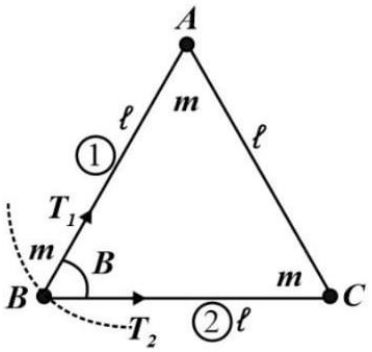
1. (d)B moves in a circle (shown by the dashed curve) of radius I with uniform speed.



Massless rod *l* can exert force T_1 and B only along its length i.e., towards the centre of the circular path. Hence T_1 contributes only to centripetal acceleration of B.

The tension in rod 2,that is T_2 can contributes to both tangential and centripetal acceleration of B. As the angular speed is uniform so tangential acceleration of B is zero. Hence $T_2 = 0$

The tension in rod connecting mass B and C is zero.

2. (a)Just after switching on inductor behaves as open circuit

$$\Rightarrow i_1 = \frac{E}{\infty} = 0, i_2 = \frac{E}{R} \text{ and } i_3 = \frac{E}{3R}$$

$$\Rightarrow i_2 > i_3 > i_1$$

3. (d)The fractional change in period $\frac{\Delta T}{T} = \frac{1}{2}\alpha\Delta\theta$

$$\frac{\Delta T}{T} = \frac{1}{2} \times 2 \times 10^{-6} \times 10 = 10^{-5}$$

% change in time period

$$= \frac{\Delta T}{T} \times 100 = 10^{-5} \times 100 = 10^{-3}$$

4. (d)Given potential energy is $U(x) = U_0(1 - \cos ax)$

Therefore force on the particle is given by

$$F = -\frac{dU}{dx} = -U_0 a \sin(ax)$$

Using small angle approximation, $\sin(ax) \approx ax$

Therefore $F = -U_0 a^2 x$

Time period of SHM is,

$T = 2\pi\sqrt{\frac{m}{k}}$ where k is force constant.

Therefore time period for given force is,

$$T = 2\pi\sqrt{\frac{m}{U_0 a^2}}$$

5. **(b)**

When the rod is lying on a horizontal table, its potential energy = 0

But when we make its stand vertical its centre of mass rises upto high $\frac{l}{2}$. So it's potential energy $= \frac{mgl}{2}$

$\therefore$ Work done = charge in potential energy

$= mg\frac{l}{2} - 0 = \frac{mgl}{2}$.

6. (b)From conservation of mechanical energy

$$\Delta KE = q(V_i - V_f) \quad \frac{K_\alpha}{K_p} = \frac{2e(V)}{e(V)} \Rightarrow \frac{K_\alpha}{K_p} = \frac{2}{1}$$

7. (c)Increase in length is given by.

$l = \frac{FL}{AY} \Rightarrow l \propto \frac{1}{r^2}$ (FL and Y are constant)

$$\frac{l_2}{l_1} = \left(\frac{r_1}{r_2}\right)^2 = (2)^2 = 4$$

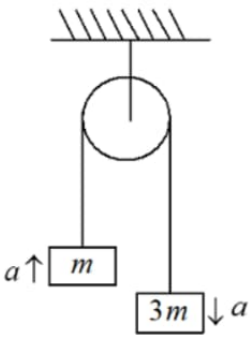
$$\Rightarrow l_2 = 4l_1 = 4cm$$

8. **(b)**

The potential difference across *B*, *D* will be zero, when the circuit will act as a balanced wheatstone bridge and $\frac{P}{Q} = \frac{R}{S} \Rightarrow \frac{12+4}{x} = \frac{1+3}{1/2} \Rightarrow x = 2\Omega$

9. (c)The magnitude of the acceleration of each mass with respect to the pulley

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



Acceleration of centre of mass

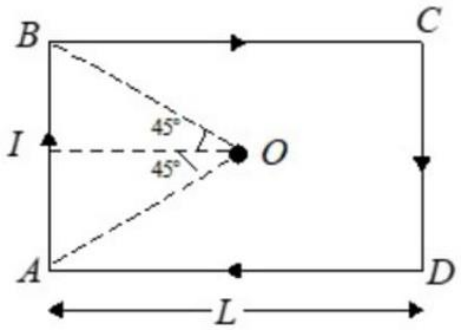
$$= \frac{(3m)g/2 - mg/2}{(3m+m)} = \frac{g}{4}$$

10. (d)The magnitude of momentum and de-Broglie wavelength are related as $\lambda = \frac{h}{p}$

Therefore if linear momenta are same then wavelengths are equal but if wavelengths are same then only the magnitudes of momenta are same while direction might be different.

11. (c)As mass and volume of the gas in an airtight container will remain same, so density will also remain same

12. (c)



Field due to wire AB at the centre,

$$B_{AB} = \frac{\mu_0 I}{4\pi\left(\frac{L}{2}\right)}\left(\sin 45^o + \sin 45^o\right)$$

$$B_{centre} = 4B_{AB}$$

$$B_{centre} = 4\frac{\mu_0 I}{4\pi\left(\frac{L}{2}\right)}\left(\frac{1}{\sqrt{2}} + \frac{1}{\sqrt{2}}\right)$$

$$B_{centre} = 2\sqrt{2}\frac{\mu_0 I}{\pi L}$$

$$B_{centre} \propto \frac{1}{L}$$

13. (a)Current in the circuit $\mathrm{I} = \frac{\mathrm{E_{net}}}{\mathrm{R_{net}}} \Rightarrow \mathrm{I} = \frac{10-4}{6} = 1\mathrm{A}$

$\therefore$ Power consumed by battery $\mathrm{P} = \mathrm{V} \times \mathrm{I}$

14. (d)As cross-section areas of both the tubes A and C are same and tube is horizontal.

Hence according to equation of continuity $v_A = v_C$

Therefore according to Bernoulli's theorem

$P_A = P_C$

i.e., height of liquid is same in both the tubes A and C

15. **(d)**

As H $\propto$ t and $\frac{dT}{dt}$ is minimum for III thus minimum rise in temperature in the same time comparing with others, i.e. it has maximum specific heat.

16. (d)Given $F \propto v^2$

As power is give by $P = Fv$

Therefore $P \propto v^3$

$$\frac{P_2}{P_1} = \left(\frac{v_2}{v_1}\right)^3 \Rightarrow \frac{P_2}{24} = \left(\frac{2v}{v}\right)^3$$

$$\Rightarrow \frac{P_2}{24} = 8 \Rightarrow P_2 = 192\,hp$$

17. (b)For A, $m_A a = f_{L_1}$; $m_A a = \mu_1 m_A g$; $a = \mu_1 g$

For B, $F - \left(f_{L_1} + f_{L_2}\right) = m_B a$

$$F = \mu_1\left(m_A g\right) + \mu_2\left(m_A + m_B\right)g$$

$$F = (0.2 + 0.4)(2 + 4)10$$

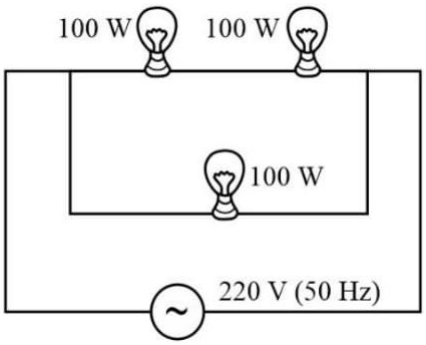
$$F = 36N$$

18. $\mathrm{U} = \frac{-\mathrm{kQq}}{\mathrm{r}} \times \frac{\mathrm{kq}^2}{2\mathrm{r}} = 0$

(d)

$$\frac{2\mathrm{kQq}}{\mathrm{r}} = \frac{\mathrm{kq}^2}{2\mathrm{r}} \Rightarrow \frac{\mathrm{Q}}{\mathrm{r}} = \frac{1}{4}$$

19. (c)



For the two bulbs in series, equivalent power is

$$P^{|} = \frac{P_1 P_2}{P_1 + P_2} = \frac{PP}{P + P}$$

$$P^{|} = 50W$$

This $P^{|}$ is in parallel with other bulb.

$$P_{eq} = P^{|} + 100W$$

$$P_{eq} = 150W$$

20. (a)Simple harmonic waves are set up in the string fixed at both two ends.

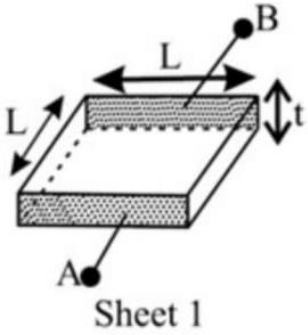
Earth spinning about its own axis, ball bouncing between two rigid vertical walls and particle moving in a circle with uniform speed, all these are periodic but not simple harmonic.

21. (c)Viscous force is given by

$$F = \eta A \frac{v}{d};\ \frac{F_1}{F_2} = \frac{v_1}{v_2}$$

$$\frac{800}{2400} = \frac{2}{v_2} \Rightarrow v_2 = 6\,cm/s$$

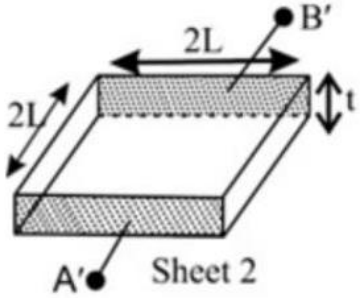
22. (a)



Sheet 1

For sheet 1 resistance is,

$$R_1 = \frac{\rho l}{lt} = \frac{\rho}{t}$$



Sheet 2

For sheet 2 resistance is,

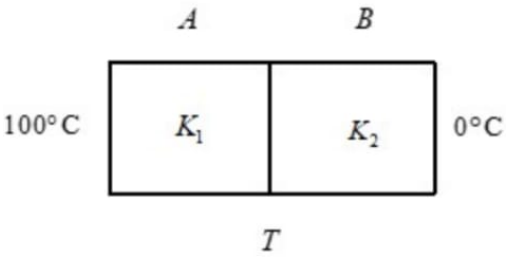
$$R_2 = \frac{\rho 2l}{2l \times t} = \frac{\rho}{t}$$

$$\therefore \frac{R_1}{R_2} = 1$$

23. (d)Thermal equilibrium implies that the temperature of gases are same and molecules are also same therefore

$$P_a V_a = P_b V_b$$

24. (a)



It is given that $\frac{K_1}{K_2} = \frac{1}{3}$

Let $K_1 = K$ & $K_2 = 3K$

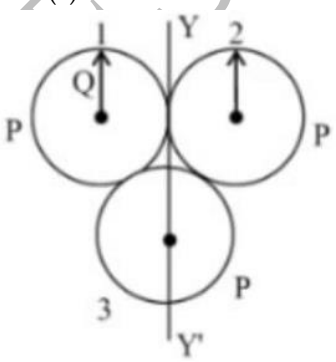
The temperature of the junction in contact

$$\theta = \frac{K_1\theta_1 + K_2\theta_2}{K_1 + K_2}$$

$$\theta = \frac{1 \times 100 \times 3 \times 0}{1+3} = \frac{100}{4}$$

$$\theta = 25^o C$$

25. (a)



For ring 1 and 2 using parallel axis theorem,

$$I_1 = I_2 = I_{cm} + Md^2$$

$$I_1 = I_2 = \frac{1}{2}PQ^2 + PQ^2$$

$$I_1 = I_2 = \frac{3}{2}PQ^2$$

For ring 3, $I_3 = \frac{1}{2}PQ^2$

Moment of inertia of the arrangement,

$$I = I_1 + I_2 + I_3$$

$$I = \frac{3}{2}PQ^2 + \frac{3}{2}PQ^2 + \frac{1}{2}PQ^2$$

$$I = \frac{7}{2}PQ^2$$

26. (d)The length of the circular plate on which the force will act $= 2\pi R$

Force to pull = (surface tension) × (length)

$$F = 75 \times 2\pi \times 5 \Rightarrow F = 750\pi \text{ dynes}$$

27. (c)

$$\mu \propto \frac{1}{\lambda} \Rightarrow \frac{\mu_1}{\mu_2} = \frac{\lambda_2}{\lambda_1} \Rightarrow \frac{1}{4/3} = \frac{\lambda_2}{4200}$$

$$\Rightarrow \lambda_2 = 3150\ \text{Å}$$

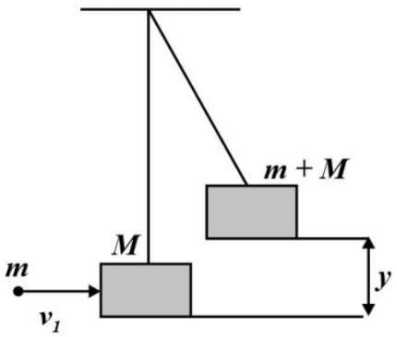
28. $\frac{g^{|}}{g} = \frac{M^{|}}{M}\left(\frac{R}{R^{|}}\right)^2$

(b)

$$\frac{g^{|}}{g} = \left(\frac{2M}{M}\right)\left(\frac{R}{2R}\right)^2 = \frac{1}{2}$$

$$\Rightarrow g^{|} = \frac{g}{2} = \frac{9.8}{2} = 4.9\, ms^{-2}$$

29. (a)



As block raises to a height y, therefore speed just after collisions is $v_1 = \sqrt{2gy}$

As the collision is perfectly inelastic, using conservation of linear momentum,

$$mv_1 = (m+M)\sqrt{2gy}$$

$$\therefore v_1 = \frac{m+M}{m}\sqrt{2gy}$$

30. (c)Heavy water is used in nuclear reactor as moderator to slow down the neutrons the thermal energies.

31. (c)

Using $\frac{1}{\lambda} = RZ^2\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$

$$\Rightarrow \frac{1}{108.5\times10^{-9}} = 1.1\times10^7 \times Z^2\left(\frac{1}{2^2} - \frac{1}{5^2}\right)$$

$$\Rightarrow \frac{1}{108.5\times10^{-9}} = 1.1\times10^7 \times Z^2 \times \frac{21}{100}$$

$$\Rightarrow Z^2 = \frac{100}{108.5\times10^{-9}\times1.1\times10^{-7}\times21} = 4 \Rightarrow Z = 2$$

Now Energy in ground state

$$E = -13.6Z^2\ eV = -13.6\times2^2\ eV = -54.4\ eV$$

32. (b)Known frequency, $n_A = 256Hz$

Unknown frequency, $n_B = ?$

Beats $x = 4\,bps$, which is decreasing after loading (i.e., *x* decreases)

We also know that the tuning fork A is loaded so n_A decreases

Hence $n_A - n_B = x$ (decreases)----------(i) correct

$n_B - n_A = x$ (increases)----------(ii) wrong

$n_B = n_A - x = 252\,Hz$

33. (b)As the angle between field and plane is 60^0, therefore angle between area vector and magnetic field is , $\theta = 30^0$

Magnetic flux through the strip is

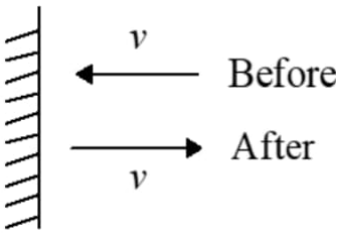
$\phi = BA\cos\theta$

$10^{-3} = B(0.02)\cos30^o$

$$B = \frac{10^{-3}}{(0.02)\left(\frac{\sqrt{3}}{2}\right)}$$

$B = 0.058T$

34. (a)



Change in momentum $\Delta p = p_f - p_i$

$\Delta p = mv - (-mv) \Rightarrow \Delta p = 2mv$

35. (b)If velocity is constant then both magnitude i.e., speed and direction remains constant and acceleration is zero. But if speed is constant then direction of velocity may change and therefore it may have acceleration.

36. (d)Heat required for 100g ice to melt is

$Q_1 = mL = 100(80) = 8000\,cal$

Heat given by 300g water when it cools to 0^oC

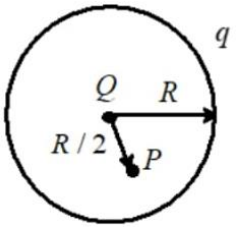
$Q_2 = ms\Delta\theta = 300(1)(25-0)$

$Q_2 = 7500\,cal$

As $Q_2 < Q_1$

Therefore ice cannot melt completely and final temperature of mixture is 0^oC

37. (a)



Potential due to point charge

$$V_1 = \frac{Q}{4\pi\varepsilon_0\left(\frac{R}{2}\right)}$$

Potential due to shell at inside point

$$V_2 = \frac{q}{4\pi\varepsilon_0 R}$$

$$V_{total} = \frac{2Q}{4\pi\varepsilon_0 R} + \frac{q}{4\pi\varepsilon_0 R}$$

38. (b)Let K_α is kinetic energy of α particle and K_d is the kinetic energy of the daughter nucleus.

Let A be the mass number of mother nucleus then the mass number of the daughter nucleus is $(A-4)$.

From the conservation of momentum

$$\frac{K_\alpha}{K_d} = \frac{p^2}{2(4)}\frac{2(A-4)}{p^2}$$

$$\frac{K_\alpha}{K_d} = \frac{A-4}{4} \;;\; K_d = \frac{4}{A-4}K_\alpha$$

Q value $= K_\alpha + K_d$

$$50 = 48 + \frac{4}{A-4}(48)$$

$$2 = \frac{4}{A-4}(48)$$

$$A-4 = 96 \Rightarrow A = 100$$

39. (c)De-Broglie wavelength is $\lambda = \frac{h}{\sqrt{2hK}} = \frac{h}{\sqrt{2mqV}}$

Therefore, de-Broglie wavelength for protons.

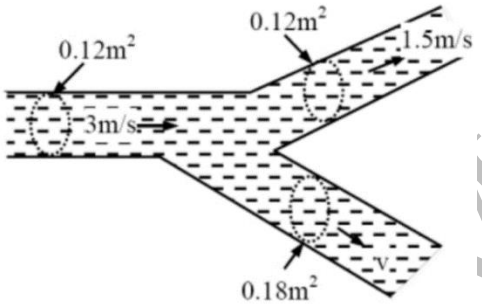
$\lambda_0 = \frac{h}{\sqrt{2}(m_p)eV_0}$ and de-Broglie wavelength for alpha particles

$$\lambda^{|} = \frac{h}{\sqrt{2(4m_p)(2e)V_0}}$$

$$\frac{\lambda_0}{\lambda^{|}} = \sqrt{8} = 2\sqrt{2}$$

$$\lambda^{|} = \frac{\lambda_0}{2\sqrt{2}}$$

40. (a)



From equation of continuity $Av = A_1v_1 + A_2v_2$

$$(0.12)(3) = (0.12)(1.5) + (0.18)v$$

$$0.36 = 0.18 + (0.18)v$$

$$0.18 = (0.18)v \Rightarrow v = 1\,m/s$$

$$v = \frac{dx}{dt} = 3 - 8t + 3t^2$$

41. (a)

Speed at t=0 is $v_0 = 3\,m/s$

Speed at t=4 is $v_4 = 19\,m/s$

According to work energy theorem

$$W = \frac{1}{2}m\left(v_4^2 - v_0^2\right)$$

$$W = \frac{1}{2}\times 0.03\times\left(19^2 - 3^2\right) = 5.28J$$

42. (a)For constant speed along circular path acceleration in centripetal which is constant in magnitude $a_c = \frac{v^2}{r}$ and always directed towards the centre so the direction changes continuously.

43. (b)If two liquids of equal masses and different densities are mixed together then the density of the mixture of

$$\rho = \frac{2\rho_1\rho_2}{\rho_1+\rho_2} \Rightarrow \rho = \frac{2\times 1\times 2}{1+2} = \frac{4}{3}$$

$$\Rightarrow \rho = \frac{4}{3}g/cc$$

44. (d)Resultant amplitude

$$A = \sqrt{a^2 + a^2 + 2aa\cos\phi}$$

$$= \sqrt{4a^2\cos^2\left(\frac{\phi}{2}\right)}$$

$$A = 2a\cos\left(\frac{\phi}{2}\right)$$

$$\therefore I \propto A^2 \Rightarrow I \propto 4a^2$$

45. (c)Time period when dip needle vibrates in the vertical plane perpendicular to the magnetic meridian is,

$$T_1 = 2\pi\sqrt{\frac{I}{MB_H}} \text{ as } T_1 = T_2 = 2s$$

$$\therefore B_V = B_H$$

Angle of dip is, $\tan\theta = \frac{B_V}{B_H} = 1 \Rightarrow \theta = 45^o$

46. (b)From Newton's first law an object will continue to move uniformly until the resultant force on it is zero

47. (b)Ratio of mass remaining undecayed to initial mass is,

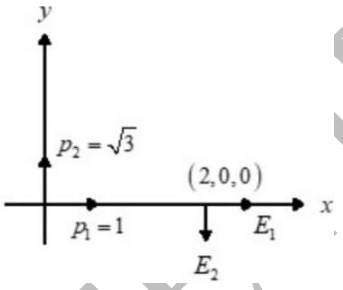
$$\frac{m}{m_0} = \left(\frac{1}{2}\right)^{\frac{t}{T}} ; \frac{16-15}{16} = \left(\frac{1}{2}\right)^{\frac{t}{T}}$$

$$\left(\frac{1}{2}\right)^4 = \left(\frac{1}{2}\right)^{\frac{t}{T}} \Rightarrow t = 4T = 4\times 140 \text{ days} ;$$

$$t = 560\, days$$

48. (c)Let $\vec{p} = \hat{i} + \sqrt{3}\,\hat{j} = \overrightarrow{p_1} + \overrightarrow{p_2}$

Therefore $\overrightarrow{p_1} = \hat{i}$ and $\overrightarrow{p_2} = \sqrt{3}\,\hat{j}$



Field due to $\overrightarrow{p_1}$ at point B,

$$E_1 = \frac{2\times K}{2^3} = \frac{K}{4}$$

Field due to $\overrightarrow{p_2}$ at point B,

$$E_2 = \frac{K\times\sqrt{3}}{8}$$

$$E_{net} = \sqrt{E_1^2 + E_2^2}$$

$$E_{net} = \sqrt{\frac{K^2}{16} + \frac{K^2\times 3}{64}}$$

$$E_{net} = \frac{\sqrt{7}K}{8}$$

49. (a)Good absorbers are good radiators and bad absorbers are bad radiators. The black spot on heating absorbs radiations and so emits them in the dark room while the polished shinning part reflects radiation and absorbs nothing and so does not emit radiations and becomes invisible in the dark

50. (b)

$$\Rightarrow \frac{dT}{dx} = 80 \Rightarrow \frac{T_2 - T_1}{l} = 80$$

$$\Rightarrow \frac{30 - T_1}{0.5} = 80 \Rightarrow 30 - T_1 = 40 \Rightarrow T_1 = -10^o C$$

CHEMISTRY

1. (c): $SO_3^{2-} \rightarrow x + (-6) = -2 \Rightarrow x = +4$

$SO_4^{2-} \rightarrow x + (-8) = -2 \Rightarrow x = +6$

$S_2O_4^{2-} \rightarrow 2x + (-8) = -2 \Rightarrow x = +3$

$S_2O_6^{2-} \rightarrow 2x + (-12) = -2 \Rightarrow x = +5$

Hence , $SO_4^{2-} > S_2O_6^{2-} > SO_3^{2-} > S_2O_4^{2-}$

2. (d)Different hydrated (d) Hydrated isomers of $CrCl_3.6H_2O$ are :

(i) $\left[Cr\left(H_2O\right)_6\right]Cl_3$

(ii) $\left[Cr\left(H_2O\right)_5 Cl\right]Cl_2.H_2O$

(iii) $\left[Cr\left(H_2O\right)_4 Cl_2\right]Cl_2.2H_2O$

They all have different conductivity, dipole moment and precipitation by $AgNO_3$. They all have similar magnetic moment because in all complexes, ligands are weak field. Cr^{+3} has 3 unpaired e^-

3. (a)The important step in the extraction of metal from carbonate ore is calcinations.

$$ZnCO_3 \rightarrow ZnO + CO_2$$

4. (d)When P_4 is treated with $N_2O(\text{O.S} = 1)$ it produces P_4O_{10} *and* N_2 (diatomic molecule)

P_4O_{10} used as dehydrating agent

$$\underset{(X)}{P_4} + 10N_2O \rightarrow \underset{(Y)}{P_4O_{10}} + \underset{(Z)}{10N_2}$$

5. (b)Wave nature of electron was shown by Davisson and Germer. Davisson and germer demonstrated the physical reality of the wave nature of electrons by showing that a beam of electrons could also diffracted by crystals just like light of x – rays.

6. (a)No. of equivalent of acid = no. of equivalent of base

$$\left(\frac{Weight}{Molecular\ weight}\times 'n'\ factor\right)_{Base} = (N\times V_{liter})_{Acid}$$

$\therefore$ n factor of NaOH = 1

$\therefore$ n factor of Oxalic acid = 1

$$1 = \frac{x\times 1000}{63\times 100}\ x = 6.3\ gms$$

7. (c)In carius method sulphur of organic compound is converted in to H_2SO_4

$$S + H_2O + 3[O] \xrightarrow[HNO_3]{\Delta} H_2SO_4$$

8. (b)From the 1st law of Thermodynamics $\Delta U = q + w$

For adiabatic process

q =0,

so, $\Delta U = W$

9. (b)Rate = $k[HI]^n$

$11\times 10^{-8} = k[0.2]^n$ .....(1)

$2.75\times 10^{-8} = k[0.1]^n$ .....(*ii*)

Dividing eq. (i) by eq. (ii),

$4 = 2^n,\ n = 2$

10. (d)Adding inert gas at constant volume does not affect any equilibrium whether $\Delta n \geq 0\ or\ \Delta \leq 0$

11. (d)The energy of second Bohr orbit of hydrogen atom (E_2) is $-328\ kJ\ mol^{-1}$

$$E_2 = -\frac{1312}{2^2}\ kJ\ mol^{-1} = 328\ kJ\ mol^{-1}$$

$$\therefore E_n = -\frac{1312}{n^2}\ kJ\ mol^{-1}$$

If n = 4

$$\therefore E_4 = -\frac{1312}{4^2}\ kJ\ mol^{-1}$$

$$= -82\ kJ\ mol^{-1}$$

12. (b)When two liquids are mixed, the boiling point of the mixture lies somewhere between the boiling points of the two pure substances. Since ethyl alcohol has a lower boiling point than water, a mixture of the two would also have a lower boiling point.

13. (d)For octahedral void

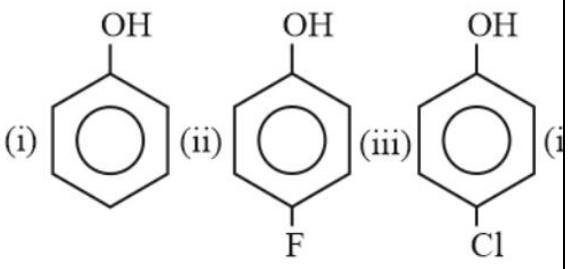
$$\frac{r_B}{r_A} = 0.414\ to\ 0.732$$

(or) $(r_B)\max = 0.732\ r_A$

14. (b)Methane is produced due to the decay of vegetables or animal organisms present in swamps and marsh, by the action of bacteria. Due to this method of formation, methane is also known as marsh gas.

15. (d)According to H.G.J. Mosley, the properties of the two elements are the periodic function of their atomic number.

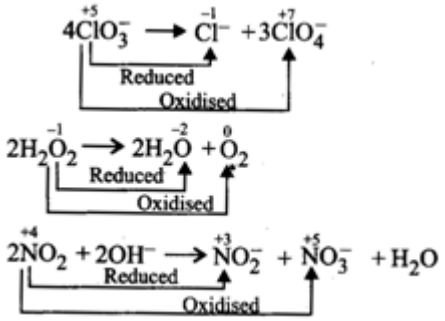
16. (c)



-I effect of F>Cl>Br>I

In (iii), (iv), (v) only –I effect is predominant, but in (ii) both –I and +R are predominant because of the effective overlapping of 2P(F)-2P(C). Net electron with drawing after in (ii) is less than (iv) and (v) so, ans is (iii)>(ii)>(iv)>(v)>(i)

17. (d):



$\overset{+4}{Ti}Cl_4 + 2\overset{0}{Mg} \rightarrow \overset{0}{Ti} + 2\overset{+2}{Mg}Cl_2$ Displacement reactio,

$$MA_2 \rightleftharpoons M^{2+} + 2A^-$$
$$1-\alpha \qquad \alpha \qquad 2\alpha$$

18. (c)

$$i = \frac{Actual\ \ no.of\ \ particles\ in\ solution}{number\ of\ \ particles\ taken}$$

$$i = 1 + 2\alpha$$

$$\Delta T_f\ of\ MA_2 = \Delta T_f \text{ of glucose}$$

$$i.K_f.m = K_f.2m \times i$$

$$1 + 2\alpha = 2 \Rightarrow 2\alpha = 1 \Rightarrow \alpha = 0.5$$

19. (c)(i) 1 mole of Ar $= 6.022 \times 10^{23}$ atoms

52 moles of $Ar = 52 \times 6.022 \times 10^{23}$ atoms

$= 313.144 \times 10^{23}$ atoms

$= 3.131 \times 10^{25}$ atoms

(ii) 4U of He = 1 He atom

$$\therefore 52U\ \ of\ \ He = \frac{52}{4} He\ atoms = 13\ He\ \ atoms$$

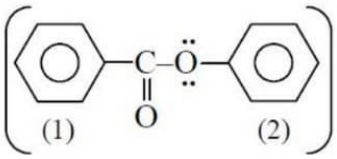
(iii) 1 mole of atom of He = 4g = 6.022×10^{23} atoms

52 g of he = $\frac{52 \times 6.022 \times 10^{23}}{4}$ atoms

$= 78.286 \times 23$ atoms

$= 7.8286 \times 10^{24}$ atoms

20. (d)In phenyl benzoate



The 1st ring gets deactivated, while 2nd ring gets activated due to lone pairs on oxygen atom. So it can give ortho or para bromo product. But the ortho position is sterically hindered, so it will give para compound as a major product.

21. (c) $K = C \times$ Cell constant

$$= \frac{Cell\ constant}{R} = \frac{1.15}{250}$$

$$\wedge_{eq} = \frac{K \times 1000}{Normality} = \frac{1.15}{250} \times \frac{1000}{1}$$

$= 4.6\,\Omega^{-1} cm^2 eq^{-1}$.

22. (c)Conceptual

23. (c) S^{2-} *and* CN^- ions if present are decomposed by conc. HNO_3 and hence do not interfere in the test.

24. (d)The ability an ion to bring about coagulation of a given colloid depend upon both the magnitude and sign of its charge.

25. (b)At 293K, 200mL He is exhibiting a pressure of 0.66 atm.

It occupies 400 mL vessel. Here its partial pressure is reduced to half of its initial pressure.

$\therefore P_{He}$ in the mixture = 0.33 atm

As $400 mL O_2$ at 293K with a pressure of 0.52 atm occupies 400 mL volume at 293K, hence its partial pressure its not altered will exhibit 0.52 atm.

26. (a): On the basis of hyperconjugation, the order of stability of free radicals is as follows t > s > p. Benzyl free radicals are stabilized by resonance and hence are more stable than alkyl free radicals. More the number of phenyl groups attachend to the carbon atom, more is the stability of free radical.

27. (b)According to Le – Chatelier's principle exothermic reactions are favourable at low pressure. The reaction in which number of moles decreases are favourable at high pressure or low volume

$$C_2H_4 + H_2 \rightleftarrows C_2H_6,\ \Delta H = -130\, kJ\ mol^{-1}$$

$\because$ The reaction is exothermic and number of moles of reactants are decreasing.

$\because$ The reaction rate is increased by decreasing temperature and increasing pressure.

28. (b)Pressure correction factor accounts for intermolecular forces.

$$\left(P + \frac{na}{v_m^2}\right)(v_m - nb) = nRT$$

If $n = 1\left(P + \frac{a}{v_m^2}\right)$ is responsible for intermolecular forces

29.

$$pH = pKa + \log\left[\frac{Salt}{Acid}\right]$$

(a)

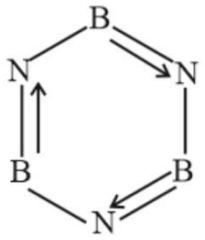
$$6 = 5 + \log\frac{Salt}{Acid}$$

$$1 = \log\frac{Salt}{Acid}$$

$$\log 10 = \log\frac{Salt}{Acid}$$

$$\frac{Salt}{Acid} = \frac{10}{1}$$

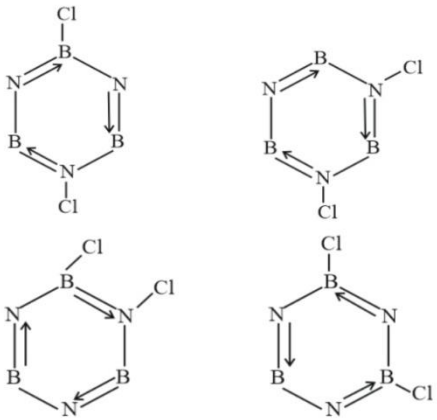
30. (b)



$B_3N_3H_6$

It is a aromatic compound like benzene and due to electro negativity difference it is polar and more reactive than benzene

Possible of Isomers $B_3N_3H_6$:



(i), (ii) and (iii)

31. (c)Acetonitrile when reduced with lithium aluminium hydride gives ethanamine.

$$CH_3CN \xrightarrow[LiAlH_4]{\text{Reduction}} \underset{\text{(ethanamine)}}{CH_3CH_2NH_2}$$

32. (a)

$= (1)2\,AgNO_3 + 2KOH \longrightarrow Ag_2O$
$\downarrow$ (black) $+ 2\,KNO_3 + H_2O$
$\downarrow$ excess KOH
No reaction

$(2)\ AgNO_3 \xrightarrow{CN^-} AgCN$
$\downarrow$ (white) $\xrightarrow[\text{excess}]{CN^-} Ag\left(CN\right)_2^-$
(Soluable)

$(3)\ AgNO_3 \xrightarrow{S_2O_3^{2-}} Ag_2S_2O_3$
$\downarrow$ (white) $\xrightarrow[\text{excess}]{S_2O_3^{2-}}$
$Ag\left(S_2O_3\right)_2^{3-}$ (Soluable)

$(4)\ AgNO_3 \xrightarrow{NH_3} Ag_2O$
$\downarrow$ (black) $\xrightarrow[\text{excess}]{NH_3} [Ag\left(NH_3\right)_2]^+$
(Soluable)

Hence (2), (3) &(4) are not the answers

33. (d)

$$CaC_2 + H_3O^{\oplus} \longrightarrow Ca(OH)_2 + CH\equiv CH \xrightarrow{NH_4OH + AgNO_3} \underset{\text{White ppt.}}{Ag^+\bar{C}\equiv\bar{C}\,Ag^+}$$

34. (b): $CH_3Cl : x+3-1=0 \Rightarrow x=-2$
$CCl_4 : x-4=0 \Rightarrow x=+4$
$CHCl_3 : x+1-3=0 \Rightarrow x=+2$
$CH_2Cl_2 : x+2-2=0 \Rightarrow x=0$

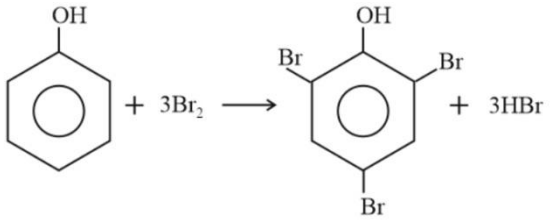
35. (b)When CO_2 gas is passed through a brine solution $(28\%\,NaCl)$ saturate with ammonia, it gives sodium bicarbonate which on drying and heating gives sodium carbonate.

36. (b)

$CH_2=CH-COOH \xrightarrow{LiAlH_4} CH_2=CH-CH_2OH + H_2O$

$LiAlH_4$ cannot reduce $C=C$ in ether.

37. (c)



1 mole 3 moles 1 moles

94g of phenol reacts with 480 g. of Br_2.

2g of phenol react with:

$\Rightarrow \frac{480}{94}\times 2 = 10.22g\ of\ Br_2$

38. (c)Natural rubber is a polymer of isoprene.

$$nCH_2=CH-\underset{CH_3}{\overset{|}{C}}=CH_2 \xrightarrow{\text{Polymerization}} \left[-CH_2-CH=\underset{CH_3}{\overset{|}{C}}-CH_2\right]_n$$

Isoprene Natural rubber

39. (b)In any reaction mechanism the no. of activated complexes showing maxima of potential energies is the no. of steps in that mechanism and in between these maxima is a valley where lies a more stable intermediate. There is one reaction intermediate lying at valley of two maxima representing two steps. E_a for first step should be higher than second step as first is slow step. These requirements fulfilled by choice (ii) & not choice (i) the choice (iv) is not possible because that is for endothermic reaction $(\Delta H + ve)$ & (ii) is single step equation so not possible.

40. (a)After mixing.

$\left[Ag^+\right] = \frac{1}{2}\times 10^{-4} = 5\times 10^{-5}M$

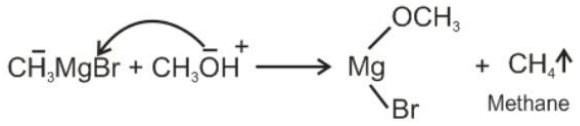
$\left[Cl^-\right] = \frac{1}{2}\times 10^{-4} = 5\times 10^{-5}M$

$K_{ip} = \left[Ag^+\right]\left[Cl^-\right] = \left(5\times 10^{-5}\right)^2 = 2.5\times 10^{-9}$

41. (a)Amoxicillin is semi – synthetic modification of penicillin

42. (b)$[MA_5B]$ due to absence of symmetry of 'B' ligand cannot exist in the form of cis – trans isomer

43. (a)



CH_3OH having acidic H so in CH_3MgBr the CH_3^- will react as a base and react with H^+ and form CH_4 by acid – base reaction.

44. (b)Let $v(ml)$ of solution is required N(acid) =

$$\frac{0.016\,v}{1000}\times 6.023\times 10^{23}$$

$$=9.637\times 10^{18}V$$

Area covered

$$=9.637\times 10^{18}V\times 0.2\times 10^{-14}cm^2$$

$$=1927V=500cm^2$$

$$V=25.94\times 10^{-3}m$$

45. (b) $CH_3-COCl+H_2\xrightarrow{Pd.BaSO_4}CH_3CHO+HCl$

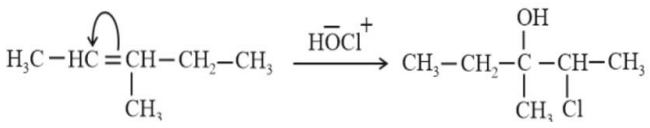
Acetyl chloride

Acetaldehyde

This reaction is called Rosenmund's reaction.

46. (d): Free radicals can undergo all given types of processes.

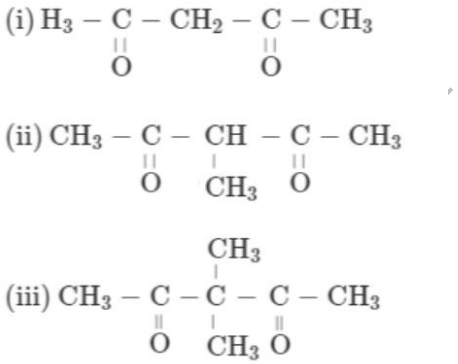
47. (c)



48. (a)1 mole $Cr_2O_7^{-2}$ require 6 Faraday

Electricity (6F)

$= 6\times 96500C=5.79\times 10^5C$



49. (b)

In 1,2,3 the acidic – H order is 1, >2, >3

1, 3 – Diketones are prone to exist as enols because of conjugation of the enol or enolate with the other carbonyl group, and the stability gained in forming a six – membered ring.

50. (b)Adenine, guanine, cytosine sets of bases is present both in DNA and RNA.

BIOLOGY

01. (b)
02. (a)
03. (c)
04. (b)
05. (b)
06. (c)

07. (b)
08. (d)
09. (c)
10. (c)
11. (c)
12. (c)
13. (a)

14. (c)
15. (b)
16. (b)
17. (a)

18. (*d*) The first cytokinin discovered was kinetin a modified form of adenine. Kinetin does not occur naturally. Search for natural substances with cytokinin like activity led to

the isolation of zeatin from corn-kernels and coconut milk. Thus, zeatin is natural and kinetin is synthetic.

19. (a)
20. (c)
21. (c)
22. C
23. (a)
24. (a)
25. (a)
26. (d)
27. (a)
28. (*c*) Xylem in plants functions as a conducting tissue and helps in the translocation of water, mineral salts, some organic nitrogen and hormones from the soil to the aerial parts of the plant.
29. (c)
30. (b)
31. (b)
32. (d) Nikolai Ivanovitch Vavilov (1926) proposed different centres of origin for various crop plants on two criteria
    (i) Occurrence of wild relatives.
    (ii) Occurrence of maximum variations in the crop. They are 11 in number.
33. (a)
34. (b)
35. (c)
36. (b)
37. (d) A specific restriction endonuclease enzyme is used for a cutting of specific part of DNA strand. Therefore they are also known as molecular scissors or biological scissors.
38. (c)
39. (c)
40. (c)
41. (a)
42. (b)
43. (a)
44. (d)
45. (c)
46. (a)
47. (d)
48. (b)
49. (d) Our breeding usually takes place between members of different varieties or strains, and in certain plants of closely related species. The progeny is known as hybrid and have phenotypes showing characteristics which are superior to either of the parents stock. This phenomenon is known as hybrid vigour or heterosis.
50. (d)
01. (c)
02. (b)
03. (b)
04. (b)
05. (c)
06. (a)
07. (a)
08. (b)
09. (d)
10. (b)
11. (d)
12. (a)
13. (b)
14. (b)
15. (b)
16. (a)
17. (d)
18. (c)
19. (c)
20. (c)
21. (d)
22. (b)
23. (a)
24. (c)
25. (c)
26. (c)

27. (b)

28. (a)
29. (d)

30. (a)

31. (d)

32. (d)
33. (d)

34. (d)

35. (a)

36. (b)
37. (d)

38. (d)

39. (d)

40. (a)

41. (d)

42. (d)
43. (a)
44. (d)
45. (a)

46. (a)

47. (c)
48. (d)

49. (c)

50. (a)