rop codes for the proteins involved in the replication of the plasmid.

123. (b) Southern blotting is used for the detection of a specific DNA sequence in a DNA sample, whereas northern blotting is used to study gene expression by detection of RNA in a sample.

124. (d) Examples of transgenic animals include rats, rabbits, pigs, sheep, cow, monkey and fish. Over 95% transgenic animals are mice.

125. (d) DCT is also capable of reabsorption of HCO_3^- and selective secretion of hydrogen and potassium ions and NH_3 to maintain the pH and sodium potassium balance in blood.

126. (b) Olfactory epithelium is specialised epithelium in nose involved in smell.

127. (b) After repolarisation, voltage gated K^+ ion channels remain open for a longer time period so that the membrane potential becomes more negative than –70 mV. This results in hyperpolarisation of the neuronal membrane.

128. (a) Fatty acids and glycerol being insoluble, cannot be absorbed into the blood. They are first incorporated into small droplets called micelles which move into the intestinal mucosa. They are re-formed into very small protein coated fat globules called the chylomicrons which are transported into the lymph vessels (lacteals) in the villi.

129. (a) The medulla oblongata is the primary respiratory control center. Its main function is to send signals to the muscles that control respiration to cause breathing to occur.

130. (b) On an average 1100-1200 ml of blood is filtered by the kidneys per minute which constitutes roughly $1/5^{th}$ of the blood pumped out by each ventricle of the heart in a minute.

131. (a) Heart failure is a state of the heart when it is not pumping blood effectively. Cardiac arrest is when the heart stops beating.

132. (d) All statements are correct.

133. (b) A destruction of adrenal cortex by diseases like tuberculosis produces Addison's disease due to the deficiency of both glucocorticoids and mineralocorticoids. Symptoms include a bronze like pigmentation of skin, low blood sugar, low plasma Na^+, plasma K^+, increased urinary Na^+, nausea, vomiting and diarrhoea.

134. (a) Homology is based on divergent evolution.

135. (c) Nearly all of the essential nutrients and 70-80 per cent of electrolytes and water are reabsorbed by PCT segment. PCT also helps to maintain the pH and ionic balance of the body fluids by selective secretion of hydrogen ions, ammonia and potassium ions into the filtrate and by absorption of bicarbonate ions from it.

136. (c) Areolar and adipose tissue are loose connective tissues which cells and fibres loosely arranged in a semi-fluid ground substance. On the other hand, cartilage is a specialised connective tissue and tendon is a dense regular connective tissue.

137. (d) Various nutrients like amino acids, monosaccharides like glucose, electrolytes like Na^+ are absorbed into the blood by this mechanism.

138. (d) Hyperthyroidism is associated with high metabolic rate and rapid heart rate. At the level of external respiration or alveoli, Cl^- move out as HCO_3^- ions enter the RBCs. The ST segment is elevated in acute myocardial infarction and depressed in a condition when the heart muscles receive insufficient oxygen.

139. (c) **Osteoporosis -** age related disorder, bone loses its minerals and fibers from the matrix decreasing the bone mass.

Gout - a type of arthritis where inflammation of joints occurs due to accumulation of uric acid crystals.

Myasthenia Gravis - an autoimmune disorder.

Muscular dystrophy - a genetic disorder.

140. (d) At each step of ascent, the strand turns 36°.

141. (b) In 1997, the first transgenic cow, Rosie, produced human protein-enriched milk (2.4 grams per litre). The milk contained the human alpha-lactalbumin and was nutritionally a more balanced product for human babies than natural cow-milk. In *'Flavr Savr'* transgenic tomato, expression of gene producing enzyme polygalacturonase which promotes softening of fruit is blocked.

142. (d) Change in frequency of alleles may result in the evolution. Saltation is single step large mutation. Five factors known to affect Hardy-Weinberg equilibrium are gene migration/gene flow, genetic drift, mutation, genetic recombination and natural selection. Bottle neck effect is the decrease in genetic variability in population, *e.g.*, cheetah population in Africa decreased due to hunting.

143. (c) Some strains of *Bacillus thuringiensis* produce proteins that kill certain insects such as *lepidopterans* (tobacco budworm, armyworm), *coleopterans* (beetles) and *dipterans* (flies, mosquitoes).

144. (c) CO_2 is primarily transported as bicarbonates.

145. (b) Human placental lactogen (hPL) is also called human chorionic somatomammotropin (hCS). It decreases material insulin sensitivity, leading to an increase in maternal blood gluose levels.

146. (c) Carotene is the source of retinal which is involved in the formation of rhodopsin of rod cells. Retinal, a derivative of vitamin. A, is the light absorbing part of all visual photopigment.

147. (d) Ball and socket joint (between humerus and pectoral girdle), Hinge joint (knee joint), Pivot joint (between atlas and axis), Gliding joint (between the carpals) and Saddle joint (between carpal and metacarpal of thumb).

148. (c) Sertoli cells secrete hormones called inhibin, which suppresses FSH synthesis. So, FSH along with testosterone stimulate the sperm production in the seminiferous tubules.

149. (c) Many fungi belonging to the genera *Microsporum*, *Trichophyton* and *Epidermophyton* are responsible for ringworms which is one of the most common infectious diseases in man. *Rhizopus* belongs to Fungi kingdom.

150. (b) The major difference between the endocrine and exocrine gland is that, an endocrine gland is missing ducts and stays as blocks of tissue.

BOTANY

151. (d) In cyclic photophosphorylation electrons return back to its site of emission *i.e.*, PS I.

152. (b) $\underset{(2n)}{\text{Megaspore mother cell}} \xrightarrow{\text{Meiosis}} \underset{(n)}{\text{Megaspore}}$

153. (c) Pollination → Fertilization → Embryogenesis.

154. (b) Trisonomy is the number of chromosomes in the cell where trisomy occurs is represented as $2n+1$.

155. (b) Non blending of alleles explains segregation.

156. (c) Plasma membrane of eubacteria has a structure similar to that of a eukaryotic cell.

157. (b) E.coli is a prokaryote.

158. (b) *Escherichia coli* is a prokaryote. It is a gram negative bacteria belonging to kingdom Monera.

159. (b) During pachytene, crossing over occurs between the non-sister chromatids of the homologous chromosomes.

160. (c) In *Solanum*, the inflorescence present is a modification of cymose inflorescence.

161. (b) In pea flower, the single large upper petal is called the banner or standard petal or vexillum. The standard, in turn, overlaps the two lateral petals called as wings which in turn overlap the two smallest anterior petals called as keel.

162. (b) The ring of vascular cambium produces secondary xylem on the inner side and secondary phloem to the outside. The cambium is generally more active on the inner side than on the outer. As a result, secondary xylem produced is 4-10 times more than secondary phloem.

163. (c) Microtubules are constituents of cilia, Flagella, centralis and Spindle fibres. They are also the part of fibres found in cytoskeleton.

164. (b) Fact – Refer fluid mosaic model diagram.

165. (a) The gymnosperms (*gymnos* : naked, *sperma* : seeds) are plants in which the ovules are not enclosed by any ovary wall and remain exposed, both before and after fertilisation.

166. (d) Electron micrographs of this stage indicate that chromosome synapsis is accompanied by the formation of complex structure called synaptonemal complex. The complex formed by a pair of synapsed homologous chromosomes is called a bivalent or a tetrad.

167. (c) In stroma of chloroplast, photolysis of water, hydrogen pumping and NADP reductase activity takes place. Due to these, the proton concentration is higher in the lumen of thylakoid.

168. (d) The C_4 plants have special type of leaf anatomy, they tolerate higher temperatures. They show a response to highlight intensities, have greater productivity of biomass and lack a process called photorespiration.

169. (a) Phototropic curvature is the result of uneven distribution of auxin. Charles Darwin and his son Francis Darwin observed that the coleoptiles of canary grass responded to unilateral illumination by growing towards the light source (phototropism). After a series of experiments, it was concluded that the tip of coleoptile contain auxin that caused the bending of the entire coleoptile in relation to the direction of light.

170. (b) *Nostoc* is a cyano bacterial cell with membrane bound organelles absent.

171. (c) In Citrus, apomictic arise from a diploid cell of maternal sporophytic tissue, such as nucellus and integument.

172. (b) Mendel studied seven constricted characters during his experiments. The nature of trichomes were not studied by him.

173. (c) Fact.

174. (d) Genetic linkage is the tendency of alleles that are located close together on a chromosome to be inherited together during meiosis. It was first coined by Thomas Hunt Morgan.

175. (d) Spliceosomes are found in cells of eukaryotes only as split genes are absent in prokaryotes.

They are used in removal of introns during post-transcriptional processing of *hn*RNA.

176. (b) Hemophilia is a sex-linked recessive disorder. The abnormal gene responsible for hemophilia is carried on the X chromosome. Males have one X chromosome and one Y chromosome. In a male, the presence of the abnormal gene results in the deficiency or absence of factor VIII or factor IX, as there is no protective X to make factor VIII or IX. Affected males cannot transmit the abnormal gene to their sons who inherit a Y chromosome from their father. However, all daughters of a man with hemophilia are considered obligate carriers of hemophilia because they must receive the affected X chromosome from their fathers to be female, and they can pass the gene to their sons.

177. (d) Hot spots are the richest and the most threatened reservoirs of plant and animal life on earth. Hence, Western Ghats possess high degree of species richness and endemism.

178. (c) Erwin Charagaff proposed two rules which played a significant role in the discovery of the double helix structure of DNA. According to its second rule, the composition of DNA varies from one species to other.

179. (c) Branched chain lipids of archaebacterial cell membrane decreases the fluidity of membrane. In archaebacteria, DNA has both exons & introns.

180. (d) *Cycas & Azolla* - have symbiotic association of *Anabaena*, a cyanobacteria.

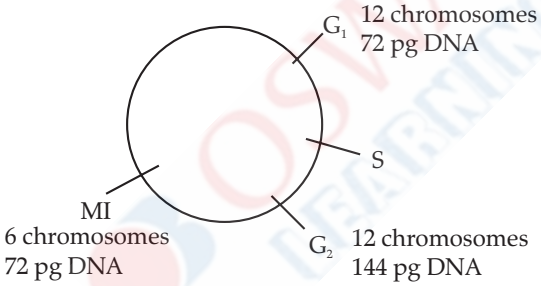
181. (c) The mitochondria is a double-membraned cell organelle, known as the powerhouse of the cell which is present in all eukaryotic cells.

The inner mitochondrial membrane has folds called cristae which helps in increasing the surface area.

The inner mitochondrial membrane is embedded with the enzyme ATP synthase (ATP synthesis), succinate dehydrogenase (oxidation-reduction reaction) and is also the site of the electron transport chain (aerobic respiration).

182. (b) Condensation of chromatin and spindle fibre formation both begin in prophase.

183. (b) Each chromosome has 6 pg DNA, thus 12 chromosomes will have 6 × 12 = 72 pg. DNA at G_1 phase.



Thus each chromosome will have 12 pg DNA.

184. (d) Members of Fabaceae (bean, gulmohar & Cassia) have zygomorphic flowers.

185. (d) Family Solanaceae possesses pentamerous, actinomorphic, hypogynous, hermaphrodite, complete flowers, bicarpellary, syncarpous, superior, bilocular ovary with axile placentation and oblique septa. The fruit is a berry or septicidal capsule.

186. (b) *Frankia* - symbiotic N_2 fixer.

Azotobacter - free living N_2 fixer.

187. (a) *Euglena*, *Trichoderma* only asexual reproduction.

188. (d) Nitrogen is the most limiting nutrient.

189. (d) Sucrose is a disaccharide & formed by two glucose molecules.

For 1 glucose molecule = 6 CO_2, 12 $NADPH_2$, 18 ATP

For 2 glucose molecule = 12 CO_2, 24 $NADPH_2$, 36 ATP

190. (d) Decarboxylation does not occur during glycolysis.

191. (d) After plasmolysis the gap between the cell wall and the cell membrane in a plant cell is filled with external solution.

192. (d) Genes of stem height and pod shape are present on same chromosome i.e., number 4 in pea. Thus they may be linked.

193. (d) DNA ligase is an enzyme which can connect two strands of DNA together by forming a bond between the phosphate group of one strand and the deoxyribose group on another. It is used in cells to join together the Okazaki fragments which are formed on the lagging strand during DNA replication.

194. (d) Fact.

195.(b) Fact.

196.(c) The leaves in gymnosperms are well adapted to withstand extremes of temperature, humidity and wind. The needle-like leaves reduce the surface area. Their thick cuticle and sunken stomata help to reduce water loss.

197.(d) Epipetalous androecium is a characteristic feature of solanaceae as in *Petunia*.

Brassica and *Sesbaniala* do not show epipetalous androecium.

Allium shows epipetalous stamens.

198.(d) Polytene chromosomes are found in salivary glands of insects and are also called as salivary chromosomes.

199.(b) Ribosomes are present in the cytoplasm, mitochondria and chloroplast.

200.(c) Bamboo species are monocarpic *i.e.*, flower generally only once in its life-time after 50-100 years.

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