Physics

1. **(a)** Given : $v = \frac{25}{\pi}$ Hz $R = 100\Omega$ $L = 2H$

   Inductive reactance $X_L = 2\pi vL = 2\pi \times \frac{25}{\pi} \times 2 = 100\Omega$

   Using $\tan\phi = \frac{X_L}{R}$

   $\Rightarrow \tan\phi = \frac{100}{100} = 1$

   $\Rightarrow \phi = 45°$
2. **(b)** For a purely capacitive circuit current leads the voltage by $\pi/2$ in phase.
3. **(d)** Given : $C = 1\mu F$

   On comparing the given voltage with $V = V_\circ \sin wt$ we get $V_0 = 100\sqrt{2}$ and $w = 100$

   Capacitive reactance $X_C = \frac{1}{wC} = \frac{1}{100\times10^{-6}} = 10^4\Omega$

   Rms value of voltage $V_{rms} = \frac{V_0}{\sqrt{2}} = 100$ volts

   Thus reading of ammeter $I_{rms} = \frac{V_{rms}}{I_{rms}} = \frac{100}{10^4} = 0.01\ A = 10\ mA$
4. **(c)**
5. **(d)** A hydrogen atom has 6 spectral lines. Spectral emissions occurs when an electron transitions jumps from a higher energy state to a lower energy state. The spectral lines are grouped into series according to the lower energy level.
6. **(b)** In α decay the mass number decreases by 4 and atomic number decreases by 2.

In β decay the mass number remains constant but atomic number increases by 1.

In γ decay the mass number and atomic number remain constant.

$\text{In } X \xrightarrow{\alpha} X_1 \xrightarrow{\beta} X_2 \xrightarrow{\alpha} X_3 \xrightarrow{\gamma} X_4$

Given: ${}^{180}_{72}X$
Now
X_1 will be ${}^{180-4}_{72-2}X_1 = {}^{176}_{70}X_1$
X_2 will be ${}^{176}_{70+1}X_2 = {}^{176}_{71}X_2$
X_3 will be ${}^{176-4}_{71-2}X_3 = {}^{172}_{69}X_3$
X_4 will be ${}^{172\pm0}_{69\neq0}X_4 = {}^{172}_{69}X_4$
Hence the atomic mass $= 69$ and mass number $= 172$ for X_4.

7. **(b)** Let there is n number of fission per second produces a power of 6.4 W, then

   $$n \times 200 \times 10^6 \times 1.6 \times 10^{-19}\ J/s = 6.4\ J/s$$
   $$\therefore n = \frac{6.4}{200\times10^{-3}\times1.6} = \frac{4}{2\times10^{-11}} = 2\times10^{11}.$$

8. **(a)** We know that atomic number of the parent nucleus decreases by 2 and mass number decreases by 4 in each alpha decay whereas atomic number of the parent nucleus increases by 1 while mass number remains the same in each beta minus decay.

   Change in mass number $\Delta A = 238 - 206 = 32$

   Number of alpha particles $N_a = \frac{32}{4} = 8$

   Decrease in mass number due to alpha decays only $= 2 \times 8 = 16$

   Net decrease in mass number $\Delta Z = 92 - 82 = 10$

So increase in mass number due to beta particles $= 16 - 10 = 6$

Number of beta particles $N_\beta = \frac{6}{1} = 6$

9. (a) Given : $\Delta I_b = 20\mu A \Delta I_c = 2\text{ mA} \Delta V_{BE} = 0.04\text{ V}$

Input resistance $R_{input} = \frac{V_{BE}}{\Delta I_b} = \frac{0.04}{20\times10^{-6}} = 2k\Omega$

A.C. current gain $\beta = \frac{\Delta I_c}{\Delta I_b} = \frac{2\times10^{-3}}{20\times10^{-6}} = 100$

10. (c)

11. (d)

12. (c)

Charge flown $Q = ne = 10^{10} \times 1.6 \times 10^{-19}C = 1.6 \times 10^{-9}C$

Emitter current $I_E = \frac{Q}{t}$

$$I_E = \frac{1.6 \times 10^{-9}}{2 \times 10^{-6}} = 0.8 \times 10^{-3}\text{ A} = 800\mu A$$

13. (c) The effective length of magnet $= 31.4$ cm

Pole strength $m = 0.8Am$

Length of semi-circle $= \pi\frac{D}{2} = 1$

where, $D =$ diameter of circle

$$\Rightarrow D = \frac{2l}{m}$$
$$= \frac{2 \times 314 \times 10^{-2}}{3.14}$$
$$D = 20 \times 10^{-2}\text{ m}$$

Now, the magnetic moment

$$= ml = mD$$
$$= 0.8 \times 20 \times 10^{-2}$$
$$= 16.0 \times 10^{-2} = 0.16Am^2.$$

14. (a) Two infinitely long equal wire carrying equal currents in same direction will attract each other.

15. (a) The equivalent resistance of the circuit

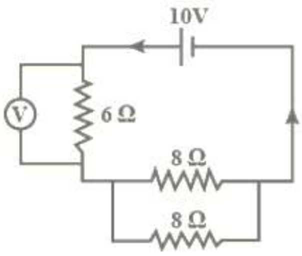
$$R_{eq} = 6 + \frac{8 \times 8}{8 + 8}$$
$$= 6 + \frac{64}{16} = 6 + 4$$
$$= 10\Omega$$

Now, current through the circuit

$$i = \frac{V}{R_{eq}} = \frac{10}{10} = 1\text{ A}$$

Now, voltmeter reading

$$V' = iR = 1 \times 6\Omega$$
$$= 6\text{ V}$$



16. (a)

Galvanometer resistance $R_G = 50\Omega$
Series resistance initially $R_1 = 3950\Omega$
Voltage $V = 8$ V
Using $V = I_G(R_G + R_1)$
$\therefore 8 = I_G(50 + 3950)$
$\Rightarrow I_G = 0.002$ A

Now I_G is reduced to half of is initial value i.e. $I_G' = 0.001$ A

Using $V = I_G'(R_G + R_2)$
$\therefore 8 = (0.001)(50 + R_2)$
$\Rightarrow R_2 = 7950\Omega$

17. (b) As, vertical component of Earth's magnetic field,

$B_V = \sqrt{3}B_H$

Angle of dip at any place is given by

$$\tan\delta = \frac{B_V}{B_H} = \frac{\sqrt{3}B_H}{B_H} = \sqrt{3}$$
$$\Rightarrow \delta = \tan^{-1}(\sqrt{3}) = 60^\circ.$$

18. (b) The output of OR gate $A + B = Y$
The output of NOR gate

$\overline{A + B} = Y$

When, $A = B$, then

$\overline{A + A} = \overline{A} =$ NOT gate.

19. (b) The optical fibre is used in the frequency range of $1 - 1000$THz (microwave to ultraviolet). An optical fibre can offer a transmission band width in excess of 100 GHz.

20. (b) Key Concept Marconi antenna is a straight conductor of length equal to a quarter of the wavelength of radio signals to be transmitted or received i.e. $l = \lambda/4$.
It depends on frequency of carrier wave and directive of the beam etc.
Given, $v = 3 \times 10^3$ Hz
Now, speed of light, $c = v\lambda$

$$\Rightarrow 3 \times 10^8 = 3 \times 10^3 \text{ Hz} \cdot \lambda$$
$$\Rightarrow 10^5 = \lambda$$

For minimum length of an antenna is

$$l = \frac{\lambda}{4} = \frac{10^5}{4} = 25000 \text{ m} = 25 \text{ km}.$$

21. **(d)** The volume of spheres.

$$27 \times \frac{4}{3}\pi r^3 = \frac{4}{3}\pi R^3$$

where, r and R are the volume of smaller and bigger sphere respectively.

$\Rightarrow R = 3r$

Now, initial potential of smaller sphere,

$$V_1 = \frac{1}{4}\pi\epsilon_o \frac{Q}{r}$$
$$\therefore Q = V_1 r \times 4\pi\epsilon_o$$

$\therefore$ Charge on 27 spheres, we have

$Q_T = 27 \times 10 \times r \times 4\pi\epsilon_o$

Now, charge on bigger sphere

$$Q_B = V_2 R \times 4\pi\epsilon_o$$
$$\text{Now, } Q_T = Q_B$$
$$\Rightarrow 270 \times r \times 4\pi\epsilon_o = V_2 R \times 4\pi\epsilon_o$$
$$\Rightarrow 270r = V_2 \times 3r \Rightarrow V_2 = 90 \text{ V}$$

22. **(b)** Step 1: Charge Removed

$$\text{Charge Removed } = Ne = 10^{19} \times (-1.6 \times 10^{-19} \text{C})$$
$$= -1.6\text{C}$$

Step 2: Charge appearing on Metal
Initially the metal is neutral, when we remove a Negative charge of -1.6 C , So equal and opposite positive charge = +1.6C will appear on the metal plate.

23. **(c)** Both the electrons repel each other when they come closer to each other. So, the kinetic energy of the electron decreases due to repulsion and thus its potential energy increases.

24. **(b)** The situation can be digrameted as below.
The electric field $E = 100 \text{ V m}^{-1}$
For the downward motion of the particle of mass 1 kg .

$$\text{mgsin}\,45° - \text{qEcos}\,45° - \mu(\text{mgcos}\,45° + \text{qEsin}\,45°) = \text{ma}$$

$$\Rightarrow 1 \times 10 \times \frac{1}{\sqrt{2}} - \frac{1}{100} \times 100 \times \frac{1}{\sqrt{2}} - \frac{1}{10}$$

$$\left(1 \times 10 \times \frac{1}{\sqrt{2}} + \frac{1}{100} \times 100 \times \frac{1}{\sqrt{2}}\right) = 1 \times \text{a}$$

$$\Rightarrow \frac{10}{\sqrt{2}} - \frac{1}{\sqrt{2}} - \frac{1}{10}\left(\frac{10}{\sqrt{2}} + \frac{1}{\sqrt{2}}\right) = \text{a}$$

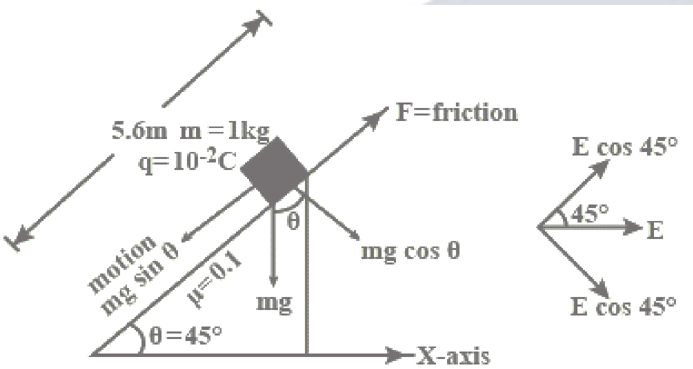
$$\Rightarrow \frac{10}{\sqrt{2}} - \frac{1}{\sqrt{2}} - \frac{1}{\sqrt{2}} - \frac{1}{10\sqrt{2}} = \text{a}$$

$$\Rightarrow \text{a} = \frac{79}{10\sqrt{2}} = \frac{7.9}{\sqrt{2}}$$

$$\Rightarrow \text{a} = 5.6\ \text{m/s}^2$$

Now, time taken by the particle to cover 5.6 m distance along the incline is

$$t = \sqrt{\frac{2\,\text{s}}{\text{a}}} = \sqrt{\frac{2 \times 5.6}{5.6}} = \sqrt{2} = 1.41\ \text{s.}$$



25. **(a)** Key Concept Here, we have to find the electric potential due to multiple of charges, so, we have to apply superposition principle to calculate net electric potential.

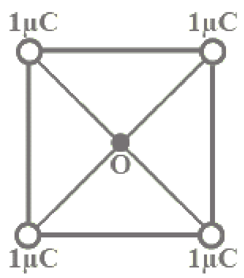
Length of the diagonals $= \sqrt{2} \times$ side length $= \sqrt{2} \times 2\sqrt{2} = 4$ m

$\therefore$ Length of semi-diagonals $= \frac{4}{2} = 2$ m.

Now, potential due to charges at point O

$$V_0 = \frac{!}{4\pi\epsilon_0}\left(\frac{1 \times 10^{-6}}{2}\right) \times 4$$

$$= 9 \times 10^9 \times 10^{-6} \times 2 = 18 \times 10^3\ \text{V}$$



26. **(d)** Step 1: Charge on the small element

Let $\lambda = \frac{Q}{L}$ be the linear charge density of rod.

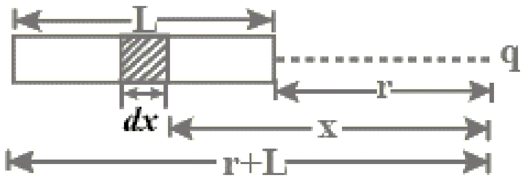
As shown in figure, Consider an elementary charge dq having length dx at a distance x from the charge q, then

$$dq = \lambda dx = \frac{Q}{L}dx$$

Step 2: Force due to small element
By Coulomb's Law:

$$dF = \frac{1qdq}{4\pi\epsilon_o x^2} = K\frac{qQdx}{Lx^2} \ldots$$

Step 3: Integrate above to get the Net force
$\therefore$ Total force, $F = \int dF = \frac{KQq}{L}\int_r^{r+L} x^{-2}dx$
$\Rightarrow F = \frac{KQq}{L}\left[-\frac{1}{x_r}\right]^{r+L} = \frac{-KQq}{L}\left[\frac{1}{r+L} - \frac{1}{r}\right]$
$\Rightarrow F = \frac{-KQq}{L}\left[\frac{r-r-L}{(r+L)r}\right] = \frac{KQq}{r(r+L)}$



27. (b)

de − Broglie wavelength $\lambda = \frac{h}{mv}$
$\Rightarrow \frac{\lambda_\alpha}{\lambda_d} = \frac{m_d v_d}{m_\alpha v_\alpha}$

We know, $m_\alpha = 2\ m_d$
Given: $v_a = v$ and $m_d = 2v$

$$\Rightarrow \frac{\lambda_a}{\lambda_d} = \frac{m_d(2v)}{2\ m_d V} = 1$$

28. (b) Key Concept The average kinetic energy of atom at temperature T K is

$$E = \frac{3}{2}KT$$

Now, kinetic energy of an atom $E = \frac{P^2}{2\ m}$

$\therefore P = \sqrt{2ME}$

$\therefore$ de-Broglie wavelength

$$\lambda = \frac{h}{P} = \frac{h}{\sqrt{2mE}}$$
$$\Rightarrow \lambda = \frac{h}{\sqrt{2\text{ m} \times \frac{3}{2}KT}} = \frac{h}{\sqrt{3mKT}}.$$

29. (c)

$$\text{Given, } \lambda = 4000\text{Å}$$
$$= 4000 \times 10^{-10}\text{ m} = 4 \times 10^{-7}\text{ m}$$

Let there is n number of waves in 1 mm, then

$$n\lambda = 1\text{ mm}$$
$$\therefore n = \frac{1\text{ mm}}{\lambda} = \frac{1 \times 10^{-3}\text{ m}}{4 \times 10^{-7}\text{ m}}$$
$$= \frac{1}{4} \times 10^4 = \frac{10000}{4} = 2500.$$

30. (d) Increasing order of wavelengths as given below Y - rays < X - rays > ultravoilet rays
Frequency order

$$\gamma - \text{ ray } > X - \text{ rays } > \text{ ultravoilet rays}$$
$$\Rightarrow q > p > r$$

Thus, $q > p$

$$q > r$$
$$p > r$$

31. (d) Key Concept According to Einstein photoelectric equation, we have

$$hv = \phi + \frac{1}{2}mv_{max}^2$$

where, ϕ is work function and $\frac{1}{2}mv_{max}^2$ is kinetic energy of a particle having velocity v, h is Planck's constant and v is frequency of light radiation.
The Einstein equation is given as

$$E - \phi = \frac{1}{2}mv_{max}^2$$
$$\frac{hc}{\lambda} - \phi = \frac{1}{2}mv_{max}^2$$

In case of photon 1 having energy 1 eV

$$(1 - 0.5)eV = \frac{1}{2}mv_{max}^2$$
$$\Rightarrow 0.5eV = \frac{1}{2}mv_{max}^2 \cdots (1)$$

Similarly, in another case, if photon 2 having energy 25 eV

$$(2.5-0.5)\text{eV} = \frac{1}{2}mv_{max}^2$$

$$2\text{eV} = \frac{1}{2}mv'^2_{max} \ldots \text{ (ii)}$$

Now, on dividing Eq. (ii) by Eq. (i), we get

$$\frac{2\text{eV}}{\frac{1}{2}\text{eV}} = \frac{\frac{1}{2}mv'^2_{max}}{\frac{1}{2}mv^2_{max}}$$

$$\Rightarrow \sqrt{4} = \frac{v_{max}}{v_{max}} \text{ or } \frac{v'^2_{max}}{v^2_{max}} = 2$$

Hence, required ratio

$$\frac{v_{max}}{v_{max}} = \frac{1}{2} = 1:2.$$

32. (d) Length of the smaller arc $l = r\theta$

So, resistance of the smaller arc $R_1 = \frac{r\theta}{2\pi r}R = \frac{\theta}{2\pi}R$

Resistance of bigger arc $R_2 = \frac{2\pi-\theta}{2\pi}R$

Since R_1 and R_2 are connected in parallel across AB.

Thus, equivalent resistance between A and B $\frac{1}{R_{AB}} = \frac{1}{R_1} + \frac{1}{R_2}$

$$\therefore \frac{1}{R_{AB}} = \frac{2\pi}{\theta R} + \frac{2\pi}{(2\pi-\theta)R}$$

$$\Rightarrow R_{AB} = \frac{R}{4\pi^2}(2\pi-\theta)\theta$$

33. (a) We know,

Resistance is given as

$$R = \frac{\rho L}{A}$$

Now we can write

$$R_1 = \frac{\rho_1 L}{A}$$

$$R_2 = \frac{\rho_2 L_2}{A}$$

For the series combination we know,

$$R_{eq} = R_1 + R_2 = \frac{(\rho_1+\rho_2)L}{A}$$

Or, we can write

$$\frac{\rho_{eq}\, 2L}{A} = \frac{(\rho_1+\rho_2)L}{A}$$

Therefore,

$$\rho_{eq} = \frac{\rho_1 + \rho_2}{2}$$

34. (d)

35. (a) Given, $\mu = 1.5$

As refractive index of a prism, $\mu = \frac{\sin\frac{A+\delta}{2}}{\sin\frac{A}{2}}$ where, δ = angle of minimum deviation and A = refracting angle of prism.

As per question $\delta = A$, then

$$\mu = \frac{\sin\frac{A+A}{2}}{\sin A/2}$$
$$= \frac{\sin A}{\sin A/2} = \frac{2\sin A/2 \cdot \cos A/2}{\sin A/2}$$
$$= 2\cos A/2$$
$$\Rightarrow \frac{15}{2} = \cos A/2 = \sin(90^\circ - A/2)$$
$$\Rightarrow 90^\circ - A/2 = \sin^{-1}(0.75) = 48^\circ 36'$$
$$\Rightarrow 90^\circ - 48^\circ 36' = \frac{A}{2}$$
$$\Rightarrow 41^\circ 24' = A/2$$
$$\therefore A = 82^\circ 48'.$$

36. (d) As the law of refraction, we have,

$$\frac{\sin i_c}{\sin 90^\circ} = \frac{1.5}{1.6}$$
$$\therefore \sin i_c = \frac{15}{16}$$
$$\Rightarrow i_c = \text{ Critical angle of medium A}$$
$$= \sin^{-1}\left(\frac{15}{16}\right)$$

37. (b) As radius of curvature of plane mirror is infinity So, its focus $f = \frac{R}{2}$ is also infinity. Now, power $= \frac{1}{f} = \frac{1}{\infty} = 0$.

38. (b) When a light wave travels from rarer medium to denser medium, its frequency remains the same but its wavelength decreases.

Velocity of light waves decreases because of change in wavelength.

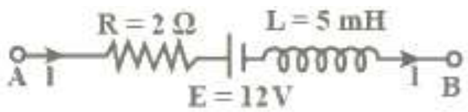
39. (a) The part of circuit is

Given, $\frac{dI}{dt} = 10^2 As^{-1}$

and I = 2 A

The voltage difference between point A and B

$$IR - 12 + L\frac{dI}{dt} = V_A - V_B$$
$$\Rightarrow 2 \times 2 - 12 + 5 \times 10^{-3} \times 10^3 = V_A - V_B$$
$$\Rightarrow 4 - 12 + 0.5 = -8.5 = V_A - V_B$$
$$\therefore V_B - V_A = -(-8.5) = 8.5\ V$$



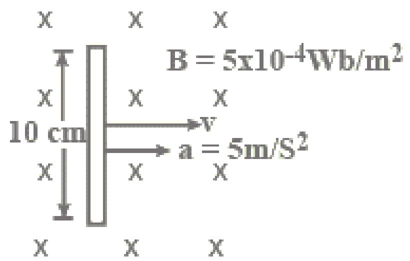
40. (a) Consider a rod of 10 cm length is moving perpendicular to uniform magnetic field as shown below. The emf induced in the rod

$\epsilon = vBl$

Differentiating with respect to time t

Rate of increase of induced emf $= \frac{d\epsilon}{dt}$

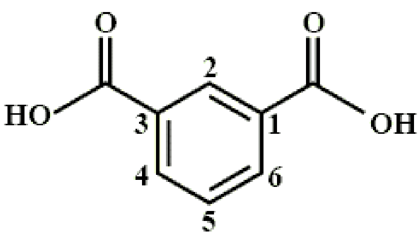
$= \frac{dv}{dt}Bl = aBl$
$= 5 \times 5 \times 10^{-4} \times 10 \times 10^{-2}$
$= 250 \times 10^{-6}$
$= 2.5 \times 10^{-4}\ V\ s^{-1}$.



Chemistry

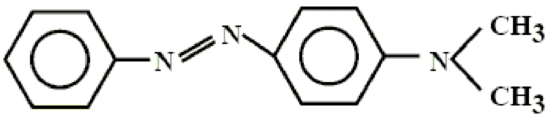
41. (d)

Isophthalic acid



Benzene-1, 3-dicarboxylic acid

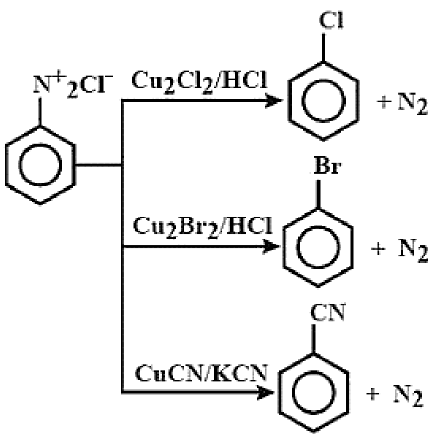
42. (a)



Red azo dye

p-N,N - dimethyl amino azo benzene

43. (b) In sandmeyer's reaction Iodo Benzene cannot be formed because of its large size.



44. (d)

45. (a) Amylopectin is a branched chain polymer of $\alpha - D -$ glucose units in which chain is formed by $C_1 - C_4$ glycosidic linkage whereas branching occurs by $C_1 - C_6$ glycosidic linkage.
Thus, amylopectin contains linkage between C_1 and C_4 and also between C_1 and C_6.

46. (a)

47. (d) Buna-S is used to bind pigmented coatings. It is the polymer derived from styrene and buta-diene.

48. (c) The most common classical preservative agents are weak organic acids, for example acetic, lactic, benzoic and sorbic acid.
These molecules inhibit the outgrowth of both bacterial and fungal cells and sorbic acid is also reported to inhibit the germination and outgrowth of bacterial spores.

49. (b) FeO shows metal deficiency defect. In crystal of FeO some Fe^{2+} cations are missing and the loss of positive charge is made up by the presence of required number of Fe^{3+} ions.

50. (a) MnO show antiferromagnetism having domain structure similar to ferromagnetic substance, but their domains are oppositively oriented and cancel out each other's magnetic moments.

51. (b)

$$\text{Molecular weight of urea } = 60 \text{ g}$$
$$\text{Molecular weight of sucrose } = 342 \text{ g}$$
$$\text{Boiling point of urea } = \text{ Boiling point of sucrose Given weight of urea } = 3 \text{ g}$$
$$\therefore \frac{(\text{ Weight })_1}{(\text{ MolecularWeighth })_1} = \frac{(\text{ Weight })_1}{(\text{ MolecularWeighth })_2}$$
$$\frac{3}{60} = \frac{(\text{ Weight })_2}{342} \Rightarrow (\text{ Weight })_2 = \frac{342 \times 3}{60} = 17.1 \text{ g}$$

52. (d) Raoult's law is obeyed by an ideal solution that satisfy following conditions: -
(a) $\Delta V_{\text{mixing}} = 0$

No change in volume in mixing the two components.
(b) $\Delta H_{\text{mixing}} = o$

No change in enthalpy on mixing the two components.
First condition is clearly proved that solute does not undergo association or dissociation in solution.
So, volume of solute + Volume of solvent = Volume of solution.

53. (a) Osmotic pressure is widely used to determine molar masses of proteins, polymers and other macromolecules.

$$M_2 = \frac{w_2 RT}{\pi V}$$

where, π = osmotic pressure, R gas constant, V = volume of the solution (in L), M_2 = molar mass, w_2 = weight of solute

54. (b) During the electrolysis of aqueous sodium chloride solution, the products are $NaOH, Cl_2$ and H_2.

$$NaCl(aq) + H_2O(l) \rightarrow Na^+(aq) + OH^-(aq) + \frac{1}{2}H_2(g) + \frac{1}{2}Cl_2(g)$$

Due to formation of base, it turns res litmus into blue.

55. (a)

Metal	E°_{read}
A	0.34 V
B	-0.80 V
C	-0.46 V

A negative E° means that the redox couple is a stronger reducing agent than the H^+/H_2 couple and H_2. while a positive E^0 means that the redox couple is a weaker reducing agent than the H^+/H_2 couple, so correct order will be $B > C > A$

56. (d)

Since, $W = Zit$

or $\frac{(W)_{All}}{(W)_{All}} = \frac{(W)_{Ni}}{(W)_{Ni}} \Rightarrow \frac{\frac{18}{27}}{3} = \frac{\frac{(W)_{All}}{58.5}}{2}$

$\frac{18}{9} = \frac{2 \times (W)_{Ni}}{58.5}$

$\Rightarrow (W)_{Ni} = 58.5\ g$

57. (a) Zone-refining is very useful for producing semiconductor and other metals of very high purity, e.g., germanium, silicon, boron, gallium and indium.

58. (b) Phosphine is formed in the reaction,

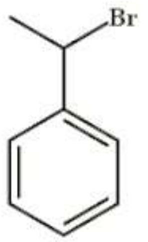
$$P_4 + 3NaOH + 3H_2O \rightarrow PH_3 + 3NaH_2PO_2$$

Sodium hydrophosphite is also one of the products of the reaction.

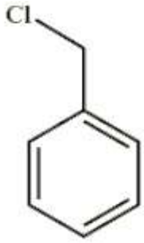
59. (a)

60. (d) Aqua regia is the mixture of conc. HCl and conc. HNO_3 in the ratio of 3: 1.

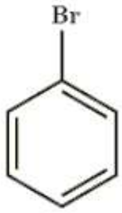
61. (a) Allylic halides are the compounds in which the halogen atom is bonded to sp^3 - hybridised carbon atom next to carbon-carbon double bond ($C = C$).



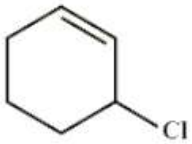
Benzylic halide



Benzylic halide



Aromatic



Allylic halide

62. (d) Dehydrohalogenation of CH_3CH_2Cl gives ethene (C_2H_4) as the main product as:

$CH_3CH_2Cl +$ alc. $KOH \rightarrow C_2H_2 + KCl + H_2O$

Molar mass of $CH_3CH_2Cl = 64.5\ g/mol$ and Molar mass of ethene $(C_2H_4) = 28\ g/mol$

Number of moles of $CH_3CH_2Cl = \frac{6\cdot45}{64\cdot5} = 0.1$ mol
Since 1 mol of CH_3CH_2Cl will give 1 mol of ethene. However, only 50% of the reagent is used. So, only 50% of product will be formed.
$\therefore$ 0.05 molCH_3CH_2Cl will react to give 0.05 mol of ethene.
mass of ethene in 0.05 mol = moles × molecular wt. = 0.05 mol × 28 g/mol = 1.4 g

63. (a)

$$CH_3CH_2Cl + NaI \xrightarrow{\text{Acetone}} CH_3CH_2I + NaCl$$

This reaction is an example of halogen exchange which is known as finkelstein in which alkyl halide such as alklychloride / bromide reacts with NaI in the presence of acetone.

64. (d)
65. (b)

66. (b) Phenol does not react with Na_2CO_3 because it is weaker acid than carboxylic acid and thereby do not have the strength to substitute or give away its H + ions to that of weak bases like sodium carbonate. Phenol is used for the preparation of aspirin which is used as an analgesic as well as antipyretic drugs. Phenol is more soluble in water than chlorobenzene due to formation of H bond with water molecules.
o-nitrophenol form intramolecular H -bonding while p-nitrophenol form intermolecular H -bonding. Due to this, nature o-nitrophenol has a lower boiling point than p -nitrophenol.

67. (d)

$$-\frac{d[X]}{dt} = K[X]^3[Y]^\circ$$

The molecularity is 2 so X when no influence from Y due to Zeroth order will become:

$$-\frac{d[X]}{dt} = k[X]^2 \cdot [X] = k[X]^3$$

68. (a) $X \xrightarrow{I} Y \xrightarrow{II}$, is a complex reaction.
Total order of reaction is 2.
Molecularity of slowest step II is also 2 because for complex reaction, molecularity of the slowest step is same as the order of the overall reaction.

69. (d)

70. (c) The amount of absorption of a gas depends on nature of gas. In general, easily liquefeble gases are readily adsorbed.
Ammonia has higher critical temperature relatively.
$\Rightarrow$ Assumption of Ammonia will take place the most.

71. (c) On dissolution, a large number of atoms or smaller molecules of a substance aggregate together to form species having a size in the colloidal range (1-1000 nm). The species thus formed are called multimolecular colloids. Sulphur sol consists of particles containing a thousand or more of S_8 sulphur molecules hence it is the multimolecular colloid.

72. (b)

73. (a) Potassium permanaganate ($KMnO_4$) forms dark purple crystals.

74. (a) Fe^{3+} has 5 unpaired electrons, Cr^{3+} has 3 unpaired electrons, Te^{3+} has 1 and Co^{2+} has 4 unpaired electrons.
Magnetic moment $= \sqrt{n(n+2)}$(n = number of unpaired electrons). Thus maximum magnetic moment is for Fe^{3+}.

75. (d) La (Lanthanum), Pr (Praseodymium), Sm (Samarium), Gd (Gadolinium) are fblock elements and they all belong to the sixth period.
The basicity decreases across a period as the electronegativity of the elements increases.
Bases have a tendency to donate electrons and form new bonds; but if they have greater attraction for electrons they are less likely to share them, thus reducing the basic character of the element.
Thus among the oxides of La, Pr, Sm and Gd , the most basic is La_2O_3.

76. (b) $SCN^- < F^- < NH_3 <$ en $< CO$

The arrangement of ligands according to their crystal field stabilization energy. The value is known as spectrochemical series. $SCN^-$is weak field ligand CO is strong field ligand.

77. (c)

78. (c)

79. (d)

$$\underset{\substack{\text{Prop-2-enal} \\ \text{(Acrolein)}}}{CH_2 = CH - CHO}$$

80. (b)

Biology

81. (c)

82. (d)

83. (b)

84. (b)

85. (b)

86. (a)

87. (d)

88. (a)
89. (d)
90. (b)
91. (b)
92. (d)
93. (c)
94. (c)
95. (d)
96. (d)
97. (c)
98. (d)
99. (c)
100. (c)
101. (a)
102. (b)
103. (b)
104. (c)
105. (c)
106. (c)
107. (d)
108. (b)
109. (b)
110. (a)
111. (c)
112. (b)
113. (c)
114. (c)
115. (a)
116. (b)
117. (b)
118. (b)
119. (b)
120. (a)