P ANSWER KEY & SOLUTION KEY FINAL ROUND - 13 (PCB) Dt.22.04.2024

PHYSICS

SECTION - A (35 Questions)

01. **(1)** When the angle of refraction is equal to 90°, the angle of incidence is called the critical angle.

02. **(1)** Distance, $x = (t+5)^{-1}$ ....(i)

Velocity, $v = \frac{dx}{dt} = \frac{d}{dt}(t+5)^{-1} = -(t+5)^{-2}$ ....(ii)

Acceleration, $a = \frac{dv}{dt} = \frac{d}{dt}[-(t+5)^{-2}] = 2(t+5)^{-3}$ ..(iii)

From equation (ii), we get

$v = -(t+5)^{-3}$

Substituting this in equation (ii), we get

Acceleration, $a = -2v^{3/2}$ or $a \propto (\text{velocity})^{3/2}$

From equation (i), we get $x^3 = (t+5)^{-3}$

Substituting this in equation (ii), we get

Acceleration, $a = 2x^3$ or $a \propto (\text{distance})^3$

Hence option (1) is correct.

03. **(2)** The formula of drift velocity is $v_d = \frac{eE}{m}\tau$

Current density $I = \frac{I}{A} = \frac{neAv_d}{A} = nev_d$

Resistivity is $\rho = \frac{m}{ne^2\tau} \Rightarrow \tau = \frac{m}{ne^2\rho}$

Resistance is $R = \frac{V}{I}$

$\rho\frac{l}{A} = \frac{El}{I} \Rightarrow \rho = \frac{EA}{I} = \frac{E}{J}.$

where, E = electric field, A = area of cross section

e = electronic charge, n = number of density of electrons, τ = relaxation time.

04. **(1)** Use $v^2 = \frac{2gh}{1+\frac{h}{R}}$ given $h = R$.

$\therefore v = \sqrt{gR} = \sqrt{\frac{GM}{R}}.$

05. **(3)** Above Curie temperature, there is a change from ferromagnetic to paramagnetic behavior.

06. **(4)**

07. **(4)** Given : $i = \frac{1}{\sqrt{2}}\sin(100\pi t)\,ampere$

Compare it with $i = i_0\sin(\omega t)$, we get

$i_0 = \frac{1}{\sqrt{2}}$ A

Given : $e = \frac{1}{\sqrt{2}}\sin\left(100\pi t + \frac{\pi}{3}\right) volt$

Compare it with $e = e_0\sin(\omega t + \phi)$, we get

$e_0 = \frac{1}{\sqrt{2}}\text{V}, \phi = \frac{\pi}{3}$

$\therefore i_{rms} = \frac{i_0}{\sqrt{2}} = \frac{1}{2}\text{A}$ and $e_{rms} = \frac{e_0}{\sqrt{2}} = \frac{1}{2}\text{V}.$

Average power consumed in the circuit,

$P = i_{rms}e_{rms}\cos\phi$

$= \left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\cos\frac{\pi}{3} = \left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right) = \frac{1}{8}W.$

08. **(3)** Here, $\vec{F} = (3\hat{i} + \hat{j})$N

Initial position, $\vec{r}_1 = (2\hat{i} + \hat{k})$m

Final position, $\vec{r}_2 = (4\hat{i} + 3\hat{j} - \hat{k})$m

Displacement, $\vec{r} = \vec{r}_2 - \vec{r}$

$\vec{r} = (4\hat{i} + 3\hat{j} - \hat{k}) - (2\hat{i} + \hat{k}) = (2\hat{i} + 3\hat{j} - 2\hat{k})m$

Work done, $W = \vec{F}.\vec{r} = (3\hat{i} + \hat{j}).(2\hat{i} + 3\hat{j} - 2\hat{k})$

$= 6 + 3 = 9$ J.

09. **(3)** When electron jumps from higher orbit to lower orbit then, wavelength of emitted photon is give by,

$$\frac{1}{\lambda} = R\left(\frac{1}{n_f^2} - \frac{1}{n_i^2}\right)$$

so $\frac{1}{\lambda} = R\left(\frac{1}{2^2} - \frac{1}{3^2}\right) = \frac{5R}{36}$ and

$$\frac{1}{\lambda'} = R\left(\frac{1}{3^2} - \frac{1}{4^2}\right) = \frac{7R}{144}$$

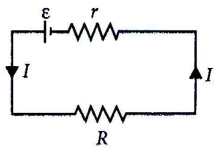
$$\therefore \lambda' = \frac{144}{7} \times \frac{5\lambda}{36} = \frac{20}{7}\lambda.$$

10. **(4)** Equal masses after elastic collision interchange their velocities. – 5 m/s and + 3 m/s.

11. **(3)** Current in the circuit, $I = \frac{\varepsilon}{R+r}$

Potential difference across R,

$$V = IR = \left(\frac{\varepsilon}{R+r}\right)R$$



$V = \frac{\varepsilon}{1+\frac{r}{R}}$, When $R = 0$, $V = 0$, $R = \infty$, $V = \varepsilon$.

Hence, option (3) represents the correct graph.

12. **(3)** $y = A_0 + A\sin\omega t + B\cos\omega t.$

or $(y - A_0) = A\sin\omega t + B\cos\omega t$ or

$$y' = A\sin\omega t + B\cos\omega t = A\cos\left(\frac{\pi}{2} - \omega t\right) + B\cos\omega t$$

$$\text{Amplitude} = \sqrt{A^2 + B^2 + 2AB\cos\frac{\pi}{2}} \quad \left(\because \phi = \frac{\pi}{2}\right)$$

$$= \sqrt{A^2 + B^2}.$$

13. **(1)** Here, Resistance of galvanometer, G = 100 Ω

Current for full scale deflection, I_g = 30 mA

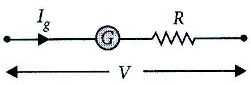
= 30 × 10^{-3} A

Range of voltmeter, V = 30 V

To convert the galvanometer into an voltmeter of a given range, a resistance R is connected in series with it as shown in the figure.

From figure, $V = I_g(G + R)$

or $R = \frac{V}{I_g} - G$

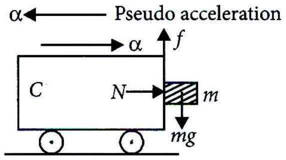


$$R = \frac{30}{3 \times 10^{-3}} - 100\Omega = 1000 - 100 = 900\Omega.$$

14. **(3)** Pseudo force or fictious force, $F_{fic} = m\alpha$

Force of friction, $f = \mu N = \mu m\alpha$

The block of mass m will not fall as long as



$f \geq mg$; $\mu m\alpha \geq mg \quad \Rightarrow \alpha \geq \frac{g}{\mu}.$

15. **(4)** Binding energy of ${}^7_3Li$ nucleus

= 7 × 5.60 MeV = 39.2 MeV

Binding energy of ${}^4_2He$ nucleus

= 4 × 7.06 MeV = 28.24 MeV

The reaction is

$${}^7_3Li + {}^1_1H \longrightarrow 2({}^4_2He) + Q$$

$$\therefore Q = 2(\text{BE of } {}^4_2He) - (\text{BE of } {}^7_3Li)$$

= 2 ×28.24 MeV – 39.2 MeV

= 56.48 MeV – 39.2 MeV = 17.28 MeV.

16. **(3)** Mass of water falling / second = 15 kg/s

h = 60m, g = 10m/s^2, loss = 10% i.e., 90% is used.

Power generated = 15 × 10 × 60 × 0.9 = 8100 W

= 8.1 kW.

17. **(3)** The stopping potential V_s is related to the maximum kinetic energy of the emitted electrons K_{max} through the relation $K_{max} = eV_s$

0.5 eV = eV_s or V_s = 0.5 V.

18. **(1)** For a point inside the earth i.e. $r < R$

$E = -\frac{GM}{R^3}r$, where M and R be mass and radius of the earth respectively.

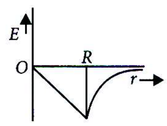
At the centre, $r = 0$

$\therefore E = 0$

For a point outside the earth i.e. $r > R$,

$$E = -\frac{GM}{r^2}$$

On the surface of the earth i.e. $r = R$,



$$E = -\frac{GM}{R^2}$$

The variation of E with distance r from the centre is as shown in the figure.

19. **(3)** $E_{medium} = \frac{E_{vacuum}}{K}$

The electric field inside the dielectrics will be less than the electric field in vacuum. The electric field inside the dielectric could not be zero. As, $K_2 > K_1$ the drop in electric field for K_2 dielectric must be more than K_1.

20. **(2)**

21. **(1)** $y = 0.25\sin(10\pi x - 2\pi t)$,

$$y_{max} = 0.25, k = \frac{2\pi}{\lambda} = 10\pi \Rightarrow \lambda = 0.2\text{m}$$

$$\omega = 2\pi f = 2\pi \Rightarrow f = 1Hz$$

The sign is negative inside the bracket. Therefore this wave travels in the positive x-direction.

22. **(4)** $|V| = \left|-L\frac{dI}{dt}\right|$

$|V| \propto$ slope of I - t graph.

23. **(2)** The instantaneous voltage, $V = V_0 \sin\omega t$ .....(i)

Displacement current is given by $i_d = \frac{CdV}{dt}$

$$i_d = \frac{Cd}{dt}(V_0 \sin\omega t) \quad \Rightarrow i_d = CV_0\omega\cos\omega t.$$

24. **(1)** Given, $T_2 = 4°C = 277$ K, $T_1 = 30°C = 303$ K

$Q_2 = 600$ cal per second.

Coefficient of performance, $\alpha = \frac{T_2}{T_1 - T_2}$

$$= \frac{277}{303-277} = \frac{277}{26}$$

Also, $\alpha = \frac{Q_2}{W}$

$\therefore$ Work to be done per second = power required

$$W = \frac{Q_2}{\alpha} = \frac{26}{277} \times 600 \text{ cal per second}$$

$$= \frac{26}{277} \times 600 \times 4.2 \text{ J per second} = 236.5 \text{ W}.$$

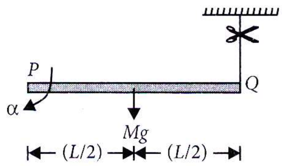
25. **(4)** Yes, the bridge will work. For a balanced condition, the current drawn from the battery will be zero. Also, $P \propto l_1$ and $Q \propto l_2$. Therefore, the condition $\frac{P}{Q} = \frac{l_1}{l_2}$ will remain same after interchanging the cell and galvanometer.

26. **(4)** Motional emf induced in the semicircular ring PQR is equivalent to the motional emf induced in the imaginary conductor PR.

i.e., $\varepsilon_{PQR} = \varepsilon_{PR} = Bvl = Bv(2r) \quad (l = PR = 2r)$

Therefore, potential difference developed across the ring is $2rBv$ with R at higher potential.

27. **(3)**



When the string is cut, the rod will rotate about P. Let α be initial angular acceleration of the rod. Then

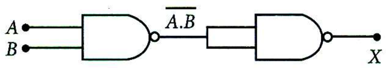
Torque, $\tau = I\alpha = \frac{ML^2}{3}\alpha$ ....(i)

Also, $\tau = Mg\frac{L}{2}$ ....(ii)

Equating (i) and (ii), we get

$$Mg\frac{L}{2} = \frac{ML^2}{3}\alpha \Rightarrow \alpha = \frac{3g}{2L}.$$

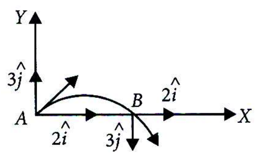
28. **(1)**



The output of the given logic circuit is

$$X = \overline{\overline{A.B}} = A.B.$$

29. **(1)**



At point B, X component of velocity remains unchanged while Y component reverse its direction.

$\therefore$ The velocity of the projectile at point B is $2\hat{i} - 3\hat{j}$ m/s.

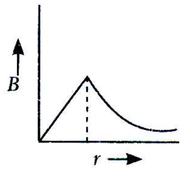
30. **(4)**

31. **(4)** By Ampere's circuital law,

$\oint \vec{B}.d\vec{l} = \mu_0 \times$ current losed by path

$$\Rightarrow B.2\pi r = \mu_0 \times \frac{Ir^2}{a^2} \quad (\because R = a)$$

At surface $r = a$, so $B = \frac{\mu_0 I}{2\pi a}$



$$\therefore B = \frac{\mu_0 I}{2\pi r} \quad (\text{for } r > a)$$

The variation of magnetic field with distance r from the axis is given by.

32. **(2)** The intensity of transmitted light through P_1,

$$I_1 = \frac{I_0}{2}$$

The intensity of transmitted light through P_3,

$$I_2 = I_1 \cos^2 45° = \frac{I_0}{2}\left(\frac{1}{\sqrt{2}}\right)^2 = \frac{I_0}{2}.\frac{1}{2} = \frac{I_0}{4}$$

Angle between polariods P_3 and P_2

$$= (90° - 45°) = 45°.$$

$\therefore$ Intensity of transmitted light through P_2,

$$I_3 = I_2 \cos^2 45° = \frac{I_0}{4}\left(\frac{1}{\sqrt{2}}\right)^2 = \frac{I_0}{8}.$$

33. **(1)** Second excited state corresponds to $n = 3$

Energy needed to ionize,

$$E = \frac{13.6}{3^2}\text{eV} = 1.51\text{eV}.$$

34. **(3)** In a uniformly charged hollow conducting sphere,

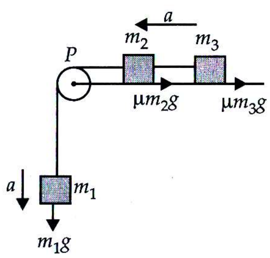
(i) for $r < R$, $\vec{E} = 0$

(ii) for $r > R$, $\vec{E} = \frac{1}{4\pi\varepsilon_0}\frac{Q}{|\vec{r}^2|}\hat{r}; \vec{E}$ decreases.

35. **(3)** Force of friction on mass $m_2 = \mu m_2 g$

Force of friction on mass $m_3 = \mu m_3 g$

Let a be common acceleration of the system.



$$\therefore a = \frac{m_1 g - \mu m_2 g - \mu m_3 g}{m_1 + m_2 + m_3}$$

Here, $m_1 = m_2 = m_3 = m$

$$\therefore a = \frac{mg - \mu mg - \mu mg}{m + m + m} = \frac{mg - 2\mu mg}{3m} = \frac{g(1-2\mu)}{3}$$

Hence, the downward acceleration of mass m_1 is $\frac{g(1-2\mu)}{3}$.

SECTION - B (Attempt Any 10 Questions)

36. **(2)** For first minimum, the path difference between extreme waves,

$$a \sin\theta = \lambda$$

Here $\theta = 30° \Rightarrow \sin\theta = \frac{1}{2}$

$$\therefore a = 2\lambda \quad \text{..........(i)}$$

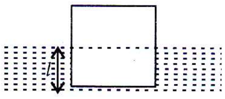
For first secondary maximum, the path difference between extreme waves

$$a \sin\theta' = \frac{3}{2}\lambda \text{ or } (2\lambda)\sin\theta' = \frac{3}{2}\lambda \text{ [Using eqn (i)]}$$

or $\sin\theta' = \frac{3}{4}$ $\qquad \therefore \theta' = \sin^{-1}\left(\frac{3}{4}\right)$.

37. **(3)** Let t be the length of block immersed in liquid as shown in the figure.

When the block is floating,



$$\therefore mg = Al\rho g$$

If the block is given vertical displacement y then the effective restoring force is

$$F = -[A(l+y)\rho g - mg] = -[A(l+y)\rho g - Al\rho g]$$

$$= -A\rho gy$$

Restoring force $= -[A\rho g]y$. As this F is directed towards equilibrium position of block, so it will execute simple harmonic motion.

Here inertia factor = mass of block = m

Spring factor $= A\rho g$

$$\therefore \text{ Time period, } T = 2\pi\sqrt{\frac{m}{A\rho g}} \quad i.e., T \propto \frac{l}{\sqrt{A}}.$$

38. **(2)** Let q be the charge on each capacitor.

$$\therefore \text{ Energy stored, } U = \frac{1}{2}CV^2 = \frac{1}{2}\frac{q^2}{C}$$

Now, when battery is disconnected and another capacitor of same capacity is connected in parallel to the first capacitor, then voltage across each capacitor, $V=\frac{q}{2C}$

$\therefore$ Energy stored in each capacitor,

$$=\frac{1}{2}C\left(\frac{q}{2C}\right)^2=\frac{1}{4}\cdot\frac{1}{2}\frac{q^2}{C}=\frac{1}{4}U.$$

39. **(1)** According to law of conservation of angular momentum $m\,v\,r=m\,v'\,r'$

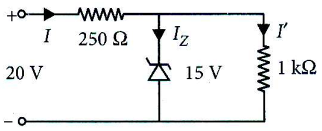
$$v_0R_0=v\left(\frac{R_0}{2}\right);\ v=2v_0\ \text{.........(i)}$$

$$\therefore\ \frac{K_0}{K}=\frac{\frac{1}{2}mv_0^2}{\frac{1}{2}mv^2}=\left(\frac{v_0}{v}\right)^2$$

$$\text{or}\ \frac{K}{K_0}=\left(\frac{v_0}{v}\right)^2=(2)^2\ \ \text{(Using (i))}$$

$$K=4K_0=2mv_0^2.$$

40. **(1)**



The voltage drop across $1k\Omega=V_Z=15V$

The current through $1k\Omega$ is

$$I'=\frac{15\text{V}}{1\times10^3\Omega}=15\times10^{-3}\text{A}=15\text{mA}$$

The voltage drop across $250\,\Omega=20\text{V}-15\text{V}=5\text{V}$

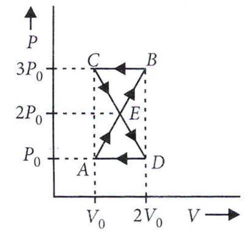
The current through $250\,\Omega$ is

$$I=\frac{5\text{V}}{250\Omega}=0.02\text{A}=20\text{mA}$$

The current through the Zener diode is

$$I_Z=I-I'=(20-15)=5\text{mA}.$$

41. **(4)** In a cyclic process work done is equal to the area under the cycle and is positive if the cycle is clockwise and negative if cycle is anticlockwise.



As is clear from figure,

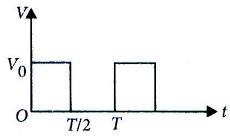
$$W_{AEDA}=+\text{area of }\Delta AED=+\frac{1}{2}P_0V_0$$

$$W_{BCEB}=-\text{area of }\Delta BCE=-\frac{1}{2}P_0V_0$$

The net work done by the system is

$$W_{net}=W_{AEDA}+W_{BCEB}=+\frac{1}{2}P_0V+-\frac{1}{2}P_0V_0=zero.$$

42. **(3)** $V=V_0$ for $0\le t\le\frac{T}{2}$



$$V_{rms}=\left[\frac{\int_0^T V^2dt}{\int_0^T dt}\right]^{1/2}=\left[\frac{\int_0^{T/2}V_0^2dt+\int_{T/2}^{T}(0)dt}{\int_0^T dt}\right]^{1/2}$$

$$=\left[\frac{V_0^2}{T}[t]_0^{T/2}\right]^{1/2}=\left[\frac{V_0^2}{T}\left(\frac{T}{2}\right)\right]^{1/2}=\left[\frac{V_0^2}{2}\right]^{1/2}$$

$$\therefore V_{rms}=\frac{V_0}{\sqrt{2}}.$$

43. **(2)** Second overtone of an open organ pipe

$$\text{(Third harmonic)}=3\times\upsilon'_0=3\times\frac{v}{2L'}$$

First overtone of a closed organ pipe

$$\text{(Third harmonic)}=3\times\upsilon_0=3\times\frac{v}{4L}$$

According to equestion,

$$3\upsilon'_0=3\upsilon_0\Rightarrow3\times\frac{v}{2L'}=3\times\frac{v}{4L}$$

$$\therefore L'=2L.$$

44. **(3)** Electric field is always direct from high potential to low potential. For the given situation the electric potential is decreasing from left to right therefore, potential energy of the dipole will also decrease. Thus dipole will move from towards the right.

45. **(2)** Angular momentum about the point of contact with the surface includes the angular momentum about the centre. Because of friction, linear momentum will not be conserved.

46. **(3)** Angle of magnet $(\theta) = 90°$ and $60°$.

Work done in turning the magnet through 90°

$W_1 = MB(\cos 0° - \cos 90°) = MB(1-0) = MB.$

Similarly,

$$W_2 = MB(\cos 0° - \cos 60°) = MB\left(1-\frac{1}{2}\right) = \frac{MB}{2}.$$

Therefore, $W_1 = 2W_2$ or $n = 2$.

47. **(4)** The rms velocity is, $v_{rms} = \sqrt{\frac{3RT}{M}}$

where, R is a gas constant, M = molecular mass, T = absolute temperature. So, $A \to Q$

Pressure exerted by ideal gas is $\frac{1}{3}mn\overline{v}^2$, where m is mass of each molecule, n = number of molecules, $\overline{v}^2$ = rms speed. So, $B \to P$.

Average kinetic energy of a molecule $\frac{3}{2}k_BT$

where, k_B = Boltzmann's constant. T = absolute temperature. $C \to S$.

Total internal energy of 1 mole of a diatomic gas, $U = \frac{5}{2}RT$. $D \to R$.

48. **(4)** Given, $i = 45°, A = 60°$

Since the ray undergoes minimum deviation,

$\therefore$ angle of emergence from second face, $e = i = 45°$

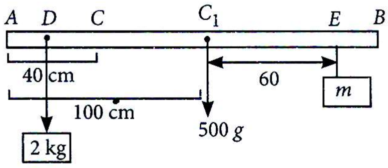
$\therefore \delta_m = i + e - A = 45° + 45° - 60° = 30°$

$$\mu = \frac{\sin\left(\frac{A+\delta_m}{2}\right)}{\sin\left(\frac{A}{2}\right)} = \frac{\sin\left(\frac{60°+30°}{2}\right)}{\sin\left(\frac{60°}{2}\right)}$$

$$\mu = \frac{\sin 45°}{\sin 30°} = \frac{1}{\sqrt{2}} \times \frac{2}{1} = \sqrt{2}.$$

49. **(1)** Here, AD = 20cm, AE = 160 cm, g = 10 m/s^2

Take moments about C



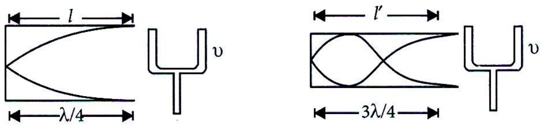
Clockwise moment = Anticlockwise moment

$2 \times g \times DC = 0.50 \times g \times CC_1 + m \times g \times CE$

or $2 \times (40 - 20) = 0.500\,(100 - 40) + m \times (60 + 60)$

or $40 - 30 = 120m$ or $m = \frac{1}{12}kg.$

50. **(1)** From figure,



First harmonic is obtained at $l = \frac{\lambda}{4} = 50\text{cm}$

Third harmonic is obtained for resonance,

$$l' = \frac{3\lambda}{4} = 3 \times 50 = 150\text{cm}$$

CHEMISTRY

SECTION - A (35 Questions)

51. **(3)** Carbon has the maximum oxidation state of +4, therefore carbon dioxide (CO_2) cannot act as a reducing agent.

52. **(3)** Relative lowering of vapour pressure depends upon the mole fraction of solute.

i.e., $\frac{P° - P}{P°}$ = mole fraction of solute

53. **(3)** $PCl_5 \to sp^3d \to$ T.B.P

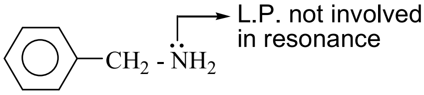
$SF_6 \to sp^3d^2 \to$ octahedral

$BF_3 \to sp^2 \to$ T. Planar

$BrF_5 \to sp^3d^2 \to$ Sq. pyramidal

54. **(4)** Stability $\propto$ Bond order

$O_2^{2+} > O_2^{+} > O_2 > O_2^{-} > O_2^{2-}$

55. **(2)** 

56. **(2)** α-D-Glucose + β-D-Fructose

57. **(4)** ΔG is negative for a spontaneous process.

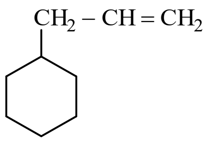
58. **(3)** A-IV, B-III, C-II, D-I

59. **(4)** C_2 consist of both π bonds because of presence if four eelectrons in two π molecular bonding orbitals.

60. **(2)** $[Ni(CO)_4]$ Coordination no = 4, Oxidation no. of Ni = 0

$$Ni = 3d^{o}, 4s^{2} \xrightarrow{SFL} 3d^{10}, 4s^{o}$$

$$\rightarrow sp^{3} \rightarrow \text{tetrahedral} \rightarrow \text{dia}$$

61. **(2)** 

62. **(4)** X = 1-butyne ; Y = 3 - hexyne

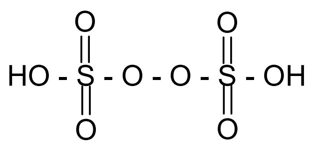
63. **(4)** HNO_2 is a weak acid and $NaNO_2$ is salt of that weak acid and strong base (NaOH).

64. **(1)** Let x = oxidation no. of Cr in $K_2Cr_2O_7$.

$\therefore (2 \times 1) + (2 \times x) + 7(-2) = 0$

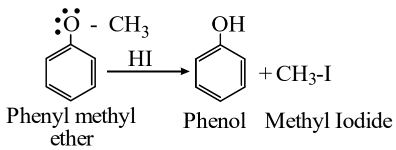
or $2 + 2x - 14 = 0$ or $x = +6$.

65. **(3)** If compound dissociates in solvent $i > 1$ and on association $i < 1$.

66. **(3)** 

Peroxodisulphuric acid

67. **(4)** Most of the trivalent Lanthanoid ions are colorless in the solid state.

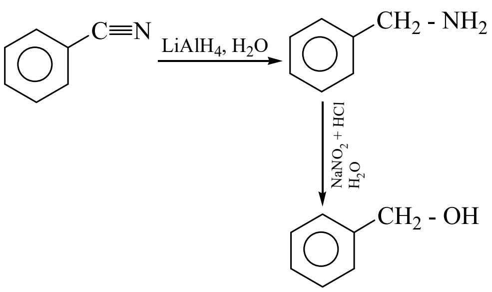
68. **(2)** 

69. **(1)** During the electrolysis of dil. sulphuric acid using Pt electrodes following reaction occurs.

At cathode : $4H^{+}(aq) + 4e^{-} \rightarrow 2H_2(g)$

At anode : $2H_2O(l) \rightarrow O_2(g) + 4H^{+}(aq) + 4e^{-}$

70. **(1)** Geometrical isomerism

71. **(3)** 

72. **(3)** Millimoles of $AgNO_3$ solution $= 10 \times 0.1 = 1$

So, the millimoles of $AgNO_3$ are double than the chloride solution.

$\therefore XCl_2 + 2AgNO_3 \longrightarrow 2AgCl + X(NO_3)_2$

73. **(4)** Atomic size of Ga is less than Al because d-block contraction.

74. **(3)** From Arrhenius equation

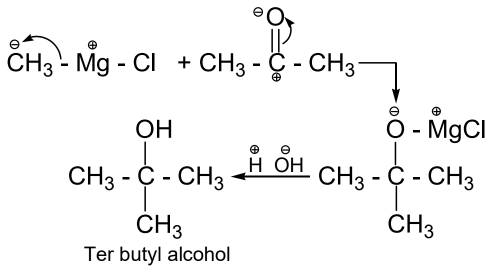
$$\log \frac{k_{400}}{k_{200}} = \frac{E_a}{2.303R}\left[\frac{T_2 - T_1}{T_1T_2}\right]$$

$$\therefore \log \frac{k_{400}}{k_{200}} = 0$$

$$\Rightarrow \frac{k_{400}}{k_{200}} = 1$$

So, $k_{400} = k_{200}$

So rate constant at 400, $k = 1.6 \times 10^{6}\ s^{-1}$

75. **(2)** 

76. **(3)** $n = 3 \rightarrow 3^{rd}$ shell

$l = 1 \rightarrow$ p sub shell

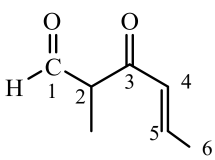
$m = -1$ is possible for two electrons present in an orbital.

77. **(3)** For an endothermic reaction, activation energy is always more than change in enthalpy.

78. **(2)** If atom contain full or half filled e^{-} configuration they are more stable

Eg. 1) Be = 4, $1s^2 2s^2$ > Be = 5, $1s^2 2s^2 2P^1$

2) N = 7, $1s^2 2s^2 2P^3$ > O = 8, $1s^2 2s^2 2P^4$

79. **(4)** 

3-Keto-2-methylhex-4-enal

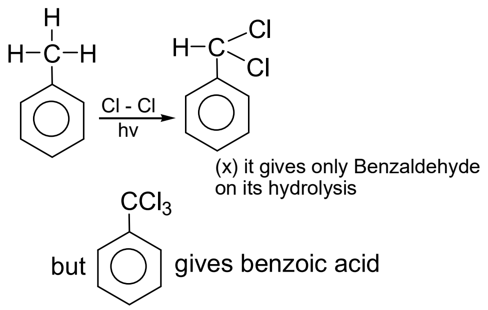
80. **(2)** 4

81. **(3)** A is false but R is true

The correct form of A is

If H_2S gas is passed through the acidic solution (containing Cu^{2+}, Pb^{2+} and Zn^{2+} cation), then only Cu^{2+} and Pb^{2+} will precipitate as sulphide because of insufficient concentration of S^{2-}.

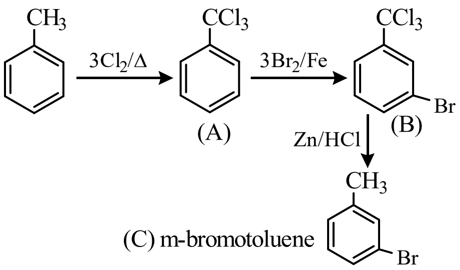
82. **(2)**



83. **(3)** If reaction is S_N1, there will be the formation of carbocation and the rearrangement takes place.

In these reactions there is no rearrangement hence both are S_N2 mechanism.

84. **(1)**



85. **(2)** (i) - d, (ii) - c, (iii) - b, (iv) - a

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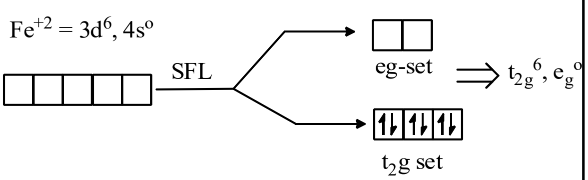
86. **(4)** This is because zinc has higher oxidation potential than Ni, Cu and Sn.

87. **(1)** $K_4Fe(CN)_6 \longrightarrow 4K^+ + [Fe(CN)_6]^{-4}$

C. No = 6 Oxidation no of Fe = + 2



88. **(1)** 4

89. **(1)** For a first order reaction

$$K = \frac{2.303}{(t_2 - t_1)} \log \frac{(a - x_1)}{(a - x_2)}$$

$$K = \frac{2.303}{(20 - 10)} \log \left(\frac{0.04}{0.03}\right)$$

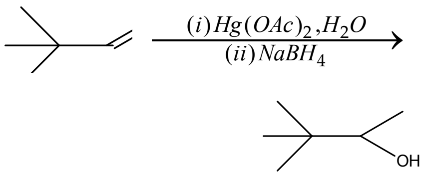
$$K = \frac{2.303 \times 0.1249}{10}$$

$$\frac{0.6932}{t_{1/2}} = \frac{2.303 \times 0.1249}{10}$$

$$t_{1/2} = \frac{0.6932 \times 10}{2.303 \times 0.1249} = 24.1 \sec$$

90. **(4)** The oxidation states of chromium in CrO_4^{-2} and $Cr_2O_7^{2-}$ are not the same.

91. **(1)**



92. **(1)** $M = \frac{6.02 \times 10^{20} \times 1000}{100 \times 6.02 \times 10^{23}} = \frac{6.02 \times 10^{21}}{6.02 \times 10^{23}} = 0.01M$

93. **(1)** Due to size difference in Si & Cl chlorine does not share its electron pair into vacant d-orbital of Si hence it is not stable.

94. **(2)** (2) Alcohol reactivity : $3^o > 2^o > 1^o$

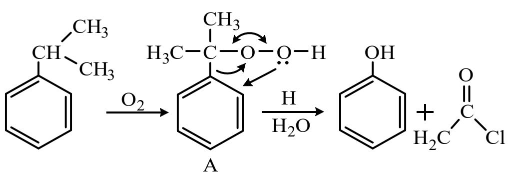
S-I is correct but S-II is incorrect as 3^o alcohol produces the most stable carbocation & thus it is most reactive with lucast reagent.

95. **(3)** NaCl is a salt of strong acid and strong base hence its aqueous solution will be neutral i.e. pH = 7. $NaHCO_3$ is an acidic salt hence pH < 7. Na_2CO_3 is a salt of weak acid and strong base. Hence its aqueous solution will be strongly basic i.e. pH > 7.

NH_4Cl is salt of weak base and strong acid, hence its aqueous solution will be strongly acidic i.e. pH < 7

96. **(1)** $H_2O < H_2S < H_2Se < H_2Te$: Increasing pK_a values

97. **(3)**



Cumene Hydroperoxide

98. **(1)** Measure of disorder of a system is nothing but Entropy. For a spontaneous reaction, $\Delta G < 0$. As per Gibbs Helmholtz equation,

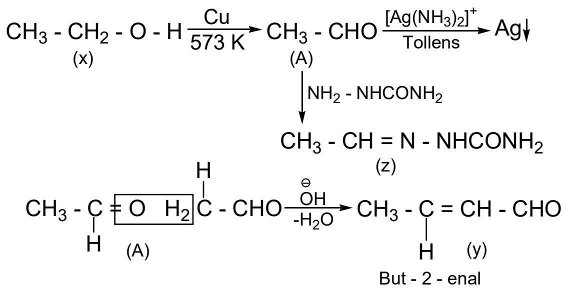
$\Delta G = \Delta H - T\Delta S$

Thus ΔG is always –ve when

ΔH = –ve (exothermic)

and ΔS = +ve (increasing disorder)

99. **(2)**



100. **(4)** Total number of nodes = (n – 1)

$3 = n - 1 \Rightarrow n = 4$

Number of angular nodes = $l = 3 \Rightarrow$ f-subshell

BOTANY

Section - A (35 Questions)

101. **(4)** (NEET - II, 2016 [NCERT class XI, Page no. 90, 92)
102. **(4)** (NEET 2019/NCERT Page No. 232)
103. **(4)** (NEET 2017)
104. **(2)** (NEET - I, 2016 [NCERT class XI, Page no. 89, Line no.- 12-14)
105. **(3)** (NEET 2022/NCERT Page No. 243 & 244)
106. **(2)** (NEET 2021)
107. **(3)** (NEET 2022)
108. **(4)** (NEET 2019)
109. **(1)** (NEET 2020/NCERT Page No. 231 & 232)
110. **(4)** (NCERT page no. 208, 2nd paragraph)
111. **(1)** (NCERT 11th, Page- 7, Paragraph-1, Line no-1-4)
112. **(2)** (NEET 2021)
113. **(3)** (NEET 2020)
114. **(1)** (NEET 2022)
115. **(4)** (NEET 2013) (NCERT XI, Page No. 74 & 80)
116. **(1)** (NEET 2018)
117. **(1)** (NEET 2018) (NCERT XI, Page No. 67)
118. **(4)** (NEET 2013)
119. **(3)**(NEET Phase-II 2016)
120. **(4)** (NEET 2019)
121. **(1)** (AIIMS 2019) (NCERT XI, Page No. 67 & 68)
122. **(4)** (NEET 2018)
123. **(4)** (2013/NCERT Page No. 36, 38 & 39)
124. **(1)** (AIPMT 2014 ,NCERT XI, Page 250, Point 15.4.3.5)
125. **(3)** (NEET 2020)
126. **(3)** (NEET 2019)
127. **(1)** (NCERT page no. 214, fig. 13.7)
128. **(2)** (NCERT 11th, Page no- 26, Figure 2.6 (a))
129. **(2)** (NCERT 11th, Page no-24, Paragraph-2.3.4, Line no- 1,2,13,14)
130. **(1)** (NCERT 11th, Page no- 23, 3rd paragraph, line no- 10 and 11)

     (NCERT 11th Page no- 24, 1st paragraph, Line no-6, 2nd paragraph- Line no- 11 and 12, 3rd paragraph- Line no- 14)
131. **(2)** (NCERT 12th, Page no- 29, 1st paragraph, Line no- 1-11)
132. **(4)** (NCERT 12th, Page no- 38, Paragraph- 2.5, Line no- 1-5)
133. **(4)** (NCERT 12th, Page no- 21, 2nd Paragraph, Line no-6,7)
134. **(4)** (NEET 2015)
135. **(1)** (NEET 2014)

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136. **(2)** (AIPMT PRE 2012 NCERT XI, Page no. 93, Point no. 6.3.4)
137. **(4)** (AIPMT PRE 2010 ,NCERT XI, Page 247, point 15.4.2)
138. **(4)** (NEET 2021/NCERT Page No. 233)
139. **(2)** (NEET 2022/ NCERT Page No. 38 & 39)
140. **(3)** (NEET 2013/ NCERT Page No. 243)
141. **(2)** (JIPMER 2016) (NCERT XI, Page No. 68)
142. **(1)** (NEET 2016 Phase – II)
143. **(3)** (NEET 2019)
144. **(4)** (NCERT XI – conceptual – table 13.1, page no. 221)
145. **(3)** (NCERT 11th, Page- 9, Paragraph-1.3.2, Line no-1)
146. **(4)** (NCERT 11th, Page no- 19, Paragraph-2.1.2, Line no- 13,14,15,16)

147. **(4)** (NCERT 12th, Page no- 23, 2nd Paragraph, Line no- 20-22)
148. **(4)** (NEET 2019)
149. **(3)** (NEET 2020)
150. **(4)** (NEET 2018)

ZOOLOGY

Section - A (35 Questions)

151. **(1)** (NCERT 12th, Page no- 133, 1st paragraph, Line no- 5-7)
152. **(4)** (NCERT 12th, Page no- 137, 3rd paragraph, 8,9)
153. **(4)** (2019, Odisha/ NCERT Page No. 159)
154. **(4)** (NEET 2022/NCERT Page No. 266)
155. **(2)** (JIPMER 2016)
156. **(1)** (NEET 2018)
157. **(3)** [CBSE AIPMT 1994]
158. **(3)** (NCERT 11th, Page no- 150, Figure- 9.3 (c))
159. **(4)** (NCERT 11th, Page no- 144, 1st paragraph, Line no-1 and 2)
160. **(2)** (NEET 2017)
161. **(1)** (NEET2017/NCERT Page No. 152)
162. **(1)** [NEET 2017]
163. **(3)** (NEET 2021/ NCERT Page No. 232)
164. **(4)** [NEET 2016, Phase I, NCERT XIIth P.No.195, Restriction enzyme, 2nd para]
165. **(2)** (NCERT XIth Page No.49; Phylum - Porifera)
166. **(4)** (NCERT XIth Page No.58; Class-Aves)
167. **(3)** (NEET 2019)
168. **(3)** (NEET 2017)
169. **(3)** (NCERT 12th, Page no- 131, 1st paragraph, Line no- 13,14)
170. **(1)** (NCERT XIth NCERT Page No. 337, Glucocorti coids and pancreas)
171. **(3)** [AIMPT 2004,NCERT XIth P.No.317,10th line]
172. **(4)** [NEET 2018, NCERT P.No.214, 2nd Para]
173. **(3)** (NCERT XIth Conceptual)
174. **(1)** [NEET 2021, NCERT XIth P.No.307, Last Para]
175. **(3)** (Odisha NEET 2019)
176. **(1)** (NEET phase-2 2016)
177. **(4)** [CBSE AIPMT 2005]
178. **(1)**[AIPMT 2015,NCERT XIIth P.No.200, Vectors for cloning gene in plants]
179. **(3)** [NEET 2020,NCERT XIIth P.No.196, 2nd and 3rd para]
180. **(3)** (NEET 2014/NCERT Page No. 263 & 264)
181. **(4)** [CBSE AIPMT 1996]
182. **(2)** [NEET (National) 2019]
183. **(1)** [NEET 2016, Phase II, NCERT P.No.303, Last Para]
184. **(3)** [NEET 2013, NCERT XIth P.No.307, Last 4 Lines]
185. **(1)** [AIPMT 2007,NCERT XIth P.No.317, First Para]

SECTION - B (Attempt Any 10 Questions)

186. **(3)** (NCERT 11th, Page no- 145, Figure- 9.1 (Lecithin))
187. **(3)** (NEET 2019)
188. **(1)** (NEET 2018)
189. **(3)** ([NEET - I, 2016] NCERT 12th, Page no- 137, Paragraph- 7.8, Conceptual)
190. **(3)** (NEET 2017)
191. **(4)** (NEET 2021/NCERT Page No. 226)
192. **(3)** (NEET 2013)
193. **(4)** (NCERT XIth Page No.114 para 2)
194. **(1)** (AIPMT 2009 NCERT XIIth Page No. 146)
195. **(2)** (NEET 2016)
196. **(1)** (NCERT XIth Page No.52; Phylum - platyhelminthes)
197. **(2)** (NCERT XIth Page No.339; 22.4)
198. **(3)** [NEET 2018, NCERT XIth P.No.307, 1st para, 10th Line]
199. **(4)** (NCERT XIth Page No. 297; Hemodialysis)
200. **(4)** [AIPMT 1996, NCERT XIth P.No.316, Human Nervous system Applied]