MP Murlidhar Mohol & APMA initiative

Mission NEET 2025

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

DATE : 19.04.2025

PCB : ENTIRE XI + XII NCERT

Note:

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

1. (2) $\frac{M}{At} \propto P^x v^y$

$\Rightarrow ML^{-2}T^{-1} = [ML^{-1}T^{-2}]^x\,[L^1T^{-1}]^y$

$= M^xL^{-x+y}T^{-2x-y}$

$x = 1, -x + y = -2$, and $-2x - y = -1$

From here, we get $y = -1$

Thus, $x = -y$

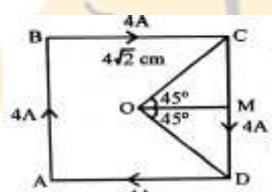
2. (1) $t = \alpha x^2 + \beta x$

Differentiating : $1 + 2\alpha \frac{dx}{dt} \times x + \beta \frac{dx}{dt}$

$$v = \frac{dx}{dt} = \frac{1}{\beta + 2\alpha x};$$

$$\frac{dv}{dt} = \frac{-2\alpha v}{(\beta + 2\alpha x)^2} = -2\alpha v^3$$

3. (1)



Magnetic field at O due to the current carrying conductor CD is

$$B_1 = \frac{\mu_0}{4\pi} \cdot \frac{I}{r}(\sin\phi_1 + \sin\phi_2)$$

Where I = 4A, $r = 2\sqrt{2}$ cm

$\phi_1 = \phi_2 = 45^o$ and $\sin 45^0 = \frac{1}{\sqrt{2}}$

$\therefore \quad B_1 = 10^{-7} \times \frac{4}{2\sqrt{2}} \times \frac{2}{\sqrt{2}} = 2 \times 10^{-7}$ T

$\therefore$ Total magnetic field at

O = $4B_1 = 8 \times 10^{-7}$ T

4. (2) The initial K.E. of the bullet

$= \frac{1}{2}mv^2 = \frac{1}{2} \times 50 \times 10^{-3} \times 200 \times 200$

$\therefore$ $K_i = 1000$ J

$\therefore$ Final K.E. $(K_f) = \frac{25}{100} \times 1000 = 250$ J

$\therefore \quad \frac{1}{2}mv_f^2 = 250$

$\therefore \quad \frac{1}{2} \times 50 \times 10^{-3} \times v_f^2 = 250$

$\therefore \quad v_f^2 = \frac{250 \times 2 \times 10^3}{50} = 10^4$

$\therefore$ $v_f = 10^2 = 100$ m/s

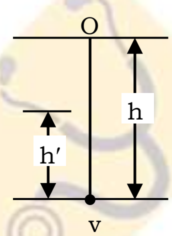
$\therefore$ Decrease in speed = (200 – 100)

= 100 m/s

$\therefore$ Percentage decrease in speed

$= \frac{100}{200} \times 100 = 50\%$

5. (3)



The ball strikes the ground with a velocity v and $v^2 = 2gh$ .... (i)

The velocity of rebound = ev

For the upward motion,

$0 = (ev)^2 - 2gh'$

$\therefore \quad e^2v^2 = 2gh'$ .... (ii)

$\therefore \quad e^2 . 2gh - 2gh'$

$\therefore \quad h' = e^2h = 0.8 \times 0.8 \times 1 = 0.64$ m

6. (4) $\dfrac{\frac{1}{2}mv_e^2}{\frac{1}{2}mv_0^2} = \dfrac{\left(\sqrt{2}\,v_0\right)^2}{v_0^2} = 2$

7. (1) From Einstein's photoelectric equation

$\frac{1}{2}mv^2 = \frac{hc}{\lambda} - W_0$ ....(i)

and $\frac{1}{2}mv'^2 = \frac{4hc}{3\lambda} - W_0$ ....(ii)

$\therefore$ $v'^2 = \frac{8hc}{3m\lambda} - \frac{2W_0}{m}$ ....(iii)

and from (i), $v^2 = \frac{2hc}{\lambda m} - \frac{2W_0}{m}$ ....(iv)

$\therefore$ $v'^2 - v^2 = \frac{8hc}{3m\lambda} - \frac{2W_0}{m} - \frac{2hc}{\lambda m} + \frac{2W_0}{m}$

$= \frac{8hc}{3m\lambda} - \frac{6hc}{3m\lambda} = \frac{2hc}{3m\lambda}$

$\therefore$ $v'^2 = v^2 + \frac{2hc}{3\lambda m}$ ....(v)

Thus $v' > v$

From (iv), $\frac{4}{3}v^2 = \frac{8hc}{3\lambda m} - \frac{4}{3}\left(\frac{2W_0}{m}\right)$ ...(vi)

$\therefore$ From (iii) and (v), we find that

$v'^2 - \frac{4}{3}v^2 = \frac{8hc}{3m\lambda} - \frac{8hc}{3m\lambda} - \frac{2W_0}{m} + \frac{4}{3}\left(\frac{2W_0}{m}\right)$

$\therefore$ $v'^2 = \frac{4}{3}v^2 + \frac{2W_0}{3m}$

Thus $v' > \sqrt{\frac{4}{3}}v$ or $v' > v\left(\frac{4}{3}\right)^{1/2}$

8. (1) Moment of Inertia of disc $I = \frac{1}{2}MR^2$

$= \frac{1}{2}(\pi R^2 t\rho)R^2 = \frac{1}{2}\pi t\rho R^4$

[As $M = V \times \rho = \pi R^2 t\rho$ where

t = thickness, ρ = density]

$\therefore \quad \frac{I_y}{I_x} = \frac{t_y}{t_x}\left(\frac{R_y}{R_x}\right)^4$ [It ρ = constant]

$\Rightarrow \quad \frac{I_y}{I_x} = \frac{1}{4}(4)^4 = 64$

[Given $R_y = 4R_x$, $t_y = \frac{t_x}{4}$]

$\Rightarrow \quad I_y = 64I_x$

9. (3) By the law of conservation of angular momentum,

$I_1\omega_1 + I_2\omega_2 = (I_1 + I_2)\omega$

Angular velocity of system, $\omega = \frac{I_1\omega_1 + I_2\omega_2}{I_1 + I_2}$

Rotational kinetic energy

$= \frac{1}{2}(I_1 + I_2)\,\omega^2 = \frac{1}{2}(I_1 + I_2)\left(\frac{I_1\omega_1 + I_2\omega_2}{I_1 + I_2}\right)^2$

$= \frac{(I_1\omega_1 + I_2\omega_2)^2}{2(I_1 + I_2)}$

10. (3) Thermal stress = $Y\alpha\Delta\theta$.

If thermal stress and rise in temperature are equal, then $Y \propto \frac{1}{\alpha}$

$\Rightarrow \quad \frac{Y_1}{Y_2} = \frac{\alpha_2}{\alpha_1} = \frac{3}{2}$

11. (4) Using Bernoulli theorem,

$P_1 + \frac{1}{2}\rho v_1^2 = P_2 + \frac{1}{2}\rho v_2^2$

In this case, $v_1 = 0$, $v_2 = v$

$\therefore \quad P_1 - P_2 = \frac{1}{2}\rho v^2$

$\therefore \quad v = \sqrt{\frac{2(P_1 - P_2)}{\rho}} = \sqrt{\frac{2 \times (3.5 - 3) \times 10^5}{10^3}}$ = 10 m/s

12. (3) Rise in temperature, $\Delta\theta = \frac{3T}{JSd}\left(\frac{1}{r} - \frac{1}{R}\right)$

$\Delta\theta = \frac{3T}{J}\left(\frac{1}{r} - \frac{1}{R}\right)$ (For water $S = 1$ and $d = 1$)

13. (2) Heat lost in t sec = mL or heat lost per sec = $\frac{mL}{t}$. This must be the heat supplied for keeping the substance in molten state per sec.

$\therefore$ L = pt/m

14. (3) For state A, $C_p - C_v = R$,

i.e. the gas behaves as an ideal gas,

For state B, $C_p - C_v = 1.06\ R (\neq R)$

i.e. the gas does not behave like an ideal gas.

We know that at high temperature and at low pressure, nature of gas may be ideal.

So we can say that $P_A < P_B$ and $T_A > T_B$.

15. (1) Given $P \propto T^3$. But for adiabatic process $P \propto T^{\gamma/\gamma-1}$. So,

$$\frac{\gamma}{\gamma-1} = 3 \Rightarrow \gamma = \frac{3}{2} \Rightarrow \frac{C_p}{C_v} = \frac{3}{2}$$

16. (1) $U = k|x|^3$

$$\Rightarrow F = -\frac{dU}{dx} = -3k|x|^2 \quad \text{... (i)}$$

Also, for SHM, $x = a\sin\omega t$ and $\frac{d^2x}{dt^2} + \omega^2 x = 0$

$$\Rightarrow \text{Acceleration } a = \frac{d^2x}{dt^2} = -\omega^2 x$$

$$\Rightarrow F = ma = m\frac{d^2x}{dt^2} = -m\omega^2 x$$

From equation (i) and (ii) we get $\omega = \sqrt{\frac{3kx}{m}}$

$$\Rightarrow T = \frac{2\pi}{\omega} = 2\pi\sqrt{\frac{m}{3kx}} = 2\pi\sqrt{\frac{m}{3k(a\sin\omega t)}} \Rightarrow T \propto \frac{1}{\sqrt{a}}.$$

17. (3) All are OR gate . $\therefore$ $Y_1 = A + B$

$Y_2 = A + B + C$, $X = A + B + C + D$

18. (1) The given equation can be x written as

$$y = \frac{A}{2}\cos\left(4\pi nt - \frac{4\pi x}{\lambda}\right) + \frac{A}{2}$$

$$\left(\because \cos^2\theta = \frac{1+\cos 2\theta}{2}\right)$$

Hence amplitude = $\frac{A}{2}$ and frequency

= $\frac{\omega}{2\pi} = \frac{4\pi n}{2\pi} = 2n$ and wave length

= $\frac{2\pi}{k} = \frac{2\pi}{4\pi/\lambda} = \frac{\lambda}{2}$.

19. (1) Power = $\frac{\text{Work}}{\text{Time}}$

$\therefore \quad W = P \times t$ and $P = \frac{3t^2}{2}$

From work power theorem,

Changing in KE = Work done = Pdt

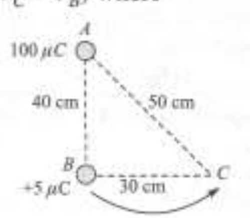
$\therefore \quad K_f - K_i = \int P\, dt = \int\left(\frac{3}{2}t^2\right)dt \qquad \therefore \quad \frac{1}{2}mv^2 - 0 = \int_0^2\left(\frac{3}{2}t^2\right)dt$

$\therefore \quad \frac{1}{2}(2)v^2 = \left[\frac{3}{2}\times\frac{t^3}{3}\right]_0^2 = \left[\frac{3}{2}\times\frac{8}{3}\right] = 4$

$\therefore \quad v^2 = 4$ or v = 2 m/s

20. (4) Work done in displacing charge of 5μC from B to C is

$W = 5 \times 10^{-6}(V_C - V_B)$ where



$$V_B = 9\times10^9 \times \frac{100\times10^{-6}}{0.4} = \frac{9}{4}\times10^6\ \text{V}$$

and $V_C = 9\times10^9 \times \frac{100\times10^{-6}}{0.5} = \frac{9}{5}\times10^6\ \text{V}$

So $W = 5\times10^{-6}\times\left(\frac{9}{5}\times10^6 - \frac{9}{4}\times10^6\right) = -\frac{9}{4}\ \text{J}$

21. (4) $E_x = -\frac{dV}{dx} = -(6-8y^2)$,

$E_y = -\frac{dV}{dy} = -(-16xy - 8 + 6z)$

$E_z = -\frac{dV}{dz} = -(6y - 8z)$

At origin x = y = z = 0 so,

$E_x = -6$, $E_y = 8$ and $E_z = 0$

$\Rightarrow \quad E = \sqrt{E_x^2 + E_y^2} = 10 N/C$

Hence force F = QE = 2 × 10 = 20 N

22. (2) The two wire have the same length, same material and stretched by same force (Mg) and $\frac{r_1}{r_2} = n:1$

$\because \quad Y = \frac{MgL}{\pi r^2 e} \quad \therefore \quad e = \frac{MgL}{\pi r^2 Y} \quad \therefore \quad e \propto \frac{1}{r^2}$

$\therefore \quad \frac{e_1}{e_2} = \frac{r_2^2}{r_1^2} = \left(\frac{1}{n}\right)^2 \quad \therefore \quad \frac{e_1}{e_2} = 1:n^2$

23. (4) $R_{eq} = \frac{5}{2}\Omega$

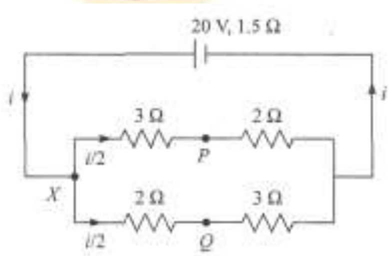
$i = \frac{20}{\frac{5}{2} + 1.5} = 5A$

Potential difference between X and P,

$V_x - V_P = \left(\frac{5}{2}\right) \times 3 = 7.5 \text{ V}$

$V_x - V_Q = \frac{5}{2} \times 2 = 5 \text{ V}$

On solving (i) and (ii) $V_P - V_Q = -2.5$ volt; $V_Q > V_P$.



24. (4) Knowledge Based

25. (1) Suppose in equilibrium wire PQ lies at a distance r above the wire AB

Hence in equilibrium mg = $Bi\ell$

$\Rightarrow \quad mg = \frac{\mu_0}{4\pi}\left(\frac{2i}{r}\right)\times i\ell \qquad \Rightarrow \quad 10^{-3}\times 10 = 10^{-7}\times\frac{2\times(50)^2}{r} = 0.5$

$\Rightarrow$ r = 25 mm

26. (4) The net current carried by the cable wires,

i_{net} = (20 – 5 + 10 + 7 – 12) A = 20 A

$\therefore$ B = $\frac{\mu_0}{4\pi}\left(\frac{2i}{r}\right) = 10^{-7}\times\frac{2\times 20}{5\times 10^{-2}}$

= $8\times 10^{-5} = 80\times 10^{-6}$ T

$\therefore$ B = 80 μT

27. (2) M = IA, A = πR^2

$\therefore$ R = $\left(\frac{A}{\pi}\right)^{1/2}$ ……… (i)

and B = $\frac{\mu_0}{4\pi}\left(\frac{2\pi I}{R}\right) = \frac{\mu_0 I}{2R}$

$\therefore$ I = $\frac{2RB}{\mu_0}$ ……….. (ii)

$\therefore$ from (i) and (ii)

$\therefore$ M = IA = $\frac{2RB}{\mu_0}\times A$

= $\frac{2RB}{\mu_0}\times\frac{A^{1/2}}{\pi^{1/2}} = \frac{2BA^{3/2}}{\mu_0\pi^{1/2}}$

28. (4) Input power (P_i) = $V_p i_p$

$\therefore$ $3\times 1000 = 200\times i_p$ $\quad\therefore$ i_p = 15 A

$\because$ The efficiency $\eta = \frac{P_0}{P_1}$

$\therefore$ $P_0 = \eta\times P_i = \frac{9}{10}\times 3000$ = 2700

$\therefore$ $V_s = \frac{P_0}{I_s} = \frac{2700}{6}$

V_s = 450 V

Thus V_s = 450 V and I_p = 15 A

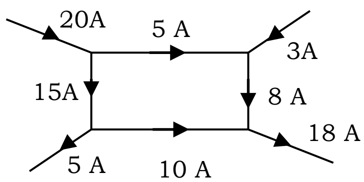
29. (2) $P = \frac{1}{2} V_0 i_0 \cos\varphi$

$$\Rightarrow 1000 = \frac{1}{2} \times 200 \times i_0 \cos 60^o$$

$$\Rightarrow i_0 = 20\ A$$

$$\Rightarrow i_{rms} = \frac{i_0}{\sqrt{2}} = \frac{20}{\sqrt{2}} = 10\sqrt{2}\ A$$

30. (3)



I = 18 A

31. (2) $\frac{P}{4} = \frac{20}{80} = \frac{1}{4}$ $\therefore$ P = 1 Ω

Since the two halves are in parallel

$\therefore$ Effective resistance = $\frac{R}{4}$ = 1 Ω

$\therefore$ R = 4 Ω

32. (2) For *glass-water* interface $_g\mu_w = \frac{\sin i}{\sin r}$

For *water-air* interface $_w\mu_a = \frac{\sin r}{\sin 90^o}$

$$\Rightarrow {}_g\mu_w \times {}_w\mu_a = \frac{\sin i}{\sin r} \times \frac{\sin r}{\sin 90^\circ} = \sin i$$

$$\Rightarrow \frac{\mu_w}{\mu_g} \times \frac{\mu_a}{\mu_w} = \sin i \Rightarrow \mu_g = \frac{1}{\sin i}$$

33. (3) For the convex mirror, f = $\frac{R}{2}$ = 10 cm

(f is +ve, v is +ve and u is – ve)

In first case, $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$

$\therefore \quad \frac{1}{u_1} = \frac{1}{f} - \frac{1}{v_1} = \frac{1}{10} - \frac{1}{25/3} = \frac{1}{10} - \frac{3}{25}$

$\therefore \quad \frac{1}{u_1} = -\frac{1}{50} \quad \therefore \quad u_1 = -50$ cm

And the second case,

$\therefore \quad \frac{1}{u_2} = \frac{1}{10} - \frac{1}{(50/7)} = \frac{1}{10} - \frac{7}{50} = \frac{-2}{50}$

$= -\frac{1}{25}$

$\therefore \quad u_2 = 25$ cm

$\therefore$ Object moves through 25 cm in 30 s.

$\therefore \quad v = \frac{25}{30}$ m/s $= \frac{25}{30} \times \frac{18}{5} = 3$ km/hour

34. (4) Let nth minima of 400 nm coincides with mth minima of 560 nm then

$(2n - 1)400 = (2m - 1)560$

$\Rightarrow \quad \frac{2n-1}{2m-1} = \frac{7}{5} = \frac{14}{10} = \frac{21}{15}$

i.e., 4th minima of 400 nm coincides with 3rd minima of 560 nm.

The location of this minima is

$= \frac{7(1000)(400\times10^{-6})}{2\times0.1} = 14\text{mm}$

Next, 11th minima of 400 nm will coincide with 8th minima of 560 nm.

Location of this minima is

$= \frac{21(1000)(400\times10^{-6})}{2\times0.1} = 42\text{mm}$

$\therefore$ Required distance = 28 mm

35. (2) $E = W_0 + eV_0$

For hydrogen atom, E = +13.6 eV

$\therefore \quad +13.6 = 4.2 + eV_0$

$\Rightarrow \quad V_0 = \frac{(13.6-4.2)\text{eV}}{\text{e}} = 9.4\text{V}$

Potential at anode = – 9.4 V

36. (2) Stopping potential equals to maximum kinetic energy. Since stopping potential is varying linearly with the frequency, max. KE for both the metals also vary linearly with frequency.

37. (4) $\frac{1}{\lambda} = R\left[\frac{1}{2^2} - \frac{1}{4^2}\right]$

or $\frac{f}{c} = R\left[\frac{1}{4} - \frac{1}{16}\right]$

or $f = cR\left[\frac{1}{4} - \frac{1}{16}\right]$

$= 3 \times 10^8 \times 10^7 \times \frac{3}{16}$

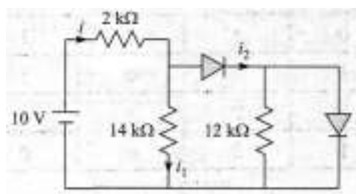
$= \frac{9}{16} \times 10^{15}$ Hz

38. (2) Knowledge Based

39. (4) Equivalent circuit can be redrawn as follows

$i = \frac{10}{2} = mA = i_2$

$i_1 = 0$



40. (2) Energy, $E = K\left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$

(K = constant)

$n_1 = 2$ and $n_2 = 3$. So $E = K\left[\frac{1}{2^2} - \frac{1}{3^2}\right] = K\left[\frac{5}{36}\right]$

For removing an electron $n_1 = 1$ to $n_2 = \infty$

Energy $E_1 = K[1] = \frac{36}{5}E = 7.2E$

$\therefore$ Ionization energy $= 7.2E$

41. (4) $E_2 = \frac{1}{2}L\left[\frac{1}{2}\right]^2 = \frac{1}{4}\left[\frac{1}{2}Li^2\right] = \frac{E_1}{4}$

42. (2) Since there is photoemission, v > threshold frequency (v_0) and the maximum velocity of the emitted photoelectron is given by using

$hv = hv_0 + \frac{1}{2}mv_m^2$

$v = \sqrt{\frac{2h(v-v_0)}{m}}$ ($\because$ $v = v_m$ given)

.... (i)

When v is increased to 4v, then maximum velocity

$v' = \sqrt{\frac{2h(4v-v_0)}{m}} = \sqrt{\frac{8h\left(v-\frac{v_0}{4}\right)}{m}}$

$v' = 2\sqrt{\frac{2h\left(v-\frac{v_0}{4}\right)}{m}}$ ...... (ii)

$\therefore$ from (i) and (ii), v′ > 2v.

43. (3) Knowledge Based

44. (4) For the OR gate, the inputs are $\overline{A}$ and B.

$\therefore$ $X = \overline{A} + B$

45. (3) This is similar to the motion of a lift. The maximum tension in the rope is given by

$T_{max} = m(g + a)$ where a = maximum acceleration

$\therefore$ 500 = 40 (10 + a) = 400 + 40 a

$\therefore$ a = 2.5 m/s^2

46. (2) Due to – I effect of '– $ClCH_2ClCOOH$ will be more acidic than CH_3COOH, so pK_a value of chloro acid decreases.

47. (1) For $K_3[Fe(CN)_6]$ i = 4

Molality = $\frac{0.1 \times 1000}{329 \times 100} = \frac{1}{329}$

$\Delta T_f = iK_f m = 4 \times 1.86 \times \frac{1}{329}$

= 2.3×10^{-2} °C.

As freezing point of water is 0°C.

$\therefore T_f = -2.3 \times 10^{-2}$ °C

48. (2) Correct order of 1st IE

Li < B < Be < C < O < N < F < Ne

$\downarrow$ $\downarrow$ $\downarrow$ $\downarrow$ $\downarrow$

E < C < A < B < D

49. (3) CH_3CHO and CH_2ICHO will give yellow CHI_3 on reaction with I_2 + NaOH.

50. (1) p_1 = 100kPa, $(t_{1/2})_1$ = 364 s

P_2 = 50kPa, $(t_{1/2})_2$ = 182 s

$(t_{1/2})_1 = \dfrac{1}{k(p_1)^{n-1}}$ and

$(t_{1/2})_2 = \dfrac{1}{k(p_2)^{n-1}}$

Divide first half-life by second half-life.

$$\frac{(t_{1/2})_1}{(t_{1/2})_2} = \frac{(p_2)^{n-1}}{(p_1)^{n-1}}$$

Now substitute given values in above equation

$$\frac{364}{182} = \left(\frac{50}{100}\right)^{n-1}$$

$$2 = \left(\frac{1}{2}\right)^{n-1}$$

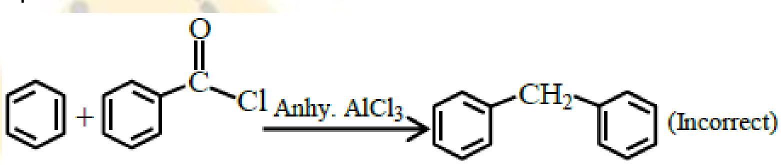
n – 1 = – 1

n = 0

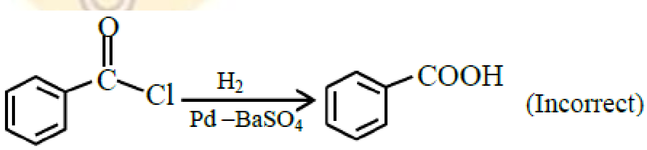
$\therefore$ The order of the reaction is zero.

51. (1) Conceptual

52. (1) (A)



(B)



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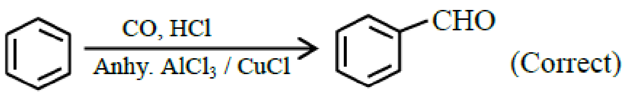
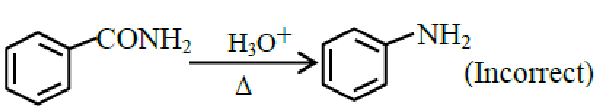
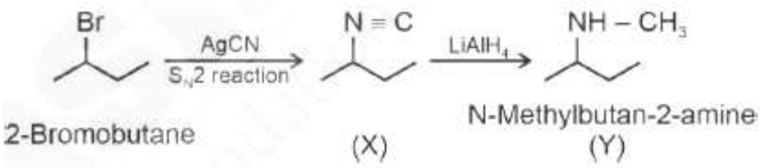


(D)



53. (4)



54. (1) Percentage of chlorine

$$= \frac{35.5}{143.5} \text{x} \frac{\text{mass of AgCl}}{\text{mass of the compound}} \text{ x } 100$$

$$= \frac{35.5}{143.5} \text{x} \frac{0.287}{0.099} \text{ x } 100 \approx 71.71\%$$

55. (3) $MnO_2 + KOH + O_2 \rightarrow \underset{(A)}{K_2MnO_4} + H_2O$

$K_2MnO_4 \xrightarrow{\text{Neutral/acidic solution}} KMnO_4 + MnO_2$

Mn^{+4} :- $[Ar]3d^3$

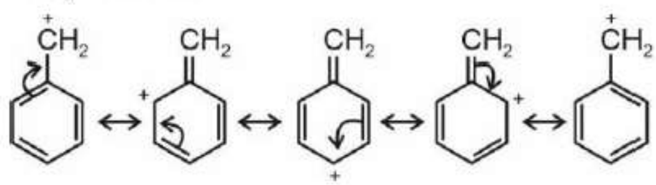
N = 3, $\mu = \sqrt{3(3+2)}$ = 3.87 B.M.

Nearest integer is (4)

56. (3) Allylic and benzylic carbocations are stabilized through resonance and show high reactivity towards S_N1 reaction.

$$H_2C=CH-\overset{\oplus}{C}H_2 \longleftrightarrow H_2\overset{+}{C}-CH=CH_2$$

Allylic cation



Benzylic cation

57. (4)

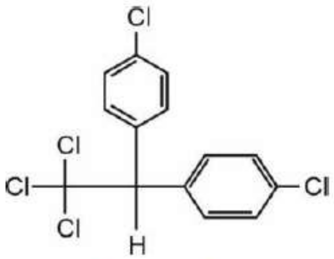
	$N_2O_4 \rightleftharpoons$	$2NO_2$
Initial moles	1	0
Moles at equilibrium	$1-\alpha$	2α

Total number of moles at equilibrium

$= 1 - \alpha + 2\alpha = 1 + \alpha$

58. (4) $2NH_4Cl + MnO_2 + 2H_2SO_4 \xrightarrow{\Delta} MnSO_4 + (NH_4)_2SO_4 + 2H_2O + \underset{\text{Greenish yellow solution}}{Cl_2} \uparrow$

59. (2) The correct structure of DDT is



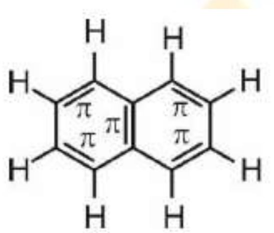
p, p′ – Dichlorodiphenyltrichloroethane (DDT)

60. (2) The possible values of l and m for an atomic orbital $4f$ is n = 4, l = 3, m = − 3 , − 2, − 1, 0, + 1, + 2, + 3

61. (4) Chemical reactivity of elements decreases along the period therefore statement – 1 is false.
Group - 1 elements from basic nature oxides while group - 17 elements form acidic oxides therefore statement - II is true

62. (2) Complex is $[\overset{III}{Fe}(NH_3)_2(CN)_4]^{\ominus}$
x = 2
y = 4
so x + y = 6

63. (2)



Total number of σ bonds = 19
Total number of π bonds = 5
Ratio – 19 : 5

64. (2) General equation for combustion is given as

$$\underset{10}{C_xH_y} + \underset{55}{\left(x+\frac{y}{4}\right)O_2} \longrightarrow xCO_2 + \frac{y}{2}H_2O$$

$$1\text{ mL } C_xH_y \equiv \left(x+\frac{y}{4}\right)\text{mL } O_2$$

10 mL $C_xH_y \equiv \left(x+\frac{y}{4}\right)$ x 10 mL

$\therefore \left(x+\frac{y}{4}\right)10 = 55$

10 x + $\frac{10y}{4}$ = 55

10 x 4 + $\frac{10y}{4}$ = 55

$\frac{10y}{4}$ = 15

y = 6

65. (1) $\Lambda_m = \Lambda_m^0 - A\sqrt{C}$

Units of $A\sqrt{C}$ = S cm^2 mole^{-1}

Units of A = S cm^2 mol$^{-3/2}$ L$^{1/2}$

66. (3) In DNA molecule, the sugar moiety is β–D-2-deoxyribose.

67. (1) The correct match is A – (i). B – (iii), C – (iv), D – (ii). $\Delta H = \Delta U + \Delta n_g(RT)$

$PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$; $\Delta H > \Delta U$	$\Delta n_g = 1$
$2HI(g) \rightleftharpoons H_2(g) + I_2(g)$; $\Delta H = \Delta U \neq 0$	$\Delta n_g = 0$
$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$; $\Delta H = \Delta U - 2RT$	$\Delta n_g = -2$
$2CO(g) + O_2(g) \rightleftharpoons 2CO_2(g)$; $\Delta H = \Delta U - RT$	$\Delta n_g = -1$

68. (2) Polar molecule : NF_3, H_2O, H_2S, HBr, HCl

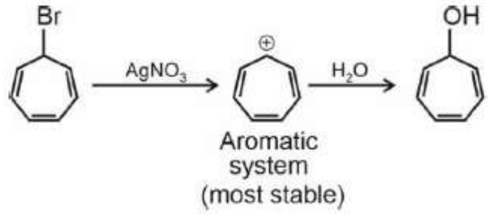
($\mu \neq 0$)

Non Polar molecule: $BeCl_2$, BCl_3, XeF_4, CCl_4, CO_2, H_2, HCl

($\mu \neq 0$)

So answer is 5.

69. (2)



Tropylium ion  is aromatic species hence, tropylium bromide reacts fastest with aqueous $AgNO_3$.

70. (1) Wavelength of transition is inversely proportional to the square of atomic number of the atom.

$$\lambda \propto \frac{1}{Z^2}$$

$$\frac{\lambda_{(Li^{2+})}}{\lambda_{(H)}} = \frac{1}{9} \Rightarrow \lambda_{(Li^{2+})} = \frac{821}{9}$$

71. (3)

72. (3) According to Faraday's law, w = z . it
Given, the value of it is same for H_2 and O_2.

Then, $\frac{w_{H_2}}{w_{O_2}} = \frac{z_{H_2}}{z_{O_2}}$

$$\frac{w_{H_2}}{w_{O_2}} = \frac{E_{H_2}}{E_{O_2}} \quad \frac{0.500}{w_{O_2}} = \frac{2}{16}$$

$$w_{O_2} = \frac{16 \times 0.500}{2} = 4.00 \text{ g}$$

73. (2) 3^0 alcohols react fastest with $ZnCl_2$ and conc. HCl, as they form most stable carbocation.

74. (2) The correct match is A – II, B – IV, C – I, D – III

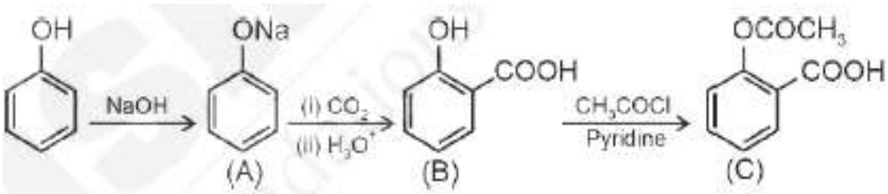
A. 16 g of CH_4 = 1 mole of CH_4 contains
$10 \times 6.02 \times 10^{23}$ electrons = 60.2×10^{23}

B. 1 g of H_2 = 0.5 mole of H_2 gas occupy 1 mole contains = 22.7 L

C. 1 mole of O_2 gas = 32 g

D. 1 mole of SO_2 = 64 g

75. (2)

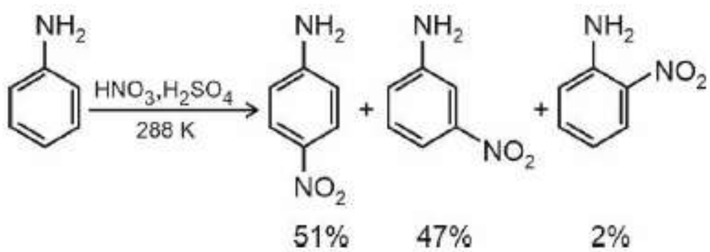


76. (4) Among the given statements I, II and IV are correct while III and V are incorrect.

The larger value of K_C suggest that the reaction should go almost to completion. However, practically, the oxidation of SO_2 to SO_3 is very slow. Hence, the rate of reaction is increased by adding catalyst.

Also, the equilibrium will shift in forward direction as the pressure increases.

77. (1)



Aniline is protonated to anilinium ion, which is meta-directing. Hence significant amount of meta-derivative is also formed.

78. (1) Trigonalbipyramidal

79. (2) Statements in options (1), (2) and (4) are correct

Statement in option (3) is incorrect, because oxidation states of Cr in CrO_4^{2-} (chromate) and $Cr_2O_7^{2-}$ (dichromate) are same and it is +6

i.e ., $\overset{x}{Cr}O_4^{2-} \Rightarrow x + 4(-2) = 2 \Rightarrow x = +6$

$\overset{y}{Cr}_2O_7^{2-} \Rightarrow 2y + 7(-2) = -2 \Rightarrow y = +6$

80. (4) Both Statement I and Statement II are correct.

81. (2)

82. (3) The compounds having same molecular formula but different alkyl groups on either side of the functional group are called metamers & the phenomenon is called metamerism.

(i) $C_4H_{10}O \Rightarrow H_3C - \underbrace{O - C_3H_7 \text{ and } H_5C_2 - O}_{\text{Metamers}} - C_2H_5$

(ii) $H_3C - O - CH_3 \Rightarrow$ Metamerism is not possible.

(iii) $CH_3 - CH_2 - O - CH_3 \Rightarrow$ Metamerism is not possible.

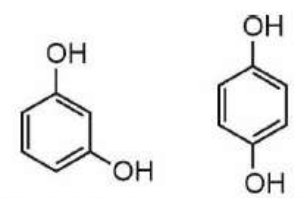
(iv) $C_2H_{12} \Rightarrow$ In absence of functional group metamerism is not possible.

83. (4) Magnitude of torsional strain depends upon the angle of rotation about C – C bond. This angle is also called dihedral angle or torsional angle.

84. (2) The correct match is A – (ii), B – (iii), C – (iv), D – (i)

A.	$Pt\|Fe^{3+}\|Fe^{2+}$	represents Oxidation reduction half-cell
B.	$Pt\|H_2\|H^+$	represents Gas-gas ion half-cell
C.	$Pt\| Hg\| Hg_2^{2+}$	represents Metal-metal ion half-cell
D.	$Pb\ \|PbSO_4\| SO_4^{2-}$	represents Metal sparingly soluble salt half-cell

85. (4)



Resorcinol   Quinol

86. (4) For a first order reaction $k = \frac{1}{t} \ln\left[\frac{C_0}{C_t}\right]$

Where, C_0 = initial concentratin of reactant

C_t = concentratin of reactant t time t.

t = 100 x 60 = 6000 sec

$k = \frac{1}{6000} \ln\left[\frac{0.2}{0.02}\right]$ = 3.8×10^{-4} sec^{-1}

87. (1) Electronic configuration of Nd(Z = 60) is $[Xe]4f^4 6s^2$

88. (3) O < S < F < Cl

89. (1) Conceptual

90. (2)