MP Murlidhar Mohol & APMA initiative

Mission NEET 2025

TIME : 3 HRS. **PAPER - I** **MARKS: 720**

DATE : 15.04.2025

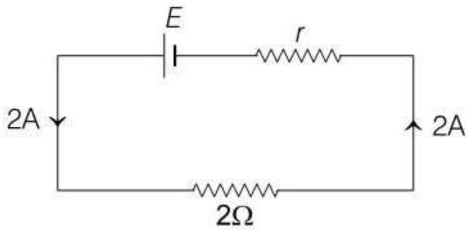
PCB : ENTIRE XI + XII NCERT

Note:

* Every correct answer (+4 Mark)
* Every wrong answer (–1 Mark)
* Not attempted question (0 Mark)

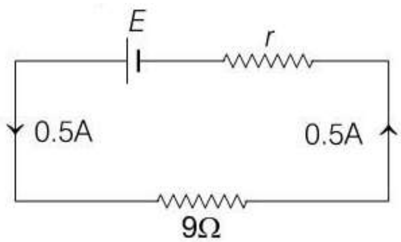
1. 3) Let E be the emf and r be internal resistance of the battery.

In the first case,



$$2 = \frac{E}{2+r} \qquad \text{...(i)}$$

In the second case,



$$0.5 = \frac{E}{9+r} \qquad \text{...(ii)}$$

Dividing Eq. (i) by Eq. (ii), we get

$$\frac{2}{0.5} = \frac{9+r}{2+r}$$

$$\Rightarrow 4 + 2r = 4.5 + 0.5r$$

$$\Rightarrow 1.5r = 0.5$$

$$\Rightarrow r = \frac{0.5}{1.5} = \frac{1}{3}\Omega$$

2. 4) As we know,

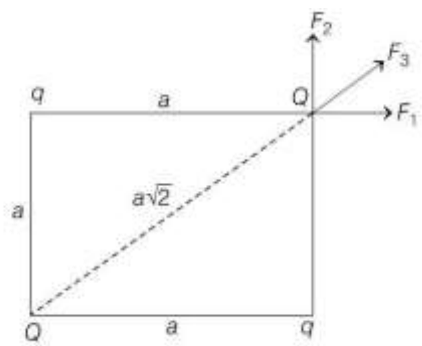
$$V_A = V\frac{C_B}{C_A + C_B} = 10\times\frac{3C}{C+3C} = 7.5V$$

$$V_B = V\frac{C_A}{C_A + C_B}$$

$$= 10\times\frac{C}{C+3C} = 2.5V$$

3. 1) Let a be the side of square,

$$\therefore F_1 = F_2 = \frac{Qq}{4\pi\varepsilon_0 a^2}$$



$$F_3 = \frac{QQ}{4\pi\varepsilon_0\left(a\sqrt{2}\right)^2} = \frac{Q^2}{4\pi\varepsilon_0\left(a\sqrt{2}\right)^2}$$

As the resultant force on Q is zero,

$$\therefore F_3 = -2F_1\cos 45°$$

$$\frac{Q^2}{4\pi\varepsilon_0\left(a\sqrt{2}\right)^2} = \frac{2Qq}{4\pi\varepsilon_0 a^2}\frac{1}{\sqrt{2}}$$

$$Q = -2\sqrt{2}q$$

4. 3) De-Broglie wavelength, $\lambda = \frac{h}{p}$ ...(i)

According to Bohr's quantisation condition, $mvr_n = \frac{nh}{2\pi} \Rightarrow p = \frac{nh}{2\pi r_n}$ ...(ii

From Eqs. (i) and (ii), we get

$$\lambda = \frac{h\times 2\pi r_n}{nh} = \frac{2\pi r_n}{n}$$

For fourth orbit $(n=4), \lambda = \frac{2\pi r_n}{4}$ ...(iii)

Moreover, $r \propto n^2$

$$\because \frac{r_1}{r_4} = \frac{(1)^2}{(4)^2} \Rightarrow r_4 = 16r_1$$

Substituting the value of r_4 in Eq. (iii), we get $\lambda = \frac{2\pi(16r_1)}{4} = 8\pi r_1$ or $8\pi r$

5. 3) The force constant of spring,

$$k = \frac{F}{x} = \frac{mg}{x} = \frac{1\times10}{2\times10^{-2}} = 500Nm^{-1}$$

Time period,

$$T = 2\pi\sqrt{\frac{m}{k}} = 2\times3.14\times\sqrt{\frac{1}{500}} = 0.28s$$

For $x = 10cm = 0.1m$

Kinetic energy

$$= \frac{1}{2}kx^2 = \frac{1}{2}\times500\times(0.1)^2 = 2.5J$$

6. 1) Let the temperature of junction be θ, then $H = H_1 + H_2$

$$\Rightarrow \frac{KA(\theta-0)}{L} = \frac{K2A(45-\theta)}{L} + \frac{K3A(60-\theta)}{L}$$

$$\Rightarrow \theta = 90 - 2\theta + 180 - 30$$

$$\Rightarrow \theta = 45°C$$

7. 1) As $mv = \frac{h}{\lambda}$ or $v = \frac{h}{m\lambda} = \frac{6.6\times10^{-34}}{2\times1.67\times10^{-27}\times10^{-12}}$

$$v = 2\times10^5 m/s$$

8. 4) The de-Broglie wavelength of a charged particle, $\lambda = \frac{h}{\sqrt{2mK}}$

Where, m is the mass and K is the kinetic energy of the charged particle.

As all the four given charged particles have same kinetic energy.

$$\therefore \lambda \propto \frac{1}{\sqrt{m}}$$

As $m_{\text{electron}} < m_{\text{proton}} < m_{\text{deuteron}} < m_{\alpha\text{-particle}}$

$$\therefore \lambda_{electron} > \lambda_{proton} > \lambda_{deuteron} > \lambda_{\alpha-particle}$$

hence, α -particle has the shortest de-Broglie wavelength.

9. 4) Force on wire C due to wire A,

$$F_A = \left(\frac{\mu_0}{4\pi}\right)\frac{2I}{r} = \frac{10^{-7}\times 2\times 30}{0.03}$$

$= 2\times 10^{-4} N$ (towards right)

Force on wire C due to wire B,

$$F_B = \left(\frac{\mu_0}{4\pi}\right)\frac{2I}{r} = \frac{10^{-7}\times 2\times 20}{2\times 10^{-2}}$$

$= 2\times 10^{-4} N$ (towards left)

Net force on wire C,

$$F_{net} = F_A - F_B = 0$$

10. 1) Given, $L = \frac{\sqrt{3}}{\pi}H, f = 50Hz$

$\phi = 60^\circ$

$\because X_L = 2\pi fL$

$$= 2\pi \times 50 \times \frac{\sqrt{3}}{\pi} = 100\sqrt{3}\Omega$$

$\therefore$ Impedance, $Z = \sqrt{R^2 + X_L^2}$

But $\cos\phi = \frac{R}{Z}$

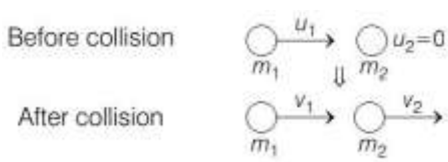
$$\Rightarrow \cos 60^\circ = \frac{R}{\sqrt{R^2 + X_L^2}}$$

$$\Rightarrow \left(\frac{1}{2}\right)^2 = \frac{R^2}{R^2 + X_L^2}$$

$$\Rightarrow 4R^2 = R^2 + X_L^2$$

$$\Rightarrow R = \frac{X_L}{\sqrt{3}} = \frac{100\sqrt{3}}{\sqrt{3}} = 100\Omega$$

11. 2) The final velocities of bodies are



We have standard result for final velocity after a head-on elastic collision

APMA ...students first

$$v_1 = \left(\frac{m_1 - m_2}{m_1 + m_2}\right)u_1 \qquad [\because u_2 = 0]$$

$$v_2 = \frac{2m_1u_1}{m_1 + m_2}$$

$$\therefore \frac{v_1}{v_2} = \frac{m_1 - m_2}{2m_1}$$

$$\Rightarrow \frac{2}{5} = \frac{m_1 - m_2}{2m_1} \Rightarrow \frac{m_1}{m_2} = 5$$

12. 4) Intensity of transmit light from one Polaroid, $I_1 = \frac{I_0}{2}$

Therefore, intensity of light transmitted from second Polaroid

$$I_2 = I_1 \cos^2\theta = \frac{I_0}{2}\cos^2(90° - 30°)$$

$$= \frac{I_0}{2}\cos^2 60°$$

$$= \frac{I_0}{2} \times \left(\frac{1}{2}\right)^2 = \frac{I_0}{8}$$

13. 1) Mass of the rope $= 6 \times \frac{1}{2} = 3kg$

Total mass $= 50 + 3 = 53kg$

$$a = \frac{F}{m} = \frac{106}{53} = 2m/s^2$$

Force utilized in pulling the rope

$= 3 \times 2 = 6N$

Force applied on the mass

$= 106 - 6 = 100N$

14. 4) As, $l = \frac{-dV}{dr} \Rightarrow dV = -Idr$

So, $\int_0^V dV = \int_\infty^x -Idr = \int_\infty^x -kr^{-3}dr$

$$\Rightarrow V = -k\left(\frac{r^{-3+1}}{-3+1}\right)_\infty^x = \frac{k}{2x^2}$$

15. 4) Let the depth of Indian ocean is *x*cm

$\therefore p_1V_1 = p_2V_2$

$$\left(tdg + xdg\right)\left(\frac{4}{3}\pi r^3\right) = tdg\left[\frac{4}{3}\pi\left(18r\right)^3\right]$$

$$\left(t + x\right) = t.18^3$$

$$18^3 t - t = x$$

So, $x = 5831t\ cm$

16. 1) As $\lambda = \frac{h}{\sqrt{3mkT}}$

So, $\lambda \propto \frac{1}{\sqrt{T}}$

Given, $T_1 = 27°C = 300K$

$T_2 = 927°c = 1200K$

$$\frac{\lambda_1}{\lambda_2} = \sqrt{\frac{1200}{300}}$$

So, λ at 1200K will be $\frac{\lambda}{2}$.

17. 3) As we know, $I_{rms} = \frac{V_{rms}}{R}$

$$= \frac{200}{100\sqrt{2}} = \sqrt{2}A$$

$\Rightarrow I_{rms} = 1.41A$

18. 4) Power, $P = \frac{V^2}{R}$

As the resistance of the bulb is constant

$\therefore \frac{\Delta P}{P} = \frac{2\Delta V}{V}$

% decrease in power $= \frac{\Delta P}{P} \times 100$

$$= \frac{2\Delta V}{V} \times 100 = 2 \times 2.5\% = 5\%$$

19. 2) The slope of the trajectory is zero at the highest point but the velocity of the particle is u cosθ.

20. 3) Impedance of the circle is given by

$$Z=\sqrt{\left(R_1+R_2\right)^2+\left(X_L-X_C\right)^2}$$

$$=\sqrt{\left(44+36\right)^2+\left(90-30\right)^2}$$

$$Z=\sqrt{\left(80\right)^2+\left(60\right)^2}=100\Omega$$

The current in the circuit,

$$I=\frac{V}{Z}=\frac{200}{100}$$

$$I=2A$$

Power dissipated in the coil,

$$P=I^3R_2=2^2\times 36$$

$$P=144W$$

So, the power dissipated in the coil is 144W.

21. 1) Here, $B=B_0\left(2\hat{i}+3\hat{j}+4\hat{k}\right)T$

Area of the square $=L^2\hat{k}m^2$

$\therefore$ Flux passing through the square,

$$\phi=B.A=B_0\left(2\hat{i}+3\hat{j}+4\hat{k}\right).L^2\hat{k}$$

$$\phi=4B_0L^2Wb$$

22. 1) $V=240\sin\left(100\pi t\right)\cos\left(100\pi t\right)$

$$\because 2\sin\theta\cos\theta=\sin 2\theta$$

$$\therefore \sin\left(100\pi t\right)\cos\left(100\pi t\right)$$

$$=\frac{\sin\left(2\times 100\pi t\right)}{2}$$

$$V=120\sin 200\pi t$$

Comparing Eq. (i) with $V=V_0\sin\omega t$

$$V_0=120V$$

$$\omega=200\pi$$

$$2\pi f=200\pi$$

$$\therefore f=100Hz$$

23. 1) Magnetic strength of bar magnet = m

Cross-sectional area = A

Let magnetic strength of each new part is m'.

Cross-section area A' = A/2

As we know that,

$m \propto A$

$\therefore \frac{m'}{m} = \frac{A'}{A}$

$m' = \frac{A/2}{A} m$

$m' = m/2$

24. 3) Given $v = -a\hat{j}$

$\therefore E \times B = v,$ which satisfies,

$\left(-E\hat{k} \times B\hat{i}\right) = -a\hat{j}$

i.e., direction of oscillating electric field of electromagnetic wave will be along negative z-direction

25. 2) Comparing the given equation with

$B_y = B_0 \sin\left(kx + \omega t\right)$

We get, $k = 10^3 or\ \frac{2\pi}{\lambda} = 10^3$

$\therefore \lambda = \frac{2\pi}{10^3} m = 6.28 \times 10^{-3} m$

= 0.63 cm

26. 2) As we know, $R = \frac{\rho l^2}{A}$ and volume $V = Al$

$\therefore R = \frac{\rho l^2}{V}$

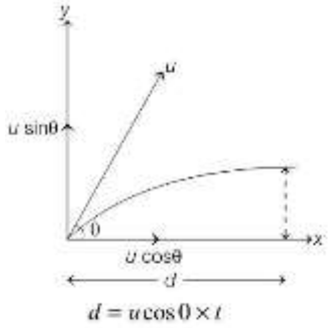
$\Rightarrow \frac{\Delta R}{R} = \frac{2\Delta l}{l} = 1\%$

27. 3) Flux associated with two opposite faces of the cube,

$\phi = \frac{2}{6} \times \frac{\text{Net charge inside the cube}}{\varepsilon_0}$

$= \frac{q}{3\varepsilon_0}$

28. 2) The motion of the stone along the horizontal direction is given by



$$t = \frac{d}{u\cos\theta} \quad \text{...(i)}$$

The motion along vertical direction,

$$h = u\sin\theta \times t - \frac{1}{2}gt^2 \quad \text{...(ii)}$$

From Eqs(i) and (ii), we get

$$h = u\sin\theta \times \frac{d}{u\cos\theta} - \frac{1}{2}g\frac{d^2}{u^2\cos^2\theta}$$

$$\Rightarrow h = d\tan\theta - \frac{1}{2}g\frac{d^2}{u^2\cos^2\theta}$$

$$\Rightarrow u^2 = \frac{gd^2}{2(d\tan\theta - h)\cos^2\theta}$$

$$\Rightarrow u = \frac{d}{\cos\theta}\sqrt{\frac{g}{2(d\tan\theta - h)}}$$

29. 2) Let the initial volume be $V = L_X L_Y L_Z$

Volume after expansion,

$$V' = L'_X \, L'_Y \, L'_Z$$

$$= L_X(1+\alpha_1\Delta)L_Y(1+\alpha_2\Delta) \; L_Z(1+\alpha_3\Delta T)$$

$$= L_X L_Y L_Z(1+\alpha_1\Delta T)(1+\alpha_2\Delta T)\;(1+\alpha_3\Delta T)$$

$$= L_X L_Y L_Z\left[1+\alpha_1\Delta T+\alpha_2\Delta T+\alpha_3\Delta T+\alpha_1\alpha_2\Delta T^2+\alpha_2\alpha_3\Delta T^2+\alpha_3\alpha_1\Delta T^2+\alpha_1\alpha_2\alpha_3\Delta T^2\right]$$

Neglecting higher power of ΔT, then

$$V' = V\left[1+(\alpha_1+\alpha_2+\alpha_3)\Delta T\right]$$

$$\therefore V' = V\left[1+\gamma\Delta T\right]$$

$$\therefore \gamma = \alpha_1+\alpha_2+\alpha_3$$

30. 3) $\because$ Velocity of light waves in material,

$v = v\lambda$ ...(i)

Refractive index of material,

$\mu = \frac{c}{v}$ ...(ii)

Where, c is speed of light in vacuum or air

or $\mu = \frac{c}{v\lambda}$ ...(iii)

given, $v = 2\times 10^{14} Hz$

$\lambda = 5000$ Å = $5000\times 10^{-10} m$

And $c = 3\times 10^{8} m/s$

Hence, from Eq. (iii), we get

$$\mu = \frac{3\times 10^{8}}{2\times 10^{14}\times 5000\times 10^{-10}} = 3$$

31. 2) We know that, in any medium except vacuum or air, then the velocities of different colours are different. Therefore, both red and green colours are refracted at different angles of refraction. So, after emerging from rectangular glass slab through opposite parallel faces, they appear at two different points and move in two different parallel directions.

32. 3) As we know that,

$\Delta Q = \Delta U + \Delta W$

For adiabatic process,

$\Delta Q = 0$

So, $\Delta U = -\Delta W$

or $\Delta W = -\Delta U$

Hence, when a gas expands adiabatically, then internal energy of the gas is used in performing work.

33. 2) End correction $= \frac{L_2 - 3L_1}{2}$

$= \frac{112.9 - 3\times 32.5}{2} = \frac{15.4}{2} = 7.7 cm$

Speed of sound in air,

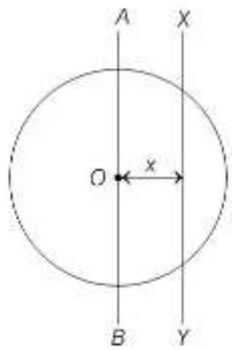
$v = 2v(L_2 - L_1)$

$= 2\times 256\times(1.129 - 0.325)$

$= 411.65 ms^{-1}$

34. 2) From parallel axes theorem,

$I_{XY} = I_{AB} + Mx^2$



$\Rightarrow Mk^2 = \frac{2}{5}MR^2 + Mx^2$

Given, $k = \sqrt{2}R$

$\therefore 2R^2 = \frac{2}{5}R^2 + x^2 \Rightarrow x = \frac{2\sqrt{2}}{\sqrt{5}}R$

35. 2)

36. 4)

37. 2) As we know that, $s = ut + \frac{1}{2}at^2$

We have, $h = u\cos\theta t_1 - \frac{1}{2}gt_1^2 \;\; = u\cos\theta t_2 - \frac{1}{2}gt_2^2$

$\Rightarrow u\cos\theta \times 1 - \frac{1}{2}\times 9.8 \times 1^2$

$= u\cos\theta \times 3 - \frac{1}{2}\times 9.8 \times 3^2$

$u\cos\theta(3-1) = 4.9\times(9-1)$

$u\cos\theta = \frac{4.9\times 8}{2} = 19.6m/s$

Maximum height is given by

$h_{\max} = \frac{u^2\cos^2\theta}{2g} \;\; = \frac{(19.6)^2}{2\times 9.8} = 19.6m$

38. 2) In L-C-R series, resonance circuit, $X_L = X_C$

i.e. At resonance frequency f_0, $X_L = X_C$

$\therefore Z = \sqrt{(X_L = X_C)^2 + R^2}$

$Z_{\min} = R$

Hence, graph showing in option (2) is correct.

39. 1) Here, p-n junction diode is in forward bias with voltage,

$V = 5 - 3 = 2V$

$\therefore$ Current, $I = \frac{2}{200} = \frac{1}{100} A$

= 10 mA

40. 1) As, $\Delta U = C_V \Delta T$

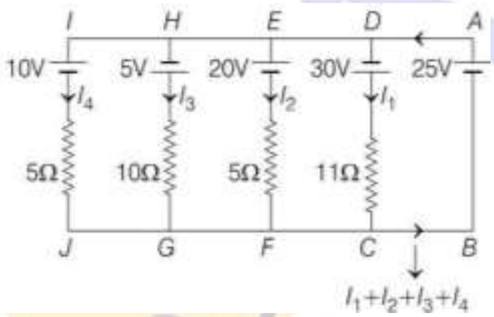
$C_p - C_V = R$

$\Rightarrow \frac{C_p}{C_V} - 1 = \frac{R}{C_V} \quad \Rightarrow C_V = \frac{R}{\gamma - 1}$

Hence, $\Delta U = \frac{R\Delta T}{(\gamma - 1)} = \frac{8.3 \times 8}{(1.4 - 1)}$

ΔU = 166 J

41. 3)



Applying KVL in closed loop ADCBA, AEFBA, AHGBA and AIJBA, we get

$30 - 11I_1 + 25 = 0$

$-20 - 5I_2 + 25 = 0$

$5 - 10I_3 + 25 = 0$

$-10 - 5I_4 + 25 = 0$

From Eqs. (i), (ii), (iii), (iv), we get

$I_1 = 5A, I_2 = 1A, I_3 = 3A, I_4 = 3A$

$I = I_1 + I_2 + I_3 + I_4 = 12A$

Hence, total current flowing through 25 V cell is 12 A.

42. 4) New fringe width,

$$\beta' = \frac{\beta}{\mu} \qquad = \frac{0.5}{5/3} = 0.3mm$$

43. 2) From second law of motion,

$$mg - T = ma \qquad \text{and} \qquad T = \frac{25}{100}mg = \frac{1}{4}mg$$

$$\Rightarrow mg - \frac{1}{4}mg = ma \Rightarrow a = \frac{3}{4}g$$

44. 1) In p-n junction, the diffusion of majority carrier takes place when junction is forward biased and drifting of minority carrier takes place across the junction when reverse biased.

45. 1) Given, h = 1600 km $= 1.6\times10^6 m$, $R_e = 6.4\times10^6 m$ and $g = 9.8ms^{-2}$

The distance of satellite from earth's centre,

$$r = R_e + h \; = 6.4\times10^6 + 1.6\times10^6$$

$$a_c^c = g_h = g\left[\frac{R}{R+h}\right]^2 = g\left[\frac{6400}{8000}\right]^2 = 0.64\text{ g}$$

$$= \left[\frac{4}{5}\right]^2_g$$

46. (1) $MX_2 \rightleftharpoons M^{2+} + 2X^-$

$K_{sp} = [M^{2+}][X^-]^2$

$\therefore K_{sp} = (S)(2S)+ = 4S^3$

$4S^3 = 32 \times 10^{-15}$

Thus, $S = \sqrt[3]{8\times10^{-15}}$

$= 2 \times 10^{-5}$ M

$\Rightarrow [M^{2+}] = 2 \times 10^{-5}$ M

47. (1)

```
      CH3                          CH3
      |                            |
CH3 – CH – CH2 – CH3  and   CH3 – C – CH3
                                   |
                                   CH3
```

(Isopentane) (Neopentane)

Both have same molecular formula but different carbon skeletons.

```
      CH3   2⁰ carbon
      |      ↑
H3C– CH – CH2 – CH3
      ↓
     3⁰ carbon
    (Isopenane)
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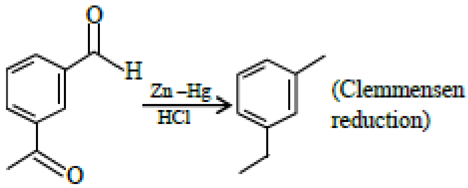
48. (4)



49. (4) For first order reaction,

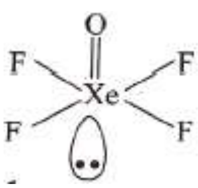
$$t_{\frac{1}{2}} = \frac{2.303}{k}\log\left(\frac{1}{1/2}\right) = \frac{2.303}{k}\log 2 \quad \ldots(i)$$

$$t_{\frac{1}{3}} = \frac{2.303}{k}\log\left(\frac{1}{1/3}\right) = \frac{2.303}{k}\log 3 \quad \ldots(ii)3$$

On dividing Eq. (i) by Eq. (ii), we get

$$\frac{t_{1/2}}{t_{1/3}} = \frac{\log 2}{\log 3} = \frac{0.3010}{0.4771} = 0.631$$

50. (1)



sp^3d^2, no. of lone pair = Square Pyramidal

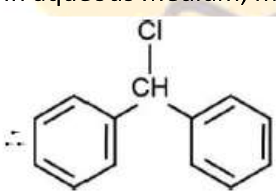
51. (3) $CH_3CH_2NH_2 \longrightarrow CH_3CH_2-OH + N_2$

Mol. wt. 45 g 14 g

Given : N_2 evolved is 2.24 L i.e. 0.1 mole. i.e. $CH_3CH_2NH_2$ (ethyl amine) will be 4.5 g (= 0.1 mole)

Hence the answer = 45×10^{-1} g

52. (2) In aqueous medium, more easily the carbocation is formed, faster is the hydrolysis.



Forms most stable carbocation, hence hydrolysis rate is fastest in the given compounds.

53. (2) The correct answer is (b) A-III, B-I, C-II, D-IV. n = Principal quantum number, *l* = Azimuthal quantum number

54. (4)

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55. (4) $K'_c = \left(\frac{1}{K_c}\right)^2 = \left(\frac{1}{4.9 \times 10^{-2}}\right)^2$

$K'_c = 416.49$

56. (1) Br

$CH_3CH_2CH = CH_2 + HBr \xrightarrow[\text{Peroxide}]{\text{Organic}} CH_3CH_2CH - CH_3 + CH_3CH_2CH_2CH_2Br$

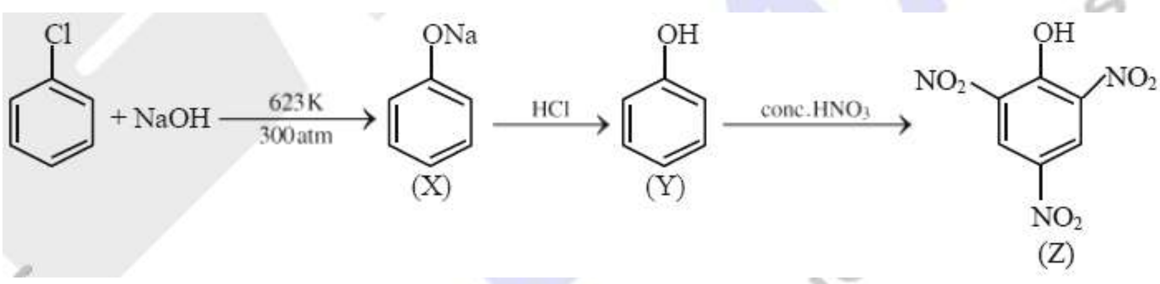
(Minor) (Major)

57. (3)

58. (4) $[Ni(CO)_4] \rightarrow$ diamagnetic, sp^3 hybridization, number of unpaired electrons = 0

$[NiCl_4]^{2-} \rightarrow$ paramagnetic, sp^3 hybridization, number of unpaired electrons = 2

59. (3)



60. (1) $C + O_2 \rightarrow CO_2$

12 g of carbon = 1 mole of carbon

Burning of 1 mole carbon requires 1 mole of oxygen (O_2)

Volume of oxygen required = 22.4 L

Let x L of air is required to completely burn 12g carbon $\Rightarrow \frac{x \times 21}{100} = 224$

So, x = 10667 L

61. (1) $N_2 : \sigma(2s)^2 \, \overset{*}{\sigma}(2s)^2 \, \pi(2p_x)^2 \, \sigma(2p_z)^2$

Bond order = $\frac{1}{2}(8 - 2) = 3$

$O_2 : (\sigma 2s)^2 \left(\overset{*}{\sigma} 2s\right)^2 (\sigma 2p_z)^2 (\pi_y 2p_y)^2 (\pi_z 2p_x)^2 \left(\overset{*}{\pi}_y 2p_y\right)^1 \left(\overset{*}{\pi}_z 2p_x\right)^1$

Bond order = $\frac{1}{2}(8 - 4) = 2$

$F_2 : (\sigma 2s)^2 \left(\overset{*}{\sigma} 2s\right)^2 (\sigma 2p_z)^2 (\pi_y 2p_y)^2 (\pi_z 2p_x)^2 \left(\overset{*}{\pi}_y 2p_y\right)^2 \left(\overset{*}{\pi}_z 2p_x\right)^2$ Bond order = $\frac{1}{2}(8 - 6) = 1$

$O_2^+ : (\sigma 2s)^2 \left(\overset{*}{\sigma} 2s\right)^2 (\sigma 2p_z)^2 (\pi_y 2p_y)^2 (\pi_z 2p_x)^2 \left(\overset{*}{\pi}_y 2p_y\right)^1$

Bond order = $\frac{1}{2}$ (8 – 3) = 2.5

62. (4)

	O^{2-} F^- Na^+ Mg^{2+}
(No. of e^-)	10 10 10 10
(Ionic radius)	$O^{2-} > F^- > Na^+ > Mg^{2+}$
Zeff	$O^{2-} < F^- < Na^+ < Mg^{2+}$

63. (3) According to Nernst equation,

$$E_{cell} = E^0_{cell} - \frac{0.059}{n}\log Q \;...\; (i)$$

At equilibrium, Q = K_{eq} and E_{cell}=0

$$0 = E^0_{cell} - \frac{0.059}{n}\log K_{eq} \text{ [from (i)]}$$

$$\log K_{eq} = \frac{E^0_{cell} \times n}{0.059} = \frac{0.59}{0.059}$$

log K_{eq} = 10

K_{eq} = antilog (10)

$K_{eq} = 10^{10}$

64. (1) $CuSO_4 \cdot 5H_2O$

Cu^{2+} : $3d^9\ 4s^0$

Unpaired electron present so it show colour due to d – d transition

65. (4) In Sandmayer reaction only bromobenzene & chlorobenzene are prepared

66. (1) Lesser is the stability of alkene more is the energy released on hydrogenation

67. (2) $Cl_2(g) + 2Br^-(aq) \longrightarrow 2Cl^-(aq) + Br_2(aq)$;

$$E^0_{cell} = 0.29\,V$$

$$E_{cell} = E^0_{cell} - \frac{0.0591}{2}\log\frac{[Cl^-]^2[Br_2]}{[Br^-]^2[Cl_2]}$$

$$E_{cell} = 0.29 - \frac{0.0591}{2}\log\frac{(0.01)^2 \times 0.01}{(0.01)^2}$$

$$E_{cell} = 0.29 - \frac{0.0591}{2}\log 10^{-2}$$

$$E_{cell} = 0.29 + 2 \times \frac{0.0591}{2}\log 10$$

$= 0.3491V = 0.35\ V$

68. (2) Due to attainment of stable configuration after losing 3 electrons, there is sudden increase in I_4 from I_3, hence it has 3 electrons in the valence shell.
$M^{+3}\ (SO_4)^{-2} \rightarrow M_2\ (SO_4)_3$

69. (4) $BaCl_2$, NaCl are soluble but on adding HCl (g) to $BaCl_2$, NaCl solutions, Sodium or Barium chlorides may precipitate out, as a consequence of the common ion effect .

70. (1) Electron withdrawing group increases acidity of substituted phenols.
Electron donating group decreases acidity of substituted phenols,

71. (1) As the two H-atoms approach each other, the force of attraction between the nucleus of one and electron of the other, and vice-versa comes into play. This process is accompanied by decrease in potential energy. The distance at which the repulsive forces are exactly balanced by attractive forces is bond length. Here, the energy is minimum. If the two atoms are further brought closer to each other, repulsive forces become more dominant and energy increases.

72. (4) Chlorine has more negative electron gain enthalpy than fluorine due to bigger size and lesser electronic re-pulsion

73. (1) A. size order T*l* > In > Al > Ga>B
B. Electronegativity order B > Al < Ga < In < T*l*
D. B, Al are more stable in +3 oxidation state So, only C, E statements are correct.

74. (2) It is given that half-life,

$$t_{1/2} = \frac{0.693}{k} = 6.93$$

$$k=0.1$$

For a first order reaction,

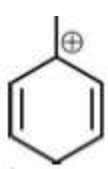
$$k = \frac{2.303}{t} \log \frac{[A_0]}{[A_t]}$$

A_0 = initial concentration
A_t = concentration at time t

$$0.1 = \frac{2.303}{t} \log \frac{100}{1} = \frac{2.303}{t} \times 2$$

$$t = \frac{4.606}{0.1} = 46.06 \text{ minutes}$$

75. (4)

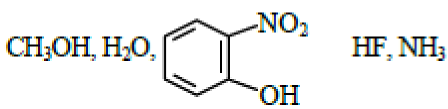


is most stable because of resonance and hyperconjugation effects.

76. (2) Hess law is not applicable for nuclear reaction.
All combustion reactions are exothermic.
Work is a path function, not a state function.
Difference between two integral heats of solution is heat of dilution.
Hence, the correct match is A-(iv), B-(iii), C-(i), D-(ii).

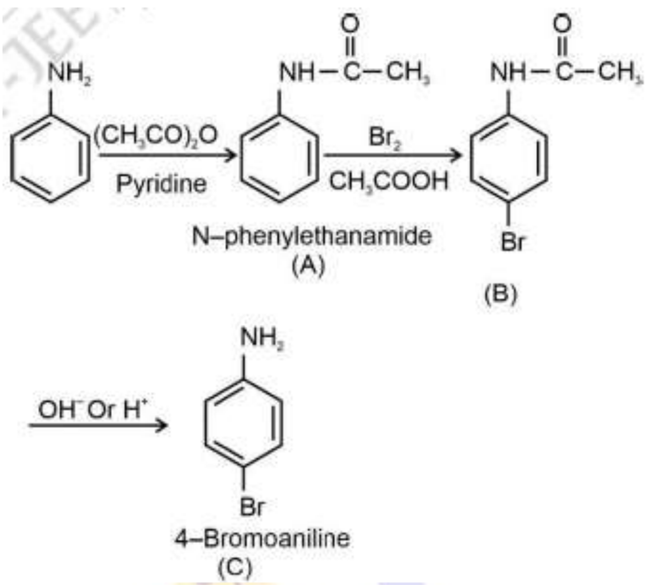
77. (4) $Cr_2O_7^{2-} + 3SO_3^{2-} + 8H^+ \rightarrow 2Cr^{3+} + 3SO_4^{2-} + 4H_2O$

78. (1)



Can show H-bonding.

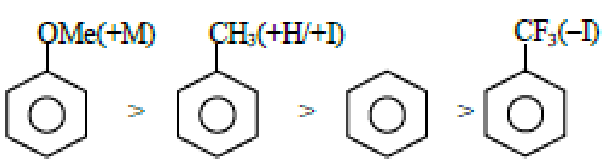
79. (2)



80. (4) $\Delta G^0 = -2.303\ RT \log K_{eq}$
Given : $K_{eq} = 4 \times 10^5$
$R = 8.314\ JK^{-1}\ mol^{-1}$ and $T = 300K$
$\Delta G^0 = -2.303 \times 8.314 \times 300 \log (4 \times 10^5)$
$= 32179$ J/mol
$\Delta G^0 = 32.18\ kJ\ mol^{-1} = 7.73$ kcal

81. (4) Di methyl glyoxime is the reagent which gives brilliant red precipitate with Nickel ions in basic medium

82. (2)



83. (2) Both aliphatic and aromatic aldehydes give positive Tollen's reagent test, while only aliphatic aldehyde gives Fehling's test.

84. (1) The radius of atom can be given as

$$r_n = \frac{n^2 a_0}{Z}$$

where, n = number of orbit

Z = atomic number

a_0 = constant value

So, the radius of hydrogen atom in the ground state.

$$r_1(H) = \frac{a_0}{1} = a_0 = 0.53\ Å$$

$$r_1(Li^{2+}) = \frac{a_0}{3} = \frac{0.53}{3} = 0.17\ Å$$

85. (1) Fe^{3+}–$3d^5$

$\because$

$A_0 < P$

$\therefore\ Fe^{3+} - t_{2g}^3 e_g^2$

CFSE=3(– 0.4 Δ_0) + 2(+ 0.6 Δ_0) = zero

86. (4) Insulin and albumins are globular proteins

87. (2) For a binary ideal liquid solution, the variation in total vapour pressure versus composition of the solution is given by graph (b) in which, total vapour pressure shows a linear composition of the solution. As the mole fraction of more volatile component increases, the total vapour pressure increases.

88. (3) Eclipsed conformation is most unstable conformation of n-butane because of torsional strain.

89. (3) Percentage of H

$$= \frac{2}{18} \times \frac{\text{Weight of } H_2O}{\text{Weight of organic compound}} \times 100$$

$$= \frac{2}{18} \times \frac{0.9}{0.5} \times 100 \quad = 20\ \%$$

$\therefore$ Percentage of carbon = 100 – 20 = 80%

90. (2) For a solution of $AlCl_3$ in water, the van't Hoff factor

(i) is greater than 1 due to hydrolysis.

$$AlCl_3 + 3H_2O \longrightarrow Al(OH)_3 + 3Cl^-$$

As the number of particles increases due to hydrolysis, the van't Hoff factor is more than 1. Hence, statement I is true. The solubility of gas in liquid is directly proportional to the pressure over the solutions at a given temperature. This is according to Henry's law. Hence, statement II is also true.

APMA ...students first