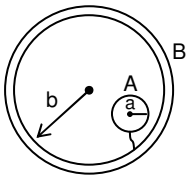
ANSWER OF MODEL QUESTION PAPER FOR AIPMT (Prelims)

PHYSICS

1. **Ans.** $\frac{a}{b}V$ **Reason:** If the charge on sphere of radius a is q, $V = \frac{1}{4\pi\varepsilon_0}\frac{q}{a}$ i.e., $q = (4\pi\varepsilon_0 a)\ V$ …….. (i)



Now, when sphere A is enclosed by spherical conductor B and the two are connected by a wire, charge will reside on outer surface of B and so the potential of B will be,

$V_B = \frac{1}{4\pi\varepsilon_0}\frac{q}{b} = \frac{1}{4\pi\varepsilon_0}\frac{4\pi\varepsilon_0 a}{b}V = \frac{a}{b}V$

Now as sphere A is inside B so its potential.

$V_A = V_B = a/b\ (V)$ [< V as a < b]

2. **Ans.** 1 : 2 **Reason:** During charging, $T_1 = RC$

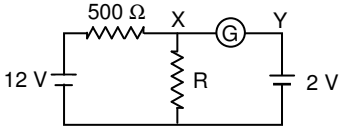
During discharging, $T_2 = 2RC$

$\therefore$ Ratio $= \frac{T_1}{T_2} = \frac{1}{2} = 1 : 2.$

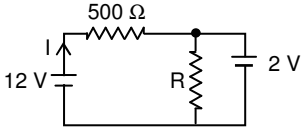
3. **Ans.** ¼ CE^2 **Reason:** $U_1 = \frac{1}{2}CE^2, U_2 = \frac{1}{2}2C\times\left(\frac{E}{2}\right)^2 = \frac{1}{4}CE^2$

$\therefore \Delta U = \frac{1}{4}CE^2.$

4. **Ans.** 100 Ω **Reason:** The galvanometer shows zero deflection. i.e., current through XY is zero.



As a result potential drop across R is 2V. Circuit can be redrawn as

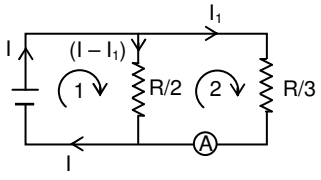


$I = \frac{12}{500+R} \Rightarrow$ Voltage across R, $V = IR$

$\Rightarrow 2 = \frac{12}{500+R}\times R \Rightarrow 1000 + 2R = 12\ R$

$\Rightarrow R = 100\ \Omega.$

5. **Ans.** $\frac{3}{5}$A **Reason:** The circuit can be represented as follows :



In loop (1),

$\therefore (I - I_1)\frac{R}{2} = 0$ …… (i)

In loop (2), $I_1\frac{R}{3} - (I - I_1)\frac{R}{2} = 0$ …. (ii)

Solving Eqs. (i) and (ii), we get $\therefore I_3 = \frac{3}{5}I$ A

$\therefore$ Reading of ammeter is I_3.

6. **Ans.** 2.5°C **Reason:** If t is the smallest temperature difference that can be detected, then

$40 \times 10^{-6}\ T = 100 \times 10^{-6} \Rightarrow T = 2.5°C$

7. **Ans.** 8 W **Reason:** Current in the circuit =

$i = \frac{\text{net emf}}{\text{total resistance}} \Rightarrow i = \frac{10-4}{3} = \frac{6}{3} = 2$ A

Power consumed by 4 V battery Ei = (4) (2) = 8 W.

8. **Ans.** 6×10^4 J **Reason:** E = nAVt =

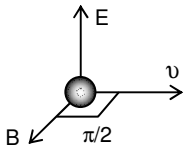
$nA\frac{m}{d}t = \frac{50\times250\times10\times3600}{7.5\times10^3} = 6 \times 10^4$ J.

9. **Ans.** $\sqrt{2}\ Ia^2$ **Reason:** The loop can be divided into two square loops. The magnetic moments of loops are perpendicular to each other.

$\therefore M_1 = M_2 = Ia^2$

$\therefore M = \sqrt{M_1^2 + M_2^2} = \sqrt{2}M_1 = \sqrt{2}Ia^2$

10. **Ans.**



Reason: For undeviated motion $|\vec{F_e}| = |\vec{F_m}|$, which happened when $\vec{\upsilon}, \vec{E}$ and $\vec{B}$ are mutually perpendicular to each other.

11. **Ans.** 13 volt. **Reason:** $V_{rms} = \sqrt{5^2 + \left(\frac{12\sqrt{2}}{\sqrt{2}}\right)^2} = 13$ volt.

12. **Ans.** III **Reason:** $E = Rhc\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$

$E_{(4\to3)} = Rhc\left[\frac{1}{3^2} - \frac{1}{4^2}\right]$

$= Rhc\left[\frac{7}{9\times16}\right] = 0.05\ Rhc$

$E_{(4\to2)} = Rhc\left[\frac{1}{2^2} - \frac{1}{4^2}\right] = Rhc\left[\frac{3}{16}\right] = 0.2\ Rhc$

$E_{(2\to1)} = Rhc\left[\frac{1}{1^2} - \frac{1}{2^2}\right] = Rhc\left[\frac{3}{4}\right] = 0.75\ Rhc$

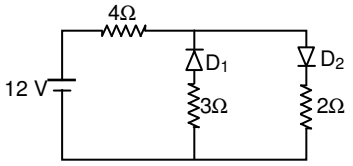
$E_{(1\to4)} = Rhc\left[\frac{1}{4^2} - \frac{1}{1^2}\right] = \frac{-15}{16}\ Rhc = -0.94\ Rhc$

Thus, III transition gives most energy. I transition represents the absorption of energy.

13. **Ans.** 1 : 2

14. **Ans.** λ

15. **Ans.** 2.00 A **Reason:** In the given circuit, diode D_1 is reverse biased while D_2 is forward biased, so the circuit can be redrawn as :

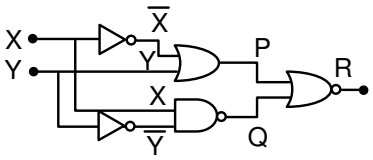


[$\because$ for ideal diodes, reverse biased means open and forward biased means short]

Apply KVL to get current flowing through the circuit

$-12 + 4i + 2i = 0 \Rightarrow i = \frac{12}{6} = 2A$

16. **Ans.** X = 1, Y = 0 **Reason:**



The truth table can be written as

X	Y	$\overline{X}$	$\overline{Y}$	$P = \overline{X} + Y$	$Q = \overline{X.\overline{Y}}$	$R = \overline{P+Q}$
0	1	1	0	1	1	0
1	1	0	0	1	1	0
1	0	0	1	0	0	1
0	0	1	1	1	1	0

Hence X = 1, Y = 0 gives output R = 1.

17. **Ans.** 20 N **Reason:** Net horizontal force on block B is zero.

Hence, the given fig.(a) can be replaced by figure (b).

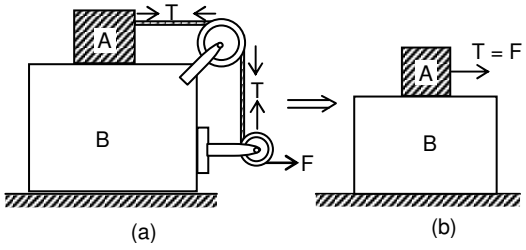
Maximum value of friction

$f_{max} = \mu m_A g = (0.5)\ (2)\ (10) = 10$ N

lock B moves due to friction.

herefore, maximum common acceleration of the two blocks can be

$a_{max} = \frac{f_{max}}{m_B} = \frac{10}{2} = 5 m/s^2$



$\therefore F_{max} = (m_A + m_B)\ a_{max} = (2 + 2)\ (5) = 20$ N.

18. **Ans.** 78

19. **Ans.** $\nwarrow$

20. **Ans.** 135 m **Reason:** $t_{BC} = 6/2 = 3s$

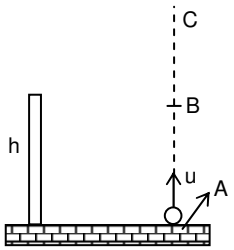
$t_{AC} = 12/2 = 6s$

$\therefore t_{AB} = 3s$

$\therefore 0 = u - (10)6$ or $u = 60$ m/s

Further $h = ut_{AB} - \frac{1}{2}gt_{AB}^2$

$= (60)\ (3) - \frac{1}{2}\ (10)\ (3)^2 = 135$ m



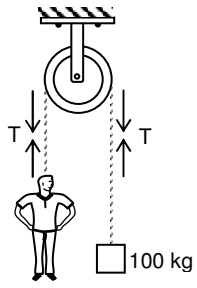
21. **Ans.** 10/13 Ω.

Reason: $R_{(paralle)} = \frac{2\times3\times4}{2\times3+3\times4+4\times2} = \frac{24}{26} = \frac{12}{13}$

$R_{(series)} = 9\Omega$, $\frac{12}{13} < \text{Resistance} < 9$.

22. **Ans.** 1218 N **Reason:** Let T be the tension in the rope and a the acceleration of rope. The absolute acceleration of man is therefore $\left(\frac{5g}{4} - a\right)$.

Equations of motion for mass and man gives :



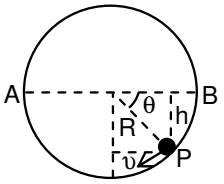
$T - 100\ g = 100\ a$ ..... (1)

$T - 60\ g = 60\left(\frac{5g}{4} - a\right)$ .....(2)

Solving Eqs. (1) an d(2), we get T = 1218 N

23. **Ans.** $\frac{3K}{R}$ **Reason:** Let velocity of particle at point P is v.

From conservation of mechanical energy



$1/2\ mv^2 = K = mgh$ ……..(1)

Let N be the normal reaction between the particle and the shell at this instant. Then

$N - mg\sin\theta = \frac{mv^2}{R}$ $\left(\frac{mv^2}{R} = \frac{2K}{R}\right)$

or $N = mg\left(\frac{h}{R}\right) + \frac{2K}{R} = \frac{K}{R} + \frac{2K}{R}$ (mgh = K)

$\therefore N = \frac{3K}{R}$ = force on shell.

24. **Ans.** V/2 **Reason:** $V_{cm} = \frac{m_1V_1 + m_2V_2}{m_1 + m_2} = \frac{V}{2}$.

25. **Ans.** 3/8 **Reason:** Let u be the velocity of ball before collision.

Speed of ball after collision will become.

$v = \sqrt{\left(\frac{u}{\sqrt{2}}\right)^2 + \left(\frac{u}{2\sqrt{2}}\right)^2} = \sqrt{\frac{5}{8}}.u$

$\therefore$ Fraction of KE lost in collision

$$\frac{\frac{1}{2}mu^2 - \frac{1}{2}mv^2}{\frac{1}{2}mu^2} = 1 - \left(\frac{v}{u}\right)^2 = 1 - \frac{5}{8} = \frac{3}{8}$$

26. **Ans.** ¾ tan θ

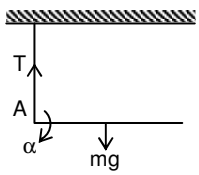
Reason: $\mu = \tan\theta\left(1 - \frac{1}{n^2}\right) = \tan\theta\left(1 - \frac{1}{2^2}\right) = \frac{3}{4}\tan\theta$

27. **Ans.** $\tan^{-1}(2\pi)$

28. **Ans.** $\frac{mg}{4}$ **Reason:** The rod will rotate about point A.

Let a be the linear acceleration of centre of mass of the rod and α the angular acceleration of the rod about A. Then $mg - T = ma$ …… (1)

$\alpha = \frac{\tau}{I} = \frac{mg\frac{l}{2}}{\frac{ml^2}{3}} = \frac{3g}{2l}$ …….. (2)



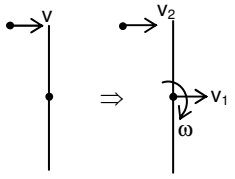
$a = \frac{l}{2}\alpha$ ……(3)

Solving Eqs. (1), (2) and (3), we get $T = \frac{mg}{4}$.

29. **Ans.** $\frac{8}{25}mv^2$ **Reason:** From conservation of linear momentum we have,

$v = v_1 + v_2$ ……(1)

From conservation of angular momentum about centre of rod we have, $mva = mv_2a + \frac{ma^2}{3}.\omega$



or $v = v_2 + \frac{a\omega}{3}$ …… (2)

Further from the definition of coefficient of restitution (e = 1) at point of impact,

Relative speed of approach = relative speed of separation

$\therefore v = v_1 + a\omega - v_2$ …… (3)

Solving these three Eqs. (1), (2) and (3) we get,

$v_1 = \frac{2}{5}v$ and $\omega = \frac{6v}{5a}$

$\therefore$ kinetic energy of rod,

$K = \frac{1}{2}\times m\times\left(\frac{2}{5}v\right)^2 + \frac{1}{2}\times\frac{ma^2}{3}\times\left(\frac{6v}{5a}\right)^2 = \frac{8}{25}mv^2$.

30. **Ans.** 2 m/s **Reason:** From work energy theorem

$\Delta KE = W_{net}$ or $K_f - K_i = \int Pdt$

or $\frac{1}{2}mv^2 = \int_0^2\left(\frac{3}{2}t^2\right)dt$ (m = 2 kg) or $v^2 = \left[\frac{t^3}{2}\right]_0^2$

or v = 2m/s.

31. **Ans.** A to B **Reason:** From the graph it is clear that force is acting on the particle in the region AB and due to this force kinetic energy (velocity) of the particle increases. So the work done by the force is positive.

32. **Ans.** 2 h

Reason: $\frac{T_2}{T_1} = \left(\frac{r_2}{r_1}\right)^{3/2} \Rightarrow T_2 = 24\left(\frac{6400}{36000}\right)^{3/2} \cong 2$ hour

33. **Ans.** 2h : R **Reason:** Energy required to raise a satellite upto a heigh h :

$E_1 = \Delta U = \frac{mgh}{1 + \frac{h}{R}}$ …… (1)

E_2 = energy required to put in orbit

$= \frac{1}{2}mv_0^2 = \frac{1}{2}m\left(\frac{GM}{r}\right)$ as v_0 = orbital speed

$= \sqrt{\frac{GM}{t}} = \frac{1}{2}m\left(\frac{GM}{R+h}\right) = \frac{1}{2}m\left(\frac{GM}{R^2}\right)\frac{R}{1+\frac{h}{R}}$

or $E_2 = \dfrac{mgh}{2\left(1+\dfrac{h}{R}\right)}$ .....(2)

From Eqs. (1) and (2) we have $\dfrac{E_1}{E_2} = \dfrac{2h}{R}$.

34. **Ans.** A. **Reason:** In this case. The restoring forces will remain same = kA. Now $kA = 2m \times \dfrac{k}{2m} A' \Rightarrow A' = A$.

35. **Ans.** T/8. **Reason:** $y = a \sin \dfrac{2\pi}{T} t \Rightarrow \dfrac{a}{\sqrt{2}} = a \sin \dfrac{2\pi}{T}.t$

$\Rightarrow \sin \dfrac{2\pi}{T} t = \dfrac{1}{\sqrt{2}} = \sin \dfrac{\pi}{4} \Rightarrow \dfrac{2\pi}{T} t = \dfrac{\pi}{4} \Rightarrow t = \dfrac{T}{8}$.

36. **Ans.** $\dfrac{32}{27}$ **Reason:** $f \propto \sqrt{T}$

$\dfrac{f_{air}}{f_{water}} = \sqrt{\dfrac{w_{air}}{w_{water}}} = \sqrt{\dfrac{V\rho g}{V\rho g - V\rho_w g}}$

or $\dfrac{f}{f/2} = \sqrt{\dfrac{\rho}{\rho - \rho_w}}$ or $2 = \sqrt{\dfrac{\rho}{\rho - \rho_w}}$

or $4\rho - 4\rho_w = \rho \therefore \rho = \dfrac{4}{3}\rho_w$ ..... (i)

Similarly in second case

$\dfrac{f}{f/3} = \sqrt{\dfrac{\rho}{\rho - \rho_L}}$ or $3 = \sqrt{\dfrac{\frac{4}{3}\rho_w}{\frac{4}{3}\rho_w - \rho_L}} = \sqrt{\dfrac{4}{4 - 3\frac{\rho_L}{\rho_w}}}$

Here, $\dfrac{\rho_L}{\rho_w}$ = specific gravity (say s)

$\therefore 9 = \dfrac{4}{4-3s}$

$\therefore 36 - 27s = 4$

$\therefore s = \dfrac{32}{27}$.

37. **Ans.** 19/18 **Reason:** $f_1 = f\left(\dfrac{v}{v - v_s}\right)$

$f_1 = f\left(\dfrac{340}{340-34}\right) = f\left(\dfrac{340}{306}\right)$

and $f_2 = f\left(\dfrac{340}{340-17}\right) = f\left(\dfrac{340}{323}\right)$

$\therefore \dfrac{f_1}{f_2} = \dfrac{323}{306} = \dfrac{19}{18}$

38. **Ans.** 24 cm. **Reason.** $\dfrac{1}{30} - \dfrac{1}{-u} = \dfrac{1}{f}$

or $\dfrac{1}{30} + \dfrac{1}{u} = \dfrac{1}{f}$ .... (i)

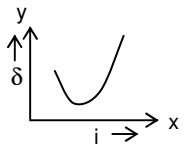
Similarly, $\dfrac{1}{120} + \dfrac{1}{u-90} = \dfrac{1}{f}$ ....(ii)

Solving these two equations we get,

f = 24 cm.

39. **Ans.** – 48. **Reason.** Magnifying power of astronomical telescope

$m = -\dfrac{f_0}{f_e}\left(1 + \dfrac{f_e}{D}\right) = -\dfrac{200}{5}\left(1 + \dfrac{5}{25}\right) = -48.$

40. **Ans.** 

. **Reason.** For a prism, as the angle of incidence increases, the angle of deviation first decreases, goes to a minimum value and then increases.

41. **Ans.** $\sqrt{2}$ **Reason.** Angle i at both focus will be 45°. For TIR to take place, $i > \theta_C$

or $\sin i > \sin \theta_C$

$\therefore \dfrac{1}{\sqrt{2}} > \dfrac{1}{\mu}$ or $\mu > \sqrt{2}$.

42. **Ans.** $\omega_1 = 2\omega_2$ and $f_1 = -2f_2$ **Reason.** Condition of achromatic combination is satisfied if

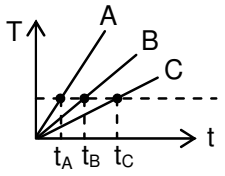
$\dfrac{\omega_1}{f_1} + \dfrac{\omega_2}{f_2} = 0.$

43. **Ans.** Gamma rays. **Reason.**

$\nu_{\gamma-rays} > \nu_{UV-rays} > \nu_{Blue\ light} > \nu_{Infrared\ rays}$

44. **Ans.** $\dfrac{5}{3}$

45. **Ans.** C. **Reason:** Substances having more specific heat take longer time to get heated to a higher temperature and longer time to get cooled. If we draw a line parallel to the time axis then it cuts the given graphs at three different points. Corresponding points on the times axis shows that $t_C > t_B > t_A \Rightarrow C_C > C_B > C_A$.



46. **Ans.** Equal for both the balls. **Reason:** Energy = ½ mv^2 = mc $\Delta\theta \Rightarrow \Delta\theta \propto v^2$. Temperature does not depend upon the mass of the balls.

47. **Ans.** 98 J. **Reason:** $\Delta U_1 = \Delta U_2 - \Delta W_1 = \Delta Q_2 - \Delta W_2$

Give, $-\Delta W_1 = 322J$

$\therefore \Delta W_2 = \Delta Q_1 - (-\Delta W_1) = (100 \times 4.2) - 322 = 98$ J

48. **Ans.** $\frac{7}{10}Q$

49. **Ans.** 81/16. **Reason:** $\frac{E_1}{E_2} = \frac{T_1^4}{T_2^4} = \left(\frac{\lambda_2}{\lambda_1}\right)^4 = \left(\frac{3}{2}\right)^4 = \frac{81}{16}$.

50. **Ans.** $\frac{4}{3}$K.

CHEMISTRY

51. **Ans.** 75%.

52. **Ans.** $\frac{x}{y-x} \times 35.46$

53. **Ans.** 20.6% **Reason:** Eq. wt of $SO_3 = \frac{80}{2} = 40$

$[SO_3 + H_2O \rightarrow H_2SO_4$ (Dibasic)
or $SO_3 + 2NaOH \rightarrow Na_2SO_4]$

Eq. wt. of $H_2SO_4 = \frac{98}{2} = 49$

Let 'x' g of SO_3 be present in 0.5 g of oleum.
Mass of H_2SO_4 in 0.5 g of oleum = (0.5 – x) g

No. of equivalents of $H_2SO_4 = \frac{(0.5-x)}{49}$

No. of equivalents of $SO_3 = \frac{x}{40}$

No. of equivalents of NaOH = $0.4 \times \left(\frac{26.7}{1000}\right) = 0.01068$ equivalents

$\frac{x}{40} + \frac{(0.5-x)}{49} = 0.01068$

$49x + 20 - 40x = 0.01068 \times 49 \times 40$

$9x = 0.9328$

$x = 0.103$

% of free $SO_3 = \frac{\text{Mass of } SO_3}{\text{Total mass}} \times 100 = \frac{0.103}{0.5} \times 100$

= 20.6%.

54. **Ans.** $[K^+]$ =0.04, $[Na^+]$ = 0.00166 $[NO_3^-]$ = 0.04166 **Reason:** In this question, $AgNO_3$ will react with KCl and AgCl will precipitate.
Also molarity of KCl = Normality of KCl
Also molarity of $NaNO_3$ = Normality of $NaNO_3$
Also molarity of $AgNO_3$ = Normality of $AgNO_3$.

No. of moles of KCl = $0.1 \times \frac{500}{1000} = 0.05$ = no. of eq. of KCl

No. of moles of $NaNO_3 = \frac{200}{1000} \times 0.01 = 0.002$ = No. of eq. of $NaNO_3$

No. of moles of $AgNO_3 = \frac{500}{1000} \times 0.1 = 0.05$ = No. of eq. of $AgNO_3$.
Since, number of eq. of KCl = No. of eq. of $AgNO_3$
Hence, number of eq. of AgCl precipitated = 0.05

Hence, in solution, only K^+ and NO_3^- ions will be present apart from $NaNO_3$ and the no. of moles = 0.05 each.
After mixing, the total volume becomes = 500 + 200 +500 = 1200 ml

$\Rightarrow$ After mixing, molarity of K^+ and NO_3^- ions are left apart from $NaNO_3$.

$= \frac{0.05}{1200} \times 1000 = \frac{0.5}{12} \sim 0.04$ each

No. of moles of $NaNO_3$ in solution = $\frac{0.002}{1200} \times 1000 = \frac{0.02}{12} = 1.60 \times 10^{-3} \sim 0.00166$

$\Rightarrow [Na^+] = 0.00166$, $[NO_3^-] = 0.00166$.

Hence, total $[K^+] = 0.04$, $[Na^+] = 0.00166$, $[NO_3^-] = 0.04 + 0.00166 = 0.04166$

55. **Ans.** $\frac{12415}{\Delta E} \times 10^{-10}$m **Reason:** ΔE in eV = $\Delta E \times 1.609 \times 10^{-19}$ J

$= h\nu = h\frac{c}{\lambda}$ or $\lambda = \frac{hc}{\Delta E \times 1.602 \times 10^{-19}}$

$= \frac{(6.63 \times 10^{-34}) \times (3 \times 10^8)}{\Delta E \times 1.602 \times 10^{-19}}$

$= \frac{12415}{\Delta E} \times 10^{-10}$m

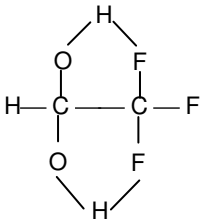
56. **Ans.** $2a_0$ from the nucleus. **Reason:** For 2s orbital, the nodal surface exists at a distance of $2a_0$.

57. **Ans.** (1→E) (2→B) (3→ C) (4→ D) **Reason:** Hydrogen (H) cannot have IE_2 and IE_3, Neon (Ne) will have highest IE_1 . For Lithium (Li), IE_1 will be low, but IE_2 will be very high ($IE_1 < < < IE_2 < IE_3$). For beryllium (Be), IE_1 is high and order is $IE_1 < IE_2 < < < IE_3$. IE_1 of boron will be less than IE_1 of beryllium.

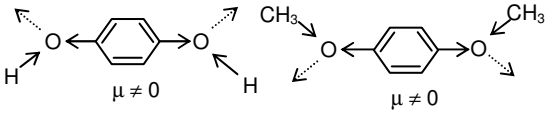
Thus (1→C) (2→B) (3→ E) (4→ D) , (IE_1 of Li, Be and B is in the order Li < Be > B)

58. **Ans.** Li < Be < B < C …. IE_1 **Reason:** IE_1 of Li < Be > B < C or IE_1 of Li < B < Be <C.

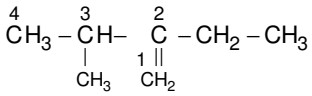
59. **Ans.** CF_3— CH $\begin{matrix}OH\\OH\end{matrix}$ **Reason:** CF_3— CH $\begin{matrix}OH\\OH\end{matrix}$ is stabilized by intramolecular hydrogen bonding



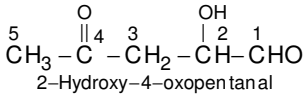
60. **Ans.** None of the other three choices given here **Reason:** Both molecules are non-planar so have non-zero dipole moment.



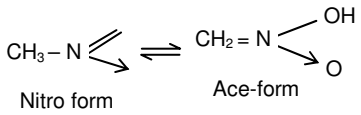
61. **Ans.** 2-Ethyl – 3-methylbut-1-ene. **Reason:**



62. **Ans.** 2-Hydroxy-4-oxopentanal. **Reason:**



63. **Ans.** Tautomerism **Reason:**



64. **Ans.** $CH_3^- > NH_2^- > HO^- > F^-$. **Reason:** The correct order of nucleophilicity is $CH_3^- > NH_2^- > HO^- > F^-$.

65. **Ans.** $Na_4[Fe(CN)_5NOS]$.

66. **Ans.** 4 **Reason:** Mol. wt. = $\frac{n}{2}\left(\frac{w}{x}\times 195 - 410\right)$

or 244 = $\frac{n}{2}\left(\frac{0.532}{0.195}\times 195 - 410\right)$

or 122 n = 2× 244 or n = 4.

67. **Ans.** 6.02×10^{17} mol^{-1}.

68. **Ans.** 0.01%. **Reason:** For NaX

$$\underset{1-h}{X^-} + H_2O \rightleftharpoons \underset{h}{HX} + \underset{h}{OH^-}$$

$$\therefore h = \sqrt{\frac{K_H}{c}} = \sqrt{\frac{K_w}{K_a.c}} = \sqrt{\frac{10^{-14}}{10^{-5}\times 0.1}}$$

$$= \sqrt{10^{-8}} = 10^{-4}$$

$$\therefore \% h = 10^{-4} \times 100 = 10^{-2} = 0.01$$

69. **Ans.** 1×10^6 **Reason:** $K_a = 10^{-6}$ for $HA + H_2O \rightleftharpoons H_3O^+ + A^-$

Thus, K for reverse reaction is $\frac{1}{10^{-6}} = 10^6$.

70. **Ans.** x > y.

71. **Ans.** K **Reason:** Rate constant is characteristic constant for a given reaction.

72. **Ans.** First **Reason:** If either of the reactant is reported in excess, it means that the concentration of that reactant does not influence the rate of reaction and thereby it will not contribute for order of reaction.

73. **Ans.** A will gradually dissolve. **Reason:** $A + B^{2+} \longrightarrow A^{2+} + B$ has a positive EMF.

74. **Ans.** MgO is formed **Reason:** $MgCl_2.6H_2O \xrightarrow[-4H_2O]{\Delta}$

$MgCl_2.2H_2O \xrightarrow[-HCl]{\Delta}$

$Mg(OH)Cl \xrightarrow{600°C} MgO + HCl.$

75. **Ans.** Gold **Reason:** Gold is found in the sediments in the ocean floor.

76. **Ans.** $Fe_2O_3 + 3C \xrightarrow{Heat} 2Fe + 3CO$. **Reason:** Smelting is reduction with carbon.

77. **Ans.** Pm **Reason:** Pm is a lanthanide element. Lanthanides do not form oxoanions while actinides forms oxoanions.

78. **Ans.** CO **Reason:** $Fe_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2$.

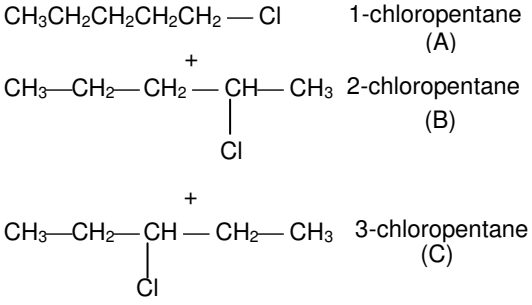
79. **Ans.** Linkage. **Reason:** $[Cr(NH_3)_5 (NO_2)]Cl_2$ shows linkage isomerism. It also shows ionization isomerism.

80. **Ans.** Both σ - and π - characters. **Reason:** In transition metal carbonyls, M — C bond possesses both σ and π character.

81. **Ans.** alc. KOH and $NaNH_2$ **Reason:** Alcoholic KOH rearranges terminal alkyne to non-terminal alkyne while $NaNH_2$ does the reverse.

82. **Ans.** square planar, tetrahedral, octahedral : dsp^2, sp^3, sp^3d^2 : 0, 5.9, 4.9.

83. **Ans.** 3 : 2 :1 respectively **Reason:** $CH_3CH_2CH_2CH_3 \xrightarrow[h\nu]{Cl_2}$



When selectivity factor is absent, then the yield depends only on number of hydrogen atoms.

The number of H-atoms available for forming (A) = 6

The number of H-atoms available for forming (B) = 4

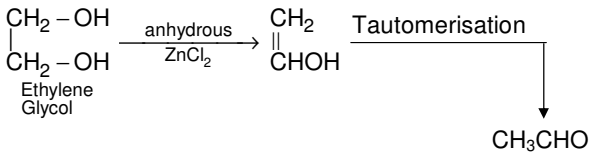
The number of H-atoms available for forming (C) = 2

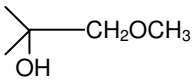
$\Rightarrow$ A : B : C

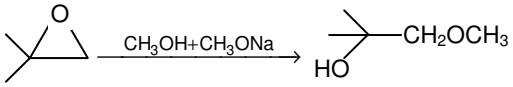
6 : 4 : 2

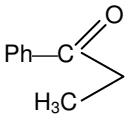
3 : 2 : 1

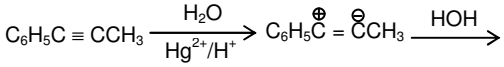
84. **Ans.** acetaldehyde **Reason:**

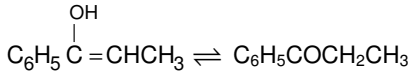


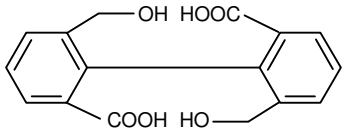
85. **Ans.**  **Reason:** This is base catalysed cleavage of cyclic ethers where nucleophele attacks least substituted carbon.

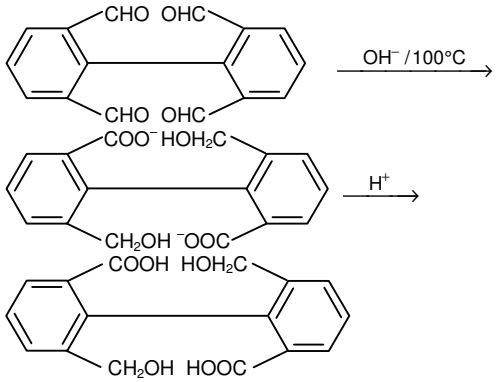


86. **Ans.**  **Reason:**

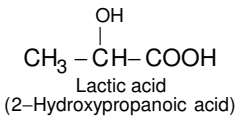


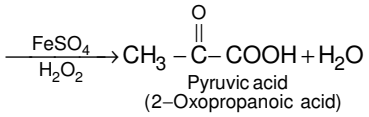


87. **Ans.**  **Reason:** This is Cannizzaro's reaction.

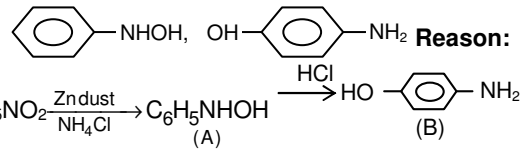


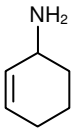
88. **Ans.** 6.

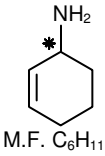
89. **Ans.** Pyruvic acid **Reason:** 



90. **Ans.** citric acid.

91. **Ans.**  **Reason:**

92. **Ans.**  **Reason:** Of all the amines listed, only (a) has the right M.F. of $C_6H_{11}N$. Since it also contain a chiral caron, therefore, it is optically active.



93. **Ans.** semisynthetic polymer **Reason:** Cellulose acetate is a semisynthetic polymer.

94. **Ans.** > 1 **Reason:** Poly despersity index (PDI) of the polymer

$= \frac{\bar{M}_w}{\bar{M}_n} = \frac{40000}{30000} = 1.33$

95. **Ans.** 4.5%

96. **Ans.** H_4SiO_4 and SiO_2

97. **Ans.** NH_4NO_3 **Reason:** $NH_4NO_3 \xrightarrow{\Delta} N_2O(g) + 2H_2O$ (g).

98. **Ans.** SO_3^{2-} **Reason:** SO_3^{2-} is $\bar{O}-\underset{\underset{\underline{O}}{|}}{S}=O$, having d (of S) and p (of O) π bond.

99. **Ans.** NaI **Reason:** As the liberated gas turns starch paper blue, it must be iodine and the substance X must contain an iodide

$2NaI + 2H_2SO_4 \longrightarrow Na_2SO_4 + SO_2 + I_2 + 2H_2O$

$I_2 + Starch \longrightarrow$ Starch – iodine complex (blue in colour)

100. **Ans.** $Cu_2I_2 + K_2SO_4$ **Reason:** $2\ CuSO_4 + 4\ KI \longrightarrow Cu_2I_2 + 2K_2SO_4 + I_2$.

BOTANY

101. **Ans.** All plant tissues. **Reason.** It was actually cell wall.

102. **Ans.** 6', 1' and 2'. **Reason.** In between A & T, two hydrogen bond are present at 1 & 6 position.

103. **Ans.** *O. sativa indica* x *O. sativa japonica*

104. **Ans. Monosomic** → 41; **Haploid** → 21; **Nullisomic**→ 40; **Trisomic** → 43. **Reason:** 6n = 42 condition is found in *Triticum aestivum.*

105. **Ans.** Euchromatin. **Reason:** In 'S' phase, it will label both enchromatin and heterochromatin, but at the time of entry into 'S' phase, it will label euchromatin only as it is less coiled or condensed than heterochromatin.

106. **Ans.** Same number of chromosomes and half number of chromatids. **Reason:** Centromere split during anaphase of mitosis.

107. **Ans.** A = α helix; B = β pleated sheet; C = disulphide linkages; D = peptide linkages. **Reason:** α - helix possess single polypeptide but β - pleated sheet possess more than one polypeptide.

108. **Ans.** Proline. **Reason.** Proline has imino group. (- NH)

Instead of amino ($-NH_2$) group.

109. **Ans.** 97 million base pairs and 18,000 genes. **Reason:** *E. coli* : 4.7 million base pairs and 4,000 genes.

Drosophilla melanogaster : 180 million base pairs and 13,000 genes.

110. **Ans.** UCU, UCC, UCA and UCG. **Reason:** CUU, CUC, CUA, CUG : - Lencine.

111. **Ans.** RNA chemically is less reactive and structurally more stable when compared to DNA. **Reason.** DNA chemically is less reactive and structurally more stable when compared to RNA.

RNA is chemically more reactive due to presence of 2' OH group.

112. **Ans.** 207 nucleotide pairs. **Reason:** Yeast alanine t-RNA possess 77 nucleotide.

113. **Ans.** (A) - (1), (B) - (2), (C) - (5), (D) - (6)

114. **Ans.** *Crotolaria juncea* and *Alhagi camelorum.*

115. **Ans.** Plant introduction.

116. **Ans.** hypertonic solution.

117. **Ans.** Only (I) & (II) **Reason:** Translocation of organic and inorganic solutes takes place by phloem.

118. **Ans.** All of the three choices are true

119. **Ans.** Cobalt

120. **Ans** *Triticum turgidum*

121. **Ans.** (i) RuBP (ii) Triose phosphate (iii) PGA

122. **Ans.** a-normal enzyme reaction, b – competitive inhibition, c – non-competitive inhibition. **Reason:** In CI, V_{max} remain constant but in NCI, V_{max} decreases.

123. **Ans.** *Brassica campestris*, *Solanum nigrum* and *Allium cepa* respectively.

124. **Ans.** Oat. **Reason:** In the coleoptile of *Avena sativa.*

Avena coleoptile curvature test is the bioassay for auxin (IAA).

125. **Ans.** Pr ⇄ P fr (Red light / Far red) **Reason:** Pr and Pfr are two interconvertable form of phytochrome.

126. **Ans.** Only (I), (II) & (III) **Reason:** Citrus Canker : *Xanthomonas citri*

Wilt of Tobaco : *Pseudomonas Solanacearum.*

127. **Ans.** both arboviruses and flaviviruses. **Reason.** Yellow fever and dengue fever (break bone fever) both are caused by a ssRNA containing enveloped ribovirus with cubical symmetry. This is an insect bome arbovirus of flavivirus group and is transmitted by female *Aedes* (tiger mosquito).

128. **Ans.** a-Heterocyst, b – Mucilage sheath. **Reason:** The figure represent the trichome of BGA.

129. **Ans.** (A →3) (B → 1) (C →4) (D →2)

130. **Ans.** –196°C

131. **Ans.** n + n. **Reason:** Longest phase of *Agaricus* is represented by dikaryotic phase in Basidiomycetes.

132. **Ans.** secondary mycelium. **Reason:** Spawn is pure inoculum of edible mushrooms. It is produced by growing fungus on sterilized rye or wheat grain with added chalk to maintain alkalinity. It contain secondary dikaryotic mycellum and used as seed for the cultivation of mushrooms.

133. **Ans.** Rhizophore of *Selaginella*, Strobuli of *Equisetum* & Submerged leafs of *Salvinia* respectively

134. **Ans.** Protonema of moss and prothallus of *Dryopteris* are gametophytic **Reason:** Protenema is the juvenile stage of *Funaria.*

135. **Ans.** pteridophytes and spermatophytes (gymnosperms and angiosperms). **Reason:** Tracheophyta includes vascular tissue possessing plants.

136. **Ans.** dioecious gametophytes.

137. **Ans.** *Saraca*, *Mirabilis* and *Euphorbia.* **Reason:** Uniparous or Monochasial Cyme. The terminal bud stops its activity or get modified into the flower/tendril/thorn. Further growth of the axis is

continued by one auxiliary branch arising laterally from axillary bud. Soon its bud also stops growth and the process is repeated. The successive branches develop on either both the sides alternately (*scorpioid, e.g., Grapevine*) or on one side only (*helicoids, e.g., Saraca*).

Biparous or Dichasial Cyme. After the inactivity of the growing point of the parent axis, further growth is continued by two lateral branches. Axis is **multipodial**, *e.g., Euphorbia helioscopia, E. tirucalli, Croton.*

138. **Ans.** lemon and tamarind. **Reason:** Stem cutting : Rose / Sugarcane /Croton / Tapioca/ Chinarose.

Root cutting : Lemon / Tamarind.

Layering : Rose, jasmine, grapevine, lemon.

139. **Ans.** long styles of carpels

140. **Ans.** 2. Berry; 3. Caryopsis; 4. Drupe; 1. Sorosis; 5. Legume. **Reason:** Drupe represent stony endocarp. Berry is a multiseeded fleshy simple fruit.

141. **Ans.** a cluster of compactly borne flowers on a common axis. **Reason:** Pineapple possess syconus type of fruit which is a example of multiple or compound fruit where the entire inflorescence developed into fruit.

142. **Ans.** *Plumule* – Lateral; *Radicle* – Axial ; *Cotyledon* – Terminal.

143. **Ans.** a few orders which could not be placed satisfactorily in the classification.

144. **Ans.** Replum of mustard synandrous stamen & Foliaceous stipules respectively

145. **Ans.** two carpels, syncarpous, ovary superior.

146. **Ans.** Marginal, parietal, free central, superficial.

147. **Ans.** A-Root hair, B-Epiblema, C-Cortex, D-Endodermis, E-Passage cell, F – Pericycle, G- Pith, H-Phloem, I – Metaxylem, J – Protoxylem.

148. **Ans.** (1→s) (2→p)(3→q) (4→r)

149. **Ans.** *Podophyllum*

150. **Ans.** *Caesalpinia pulcherrima.*

ZOOLOGY

151. **Ans:** Grouping according to evolutionary trends. **Reason:** phylogenetic system is based on evolutionary history

152. **Ans:** 16s r-RNA **Reason:** Carl Woose proposed six kingdom classification on the basis of genetic characters particularly genetic analysis of 16S r-RNA.

153. **Ans:** Hot dilute soup **Reason:** Haldane's hot dilute soup was produced by the combination of various organic compounds.

154. **Ans:** Alluring mimicry **Reason:** Heterodon – Warning mimicry , Butea albonotatus – Concealing mimicry , Didelphis – Conscious mimicry.

155. **Ans:** Melghat national park **Reason:** Melghat national park is in Maharashtra.

156. **Ans:** Rice fields **Reason:** Major sources of methane are flooded from paddy fields, marshes etc.

157. **Ans:** Thymus - Microgleal cells **Reason:** Thymus - Hassels granules, Brain - Microgleal cells.

158. **Ans:** Non-striated or smooth **Reason:** T-tubules are present in striated muscles at the level of A-I bands and associated with terminal cisternae to form triads. In cardiac muscles they are found at the level of Z-discs. T-tubules are associated with junctional processes of sarcoplasmic reticulum to form diads.

159. **Ans:** Ectrodactyly, Ichthyosis, Sickle cell anemia. **Reason:** Ectrodactyly (abortive fingures) and Ichthyophis (Scaly skin) are autosomal dominant traits.

160. **Ans:** Coat colour in mice. **Reason:** Coat colour in mice is an example of recessive epistasis which shows the phenotypic ratio of 9:3:4.

161. **Ans:** 50%. **Reason:** Female produces one type of gamete i.e. "22+X" male produces two types of gametes i.e. "22+X" and "22 + Y". So chance of a son in every issue is 50%.

162. **Ans:** Haemophilia and red green colour blindness.

163. **Ans:** Inversion.

164. **Ans:** Horns in sheep, Spotting in cattle **Reason:** Deep male voice, male musculature, Beard development in male, Breast in female, Feminine musculature, male musculature are sex limited characters.

165. **Ans:** Vincristaine, Vinblastin. **Reason:** These are derived from *Catharanthus roseus*. These are commonly called as Sadabahar. These are mostly used against leukemia.

166. **Ans:** Cartilage.

167. **Ans:** Latissimus dorsi.

168. **Ans:** Rumen **Reason:** Rumen of ruminants has symbiotic bacteria which secretes cellulase, an enzyme to digest cellulose

169. **Ans:** starch, dextrin and maltose **Reason:** Small amount of starch can be digested by ptyalin into dextrin and maltose.

170. **Ans:** Headache, nausea, vomiting, drowsiness and loss of appetite.

171. **Ans:** Helps in erythropoesis. **Reason:** Cobalt is a very essential element for erythropoesis.

172. **Ans:** external intercoastal muscle. **Reason:** It occurs during breathing.

173. **Ans:** succinic acid to fumaric acid. **Reason:** In ETS one FAD produces two ATP.

174. **Ans:** Lymphatic system **Reason:** The posterior end of the left thoracic lymphatic duct is dilated to form a sac like structure called as cisterna chyle located behind diaphragm.
175. **Ans:** GnRH – single chain of 14 amino acid – stimulates FSH and LH by gonadotropes **Reason:** GnRH is single chain of 10 amino acid only.
176. **Ans:** one **Reason:** Ascaris has only one excretory pore.
177. **Ans:** Pharyngeal nephridia. **Reason:** Pharyngeal nephridia secretes proteolytic enzymes.
178. **Ans:** Medulla and divides into ophthalmic, maxillary and mandibular.
179. **Ans:** Hypoglossal and spinal accessory **Reason:** Hypoglossal XII spinal accessery - XI.
180. **Ans:** Receptor, spinal cord, muscle **Reason:** The neural path way along with the nerve message passes during reflex action is called reflex arc.
181. **Ans:** 3, 6 **Reason:** There are three thoracic and 6 abdominal ganglia in cockroach.
182. **Ans:** Glucocorticoids **Reason:** Glucocorticoid raises the glucose level in blood; break down of fats and proteins for release of energy.
183. **Ans.** Laryngeal muscles **Reason:** Spasm of laryngeal muscles obstructs respiration, which is the usual cause of death in tetany, unless appropriate treatment is applied.
184. **Ans:** Liver **Reason:** Glucoronides are excreted either into gut or by way of liver bile or into the urine through Kidneys.
185. **Ans:** Cortisol **Reason:** Allthis syndrome is due to elevated plasma cortisol.
186. **Ans:** Stimulating sperm activity. **Reason:** Prostate secretion is milky slightly alkaline, contains calcium phosphate, citrate, a proteolytic enzyme fibrinolysin. It is essential for sperm motility, removal caused sterility.
187. **Ans:** mass of epithelial cells in the Graafian follicies **Reason:** The maturing oocyte adheres to the wall of the follicle through a pedicel, the cumulus oophorus formed by granulosa cells.
188. **Ans:** Perameles **Reason:** A primitive allantoic placenta is found only in perameles besides eutheria. Macropus and Didelphys are metatheria which have yolk sac placenta.
189. **Ans:** Periblastula– Perameles, Didelphys. **Reason:** Periblastula or superficial blastula is found in organisms with centrolecithal eggs such as the insects.
190. **Ans.** the androgens androstenediones and testosterones **Reason:** The granulosa cells secrete progesterone and oestrogen.
191. **Ans:** corpus albicans.
192. **Ans:** Chrysolaminarin **Reason:** Chrysolaminarin is the food reserveof diatoms. paramylon in the food reserve of Euglena. Glygoven is the reserve food in Pelomyxa (giant amobeba), Entamoeba etc.
193. **Ans:** Flat worm **Reason:** Flat worm - Acoelomate, Ascaris - pseudocoelomate, Earthworm - Coelomate .
194. **Ans:** as scattered pouches in between endoderm and ectoderm **Reason:** In roundworms or pseudocoelomates the coalom is not lined by mesoderm instead, mesoderm is present as scattered pounches
195. **Ans:** Pennatula - Sea fan **Reason:** Pennatula - Sea pen, Gorgonia - Sea fan
196. **Ans:** Paurometabolous **Reason:** Gradual metamorphosis is called paurometabolus in which newly hatched nymphs undergoes several nymphal stages through successive moulting to become an adult.
197. **Ans:** α-ketoglutaric acid **Reason:** The worker bee is a sterile female member of the colony. The a-ketoglutaric acid secreted by the queen destroys the developing ovary of the worker bees. as scattered pounches
198. **Ans:** smell **Reason:** Koliker's pit in amphixus is concerned with sense of smell.
199. **Ans:** Absence of paired fins and true jaws **Reason:** Petromyzon belongs to agnatha. It is without paired fins.
200. **Ans:** Sirenia **Reason:** Sirena is an order of herbivarous aquatic mammals without ear pinna.