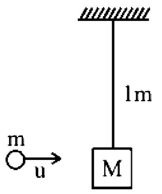
P ANSWER KEY & SOLUTION KEY FINAL ROUND - 03 (PCB) Dt.05.04.2024

PHYSICS

SECTION - A (35 Questions)

01. **(2)** $mu = (M+m)V$



$10^{-2} \times 2 \times 10^{2} \cong 1 \times V$

$V \cong 2\text{m/s}$

$h = \frac{V^2}{2g} = 0.2m.$

02. **(2)** Breaking stress remains same.

03. **(1)** Here, LFP = 20°C, UFP = 150°C, C = 60°, x = ?

From $\frac{C}{100} = \frac{x - LFP}{UFP - LFP} = \frac{x-20}{150-20}$

$\Rightarrow \frac{60}{100} = \frac{x-20}{130}$

$\Rightarrow x - 20 = \frac{130 \times 60}{100} = 78\,; x = 78 + 20 = 98°C.$

04. **(4)**

05. **(2)**

06. **(3)** Work done, $W = \int P\,dt$

or $\frac{1}{2}mv^2 = \int P\,dt = \int_0^2 \left(\frac{3t^2}{2}\right) dt = 4\,J$

$v^2 = \frac{2 \times 4}{m} = \frac{2 \times 4}{2} = 4$

$\Rightarrow v = 2\ ms^{-1}$

07. **(3)** N vernier scale divisions are equivalent to (N – 1) Main scale division

$\Rightarrow$ 1 V.S.D. is equivalent to $\frac{(N-1)}{N}$ M.S.D.

Now Least count = 1 M.S.D. – 1 V.S.D.

$= 1\ \text{M.S.D.} - \frac{N-1}{N} M.S.D.$

$= \frac{1}{N} M.S.D.$

$= \frac{1}{N}\text{mm} = \frac{1}{10\ N}\text{cm}$

08. **(1)** Let q and q' be the charges on spheres of radii R and 2R respectively.

Given q + q' = Q ...(i)

Surface charge densities are

$\sigma = \frac{q}{4\pi R^2}$ and $\sigma = \frac{q'}{4\pi(2R)^2}$

Given $\sigma = \sigma'$

$\therefore \frac{q}{4\pi R^2} = \frac{q'}{4\pi(2R)^2}$ or $, q' = 4q$

From eq. (i), q' = Q – q or, 4q = Q – q

or, Q = 5q ...(ii)

$\therefore q' = Q - q = Q - \frac{Q}{5} = \frac{4Q}{5}.$

09. **(2)** Projectile has same range for θ and 90° – θ

Hence when θ = 40°, 90° – θ = 50°

10. **(2)** $\vec{v} = \hat{i} + 2\hat{j}$

$\Rightarrow x = t$ ...(i)

$y = 2t - \frac{1}{2}(10t^2)$ ...(ii)

11. **(1)** When a stone tied with string is rotated in horizontal circle, then centripetal force is required which is given as

$F = \frac{mv^2}{r}$

$\therefore \quad F \propto v^2, F \propto \frac{1}{r}$

From above, it is clear that when stone is rotated with greater speed, then greater force (centripetal force) is required.

Again, when stone is rotated in a circle of smaller radius, greater force is required.

So, statement I and II are correct but III is incorrect

12. **(2)** From the principle of dimensional homogeneity [F] = [at]

$$\therefore\ [a]\left[\frac{F}{t}\right]=\left[\frac{MLT^{-2}}{T}\right]=[MLT^{-3}]$$

Similarly $[F]=[bt^2]$

$$\therefore\ [b]\left[\frac{F}{t^2}\right]=\left[\frac{MLT^{-2}}{T^2}\right]=[MLT^{-4}]$$

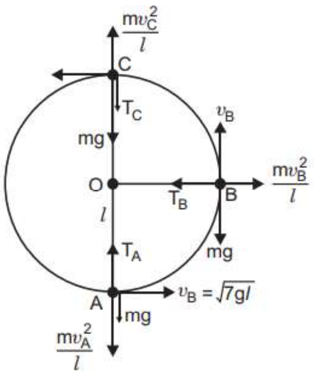
13. **(2)** $F=\frac{-dU}{dx}=-(\text{Slope})$

14. **(2)** Tension at lowest point A

$$T_A-mg=\frac{mv_A^2}{l}$$

$$T_A=mg+\frac{m(\sqrt{7gl})^2}{l}$$

$$T_A=8mg$$



15. **(3)** For circular disc, $I=\frac{1}{2}MR^2$

$$\therefore\ I_A=\frac{1}{2}M_AR_A^2=\frac{1}{2}(\pi R_A^2t_A)dR_A^2=\frac{1}{2}\pi t\,dr^3$$

and $I_B=\frac{1}{2}\pi\left(\frac{t}{4}\right)d(4r)^3=\frac{1}{2}\pi d(16r^3)$

$\therefore I_A<I_B$

16. **(2)** If the ice cap of the poles melts, ice will flow towards the equator, and will increase the moment of inertia of the earth thereby decreasing its frequency of rotation. Due to decrease of the frequency of motion, the day length increases.

Hence, the correct answer is option (2).

17. **(3)**

A. Static friction is the frictional force between the surfaces of two objects when they are not in motion with respect to each other. Due to this reason, static friction has the highest value of frictional force and hence μ is highest.

B. rolling friction takes place when one body rolls over the surface of another body due to which the value of friction is less in case of rolling friction and hence μ is lowest.

C. Kinetic friction takes place when one body slides over the surface of the another body. Value of friction is moderate and lie in between the friction value of rolling and static friction and hence μ is moderate.

Hence, $A\rightarrow1$, $B\rightarrow3$ and $C\rightarrow2$

18. **(4)** $V_D=\frac{m_C}{\rho_W}+\frac{m_B}{\rho_W}$ and $V_g=\frac{m_C}{\rho_C}+\frac{m_B}{\rho_W}$

Since, $\rho_C>\rho_W, V_g<V_D$

Hence, l and h both decrease.

Hence, the correct answer is option (4)

19. **(1)** Stoke's law: $6\pi r\eta v=\frac{4}{3}\pi r^3(\rho-\sigma)g$

$\therefore\ v\propto r^2.$

As M is given, $\rho=\frac{M}{\frac{4}{3}\pi r^3}$

But as r^3 increases, M also increases and ρ is constant

$\therefore$ v, the terminal velocity $\propto r^2$.

Hence, the correct answer is option (1).

20. **(1)** By Newton's law of cooling,

$$\frac{dH}{dt}=K\left(\frac{\theta_1+\theta_2}{2}-\theta_0\right)$$

where, θ_0 is temperature of surroundings and $\frac{\theta_1+\theta_2}{2}$ is the temperature of body.

Hence, $t_3>t_2>t_1$.

21. **(3)** $PV=nRT=\frac{M}{M_0}RT$

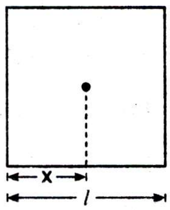
$$P=\frac{M}{V}\frac{RT}{M_0}=d\frac{RT}{M_0}$$

$$2P = d'\frac{R(T/3)}{M_0}$$

$$2d\frac{RT}{M_0} = \frac{d'R(T/3)}{M_0} \quad \Rightarrow \therefore d' = 6d.$$

22. **(4)** $\frac{x}{\mu} + \frac{(l-x)}{\mu} = 3+5$

$\Rightarrow \frac{l}{\mu} = 8$



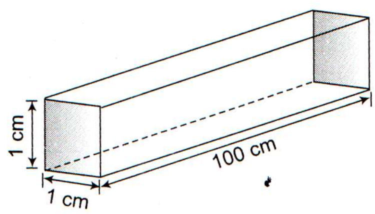
$\Rightarrow l = 8 \times \frac{3}{2}$

$\Rightarrow \therefore l = 12cm.$

23. **(3)** The electric field lines, are directed away from positively charged source and directed toward negatively charged source. In electric field force are directly proportional to the electric field strength hence, higher the electric field strength greater the force and vice-versa. The space between the electric field lines is increasing, from left to right so strength of electric field decreases with the increase in the space between electric field lines. Then the force on charges also decreases from left to right. Thus, the force on charge –q is greater than force on charge +q in turn dipole will experience a force towards left.

24 **(3)**

25. **(2)** Length l = 1 cm = 10^{-2} m



Area of cross-section A = 1 cm × 100 cm = 100 cm^2 = 10^{-2}m^2

Resistance R = 3 × 10^{-7}× $\frac{10^{-2}}{10^{-2}} = 3\times10^{-7}\,\Omega$

26. **(4)** $e = \frac{d\phi}{dt}$

$$e = \frac{dNBA}{dt} \Rightarrow e = \frac{NAdB}{dt}$$

$$44 = N \times \frac{\pi}{4} \times (.02)^2 \times \frac{3000}{3}$$

N = 140

27. **(2)** In the given situation, motional e.m.f.

$e = B\,l\,\upsilon$

Induced current, $i = \frac{e}{r} = \frac{B\,l\,\upsilon}{r}$

Force on conductor

$$F = B\,i\,l = B\left(\frac{B\,l\,\upsilon}{r}\right)l = \frac{B^2l^2\upsilon}{r}$$

Power dissipated = power required to push the conductor

$$= F \times \upsilon = \frac{B^2\,l^2\,\upsilon}{r} \times \upsilon = \frac{B^2l^2\upsilon^2}{r}$$

28. **(4)** $P = V_{rms}I_{rms}\cos\phi = \frac{40}{\sqrt{2}}\left(\frac{5}{\sqrt{2}}\right)\cos\frac{\pi}{3} = 50\text{ W}$

29. **(2)** $W = hv - \frac{1}{2}mv^2$

hv = energy of incident photon

$$= \frac{12400}{1240}eV = 10eV$$

$\therefore \; W = 10 - 8 = 2eV$

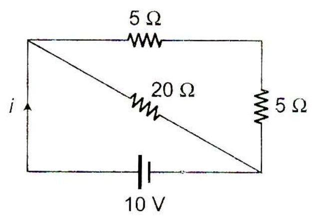
So, λ_o = Threshold wavelength

$$= \frac{12400}{2eV} = 6200\,\mathring{A}$$

30. **(4)** $\because B = \frac{\mu_0 I}{2r}$ *and* $I = \frac{e}{T}$

$$B = \frac{\mu_0 e}{2rT}[r \propto n^2, T \propto n^3]; \quad B \propto \frac{1}{n^5}.$$

31. **(3)** D_1 is in reverse bias, D_2, D_3 in forward bias.



$$R_{eq} = \frac{10\times20}{10+20} = \frac{20}{3}$$

$$i = \frac{10}{20/3} = 1.5\text{ A}$$

32. **(2)** $n_i^2 = n_e n_h$

$(1.5 \times 10^{16})^2 = n_e(4.5 \times 10^{22})$

$n_e = 0.5 \times 10^{10} = 5 \times 10^9$

$n_h = 4.5 \times 10^{22}$

$n_h > n_e$ (p-type)

33. **(4)** Let ρ_1, ρ_2 be the density of bob and liquid respectively. When simple pendulum is oscillating in air, then

$$T = 2\pi\sqrt{\frac{l}{g}}$$

When bob of pendulum is in liquid, the period of oscillation is $3T = 2\pi\sqrt{\frac{l}{g(1-\rho_2/\rho_1)}}$

or $\frac{1}{3} = \sqrt{1-\rho_2/\rho_1}$ or $1-\frac{\rho_2}{\rho_1} = \frac{1}{9}$

or $\frac{\rho_2}{\rho_1} = 1-\frac{1}{9} = \frac{8}{9}$ or $\therefore \frac{\rho_1}{\rho_2} = \frac{9}{8}$.

34. **(3)** The given equation of wave,

$y = A\sin(kx - \omega t + \phi)$

At x = 0, t = 0, y = 0 and slope is negative

$\Rightarrow \phi = \pi$

35. **(4)** In this case $|m| = \frac{f_o}{f_e} = 5$

$\therefore f_o = 5f_e$

Length of telescope = $f_o + f_e = 36$

$\therefore 5f_e + f_e = 36$

$6f_e = 36 \quad \therefore f_e = 6$ cm

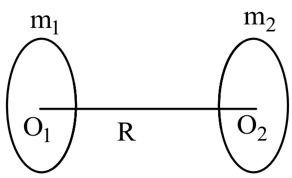
As $f_o + f_e = 36$

$f_o + 6 = 36$

$f_o = 36 - 6 = 30$ cm.

SECTION - B (Attempt Any 10 Questions)

36. **(4)** The situation is as shown in the figure.



Gravitational potential at the centre of the first ring (i.e., at O_1) is

$$V_1 = -\frac{Gm_1}{R} - \frac{Gm_2}{\sqrt{R^2+R^2}} = -\frac{Gm_1}{R} - \frac{Gm_2}{\sqrt{2}R}$$

Gravitational potential at the centre of the second ring (i.e., at O_2) is

$$V_2 = -\frac{Gm_2}{R} - \frac{Gm_1}{\sqrt{R^2+R^2}} = -\frac{Gm_2}{R} - \frac{Gm_1}{\sqrt{2}R}$$

Work done in moving a mass m from O_1 to O_2 is

$W = m(V_2 - V_1)$

$$= m\left[-\frac{Gm_2}{R} - \frac{Gm_1}{\sqrt{2}R} - \left(-\frac{Gm_1}{R} - \frac{Gm_2}{\sqrt{2}R}\right)\right]$$

$$= m\left[-\frac{Gm_2}{R} - \frac{Gm_1}{\sqrt{2}R} + \frac{Gm_1}{R} + \frac{Gm_2}{\sqrt{2}R}\right]$$

$$= \frac{Gm}{R}\left[\frac{-\sqrt{2}m_2 - m_1 + \sqrt{2}m_1 + m_2}{\sqrt{2}}\right]$$

$$= \frac{Gm}{\sqrt{2}R}\left[\sqrt{2}(m_1 - m_2) - (m_1 - m_2)\right]$$

$$= \frac{Gm(m_1 - m_2)}{\sqrt{2}R}\left[\sqrt{2} - 1\right]$$

As we don't know wether $m_1 > m_2$ or $m_2 > m_1$

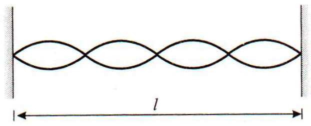
$\Rightarrow$ we can't say

37. **(2)** $P_2 = 0.8\ P_1 = 0.8$ (4 kW) = 3.2 kW

$I_2 = \frac{P_2}{V_2} = \frac{3.2\times10^{+3}}{240} = 13.33$A

38. **(2)** In case of 4th harmonic

$4\frac{\lambda}{2} = l$ or $2\lambda = l$



From equation $\frac{2\pi}{\lambda} = 0.157$

$\Rightarrow \lambda = \frac{2\pi}{0.157} = 40m$

Hence, $l = 2\lambda = 80$ m

39. **(2)** In the given SHM, at time t = 0, the particle is passing from mean position. So displacement of SHM at time t is

$y = A\sin\omega t$

Velocity, $V = \frac{dy}{dt} = A\omega\cos\omega t$

K.E. of particle,

$$K = \frac{1}{2}mV^2 = \frac{1}{2}m\omega^2A^2\cos^2\omega t$$

Hence, the variation between KE v/s time is of the type as shown in option (2).

40. **(1)** In magnetic field speed is constant so λ will remain constant.

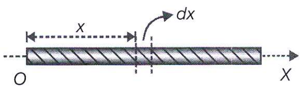
41. **(3)** $R = \frac{V - I_gR_g}{I_g} = \left(\frac{V - V_g}{I_g}\right)$

$R = \frac{V}{I_g} - R_g$

$$\frac{50}{2\times10^{-3}}-50=25000-50=24950$$

42. **(2)** Linear density of the rod varies with distance

$$\frac{dm}{dx}=\lambda \text{ [Given] } \therefore dm=\lambda dx$$



Position of centre of mass $x_{CM}=\frac{\int dm\times x}{\int dm}$

$$\frac{\int_0^3(\lambda dx)\times x}{\int_0^3 \lambda dx}=\frac{\int_0^3(2+x)\times xdx}{\int_0^3(2+x)dx}=\frac{\left[x^2+\frac{x^3}{3}\right]_0^3}{\left[2x+\frac{x^2}{2}\right]_0^3}$$

$$=\frac{9+9}{6+\frac{9}{2}}=\frac{36}{21}=\frac{12}{7}\text{m.}$$

43. **(2)** $d\sin\theta=n\lambda$

$$\therefore \lambda=\frac{d\sin\theta}{n}=10^{-4}\times\frac{1}{40}\times\frac{1}{n}$$

$$\therefore \lambda=\frac{2.5\times10^{-6}}{n}=\frac{2500\times10^{-9}}{n}=\frac{2500}{n}\text{ nm}$$

Putting n = 1, $\lambda_1=2500$ nm

$n=2, \lambda_2=1250$ nm

$n=3, \lambda_3=833$ nm

$n=4, \lambda_4=625$ nm

$n=5, \lambda_5=500$ nm

$n=6, \lambda_6=357$ nm

44. **(1)** Distance of closest approach

$$r_0=\frac{Ze(2e)}{4\pi\varepsilon_0\left(\frac{1}{2}mv^2\right)}$$

Energy, $E=5\times10^6\times1.6\times10^{-19}J$

$$\therefore r_0=\frac{9\times10^9\times(92\times1.6\times10^{-19})(2\times1.6\times10^{-19})}{5\times10^6\times1.6\times10^{-19}}$$

$$\Rightarrow r=5.2\times10^{-14}m=5.3\times10^{-12}cm.$$

45. **(3)** n = 2 , $\Delta Q_{cyclic}=-1200$ J

AB : isobaric process

$$\Delta W_{AB}=\Delta T=nR(T_B-T_A)$$

$$=2\times8.3\,(500-300)=3320\text{ J}$$

CA : isochoric process

$$\Delta W_{CA}=0$$

$$\Delta W_{cyclic}=\Delta W_{AB}+\Delta W_{BC}+\Delta W_{CA}=\Delta Q_{cycli}$$

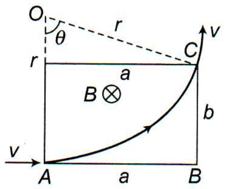
$$3320+\Delta W_{BC}+0=-1200$$

$$\Delta W_{BC}=-4520J.$$

46. **(2)** $I_D=\varepsilon_0\frac{d\phi_E}{dt}=\varepsilon_0\frac{EA}{t}=\varepsilon_0\left(\frac{V}{d}\right)\cdot\frac{A}{t}$

$$=\frac{8.85\times10^{-12}\times400\times60\times10^{-4}}{2\times10^{-3}\times10^{-6}}=1.062\times10^{-2}\text{amp}$$

47. **(1)** Let speed of the particle be v (speed will remain constant)



$r=AO=CO=\frac{mv}{qB}$; Also

$$\frac{a}{r}=\sin\theta, \frac{r-b}{r}=\cos\theta$$

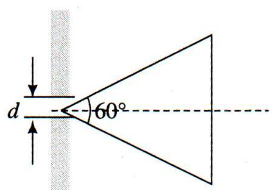
Solving the above equations, we get

$$v=\frac{qB(a^2+b^2)}{2mb}$$

48. **(2)** Due to decreasing current along AB, magnetic flux linked with loop is decreasing. To oppose this decreases, current induced in the loop must be anticlockwise.

49. **(2)** In case of single slit diffraction of d sin 30° = λ

$$d\times\frac{1}{2}=\lambda \text{ or } \lambda=\frac{d}{2}\Rightarrow\lambda=\frac{10^{-6}}{2}\text{ m}$$



We know Young's fringe width $\beta=\frac{D\lambda}{d'}$,

where d' = separation between two slits.

Substituting the corresponding values

$$10^{-2} = \frac{50\times10^{-2}\times10^{-6}}{2d'} = \frac{25\times10^{-8}}{d'},$$

We get d' = 25μm

50. **(2) (A)→(1); (B)→(1); (C)→(2); (D)→(2)**

If V is the potential applied across the capacitor then p.d. across each capacitor will be $\frac{V}{2}$. When

(A) dielectric is inserted in capacitor B, then

(B) $V_1 + V_2 = V$

(C) and $CV_1 = kCV_2$

(D) On solving above equations, we get

$$V_1 = \left(\frac{kV}{k+1}\right) \text{ and } V_2 = \left(\frac{V}{k+1}\right).$$

Clearly potential of A increases and that of B decreases. Initial charges on the capacitors are:

$$q_1 = \frac{CV}{2},\ q_2 = \frac{CV}{2}$$

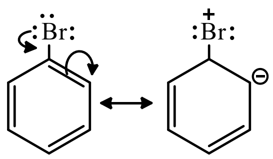
$$\text{charges}:\ q_1 = CV_1 = \frac{kCV}{k+1} \text{ and } q_2 = \frac{CV}{k+1}.$$

Charge on capacitor A will increase, and on B will decrease.

CHEMISTRY

SECTION - A (35 Questions)

51. **(2)** Catalyst brings the equilibrium faster by decreasing the activation energy for both forward and backward reaction.

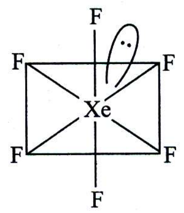
52. **(4)** (II) 

C-X bond is stabilised by resonance.

(III) 3°-alkyl halide undergoes elimination.

53. **(4)** AB_6 E type (:XeF_6) have sp^3d^3 hybridisation with Pbp geometry and it should have pentagonal pyramid shape.

But this case is a exception in which it has distorted OH structure.



54. **(3)** If assertion is true but reason is false

55. **(1)** Alkyl group is +I showing group, In general, it increases the electron density over nitrogen, thus, increase the availability of lone pair for donation. But in case of tertiary amines, in aqueous solution, the over crowing of three bulkier alkyl group result in increased strain, which decreases the availability of lone pairs for donation and thus result in decreased basicity. Hence, in aqueous solution, 3° amines are less basic as compared to 2° amine.

56. **(4)** Some interhalogens are solids and are not volatile.

57. **(3)** Conductivity $= \frac{1}{R}\times\frac{l}{A}$

58. **(2)** Acid which can form mole stable conjugate base is more basic

59. **(2)** Only bonding σs MO's have zero nodal plane.

60. **(1)** Atomic mass

$$= \frac{10\times19+81\times11}{100} = \frac{190+891}{100} = \frac{1081}{100} = 10.81$$

61. **(1)** $LiAlH_4$ reduces both $-\overset{O}{\overset{\|}{C}}-H$, $-\overset{O}{\overset{\|}{C}}-$ and acid ester to alcohol $NaBH_4$ reduces $-\overset{O}{\overset{\|}{C}}-H$, $-\overset{O}{\overset{\|}{C}}-$ without affecting C = C/C ≡ C

62. **(4)** Not more than four hydrogen atoms can be substituted by methyl groups in the molecule of B_2H_6. The bridge hydrogen atoms are not to be substituted.

63. **(1)**

(A) $Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(s) + H_2(g)$

2 mole ER	2 mole LR	0	0
2–1 = 1 mole	2–2 = 0	1 mole	1 mole

(B) $AgNO_3(aq) + HCl(aq) \rightarrow AgCl(s) + HNO_3(g)$

170g	18.25g	0	0
n = 1 mole	0.5 moles		
ER	LR		
1 – 0.5 = 0.5 moles	0.5 – 0.5 = 0 moles	0.5	0.5

(C) $\underset{100g}{CaCO_3(s)} \longrightarrow CaO(s) + w_2(g)$

n = 1 mole 0 0

1 – 1 1 mole 1 mole

= 0

(D) $2KClO_3(s) \longrightarrow 2KCl(s) + 3O_2(g)$

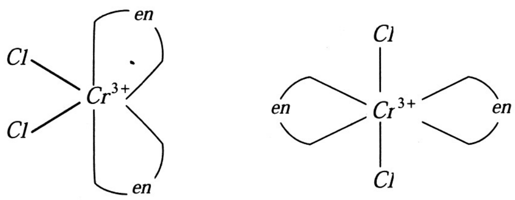
$\frac{2}{3}$ moles 0 0

$\frac{2}{3} - \frac{2}{3}$ $\frac{2}{3}$ moles 1 mole

= 0 mole

64. **(2)** c > b > a

65. **(1)**

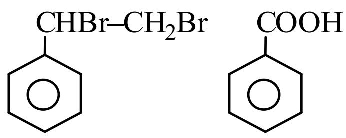


cis- trans-

It contains Cl^- and ethylene diamine as ligands.

66. **(3)** A, D

67. **(4)**



(A) (B)

68. **(1)** Be^{2+} ion is of 2nd period, whereas Mg^{2+} and Na^+ ions are of 3rd period. Size of 3rd period ions is greater than that of 2nd period. Moreveor , more positive charge have lesser size. Therefore, order of sizes is

$$\underset{\text{2nd period}}{Be^{2+}} < \underset{\text{3rd period}}{Mg^{2+} < Na^{\oplus}}.$$

69. **(4)** (I) $N_2 + 3H_2 \rightleftharpoons 2NH_3$ K_1

(II) $N_2 + O_2 \rightleftharpoons 2NO$ K_2

(III) $H_2 + \frac{1}{2}O_2 \rightleftharpoons H_2O$ K_3

(IV) $2NH_3 + \frac{5}{2}O_2 \rightleftharpoons 2NO + 3H_2O$ $K_{aq} = ?$

eq(V) = – eq(I)

(V) $2NH_3 \rightleftharpoons N_2 + 3H_2$ $K_5 = \frac{1}{K_1}$

(VI) = 3eq(I)

(VI) $3H_2 + \frac{3}{2}O_2 \rightleftharpoons 3H_2O$ $K_6 = K_3^3$

eq(II) + eq(V) + eq(VI) is

$$N_2 + O_2 + 2NH_3 + 3H_2 + \frac{3}{2}O_2 \rightleftharpoons 2NO + N_2 + 3H_2 + 3H_2O$$

$$2NH_3 + \frac{5}{2}O_2 \rightleftharpoons 2NO + 3H_2O \quad eq(IV)$$

eq(IV) = eq(II) + eq(V) + eq(VI)

$$\Rightarrow K_4 = K_2 \times K_5 \times K_6 = K_2 \times \frac{1}{K_1} \times K_3^3$$

$$K_4 = \frac{K_2K_3^3}{K_1}$$

70. **(3)** Electrophilic substitution takes place activated ring

71. **(4)** Four coordinate isomers are possible.

(i) $[Cu(NH_3)_2Cl_2][Pt(NH_3)_2Cl_2]$

(ii) $[Pt(NH_3)_4][CuCl_4]$

(iii) $[Cu(NH_3)_3Cl][PtCl_3(NH_3)]$

(iv) $[Pt(NH_3)_3Cl][CuCl_3(NH_3)]$

72. **(2)** Solubility of $BaSO_4(s) = \sqrt{K_{sp}} = \sqrt{10^{-11}}$

$= 3.16 \times 10^{-6}$ mol/L

Solubility of $CaSO_4(s) = \sqrt{K_{sp}} = \sqrt{10^{-6}}$

$= 1.0 \times 10^{-3}$ mol/L

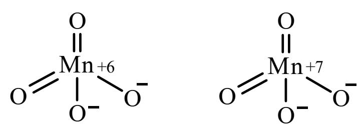
Solubility of $Ag_2SO_4 = \sqrt[3]{\frac{K_{sp}}{4}}$

$(\because Ag_2SO_4, 4s^3 = K_{sp})$

$$= \sqrt[3]{\frac{10^{-5}}{4}} = 1 \times 10^{-2} \text{ mol / L}$$

73. **(4)** Both silica gel and alumina are used as adsorbents in adsorption chromatography.

74. **(3)** Manganate Permanganate



Paramagnetic, green in colour, Tetrahedral & contains pπ-dπ bond

Diamagnetic, purple in colour, Tetrahdral & contains pπ-dπ bond

Manganate ion is paramagnetic while permanganate ion is diamagnetic.

75. **(3)** $W = -P\Delta V = -10^5(1\times10^{-2} - 1\times10^{-3}) = -900\,J$

76. **(4) III > I > IV > II**

77. **(3)** In acidic medium, $\overset{+7}{Mn}O_4^- \longrightarrow Mn^{2+}$ Change in O.N. of Mn = 5.

$\therefore$ Eq. wt. of $KMnO_4$

$$= \frac{\text{Mol.wt.}}{5} = \frac{39+55+64}{5} = \frac{158}{5} = 31.6.$$

78. **(1)** (i)–(b), (ii)–(d), (iii)–(a), (iv)–(e), (v)–(c)

79. **(3)** Balmer series

80. **(2)** As

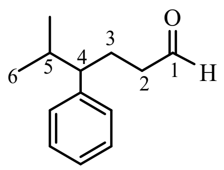
$$E \propto \frac{1}{\lambda} \text{ so } \frac{E_1}{E_2} = \frac{\lambda_2}{\lambda_1}$$

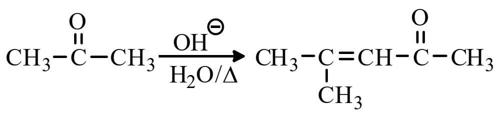
$$\frac{2.5}{5} = \frac{\lambda_2}{\lambda_1} \text{ or } l_1 = 2l_2$$

81. **(2)**

$$CH_3CH_2CHO \xleftarrow[H_2O_2/^-OH]{BH_3/THF} CH_3-C\equiv CH \xrightarrow{HgSO_4/H_2SO_4} CH_3COCH_3$$

82. **(4)** The compound is an aldehyde containing longest chain of 6 C-atoms and side chains.



83. **(2)** 

84. **(1)** In case of $d_{z^2}, d_{x^2-y^2}$, e^- density is along with the axes while in d_{xy}, d_{yz}, d_{xz} it is in between two axis at 45°.

85. **(2)** [Bond angle for ABx molecule]

$$\propto \frac{1}{\text{EN of atom B}}$$

EN of Cl < F. So, bond angle of $NH_3 > NF_3$. Hence I is correct. EN of H < F. So, bond angle of $NH_3 > NF_3$. Hence, III is also correct. Thus, decreasing order of bond angle is :

$NH_3 > NCl_3 > NF_3$. Since EN of H < Cl.

SECTION - B (Attempt Any 10 Questions)

86. **(2)** As total time, $T = n \times t_{1/2}$

$\therefore$ 48 = n × 12 or n = 4

Now from equation, $\left[\frac{A}{A_0}\right] = \left(\frac{1}{2}\right)^n$

$$\Rightarrow \left(\frac{A}{10}\right) = \left(\frac{1}{2}\right)^4 \qquad \Rightarrow \left(\frac{A}{10}\right) = \frac{1}{16}$$

$$\therefore [A] = \frac{10}{16} = 0.625$$

87. **(2)** Alkyl halide (RX) should be 2^0 or 3^0 while alkoxide (RO^-Na^+) should be 1^0

88. **(1)** Na_2O, MgO, Al_2O_3, CuO

89. **(3)** Equal to $\frac{\text{Normal molecular mass}}{\text{Observed molecular mass}}$

90. **(1)** Starch is a polymer of α-glucose

91. **(3)** In group 15 hydrides, the basic character decreaes on going down the group due to decrease in the availability of the lone pair of electrons because of the increase in size of elements from N to Bi. Thus, correct order of basicity is $NH_3 > PH_3 > AsH_3 > SbH_3$.

92. **(2)** $\frac{1}{2}H_2 + \frac{1}{2}Cl_2 \rightarrow HCl$

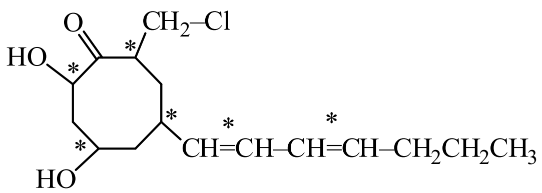
$\Delta H_{HCl} = \Sigma$ B.E. of reactant

$-\Sigma$ B.E. of products

$$-90 = \frac{1}{2}\times430 + \frac{1}{2}\times240 - \text{B.E. of HCl}$$

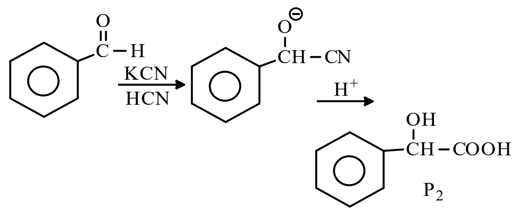
$\therefore$ B.E. of HCl = 215 + 120 + 90 = 425 kJ mol^{-1}

93. **(4)**



Total isomer = 2^6 = 64

94. **(2)** $\overset{+5}{NO_3^-} \longrightarrow \overset{-2}{N_2H_4}$; $+e^- \times 1 = +7e^-$

95. **(3)** 

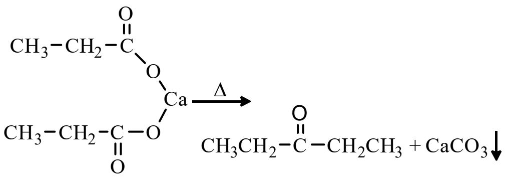
96. **(4)** $[Co(CN)_6]^{-3}$ (Tetrahedral)
O.N. of Co = +3
Co^{+3} = $4s^0 3d^6$, CN^- is strong field ligand so hybridisation is d^2sp^3 and has no unpaired electrons.

97. **(2)** $\lambda = \frac{h}{mv} = \frac{6.626\times10^{-34}\,Js}{0.01kg\times100ms^{-1}} = 6.626\times10^{-34}$ m

98. **(4)** Aromatic aldehyde does not reduced by Fehling's reagent

99. **(2)** Lattice energy of the carbonates of group 2 elements decreases down the group (↓), due to decrease in charge density of cations.

100. **(2)**



BOTANY

Section - A (35 Questions)

101. **(1)** [NCERT class XI, Page no. 93, Point 6.3.5]
102. **(3)** (NCERT XII, Pg 82, Para 3, line 2; Pg 83, Para 2, line 7;Pg 88, Para 3, line 1; Pg 91, Para 2, line 6; Pg 94, Para 1, line 2;)
103. **(4)** (NCERT XII, Pg 120, Para 1, Line 1)
104. **(2)** (NCERT XII, Pg 83, Concept- Linkage)
105. **(1)** [NCERT XI, Page 250, point 15.4.3.4]
106. **(3)** (NCERT XI Pg.234, 145)
107. **(4)** (NCERT XI Pg.228, 14.2)
108. **(1)** (11th NCERT old ,page no.35 last para)
109. **(1)** (12th NCERT Page no.248-249 conceptual)
110. **(2)** (NCERT XII, Pg 81, Para 3, Line 8)
111. **(2)** (NCERT XII, Pg 90, Para 4,5)
112. **(3)** (NCERT XII, Pg 80, Concept- Law of independent assortment)
113. **(3)** (11th NCERT PK Conceptual)
114. **(2)** (NCERT 12th, Page no- 23, 2nd paragraph, Line no- 22, 23)
115. **(3)** [NCERT XI, page no. 248, Point no.- 15.4.3.1, page no. 249, Point no. 15.4.3.2 and page no. 250, Point 15.4.3.5]
116. **(1)** (11th Para 8.1,8.2, Page no. 125,126)
117. **(4)** (NCERT 11th, page no- 9, Last paragraph, Line no- 30, 31, 32)
118. **(3)** (NCERT XII, Pg 89, 5.8.2 Mendelian Disorders)
119. **(3)** (NCERT XI; Sub-topic 5.5.1.3 and 5.9.3)
120. **(1)** (NCERT XI Page No. 76; Sub-topic 5.6. conceptual)
121. **(4)** (NCERT XI Page No.79; Sub-topic 5.9.1)
122. **(1)** (NCERT 11th, Page no- 19, 3rd paragraph, Concept based)
123. **(1)** NCERT Page no- 34, Figure- 2.13(b)
124. **(4)** (NCERT XI Pg. No. 211, 13.5, 213, 13.6.3)
125. **(3)** (NCERT XI Pg. No. 218 table above 13.8)
126. **(3** (11th Para 10.2.4,10.2.1, Page no. 166,164)
127. **(1)** (NCERT XII, Pg 92, last Para)
128. **(4)** (NCERT 12th, page no- 34, 1st paragraph, Line no-3 and 4)
129. **(4)** (11th Para 10.2.4, Page no. 166)
130. **(2)** [NCERT class XI, Page no. 91, Point 6.3.2]
131. **(4)** (11th NCERT Page no.36 and 37)
132. **(2)** NCERT Page no- 24, Paragraph- 2.3.4, Line no- 29,30
133. **(3)** NCERT page no- 20, Paragraph- 2.2.1, Line no- 30
134. **(3)** (11th Para 8.3, Page no. 126)
135. **(4)** (11th Para 8.5.2, Page no.132)

SECTION - B (Attempt Any 10 Questions)

136. **(1)** [NCERT class XI, Page no. 86, Point 6.1.2.1, Page no. 94, Line number- 06-09, Page no. 91 (Line no.- 05-08), Page no. 93- Point- 6.3.5]
137. **(2)** (NCERT XI Pg.232, 14.3)
138. **(4)** (12th NCERT Conceptual)
139. **(4)** (NCERT XII, Pg 116, Para 3, line 3)
140. **(3)** (NCERT XII, Hardy Weinberg Concept.)
141. **(2)** (11th Para 8.5.3.2, Page no.133, 134)
142. **(3)** (NCERT 11th, Page no- 23, 2nd paragraph, Line no- 26, 27, 28, 29)
143. **(2)** (NCERT 11th, Page no- 10, 1st paragraph, Line no- 9)
(NCERT 11th, Page no- 11, Table-1.1)

144. **(1)** (NCERT 12th, Page no- 35, Figure- 2.14 (b))
145. **(3)** (11th Para10.4.1, Page no. 168)
146. **(1)** (NCERT XII, Pg 85, Para 2, Line 8)
147. **(4)** (NCERT XI Pg. No. 208, 2nd paragraph)
148. **(3)** (NCERT XI Page No.71; Sub-topic 5.3.3)
149. **(1)** (11th NCERT PK ,CONCEPTUAL)
150. **(2)** (NCERT XII, Pg 118, Goals of HGP- Point vi.)

ZOOLOGY

Section - A (35 Questions)

151. **(3)** (NCERT Conceptual)

     (NCERT XI Page No. 334, Last line of 1st paragraph)

     (NCERT XI Page No. 338, 2nd paragraph)
152. **(4)** (NCERT XI Page No. 56; Class-chondrichthyes)
153. **(4)** [NCERT Practical Syllabus P. No.128 , Point iii]
154. **(4)** [NCERT P. No.312 2nd para 2nd Line]
155. **(3)** (12th NCERT page no.261,15.1.2 1st para)
156. **(3)** (12th NCERT Page no.266 to 267)
157. **(3)** [NCERT P. No.308 Last Para]
158. **(4)** [NCERT P. No.317 Last 3rd Line]
159. **(2)** (NCERT XI Page No. 59, Class - mammalia)
160. **(3)** (NCERT XI Page No. 58; 4.2.11.5)
161. **(3)** [NCERT P. No.318 1st three lines]
162. **(1)** [NCERT P.No.208, Pest resistant Plants]
163. **(2)** [NCERT P.No.208, 2nd para]
164. **(3)** [NCERT P.No.212, 3rd para]
165. **(4)** (NCERT 12th, p.no. 62, para3, line7)
166. **(3)** (NCERT P.No. 149)
167. **(1)** (NCERT XI Page No. 337, 2nd paragraph)
168. **(3)** (NCERT XI Page No. 297, 2nd paragraph of 19.5)
169. **(3)** (12th NCERT,Page no.236 to 238)
170. **(1)** (NCERT 12th, p.no.51, para 1, line5)
171. **(4)** (12th Para10.2.3 , Page no.183)
172. **(3)** (NCERT based - applied)
173. **(1)** (NCERT12th, p.no.60, para1, line7)
174. **(3)** (NCERT11th page no 114, para 3, line 8)
175. **(3)** (NCERT 11th page116, para4, line3)
176. **(4)** (NCERT P.No. 158 - Drug & Alcohol abuse)
177. **(3)** (NCERT Pg.274)
178. **(4)** (NCERT 12th, Page no- 135, 3rd paragraph, Line no- 1 and 2)
179. **(4)** (NCERT 12th, Page no- 129, Last paragraph, Concept based)
180. **(3)** (NCERT 12th, Page no- 142, Summary)
181. **(3)** (NCERT P.No. 282 - Circulatory pathway)
182. **(1)** NCERT 11th, Page no-159, Paragraph-9.12.6, Line no-1-6
183. **(4)** NCERT 11th, Page no-,159 Paragraph-9.12.6, Line no-16,17
184. **(1)** (12th Para10.2.3, 10.5, Page no.183, 187)
185. **(4)** (NCERT Pa. No.155)

SECTION - B (Attempt Any 10 Questions)

186. **(4)** (NCERT XI Page No. 295, 1st paragraph)
187. **(3)** [NCERT P. No.312 Disorders 1st Line]
188. **(3)** [NCERT P. No.321 Midbrain 2nd Line]
189. **(2)** [NCERT P.No.203 last para , P-204 1st para,]
190. **(2)** (NCERT 11th page 102, 7.1.2 Connective Tissue)
191. **(3)** (NCERT 12th, Page no- 135, 3rd paragraph, Line no- 18, 19, 20, 21)
192. **(3)** NCERT 11th, Page no-154, Paragraph-9.12, Line no-1 and 2
193. **(1)** (NCERT based - applied)
194. **(4)** (NCERT P.No. 158 -159 drug & alcohol abuse)
195. **(4)** (NCERT 12TH HR)
196. **(3)** (12th NCERT Page no.232. table no.13.1)
197. **(2)** (NCERT 12th, p.no.45, para 1)
198. **(2)** (NCERT 12th, page 59, para 2)
199. **(2)** (NCERT Pg.285)
200. **(2)** (12th Para 10.6 /Page no.188)