

SOLUTION – AIIMS 2017

PHYSICS

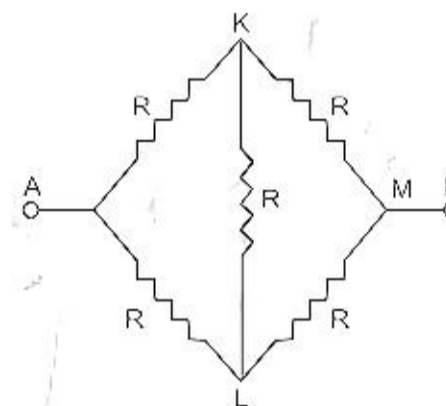
107. (d) $K_{\max} = \frac{hc}{\lambda} - W = \frac{hc}{\lambda} - 5.01 =$
 $\frac{12375}{\lambda(\text{in } \text{Å})} - 5.01$
 $= \frac{12375}{2000} - 5.01 = 6.1875 - 5.01 =$
 $1.1775 \approx 1.2 \text{ V}$

53. (b) Components of velocity before and after collision parallel to the plane are equal, So
 $v \sin 60^\circ = u \sin 30^\circ \dots\dots(1)$
 Components of velocity normal to the plane are related to each other
 $v \cos 60^\circ = e u (\cos 30^\circ) \dots\dots(2)$
 $\Rightarrow \cot 60^\circ = e \cot 30^\circ \Rightarrow e = \frac{\cos 60^\circ}{\cot 30^\circ}$
 $\Rightarrow e = \frac{1}{\sqrt{3}} \Rightarrow e = \frac{1}{3}$

146. (c) No. of electrons reaching the collector,
 $n_C = \frac{96}{100} \times 10^{10} = 0.96 \times 10^{10}$
 Emitter current, $I_E = \frac{n_E \times e}{t}$
 Collector current, $I_C = \frac{n_C \times e}{t}$
 \therefore Current transfer ratio,
 $\alpha = \frac{I_C}{I_E} = \frac{n_C}{n_E} = \frac{0.96 \times 10^{10}}{10^{10}} = 0.96$

122. (a) The equivalent circuit is shown in fig. Since the Wheatstone's bridge is balanced, therefore no current will flow through the

equivalent resistance between A and B is given by



$$\frac{1}{R'} = \frac{1}{2R} + \frac{1}{2R} = \frac{2}{2R} = \frac{1}{R}$$

i.e., $R' = R$

62. (d) $\alpha = \frac{\omega_2 - \omega_1}{t_2 - t_1}$
 $\omega_1 = \frac{2\pi \times 1200}{60} = 40\pi$
 $\omega_2 = \frac{2\pi \times 4500}{60} = 150\pi$
 $\alpha = \frac{110\pi}{10} \text{ rad/sec}^2$

Now, π radian = 180°

$$\therefore 1 \text{ rad} = \frac{180}{\pi} \text{ degree}$$

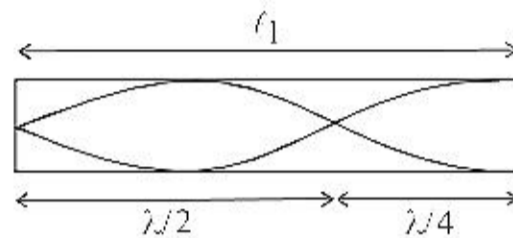
$$\therefore \alpha = \frac{11\pi \times 180}{\pi} \text{ degree/sec}^2$$

$$= 1980 \text{ degree/sec}^2$$

55. (a) For 3rd harmonic/2nd over tone of organ pipe open at ends
 $l = \frac{3\lambda}{2}$

$$\Rightarrow n_2 = \frac{3v}{2l_2}$$

For 1st overtone of organ pipe open at one end



$$\Rightarrow n_1 = \frac{3v}{4l_1}$$

$$\text{Given } n_1 = n_2 \Rightarrow \frac{3v}{2l_2} = \frac{3v}{4l_1} \text{ or } \frac{l_1}{l_2} = \frac{1}{2}$$

5. (a) $K = \frac{p}{\Delta V/V}$ or $\frac{\Delta V}{V} = \frac{p}{K}$;
 Also $\rho = \frac{M}{V}$ and $\rho' = \frac{M}{V - \Delta V}$;
 $\therefore \frac{\rho'}{\rho} = \frac{V}{V - \Delta V} = \frac{1}{1 - \Delta V/V} = \left(1 - \frac{\Delta V}{V}\right)^{-1}$
 $\approx \left(1 + \frac{\Delta V}{V}\right) = 1 + \frac{p}{K}$ or $\frac{\rho'}{\rho} - 1 = \frac{p}{K}$
 or $\rho' - \rho = \frac{\rho p}{K}$ ($\because \Delta V \ll V$)

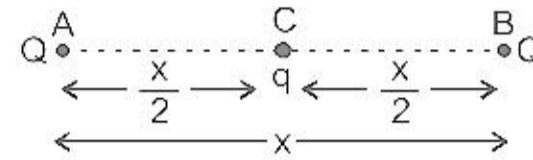
102. (a) $e = \frac{-d\phi}{dt} = \frac{-d}{dt}(6t^2 - 5t + 1) = -12t + 5$
 $e = -12(0.25) + 5 = 2 \text{ volt}$
 $i = \frac{e}{R} = \frac{2}{10} = 0.2 \text{ A}$

4. (d) is not possible, because at a particular time t , displacement cannot have two values.

39. (c) The chemical reaction of process is $2^2_1\text{H} \rightarrow 2^4_2\text{He}$

$$\text{Energy released} = 4 \times (7.1) - 4(1.1) = 24 \text{ eV}$$

119. (d) Let q charge is situated at the mid position of the line AB. The distance between AB is



$$\text{Let } AC = \frac{x}{2}, BC = \frac{x}{2}$$

The force on A due to charge q at C,

$$\vec{F}_{CA} = \frac{1}{4\pi\epsilon_0} \cdot \frac{Qq}{(x/2)^2} \text{ along } \overrightarrow{AC}$$

The force on A due to charge Q at B

$$\vec{F}_{AB} = \frac{1}{4\pi\epsilon_0} \cdot \frac{Q^2}{x^2} \text{ along } \overrightarrow{BA}$$

The system is in equilibrium, then two oppositely directed force must be equal, i.e., total force on A is equal to zero.

$$\vec{F}_{CA} - \vec{F}_{AB} = 0 \Rightarrow \vec{F}_{CA} = -\vec{F}_{AB}$$

$$\frac{1}{4\pi\epsilon_0} \cdot \frac{4Qq}{x^2} = \frac{1}{4\pi\epsilon_0} \cdot \frac{Q^2}{x^2}$$

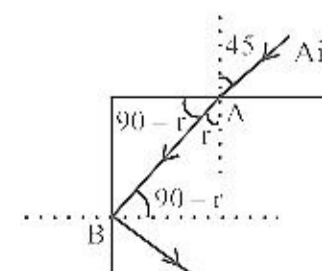
$$\Rightarrow q = -\frac{Q}{4}$$

35. (d) $B = x = [L]$; $A\sqrt{x} = Vx$; $A = V\sqrt{x}$
 $= ML^2 T^{-2} L^{1/2} = ML^{5/2} T^{-2}$
 $AB = (ML^{5/2} T^{-2})(L) = [M^1 L^{7/2} T^{-2}]$

83. (a) For point A, $\mu_g = \frac{\sin 45^\circ}{\sin r}$

$$\Rightarrow \sin r = \frac{1}{\sqrt{2} \mu_g}$$

for point B, $\sin(90 - r) = \mu_a$
 $(90 - r)$ is critical angle.

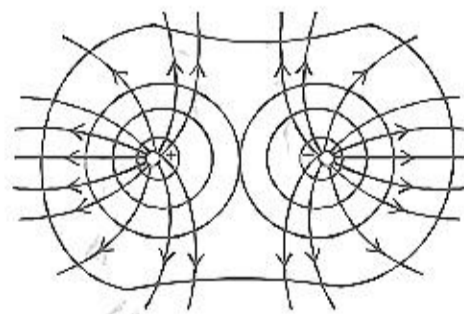


$$\begin{aligned} \therefore \cos r &= \frac{g\mu_a}{a\mu_g} = \frac{1}{a\mu_g} \\ \Rightarrow a\mu_g &= \frac{1}{\cos r} \\ &= \frac{1}{\sqrt{1-\sin^2 r}} = \frac{1}{\sqrt{1-\frac{1}{2a\mu_g^2}}} \\ \Rightarrow a\mu_g^2 &= \frac{1}{1-\frac{1}{2a\mu_g^2}} = \frac{2a\mu_g^2}{2a\mu_g^2-1} \\ \Rightarrow 2a\mu_g^2-1 &= 2 \Rightarrow a\mu_g = \sqrt{\frac{3}{2}} \end{aligned}$$

77. (a) Since water does not fall down, therefore the velocity of revolution should be just sufficient to provide centripetal acceleration at the top of vertical circle. So,

$$v = \sqrt{gr} = \sqrt{10 \times (1.6)} = \sqrt{16} = 4 \text{ m/sec.}$$

74. (c) Equipotential surfaces are normal to the electric field lines. The following figure shows the equipotential surfaces along with electric field lines for a system of two positive charges.



58. (a) The displacement of a particle in S.H.M. is given by

$$y = a \sin(\omega t + \phi)$$

$$\text{velocity} = \frac{dy}{dt} = \omega a \cos(\omega t + \phi)$$

The velocity is maximum when the particle passes through the mean position i.e.,

$$v = (dv)$$

$$\frac{1}{2} m \left(\frac{dy}{dt} \right)_{\max}^2 = \frac{1}{2} m \omega^2 a^2 = 8 \times 10^{-3} \text{ joule}$$

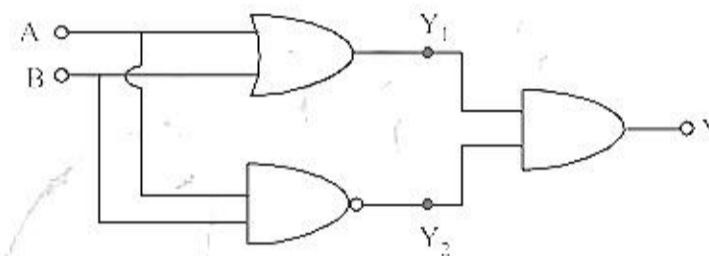
$$\text{or } \frac{1}{2} \times (0.1) \omega^2 \times (0.1)^2 = 8 \times 10^{-3}$$

Solving we get $\omega = \pm 4$

Substituting the values of a , ω and ϕ in the equation of S.H.M., we get

$$y = 0.1 \sin(\pm 4t + \pi/4) \text{ metre.}$$

99. (b)



$$Y_1 = A + B, Y_2 = \overline{A \cdot B}$$

$$Y = (A + B) \cdot \overline{A \cdot B} = A \cdot \overline{A \cdot B} + B \cdot \overline{A \cdot B}$$

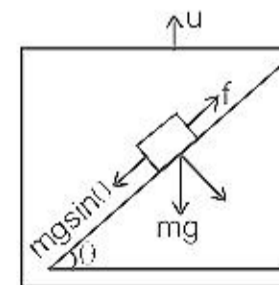
$$= 0 + A \cdot \overline{B} + B \cdot \overline{A} + 0 = A \cdot \overline{B} + B \cdot \overline{A}$$

This expression is for XOR

18. (c) $B = \frac{\mu_0}{4\pi} \frac{2i_2}{(r/2)} - \frac{\mu_0}{4\pi} \frac{2i_1}{(r/2)} = \frac{\mu_0}{4\pi} \frac{4}{r} (i_2 - i_1)$

$$= \frac{\mu_0}{4\pi} \frac{4}{5} (5 - 2.5) = \frac{\mu_0}{2\pi}$$

70. (a) Since block does not slide on wedge so displacement is zero & hence work done by force is zero.



123. (d) The distance between the first dark fringe on either side of the central bright fringe = width of central maximum

$$= 2D\lambda = \frac{2 \times 2 \times 600 \times 10^{-9}}{1}$$

51. (c) Pressure is proportional to depth from the free surface and is same in all directions.

47. (b)

$$114. (d) |Y| = \frac{[X]}{[Z^2]} = \frac{M^{-1}L^{-2}T^4A^2}{M^2T^{-4}A^{-2}}$$

$$= M^{-3}L^{-2}Q^4T^4 \quad \left(\because A = \frac{Q}{T} \right)$$

66. (b) Effective half life is calculated as

$$\frac{1}{T} = \frac{1}{T_1} + \frac{1}{T_2}$$

$$\frac{1}{T} = \frac{1}{16} + \frac{1}{48} \Rightarrow T = 12 \text{ years}$$

Time in which $\frac{3}{4}$ will decay is 2 half lives = 24 years

41. (d) Angle of dip, $\delta = 45^\circ$

$$\therefore \tan \delta' = \frac{\tan \delta}{\cos \theta} = \frac{\tan 45}{\cos 30^\circ} = \frac{1}{\sqrt{3}/2} = \frac{2}{\sqrt{3}}$$

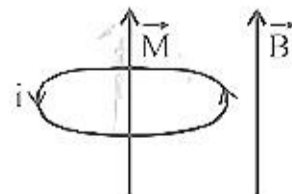
$$\therefore \text{Real dip } \delta' = \tan^{-1} (2/\sqrt{3})$$

50. (b) Gauss's law is applicable only for closed surface and for the charge placed inside it not near it.

$$\text{Total electric flux, } \phi_E = \frac{1}{\epsilon_0} Q$$

18. (d) $\vec{\tau} = (\vec{M} \times \vec{B})$, where $|\vec{M}| = iA$
 $= MB \sin \theta$

where θ is angle between Magnetic moment & \vec{B} . For $\theta = 0$ $\vec{\tau} = 0$ & coil is in stable equilibrium. Hence plane of coil must be perpendicular to magnetic field.



33. (a) In vacuum velocity of all EM waves are same but their wavelengths are different.

28. (a) In adiabatic process

$$\Delta Q = 0$$

$$\therefore \Delta W = -\Delta U$$

90. (d) F_f = Force of friction between B and A

$$= \mu_2 m_2 g = \mu_2 (\text{mass of A and B}) g$$

$$= \frac{1}{3} (100 + 200) g = \frac{300}{3} g = 100g \text{ newton}$$

$$\therefore F = F_1 + F_2$$

$$= 25g + 100g = 125g = 125 \times 10 \text{ N}$$

$$\therefore F = 1250 \text{ N}$$

129. (d) Power, $P = I_{r.m.s} \times V_{r.m.s} \times \cos \phi$

In the given problem, the phase difference between voltage and current is $\pi/2$. Hence

$$P = I_{r.m.s} \times V_{r.m.s} \times \cos(\pi/2) = 0.$$

1. (a) Figure indicates the presence of some positive charge to the left of A.

$$\therefore E_A > E_B (\because r_A < r_B)$$

65. (d) For slab in series, we have

$$R_{eq} = R_1 + R_2 = \frac{x}{KA} + \frac{4x}{2KA} = \frac{3x}{KA}$$

Now, in a steady state rate of heat transfer through the slab is given by

$$\frac{dQ}{dt} = \frac{T_2 - T_1}{R_{eq}} = \frac{(T_2 - T_1)}{3x} KA \quad \dots(i)$$

$$\text{Given } \frac{dQ}{dt} = \left(\frac{\Lambda(T_2 - T_1)K}{x} \right) f \quad \dots(ii)$$

Comparing (i) and (ii), we get $f = 1/3$

37. (a) For Bracket series

$$\frac{1}{\lambda_{\max}} = R \left[\frac{1}{4^2} - \frac{1}{5^2} \right] = \frac{9}{25 \times 16} R$$

$$\text{and } \frac{1}{\lambda_{\min}} = R \left[\frac{1}{4^2} - \frac{1}{\infty^2} \right] = \frac{R}{16} \Rightarrow \frac{\lambda_{\max}}{\lambda_{\min}} = \frac{25}{9}$$

41. (a)

$$54. (c) X_{C.M.} = \frac{1 \times 0 + 2 \times 2 + 3 \times 0 + 4 \times 2 + 5 \times 1}{1 + 2 + 3 + 4 + 5}$$

$$= \frac{4 + 8 + 5}{15} = \frac{17}{15} = 1.1$$

$$Y_{C.M.} = \frac{1 \times 0 + 2 \times 0 + 3 \times 2 + 4 \times 2 + 5 \times 1}{1 + 2 + 3 + 4 + 5}$$

29. (c) All the charge given to inner sphere will pass on to the outer one. So capacitance that of outer one is $4\pi \epsilon_0 b$.

30. (c) $\lambda = \frac{h}{\sqrt{2mE}}$ so $h \propto \frac{1}{\sqrt{m}}$

Since $m_\alpha > m_n > m_p > m_e$

so de-Broglie wavelength in increasing order will be

$\lambda_{\alpha}, \lambda_n, \lambda_p, \lambda_e$

54. (c) $C_{v\text{mix}} = \frac{n_1 C_{v1} + n_2 C_{v2}}{n_1 + n_2}$

$\Rightarrow \frac{13R}{6} = \frac{n_1 C_{v1} + 2n_1 C_{v2}}{n_1 + 2n_1} \quad \left[\because \frac{n_1}{n_2} = \frac{1}{2} \right]$

$\Rightarrow \frac{13R}{2} = C_{v1} + 2C_{v2}$

Possible values are,

$C_{v1} = \frac{3R}{2}, C_{v2} = \frac{5R}{2}$

\therefore Gases are monatomic (like He) and diatomic (like N_2)

39. (d) We can combine two prisms in such a way
(i) deviation is zero but dispersion not
(ii) dispersion is zero but deviation is not.
But in any situation both deviation & dispersion can not be zero simultaneously.

ASSERTION - REASON TYPE QUESTIONS

96. (d) $f_u = f \frac{\left(\frac{\mu_g}{\mu_n} - 1\right)}{\left(\frac{\mu_g}{\mu_n} - 1\right)} = f \frac{\left(\frac{3}{2} - 1\right)}{\left(\frac{4}{3} - 1\right)} = 4f$

90. (d) Pressure of water reduces when it comes from wide pipe to narrow pipe. According to equation of continuity, $av = \text{constant}$. As the water flows from wider tube to

117. (c) Amplitude of oscillation for a forced damped

oscillatory is $A = \frac{F_0 / m}{\sqrt{(\omega^2 - \omega_0^2)^2 + (b\omega / m)^2}}$

where b is constant related to the strength of the resistive force, $\omega_0 = \sqrt{k/m}$ is natural frequency of undamped oscillator ($b=0$)

When the frequency of driving force (ω) $\approx \omega_0$, then amplitude A is very larger.

For $\omega < \omega_0$ or $\omega > \omega_0$, the amplitude decreases.

103. (a)

102. (b)

114. (b) Study of junction diode characteristics shows that the junction diode offers a low resistance path, when forward biased and high resistance path when reverse biased. This feature of the junction diode enables it to be used as a rectifier.

86. (d) Ampere's circuital law can be derived from Biot-Savart law and is not independent of Biot-Savart law.

111. (d)

95. (d) Large eddy currents are produced in non-laminated iron core of the transformer by the induced emf, as the resistance of bulk iron core is very small. By using thin iron sheets as core the resistance is increased. Laminating the core substantially reduces the eddy currents. Eddy current heats up the core of the transformer. More the eddy currents greater is the loss of energy and the efficiency goes down.

77. (a)

116. (a) Carnot cycle has maximum efficiency.

82. (a) Lenz's law (that the direction of induced emf is always such as to oppose the change that cause it) is direct consequence of the law of conservation of energy.

90. (d) Law of conservation of linear momentum is correct when no external force acts. When bullet is fired from a rifle then both

of bullet because $E \propto 1/m$

104. (d)

94. (a)

70. (a) Work done

$$= \frac{1}{2} \times \text{Stress} \times \text{Strain} = \frac{1}{2} \times Y \times (\text{Strain})^2$$

Since, elasticity of steel is more than copper, hence more work has to be done in order to stretch the steel.

107. (b) Electromagnets are magnets, which can be turned on and off by switching the current on and off.

As the material in electromagnets is subjected to cyclic changes (magnetisation and demagnetisation), the hysteresis loss of the material must be small. The material should attain high value of I and B with low value of magnetising field intensity H. As soft iron has small coercivity, so it is a best choice for this purpose.

86. (a) In real gas, intermolecular force exist. Work has to be done in changing the distance between the molecules. Therefore, internal energy of real gas is sum of internal kinetic and internal potential energy which are function of temperature and volume respectively. Also change in internal energy of a system depends only on initial and final states of the system.

69. (a) de-Broglie wavelength associated with gas molecules varies as 1

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

111. (b) intensity, $I = \frac{1}{2} \rho \omega^2 A^2 v$

\therefore Intensity depend upon amplitude, frequency as well as velocity of wave.

$$\text{Also } I_1 = I_2$$

CHEMISTRY

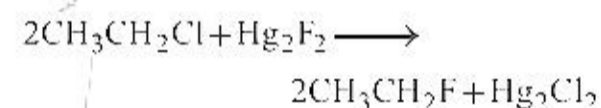
5. (c) In bcc the atoms touch along body diagonal

$$\therefore 2r + 2r = \sqrt{3}a$$

$$\therefore r = \frac{\sqrt{3}a}{4} = \frac{\sqrt{3} \times 4.29}{4} = 1.857 \text{ \AA}$$

8. (a) Phenelzine is an antidepressant, while others are antacids.

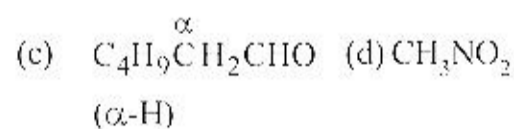
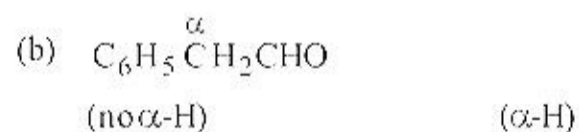
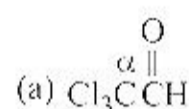
21. (b) Alkyl fluorides are more conveniently prepared by heating suitable chloro- or bromo-alkanes with organic fluorides such as AsF_3 , SbF_3 , CoF_2 , AgF , Hg_2F_2 etc. This reaction is called Swarts reaction.



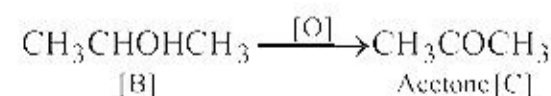
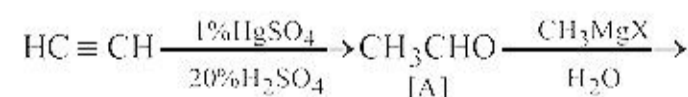
20. (a) The lines falling in the visible region comprise Balmer series. Hence the third line would be $n_1 = 2$, $n_2 = 5$ i.e. $5 \rightarrow 2$.

109. (b)

62. (a) only those compounds which have α -H give Aldol condensation



84. (c)

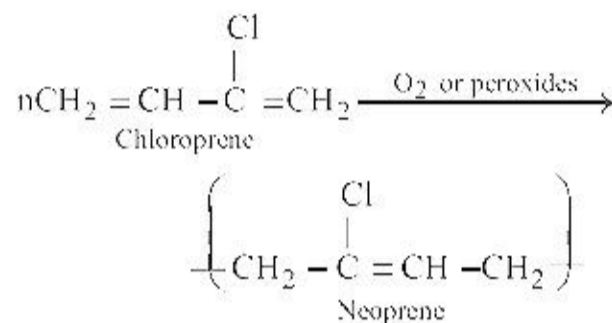


37. (b)

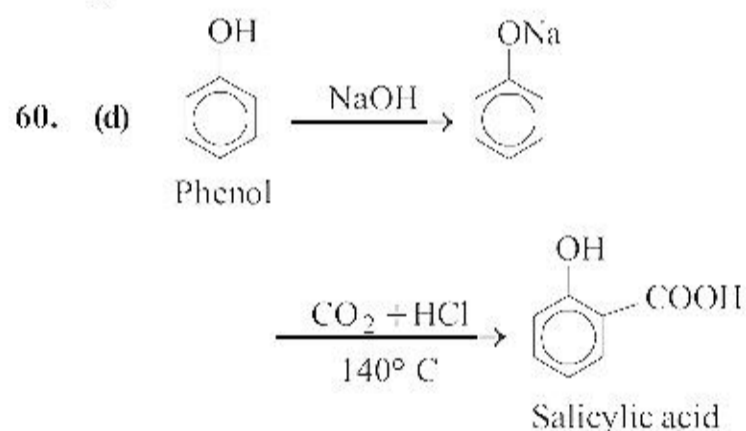
24. (a) Since glycerol has three -OH groups, it can

glucose differ in configuration at C-1 atom so they are anomers.

6. (d) Neoprene is an addition polymer of isoprene.



17. (c)



39. (c) Given $C_p = 75 \text{ JK}^{-1} \text{ mol}^{-1}$
 $n = \frac{100}{18} \text{ mole}$ $Q = 1000 \text{ J } \Delta T = ?$

$$Q = nC_p \Delta T \Rightarrow \Delta T = \frac{1000 \times 18}{100 \times 75} = 2.4 \text{ K}$$

51. (b) $\Delta H = \Sigma [\Delta H_f^\circ \text{ products}] - \Sigma [\Delta H_f^\circ \text{ reactants}]$

$$\Delta H^\circ = [\Delta H_f^\circ(\text{CO})(\text{g}) + \Delta H_f^\circ(\text{H}_2\text{O})(\text{g})] - [\Delta H_f^\circ(\text{CO}_2)(\text{g}) + \Delta H_f^\circ(\text{H}_2)(\text{g})]$$

$$= [-110.5 + (-241.8)] - [-393.5 + 0]$$

$$= 41.2$$

21. (b) For a gaseous phase reaction K_p and K_c are related as

$$K_p = K_c (RT)^{\Delta n_g}$$

For the given reaction,

$$\therefore K_p = K_c (RT)^{-\frac{1}{2}}$$

$$\text{or } \frac{K_p}{K_c} = (RT)^{-\frac{1}{2}}$$

39. (c) $\Delta G = -2.303 RT \log K$
 $-nFE^\circ = -2.303 RT \log K$
 $\log K = \frac{nFE^\circ(1)}{2.303 RT}$
 $= 0.4342 \frac{nFE^\circ}{RT}$ (i)

$$\ln K = \frac{nFE^\circ}{RT}$$

$$K = e^{\frac{-nFE^\circ}{RT}}$$

..... (ii)

115. (b) $\text{Mg}(\text{OH})_2 \rightleftharpoons \text{Mg}^{2+} + 2\text{OH}^-$
 $K_{sp} = [\text{Mg}^{2+}][\text{OH}^-]^2$
 $1.0 \times 10^{-11} = 10^{-3} \times [\text{OH}^-]^2$

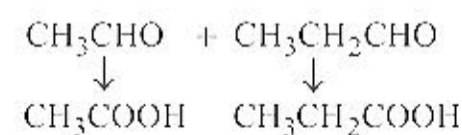
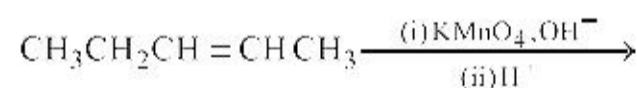
$$[\text{OH}^-] = \sqrt{\frac{10^{-11}}{10^{-3}}} = 10^{-4}$$

$$\therefore \text{pOH} = 4$$

$$\therefore \text{pH} + \text{pOH} = 14$$

$$\therefore \text{pH} = 10$$

67. (d) A doubly bonded carbon atom having an alkyl group is oxidised to aldehyde which is further oxidised to carboxylic acid.



128. (d)

99. (b) Given $N_1 = 10\text{N}$, $V_1 = 10 \text{ ml}$, $N_2 = 0.1\text{N}$, $V_2 = ?$

$$N_1V_1 = N_2V_2$$

$$\text{or } 10 \times 10 = 0.1 \times V_2$$

$$\text{or } V_2 = \frac{10 \times 10}{0.1}, V_2 = 1000 \text{ ml}$$

Volume of water to be added

183. (a) Hybridisation of carbon in CH_3^- is sp^2 and in CH_4 its hybridisation is sp^3

192. (d) According to Fajan's rule :

$$\text{Covalent character} \propto \frac{1}{\text{size of cation}}$$

$$\propto \text{size of anion}$$

Among the given species order of size of cations



order of size of anions $\text{O}^{2-} > \text{Cl}^-$.

Hence the order of covalent character is

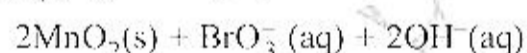
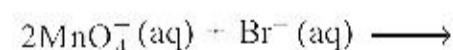


BaCl_2 is least covalent in nature.

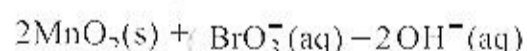
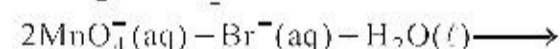
4. (a) According to the law of triads the atomic wt of the middle element is arithmetic mean of I and III.

$$\text{At wt of Br} = \frac{\text{At.wt of Cl} + \text{At wt of I}}{2}$$

57. (d) Since reaction is occurring in basic medium therefore 2OH⁻ are added on right side.



Now, hydrogen atoms can be balanced by adding one H_2O molecule to the left side



19. (c) From the given data we find Fe^{3+} is strongest oxidising agent. More the positive value of E° , more is the tendency to get oxidized. Thus correct option is (c).

35. (d) Here $n = 4$, and $[\text{H}^+] = 10^{-3}$ (as $\text{pH} = 3$)

Applying Nernst equation

$$E = E^\circ - \frac{0.059}{n} \log \frac{[\text{Fe}^{2+}]^2}{[\text{H}^+]^4 (\text{pO}_2)}$$

$$= 1.67 - \frac{0.059}{4} \log \frac{(10^{-3})^2}{(10^{-3})^4 \times 0.1}$$

0.059

101. (c) Electrolysis involves movement of ions towards oppositely charged electrodes.

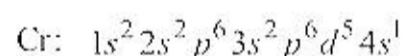
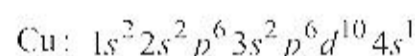
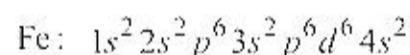
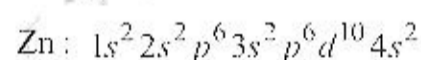
Urea being a covalent compound does not dissociate to give ions and hence it cannot be removed by electrolysis. However all the other given compounds are ionic which can undergo dissociation to give oppositely charged ions and thus can be separated.

27. (b)

19. (a) NF_5 does not exist because N does not form pentahalides due to the absence of d-orbital in its valence shell. While P, As and Sb form pentahalides of the general formula MX_5 (where, M = P, As and Sb) due to the presence of vacant d-orbitals in their respective valence shell.

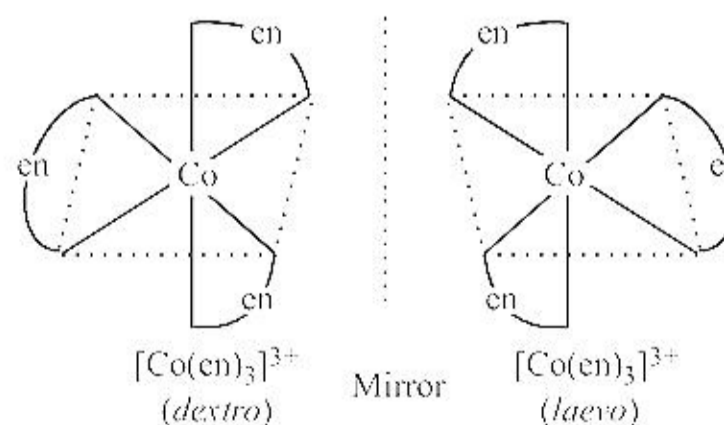
125. (a) Both have peroxy linkage

35. (a) The ionisation energies increase with increase in atomic number. However, the trend is irregular among some d-block elements. On the basis of electronic configuration, the



IE_1 follows the order : $\text{Zn} > \text{Fe} > \text{Cu} > \text{Cr}$

57. (d) The optical isomers are pair of molecules which are non superimposable mirror images of each other.



107. (b) As $\Delta T_f = K_f \cdot m$
 $\Delta T_b = K_b \cdot m$

Hence, we have $m = \frac{\Delta T_f}{K_f} = \frac{\Delta T_b}{K_b}$

or $\Delta T_f = \Delta T_b \frac{K_f}{K_b}$

$\Rightarrow [\Delta T_b = 100.18 - 100 = 0.18^\circ\text{C}]$

$= 0.18 \times \frac{1.86}{0.512} = 0.654^\circ\text{C}$

As the Freezing Point of pure water is 0°C ,

$\Delta T_f = 0 - T_f$

$0.654 = 0 - T_f$

$\therefore T_f = -0.654$

Thus the freezing point of solution will be -0.654°C .

44. (c) $n = \frac{PV}{RT} = \frac{m}{M}$

$m = \frac{MPV}{RT} = \frac{34 \times 2 \times 100}{0.082 \times 293} = 282.68\text{gm}$

85. (b) The order of stability of free radicals



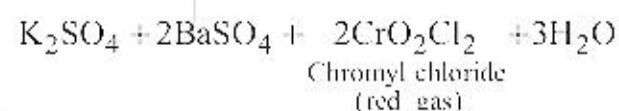
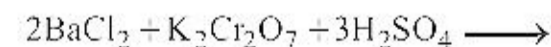
The stabilisation of first two is due to resonance and last two is due to inductive effect.

48. (b)

85. (a)

53. (b) $\text{Na zeolite} + \text{CaCl}_2 \rightarrow \text{Ca zeolite} + 2\text{NaCl}$

16. (b) The reagent is BaCl_2 which imparts green colour to flame. BaCl_2 forms chromyl chloride (which is red in colour), when treated with $\text{K}_2\text{Cr}_2\text{O}_7$ and conc. H_2SO_4 .



ASSERTION / REASON

101. (b) Both assertion and reason are true but reason is not the correct explanation of assertion. Non fusible mass present in ore in mixing with suitable flux are fused which are then reduced by coke to give free metal.

247. (a)

107. (a)

123. (c) Equal moles of different substances contain same number of constituent particles but equal weights of different substances do not contain the same number of constituent particles.

89. (b) Both Assertion and Reason are true but reason is not the correct explanation of assertion. Greater the number of negative atoms present in the oxy-acid make the acid stronger. In general, the strengths of acids that have general formula $(\text{HO})_m\text{ZO}_n$ can be related to the value of n. As the value of n increases, acidic character also increases. The negative atoms draw electrons away from the Z-atom and make it more positive. The Z-atom, therefore, becomes more effective in withdrawing electron density away from the oxygen atom that bonded to hydrogen. In turn, the electrons of H - O bond are drawn more strongly away from the H-atom. The net effect makes it easier from the proton release and increases the acid a strength.

108. (a) Lithium carbonate is unstable to heat; lithium being very small in size polarises a large CO_3^{2-} ion leading to the formation of more stable Li_2O and CO_2 .

154. (b) Both Assertion and Reason are true but Reason is not the correct explanation of statement-I. $[\text{Fe}(\text{CN})_6]^{3-}$ is weakly paramagnetic as it has unpaired electrons while $[\text{Fe}(\text{CN})_6]^{2-}$ has no unpaired electron. \therefore It is diamagnetic.

150. (b)

115. (a)

172. (a) It is fact that aniline is better nucleophile

34. (b) The ratio of the volume of CO_2 liberated to the volume of oxygen absorbed per molecule during respiration is called Respiratory Quotient (RQ). The value of RQ indicates the types of respiratory substrate.

$$\text{RQ} = \frac{\text{Volume of CO}_2 \text{ evolved}}{\text{Volume of O}_2 \text{ consumed}}$$

$$\text{RQ} = \frac{102}{145} = 0.7$$

In the following questions, a statement of Assertion is followed by a statement of Reason.

- (a) If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.
 (b) If both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion.
 (c) If Assertion is true but Reason is false.
 (d) If both Assertion and Reason are false.

74. (a)

In the following questions, a statement of Assertion is followed by a statement of Reason.

- (a) If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.
 (b) If both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion.
 (c) If Assertion is true but Reason is false.
 (d) If both Assertion and Reason are false.

71. (b) Hind brain consists of cerebellum located dorsally to medulla oblongata and pons varolii. It contains centres for maintenance of posture and equilibrium of the body and for the muscle tone. All activities of the cerebellum are involuntary but may involve learning in their early stages.

74. (d) Parthenogenesis is a form of reproduction in which an unfertilized egg develops into a new individual, occurring commonly among

Reason is the correct explanation of the Assertion.

- (b) If both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion.
 (c) If Assertion is true but Reason is false.
 (d) If both Assertion and Reason are false.

47. (a) Male gamete (n) + secondary nucleus ($2n$) = primary endosperm nucleus which develops into endosperm ($3n$)

Endosperm is the reserve food used by developing embryo.

74. (b) Step A: Attachment of myosin head to actin forming cross bridge.

Step B: Release of phosphate. Myosin changes shape to pull actin.

Step C: Attachment of new ATP to myosin head. The cross bridge detaches.

Step D: Splitting of ATP into ADP and P_i . Myosin cocks into its high energy conformation.

91. (c) Oogonia are called as gamete mother cell. Corpus luteum is formed as a temporary endocrine structure after the ovulation. It is involved in the production of relatively high levels of progesterone and moderate levels of estradiol and inhibin A to maintain pregnancy. A large number of primary follicles degenerate during the phase from birth to puberty.

53. (d) ICSI (Intracytoplasmic sperm injection) - Formation of embryo by directly injecting sperm into the ovum

IUI (intrauterine insemination) - Artificial introduction of semen into the vagina or uterus

IUT (Intra uterine transfer) - Transfer of embryo with more than 8 blastomeres into the uterus

GIFT (Gamete intra fallopian transfer) - Transfer of ovum collected from a donor into the fallopian tube where fertilization

upto 8 blastomeres) into a fallopian tube.

In the following questions, a statement of Assertion is followed by a statement of Reason.

- (a) If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.
- (b) If both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion.
- (c) If Assertion is true but Reason is false.
- (d) If both Assertion and Reason are false.

50. (c) In human, the gamete contributed by the male determines whether the child produced will be male or female. Sex in humans is a polygenic trait depending upon cumulative effect of some genes present on Y-chromosome. Only sex in human is amonogenic trait.

In the following questions, a statement of Assertion is followed by a statement of Reason.

- (a) If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.
- (b) If both Assertion and Reason are true but the Reason is not the correct explanation of the Assertion.
- (c) If Assertion is true but Reason is false.
- (d) If both Assertion and Reason are false.

52. (a) In eukaryotes, the replication and transcription takes place in the nucleus. mRNA came out from the nucleus through the nuclear pore. In cytoplasm, translation occurs. In prokaryote, there is no nuclear membrane, so replication, transcription and translation all occur in the cytoplasm.

64. (a) Nucleosome is a structural unit of a eukaryotic chromosome which consists of a length of DNA coiled around a core of histones and are thought to be present only during interphase of cell cycle. In the given figure of nucleosome structure, the parts marked as A, B and C are respectively DNA, H1 histones and histone octamer.

UCU – Serine
CCC – Proline
AUG – Methionine

89. (a) Occurrence of natural selection and small size of population do not meet for a population to reach Hardy-Weinberg Equilibrium. For Hardy-Weinberg equilibrium to be reached, natural selection should not be occurring. If populations are undergoing natural selection at the locus under consideration, allele frequencies will be changing in a specific direction and continuously, Hardy-Weinberg Equilibrium predicts that allele frequencies will stay constant. It assumes that population size is very large.

47. (a) Somatic embryos are non-zygotic embryo like structures that develop into from any type of tissue in plant tissue culture.

51. (b) An important technique of tissue culture, somatic hybridization results in the production of somatic hybrid plants. Two different plant varieties each with a desirable character can be made to undergo protoplast fusion, which further can be grown into a new plant.

42. (a) BOD is the method of determining the amount of oxygen required by microorganisms to decompose the waste present in the water supply. It is a measure of organic matter present in the water. If the quantity of organic wastes in the water supply is high then the number of decomposing bacteria present in the water will also be high. As a result, BOD value will increase.

33. (b) Selectable marker selectively permitting the growth of the transformants.

41. (d) Biodiversity refers to the variety found in biota from genetic make-up of plants and animals to cultural diversity. The main cause of the loss of biodiversity can be attributed

- over exploitation of resources, pollution, exotic species, co-extinction, alien species invasion, intensive agriculture and forestry.
43. (a) Communities with higher number of species are more stable as it can resist occasional disturbances. A stable community should show less variation in productivity from year to year and resistant towards by alien species.
8. (a) The Govt. of India through a new auto fuel policy has laid out a roadmap to cut down the vehicular pollution in Indian cities. For example, Euro II norms stipulate that sulphur be controlled at 350 ppm in diesel and 150 ppm in petrol.
43. (b) Eutrophication is a natural process which literally means well nourished or enriched. It is a natural state in many lakes and ponds which have a rich supply of nutrients. Eutrophication becomes excessive, when abnormally high amount of nutrient from sewage, fertilizers, animal waste and detergent, enter streams and lakes causing excessive growth or blooms of microorganisms. With increasing eutrophication, the diversity of the phytoplankton community of a lake increases and the lake finally becomes dominated by blue - green algae.
37. (d) When food is made available automatically the next higher level of organism in the hierarchy should increase. This is because when the forest cover got depleted it led to the increase in the number of endangered species. If the deer population is more, it automatically leads to an increase in the tiger population.
53. (b) A group of individuals resembling each other in morphological, physiological, biochemical and behavioural characters constitute a species. Such individuals can breed among themselves but cannot breed with members other than their own to produce fertile offsprings. New species are formed mainly due to reproductive isolation
- chromogenic substrate. The plasmid in the bacteria, lacking an insert produces blue coloured colonies, while those plasmids with an insert do not produce any colour due to insertional inactivation of the enzyme, β -galactosidase.
87. (b) Artificially acquired passive immunity results when antibodies or lymphocytes that have been produced outside the host are introduced into a host. This type of immunity is immediate short lived, lasting only a few weeks to a few months. An example is bone marrow transplant given to a patient with genetic immunodeficiency.
71. (c) Leydig cells, also known as interstitial cells, are found adjacent to the seminiferous tubules in the testicle. They produce testosterone in the presence of luteinizing hormone (LH).
53. (a) Painful inflammation of the synovial membrane of the joints results in stiffening of joints and painful movement. Uric acid accumulation in the joints can lead to painful movement of joint.
48. (b) Auxin delays abscission of young leaves and fruits. Its effect is through non-formation of abscission zone below a leaf or fruit. Abscission zone cuts off nutrients and water supply. However, auxin promotes the abscission of mature or older leaves and fruits.
56. (b)
56. (a) The water vascular system is a unique organ system that functions in locomotion, feeding, respiration and excretion. Ambulacral canal is connected to outside through external tube feet. Hydraulic pressure of fluid and contraction of muscle of tube feet make possible movement of Echinoderm.
49. (a) *Nostoc* is a cyanobacterium. Cyanobacteria are gram (-) ve prokaryotes which perform oxygenic photosynthesis like plants. Cyanobacteria can be unicellular (e.g.



17. (b) Thorn is a stiff, sharp-pointed woody projection on the stem or other part of a plant. Thorns are found in many plants such as *Citrus*, *Bougainvillea*. They protect plants from grazing animals.
74. (d) The skeleton of Cro-Magnon was almost identical to the modern man.
76. (c) Before transferring on the culture medium, the explant is first of all disinfected by surface sterilization using clorx water, sodium or calcium hypochlorite solution or methiolate. Too much care must be taken in this operation so that the cells do not die.
2. (b) Coccidiosis is a protozoan disease.
26. (b) Trichoderma is a free-living saprophytic fungi that most commonly lives on dead organic matter in the soil and rhizosphere (root ecosystem). It inhibits pathogens through release of gliotoxin, viridin, gliovirin and trichodermin like substances.
34. (c) In Urn Shaped pyramid the individuals below the reproductive age are fewer in number than the individuals of reproductive age.
56. (d) Net primary productivity (NPP) is the biomass or storage of energy by green plants. It is equal to the gross primary productivity minus loss due to respiration. The productivity generally increases from polar regions toward the tropics, because of the increasing sunlight and temperature.
22. (a) Yeast being a unicellular fungus does not show filamentous nature. It is a microscopic fungus consisting of a single oval cell that reproduces by budding.
24. (c) Virus is a small infectious agent that replicates only inside the living cells of other organisms. Viruses can infect all types of life forms, from animals and plants to microorganisms, including bacteria and archaea. Viruses can pass through bacterial proof filters as they are smaller than bacteria.
46. (b) Cyanobacteria are photosynthetic (containing a blue photosynthetic pigment)
21. (a) Leaves of dicotyledonous plants possess reticulate venation while parallel venation is the characteristics of most monocotyledonous. In reticulate venation, the main veins of leaf form numerous irregular branches and as a result a net like arrangements is formed. Reticulated venation is the most common vein formation in leaves. It can be found in the leaves of maple trees, oak trees and rose bushes. In parallel venation veins are arranged parallel to each other.
20. (a) The first formed primary xylem elements are called protoxylem and the later formed primary xylem is called metaxylem. In stems, the protoxylem lies towards the centre (pith) and the metaxylem lies towards the periphery of the organ. This type of primary xylem is called endarch.
25. (d) Both the sexes of cockroach have anal cerci which are jointed structures. But in the male, in addition, there is a paired unjointed needle-like anal style, which serve to distinguish between the male and the female.
32. (d) Frog has different types of sense organs like organs of touch (sensory papillae), taste (taste buds), smell (nasal epithelium), vision (eyes) and hearing (tympanum with internal ears).
22. (d) Except the first, the last and clitellar segment in each segment bear a ring of tiny curved, chitinous structure known as setae. Setae helps in locomotion and copulation.
35. (c) Statements (iv) and (v) are not correct.
- (iv) Xylem is associated with the translocation of mainly water, mineral salts, some organic nitrogen and hormones from roots to the aerial parts of the plants.
- (v) Phloem translocates a variety of organic and inorganic solutes mainly from the leaves to other parts of the plants.
76. (a) Alcoholic fermentation is a process in which

