

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

### PHYSICS

#### SECTION - A (35 Questions)

01. (3) Current in the circuit,  $I = \frac{\epsilon}{R+r}$

Potential difference across  $R$ ,

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

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

Hence, option (3) represents the correct graph.

02. (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

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

$$\text{Amplitude} = \sqrt{A^2 + B^2 + 2AB \cos \frac{\pi}{2}}$$

$$\left( \because \phi = \frac{\pi}{2} \right)$$

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

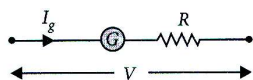
03. (1) Here, Resistance of galvanometer,  $G = 100 \Omega$   
 Current for full scale deflection,  $I_g = 30 \text{ mA}$   
 $= 30 \times 10^{-3} \text{ A}$

Range of voltmeter,  $V = 30 \text{ V}$

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,  $V = I_g (G + R)$

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

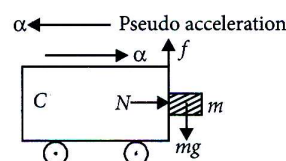


$$R = \frac{30}{3 \times 10^{-3}} - 100 \Omega = 1000 - 100 = 900 \Omega.$$

04. (3) Pseudo force or fictitious 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



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

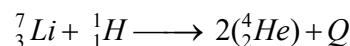
05. (4) Binding energy of  ${}^7_3\text{Li}$  nucleus

$$= 7 \times 5.60 \text{ MeV} = 39.2 \text{ MeV}$$

Binding energy of  ${}^4_2\text{He}$  nucleus

$$= 4 \times 7.06 \text{ MeV} = 28.24 \text{ MeV}$$

The reaction is



$$\therefore Q = 2(\text{BE of } {}^4_2\text{He}) - (\text{BE of } {}^7_3\text{Li})$$

$$= 2 \times 28.24 \text{ MeV} - 39.2 \text{ MeV}$$

$$= 56.48 \text{ MeV} - 39.2 \text{ MeV} = 17.28 \text{ MeV}.$$

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

$h = 60 \text{ m}$ ,  $g = 10 \text{ m/s}^2$ , loss = 10% i.e., 90% is used.

$$\text{Power generated} = 15 \times 10 \times 60 \times 0.9 = 8100 \text{ W} \\ = 8.1 \text{ kW}.$$

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

$$0.5 \text{ eV} = eV_s \quad \text{or} \quad V_s = 0.5 \text{ V}.$$

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

$$E = -\frac{GM}{R^3} r, \text{ where } M \text{ and } R \text{ be mass and radius}$$

of the earth respectively.

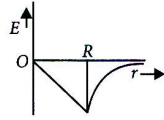
At the centre,  $r = 0$

$$\therefore E = 0$$

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.

09. (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  $K_1$ .

10. (2)

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

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

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

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

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

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

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

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

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

14. (1) Given,  $T_2 = 4^\circ C = 277 K$ ,  $T_1 = 30^\circ C = 303 K$   
 $Q_2 = 600$  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

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

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

15. (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

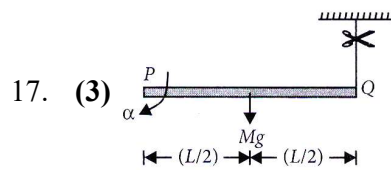
condition  $\frac{P}{Q} = \frac{l_1}{l_2}$  will remain same after

interchanging the cell and galvanometer.

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

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

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



17. (3)

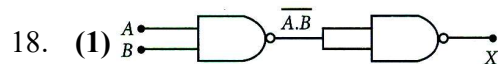
When the string is cut, the rod will rotate about  $P$ . Let  $\alpha$  be initial angular acceleration of the rod. Then

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

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

Equating (i) and (ii), we get

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

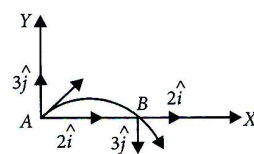


18. (1)

The output of the given logic circuit is

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

19. (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

$$2\hat{i} - 3\hat{j} \text{ m/s.}$$

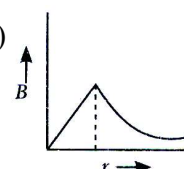
20. (4)

21. (4) By Ampere's circuital law,

$$\oint \vec{B} \cdot d\vec{l} = \mu_0 \times \text{current lost by path}$$

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

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.

22. (2) The intensity of transmitted light through  $P_1$ ,

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

The intensity of transmitted light through  $P_3$ ,

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

Angle between polaroids  $P_3$  and  $P_2$

$$= (90^\circ - 45^\circ) = 45^\circ.$$

$\therefore$  Intensity of transmitted light through  $P_2$ ,

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

23. (1) Second excited state corresponds to  $n = 3$   
Energy needed to ionize,

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

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

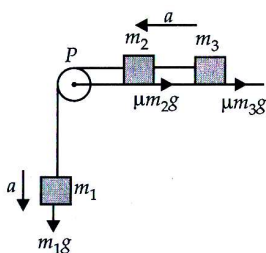
(i) for  $r < R$ ,  $\vec{E} = 0$

(ii) for  $r > R$ ,  $\vec{E} = \frac{1}{4\pi\epsilon_0} \frac{Q}{r^2} \hat{r}$ ;  $\vec{E}$  decreases.

25. (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  $\frac{g(1 - 2\mu)}{3}$ .

26. (1) When the angle of refraction is equal to  $90^\circ$ , the angle of incidence is called the critical angle.

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

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

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

From equation (ii), we get

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

Substituting this in equation (ii), we get

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

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

Substituting this in equation (ii), we get

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

Hence option (1) is correct.

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

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

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

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

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

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

$e$  = electronic charge,  $n$  = number of density of electrons,  $\tau$  = relaxation time.

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

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

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

31. (4)

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

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

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

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

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,

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

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

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

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

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

Displacement,  $\vec{r} = \vec{r}_2 - \vec{r}_1$

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

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

$$= 6 + 3 = 9 \text{ J.}$$

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

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

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

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

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

35. (4) Equal masses after elastic collision interchange their velocities.  $-5 \text{ m/s}$  and  $+3 \text{ m/s}$ .

### SECTION - B (Attempt Any 10 Questions)

36. (3) Angle of magnet ( $\theta$ ) =  $90^\circ$  and  $60^\circ$ .

Work done in turning the magnet through  $90^\circ$

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

Similarly,

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

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

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

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

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

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

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

Total internal energy of 1 mole of a diatomic gas,

$$U = \frac{5}{2} RT. \text{ D} \rightarrow \text{R.}$$

38. (4) Given,  $i = 45^\circ$ ,  $A = 60^\circ$

Since the ray undergoes minimum deviation,

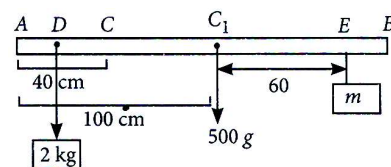
$\therefore$  angle of emergence from second face,  $e = i = 45^\circ$

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

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

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

39. (1) Here,  $AD = 20 \text{ cm}$ ,  $AE = 160 \text{ cm}$ ,  $g = 10 \text{ m/s}^2$   
Take moments about  $C$



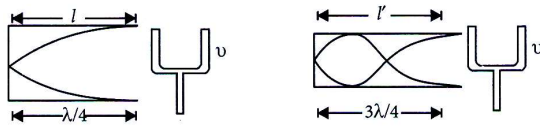
Clockwise moment = Anticlockwise moment

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

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

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

40. (1) From figure,



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

Third harmonic is obtained for resonance,

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

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

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

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

$$\therefore a = 2\lambda \dots\dots\dots(i)$$

For first secondary maximum, the path difference between extreme waves

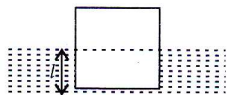
$$a \sin \theta' = \frac{3}{2}\lambda \text{ or } (2\lambda) \sin \theta' = \frac{3}{2}\lambda \text{ [Using eqn (i)]}$$

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

42. (3) Let  $l$  be the length of block immersed in liquid as shown in the figure.

When the block is floating,

$$\therefore mg = A l \rho g$$



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

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

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 =  $A \rho g$

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

43. (2) Let  $q$  be the charge on each capacitor.

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

Now, when battery is disconnected and another capacitor of same capacity is connected in parallel to the first capacitor, then voltage across each

$$\text{capacitor, } V = \frac{q}{2C}$$

$\therefore$  Energy stored in each capacitor,

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

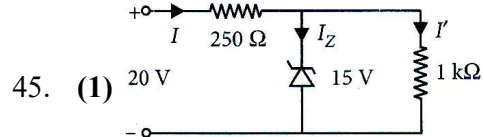
44. (1) According to law of conservation of angular momentum  $m v r = m v' r'$

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

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

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

$$K = 4K_0 = 2m v_0^2.$$



45. (1)

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

The current through  $1k\Omega$  is

$$I' = \frac{15V}{1 \times 10^3 \Omega} = 15 \times 10^{-3} \text{ A} = 15\text{mA}$$

The voltage drop across  $250\Omega = 20V - 15V = 5V$

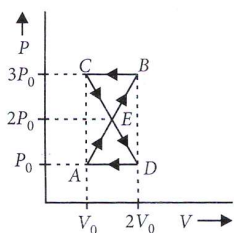
The current through  $250\Omega$  is

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

The current through the Zener diode is

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

46. (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,

$$W_{AEDA} = +\text{area of } \triangle AED = +\frac{1}{2} P_0 V_0$$

$$W_{BCEB} = -\text{area of } \triangle BCE = -\frac{1}{2} P_0 V_0$$

The net work done by the system is

$$W_{net} = W_{AEDA} + W_{BCEB} = +\frac{1}{2} P_0 V_0 - \frac{1}{2} P_0 V_0 = \text{zero.}$$

47. (3)  $V = V_0$  for  $0 \leq t \leq \frac{T}{2}$

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

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

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

48. (2) Second overtone of an open organ pipe

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

First overtone of a closed organ pipe

$$(\text{Third harmonic}) = 3 \times v_0 = 3 \times \frac{v}{4L}$$

According to question,

$$3v'_0 = 3v_0 \Rightarrow 3 \times \frac{v}{2L'} = 3 \times \frac{v}{4L}$$

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

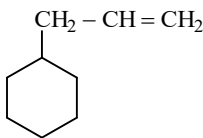
49. (3) Electric field is always direct from high potential to low potential. For the given situation the electric potential is decreasing from left to right therefore, potential energy of the dipole will also decrease. Thus dipole will move from towards the right.

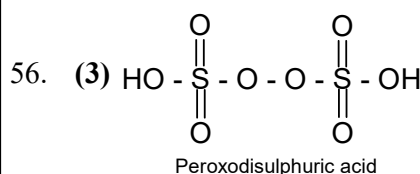
50. (2) Angular momentum about the point of contact with the surface includes the angular momentum

about the centre. Because of friction, linear momentum will not be conserved.

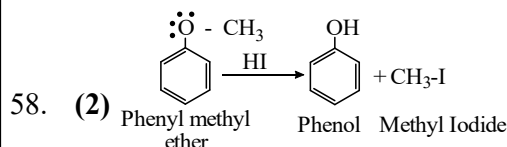
## CHEMISTRY

### SECTION - A (35 Questions)

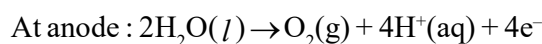
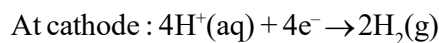
51. (2) 
52. (4) X = 1-butyne ; Y = 3-hexyne
53. (4)  $\text{HNO}_2$  is a weak acid and  $\text{NaNO}_2$  is salt of that weak acid and strong base (NaOH).
54. (1) Let x = oxidation no. of Cr in  $\text{K}_2\text{Cr}_2\text{O}_7$ .  
 $\therefore (2 \times 1) + (2 \times x) + 7(-2) = 0$   
 or  $2 + 2x - 14 = 0$  or  $x = +6$ .
55. (3) If compound dissociates in solvent  $i > 1$  and on association  $i < 1$ .



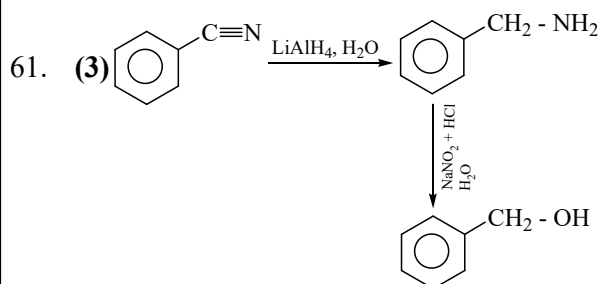
57. (4) Most of the trivalent Lanthanoid ions are colorless in the solid state.



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

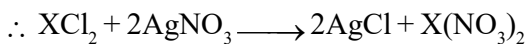


60. (1) Geometrical isomerism



62. (3) Millimoles of  $\text{AgNO}_3$  solution =  $10 \times 0.1 = 1$   
 So, the millimoles of  $\text{AgNO}_3$  are double than the chloride solution.





63. (4) Atomic size of Ga is less than Al because d-block contraction.
64. (3) From Arrhenius equation

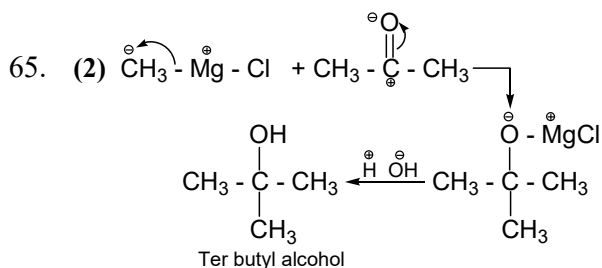
$$\log \frac{k_{400}}{k_{200}} = \frac{E_a}{2.303R} \left[ \frac{T_2 - T_1}{T_1 T_2} \right]$$

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

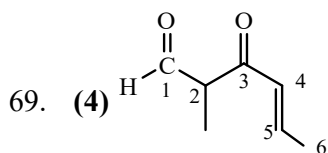
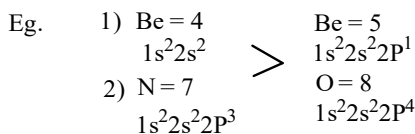
$$\Rightarrow \frac{k_{400}}{k_{200}} = 1$$

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

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



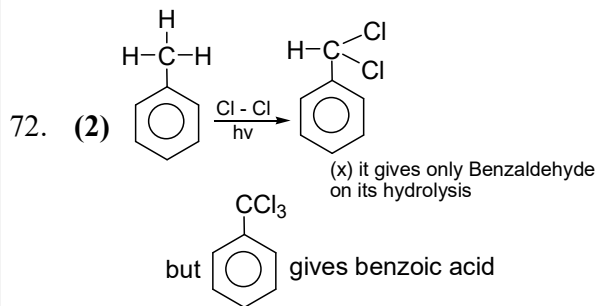
66. (3)  $n = 3 \rightarrow 3^{\text{rd}}$  shell  
 $l = 1 \rightarrow p$  sub shell  
 $m = -1$  is possible for two electrons present in an orbital.
67. (3) For an endothermic reaction, activation energy is always more than change in enthalpy.
68. (2) If atom contain full or half filled  $e^-$  configuration they are more stable



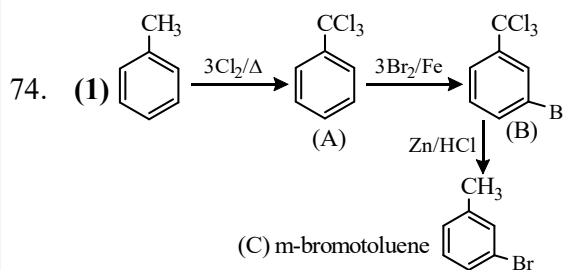
3-Keto-2-methylhex-4-enal

70. (2) 4
71. (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  $S^{2-}$ .



73. (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.

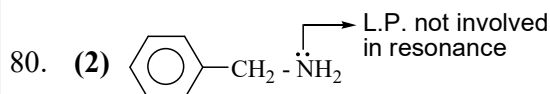


75. (2) (i) - d, (ii) - c, (iii) - b, (iv) - a
76. (3) Carbon has the maximum oxidation state of +4, therefore carbon dioxide ( $CO_2$ ) cannot act as a reducing agent.
77. (3) Relative lowering of vapour pressure depends upon the mole fraction of solute.

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

78. (3)  $PCl_5 \rightarrow sp^3d \rightarrow T.B.P$   
 $SF_6 \rightarrow sp^3d^2 \rightarrow \text{octahedral}$   
 $BF_3 \rightarrow sp^2 \rightarrow T. \text{ Planar}$   
 $BrF_5 \rightarrow sp^3d^2 \rightarrow Sq. \text{ pyramidal}$

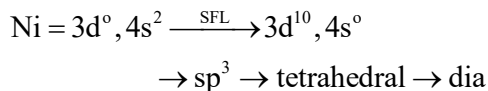
79. (4) Stability  $\propto$  Bond order  
 $O_2^{2+} > O_2^+ > O_2 > O_2^- > O_2^{2-}$



81. (2)  $\alpha$ -D-Glucose +  $\beta$ -D-Fructose
82. (4)  $\Delta G$  is negative for a spontaneous process.
83. (3) A-IV, B-III, C-II, D-I

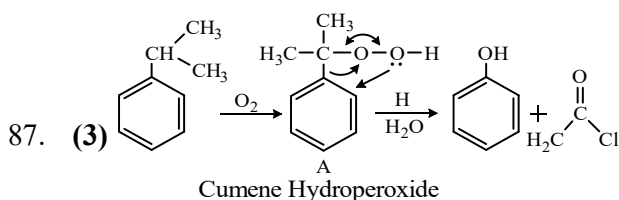
84. (4)  $C_2$  consist of both  $\pi$  bonds because of presence of four electrons in two  $\pi$  molecular bonding orbitals.

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



### SECTION - B (Attempt Any 10 Questions)

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



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

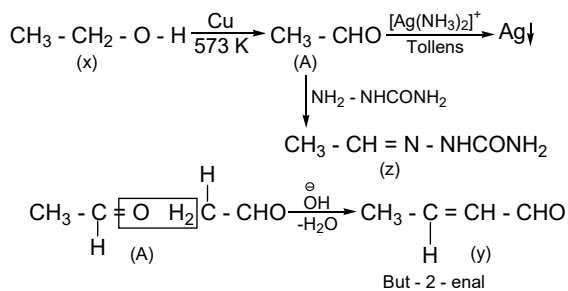
$$\Delta G = \Delta H - T\Delta S$$

Thus  $\Delta G$  is always -ve when

$$\Delta H = -ve \text{ (exothermic)}$$

and  $\Delta S = +ve$  (increasing disorder)

89. (2)



90. (4) Total number of nodes =  $(n - 1)$

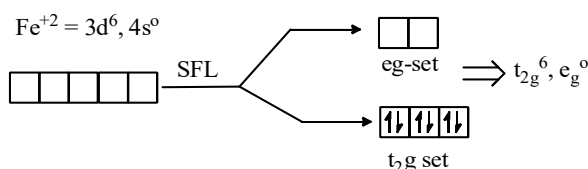
$$3 = n - 1 \Rightarrow n = 4$$

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

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

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

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



93. (1) 4

94. (1) For a first order reaction

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

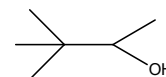
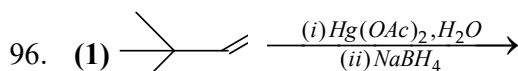
$$K = \frac{2.303}{(20 - 10)} \log \left( \frac{0.04}{0.03} \right)$$

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

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

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

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



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

98. (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.

99. (2) (2) Alcohol reactivity :  $3^\circ > 2^\circ > 1^\circ$

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

100. (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.  $pH < 7$



## BOTANY

### Section - A (35 Questions)

101. (1) (NCERT 11<sup>th</sup>, Page- 7, Paragraph-1, Line no-1-4)
102. (2) (NEET 2021)
103. (3) (NEET 2020)
104. (1) (NEET 2022)
105. (4) (NEET 2013) (NCERT XI, Page No. 74 & 80)
106. (1) (NEET 2018)
107. (1) (NEET 2018) (NCERT XI, Page No. 67)
108. (4) (NEET 2013)
109. (3) (NEET Phase-II 2016)
110. (4) (NEET 2019)
111. (1) (AIIMS 2019) (NCERT XI, Page No. 67 & 68)
112. (4) (NEET 2018)
113. (4) (2013/NCERT Page No. 36, 38 & 39)
114. (1) (AIPMT 2014, NCERT XI, Page 250, Point 15.4.3.5)
115. (3) (NEET 2020)
116. (3) (NEET 2019)
117. (1) (NCERT page no. 214, fig. 13.7)
118. (2) (NCERT 11<sup>th</sup>, Page no- 26, Figure 2.6 (a))
119. (2) (NCERT 11<sup>th</sup>, Page no-24, Paragraph- 2.3.4, Line no- 1,2,13,14)
120. (1) (NCERT 11<sup>th</sup>, Page no- 23, 3<sup>rd</sup> paragraph, line no- 10 and 11)  
(NCERT 11<sup>th</sup> Page no- 24, 1<sup>st</sup> paragraph, Line no-6, 2<sup>nd</sup> paragraph- Line no- 11 and 12, 3<sup>rd</sup> paragraph- Line no- 14)
121. (2) (NCERT 12<sup>th</sup>, Page no- 29, 1<sup>st</sup> paragraph, Line no- 1-11)
122. (4) (NCERT 12<sup>th</sup>, Page no- 38, Paragraph- 2.5, Line no- 1-5)
123. (4) (NCERT 12<sup>th</sup>, Page no- 21, 2<sup>nd</sup> Paragraph, Line no-6,7)
124. (4) (NEET 2015)
125. (1) (NEET 2014)
126. (4) (NEET - II, 2016 [NCERT class XI, Page no. 90, 92)

127. (4) (NEET 2019/NCERT Page No. 232)
128. (4) (NEET 2017)
129. (2) (NEET - I, 2016 [ NCERT class XI, Page no. 89, Line no.- 12-14)
130. (3) (NEET 2022/NCERT Page No. 243 & 244)
131. (2) (NEET 2021)
132. (3) (NEET 2022)
133. (4) (NEET 2019)
134. (1) (NEET 2020/NCERT Page No. 231 & 232)
135. (4) (NCERT page no. 208, 2<sup>nd</sup> paragraph)

### SECTION - B (Attempt Any 10 Questions)

136. (4) (NCERT 11<sup>th</sup>, Page no- 19, Paragraph- 2.1.2, Line no- 13,14,15,16)
137. (4) (NCERT 12<sup>th</sup>, Page no- 23, 2<sup>nd</sup> Paragraph, Line no- 20-22)
138. (4) (NEET 2019)
139. (3) (NEET 2020)
140. (4) (NEET 2018)
141. (2) (AIPMT PRE 2012 NCERT XI, Page no. 93, Point no. 6.3.4)
142. (4) (AIPMT PRE 2010, NCERT XI, Page 247, point 15.4.2)
143. (4) (NEET 2021/NCERT Page No. 233)
144. (2) (NEET 2022/ NCERT Page No. 38 & 39)
145. (3) (NEET 2013/ NCERT Page No. 243)
146. (2) (JIPMER 2016) (NCERT XI, Page No. 68)
147. (1) (NEET 2016 Phase – II)
148. (3) (NEET 2019)
149. (4) (NCERT XI – conceptual – table 13.1, page no. 221)
150. (3) (NCERT 11<sup>th</sup>, Page- 9, Paragraph-1.3.2, Line no-1)

## ZOOLOGY

### Section - A (35 Questions)

151. (1) (NEET 2017/NCERT Page No. 152)
152. (1) [NEET 2017]

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

**SECTION - B (Attempt Any 10 Questions)**

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