NEET 2020
FULL TEST-7 SOLUTIONS

STANDARD ANSWER KEY										
Q	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
A	2	2	3	4	4	2	1	2	4	3	4
Q	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
A	4	1	4	2	4	2	2	3	3	4	4
Q	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**
A	1	4	2	2	3	4	3	1	1	1	2
Q	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**
A	2	2	2	4	1	2	2	2	1	2	3
Q	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**
A	1	1	3	4	4	2	1	3	4	1	1
Q	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**
A	1	3	3	1	1	4	4	2	3	3	1
Q	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74**	**75**	**76**	**77**
A	4	1	3	3	2	1	4	4	1	1	1
Q	**78**	**79**	**80**	**81**	**82**	**83**	**84**	**85**	**86**	**87**	**88**
A	2	1	1	3	1	3	2	3	1	4	3
Q	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**
A	2	2	4	1	4	3	4	3	3	4	2
Q	**100**	**101**	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**
A	3	1	4	3	2	1	2	2	2	2	3
Q	**111**	**112**	**113**	**114**	**115**	**116**	**117**	**118**	**119**	**120**	**121**
A	2	2	1	3	2	2	2	2	1	4	3
Q	**122**	**123**	**124**	**125**	**126**	**127**	**128**	**129**	**130**	**131**	**132**
A	4	2	3	2	1	1	2	1	1	3	2
Q	**133**	**134**	**135**	**136**	**137**	**138**	**139**	**140**	**141**	**142**	**143**
A	1	4	4	1	3	2	4	1	3	1	2
Q	**144**	**145**	**146**	**147**	**148**	**149**	**150**	**151**	**152**	**153**	**154**
A	1	2	4	4	4	4	3	1	4	2	2
Q	**155**	**156**	**157**	**158**	**159**	**160**	**161**	**162**	**163**	**164**	**165**
A	2	3	3	1	2	1	3	2	4	3	4
Q	**166**	**167**	**168**	**169**	**170**	**171**	**172**	**173**	**174**	**175**	**176**
A	4	2	1	2	3	2	3	3	4	1	3
Q	**177**	**178**	**179**	**180**							
A	1	2	2	1							

(1) **(2).** From Dalton's law, the partial pressures of nitrogen and water vapour must add up to the total pressure in the container. The partial pressure of water vapour in a closed container will be equal to its vapour pressure, so the partial pressure of nitrogen is 796 mm Hg – 55 mm Hg = 741 mm Hg.

(2) **(2).** In the reaction, a solid combines with a gas to produce fewer moles of solid, so the entropy change is negative and (I) is not true. The reaction is spontaneous, so the free energy change is negative and (III) is not true. For a reaction with decreasing entropy to be spontaneous, it must be exothermic. The enthalpy change is negative for an exothermic reaction and (II) is true.

(3) **(3).** $\Delta T = k_b\, mx$
Each NaCl dissociates into two particles, so x = 2.
$\Delta T = (0.5°C/m)\,(2\ m)\,(2) = 2°C$
So the boiling point of the solution is 102°C.

(4) **(4).** According to Le Chatelier's law, the equilibrium will shift to counteract any stress that is placed on it. If the temperature is decreased, the equilibrium will shift toward the side that produces energy or heat. That's the product side where I_2 is produced.
Choices (1) and (2) are wrong because there are equal numbers of moles of gas (3 moles) on each side, so changing the volume will not affect the equilibrium. Choice (3) is wrong because the addition of a substance that does not affect the reaction will not affect the equilibrium conditions.

(5) **(4).** From a comparison of experiments 1 and 2, when [B] is doubled while [A] is held constant, the rate doubles. That means that the reaction is first order with respect to B.
From a comparison of experiments 2 and 3, when both [A] and [B] are doubled, the rate increases by a factor of 4. We would expect the rate to double based on the change in B; because the rate is in fact multiplied by 4, the doubling of A must also change the rate by a factor of 2, so the reaction is also first order with respect to A. So the rate law is
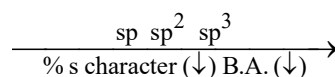Rate = k [A] [B].

**(6)** **(2).** MX_3 : T-shaped
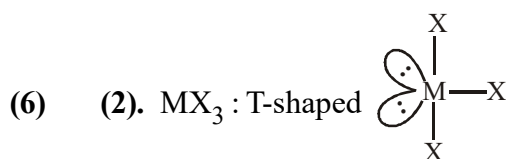
Non-bonding pairs of electrons = 2

(7) **(1).** [Bond angle ∝ % s character]

$$\left[\text{B.A.} \propto \frac{1}{\%p\ \text{character}} \right]$$

$$\xrightarrow[\%\ s\ \text{character} (\downarrow)\ \text{B.A.} (\downarrow)]{sp\ \ sp^2\ \ sp^3}$$

(8) **(2).** The molecule is correctly named as a cycloalkane since the ring contains more carbons than any of the straight chain substituents on the ring. By numbering the carbon attached to the bromine atom as carbon 1, you obtain the lowest combination of numbers by continuing to number clockwise around the ring.
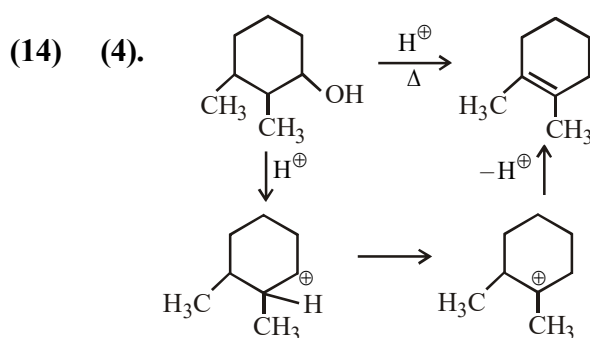
(9) **(4).** (i) H_2SO_4 :

(ii) O_3 :

(iii) SO_3 :
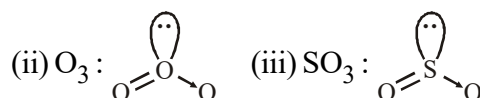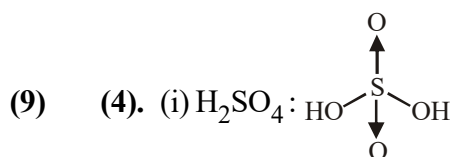
(10) **(3).** $KO_2 + CO_2 \rightarrow K_2CO_3 + O_2$

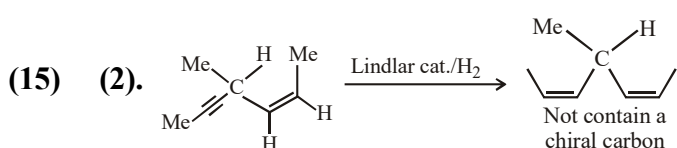**(11)** **(4).** Only amphoteric element produces hydrogen with NaOH.

(12) **(4).** Temporary hardness arises due to $Ca(HCO_3)_2$ & $Mg(HCO_3)_2$.

(13) **(1).** $H_2O_2 \rightarrow H_2O + [O]$
Bleaching action due to formation of Nascent oxygen (Oxidation).

(14) **(4).**

(15) **(2).**

Me₂C(H)–C≡C–CH(Me)(H) with structure. Lindlar cat./H₂ → Me–CH=CH–CH(Me)... Not contain a chiral carbon

(16) **(4).** The equations given above the question give the heats of formation of all the reactants and products (remember, the heat of formation of O_2, an element in its most stable form, is zero).
$\Delta H°$ for a reaction

$= (\Delta H°$ for the products$) - (\Delta H°$ for the reactants$)$.

First, the products:

From $2H_2O$, we get $2z$

From CO_2, we get y

So $\Delta H°$ for the products $= 2z + y$

Now the reactants:

From CH_4, we get x. The heat of formation of O_2 is defined to be zero, so that's it for the reactants.

$\Delta H°$ for the reaction $= (2z + y) - (x)$

$= 2z + y - x$

(17) **(2).** For the reaction

$Cl_2(g) + 2Br^-(aq) \rightarrow 2Cl^-(aq) + Br_2$
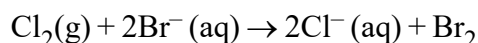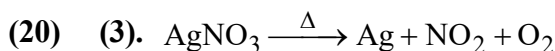
$$E_{cell} = E_{cell}^° - \frac{0.0591}{2} \log \frac{[Cl^-][Br_2]}{P_{Cl_2}[Br^-]^2}$$

$$E_{cell} = 0.29 - \frac{0.0591}{2} \log \frac{[0.01]^2[0.01]}{[0.01]^2}$$

(18) **(2).** $\overset{+2}{Xe}F_2 \xrightarrow{H_2O} \overset{0}{Xe} + HF + \frac{1}{2}O_2$

$\overset{+4}{Xe}F_4 \xrightarrow{H_2O} \overset{0}{Xe} + XeO_3 + HF + O_2$
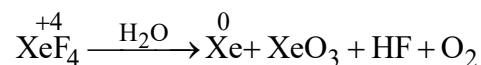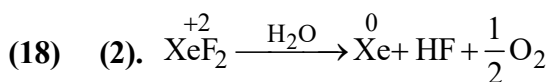
(19) **(3).** O_3 is stronger oxidant (less stable than O_2)

$O_3 \rightarrow O_2 + O$

(20) **(3).** $AgNO_3 \xrightarrow{\Delta} Ag + NO_2 + O_2$

(21) **(4).** XeF_6 has distorted octahedral structure in which all the six position are occupied by fluorine atoms and one lone pair is present at the centre of one of the triangular faces. It involves sp^3d^3 hybridisation of xenon.
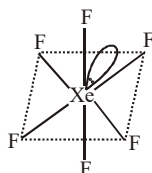
(22) **(4).** When a non-volatile solute is added to a volatile solvent, the solute covers up some of the surface of solvent. Thus, less surface area is available for vaporisation of solvent and hence, vapour pressure decreases. As the amount of non-volatile solute increases, vapour pressure decreases accordingly.

The order of concentration of X is

$0.01 < 0.10 < 0.25$

∴ The order of vapour pressure is $p_3 > p_1 > p_2$

(23) **(1).** Remember, $\Delta G = \Delta H - T\Delta S$. If the reaction is spontaneous at standard temperature but becomes nonspontaneous at higher temperatures, then ΔG is negative only at lower temperatures.

This can only happen when ΔH is negative (which favors spontaneity) and ΔS is negative (which favors nonspontaneity). As the value of T increases, the influence of ΔS increases, eventually making the reaction nonspontaneous.

(24) **(4).** These reaction conditions will essentially add water over the double bond yielding an alcohol as the final product. Since the reaction proceeds with Markovnikov addition, the alcohol attaches to the more substituted carbon of the double bond as this is the location of the most stable carbocation intermediate.

(25) **(2).** Meta indicates a 1,3 relationship between substituents. The hydroxyl group is three carbons from the amine group on the ring.

(26) **(2).** Reaction of an alkoxide ion with an alkyl halide is known as the Williamson ether synthesis. It is the most common method for constructing ethers.

(27) **(3).** The combined inductive electron withdrawing effects of the chlorine and fluorine, two very electronegative atoms, make this acid more acidic than the others.

(28) **(4).** The organocopper reagent adds one alkyl group to the acid halide's carbonyl carbon while displacing the halogen. A ketone is the final product.

(29) **(3).** The nucleophile of the reaction, the enolate, will attack methyl and primary alkyl halides but not secondary or tertiary alkyl halides due to steric hindrance.

(30) (1). The acid and the heat hydrolyze the ester to the carboxylic acid and then cause the acid to decarboxylate. The final product is this ketone.
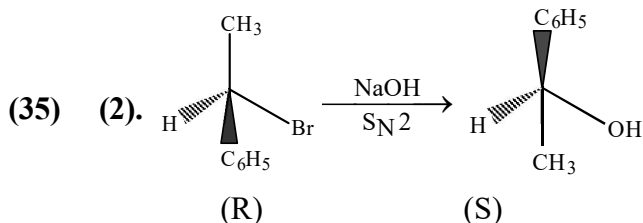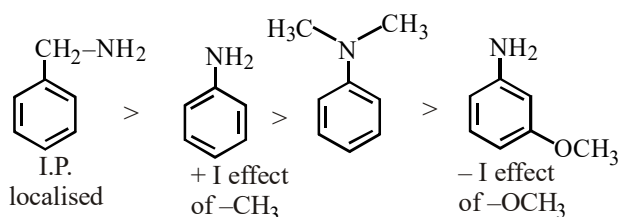
(31) (1). The ylide formed in this Wittig is unstabilized so we would expect the major product to be the Z alkene.

(32) (1). Potassium permanganate oxidizes an alkyne to a diketone.
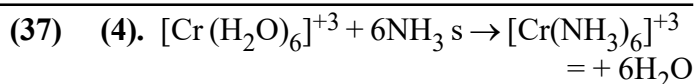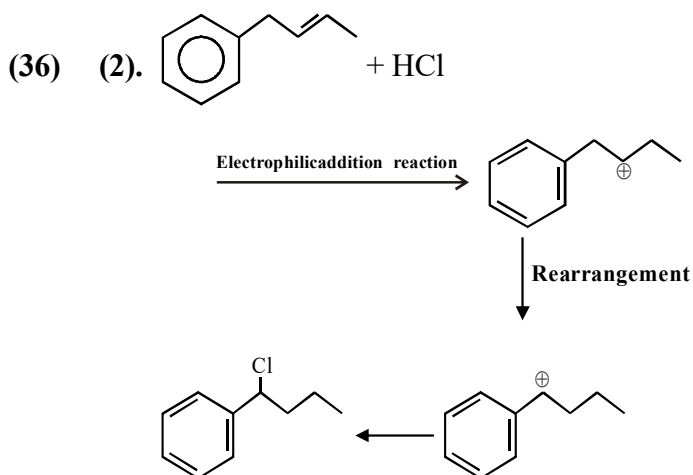
(33) (2).
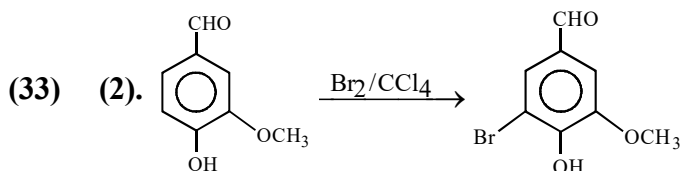
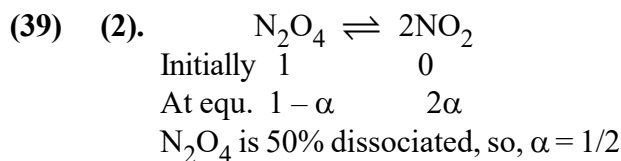– OH group is more activating so attack of Br^+ (electrophile) occurs at ortho position of –OH group during ESR

(34) (2).

(35) (2).
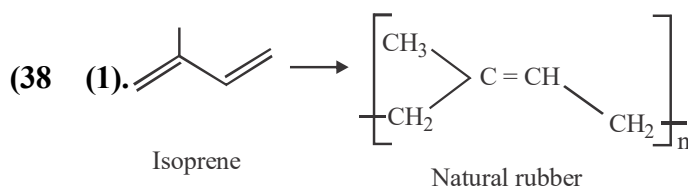

(R)   (S)

Inversion of configuration.

(36) (2).

(37) (4). $[Cr(H_2O)_6]^{+3} + 6NH_3 \ s \rightarrow [Cr(NH_3)_6]^{+3}$
$$= +6H_2O$$

Cr^{+3} show six C.N. with NH_3

(38) (1).

(39) (2).
$$N_2O_4 \rightleftharpoons 2NO_2$$
Initially 1   0
At equ. $1-\alpha$ 2α
N_2O_4 is 50% dissociated, so, $\alpha = 1/2$
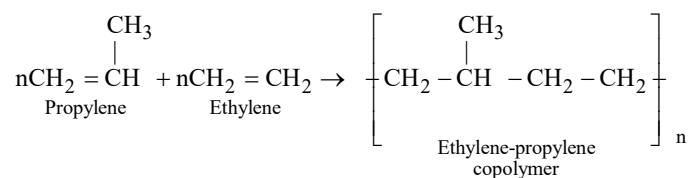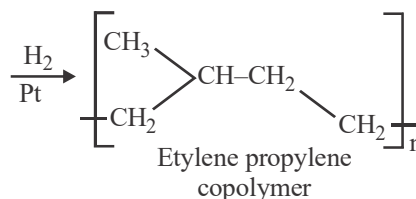
$$K_p = \frac{p_{NO_2}^2}{p_{N_2O_4}} = \frac{\left(2 \times \frac{1}{2}\right)^2}{\left(1 - \frac{1}{2}\right)} = 2 \ atm$$
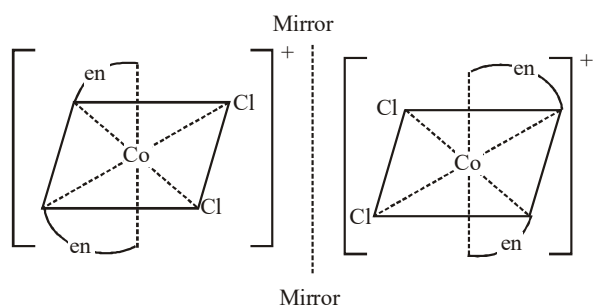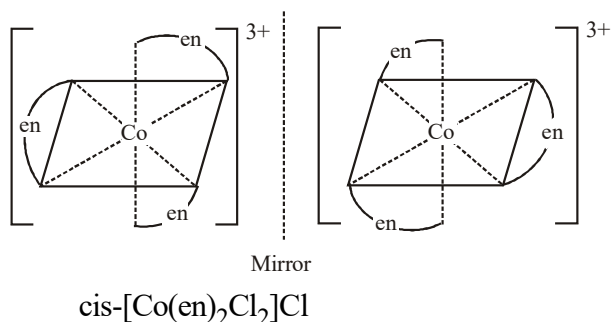
(40) (2). Among the given drugs, ibuprofen is a non-narcotic (ie, not habit forming) analgesic.
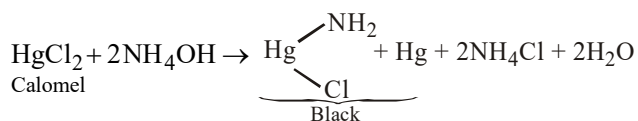**Note :** Diazepam is hypnotic and sedative. Formalin and terpineol have antiseptic properties.

(41) (2).
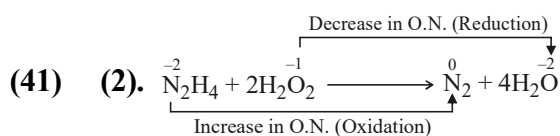
(42) (1). Due to high electronegativity and small size, fluorine forms only one oxoacid, HOF known as fluoric (I) acid or hypofluorous acid.

(43) **(2).** $[Co(en)_3]Cl_3$

Mirror

cis-$[Co(en)_2Cl_2]Cl$

Mirror

(44) **(3).**

$$HgCl_2 + 2NH_4OH \rightarrow \underset{\substack{\text{Black}}}{Hg\!\!\begin{array}{c} NH_2 \\ \\ Cl \end{array}} + Hg + 2NH_4Cl + 2H_2O$$

Calomel

(45) **(1).**

(46) **(1).** Ferromagnetic substances, magnetised strongly in the direction of magnetic field, paramagnetic substances magnetised weakly in the direction of magnetic field. While diamagnetic substance is magnetised weakly in opposite direction of magnetic field.

(47) **(3).** Energy(E) $\propto$ (Amplitude)^2 (Frequency)^2
Amplitude is same in both the cases, but frequency 2ω in the second case is two times the frequency (ω) in the first case,
Hence $E_2 = 4E_1$.

(48) **(4).** $eV = \dfrac{hc}{\lambda} - \dfrac{hc}{\lambda_0}$ .... (1)

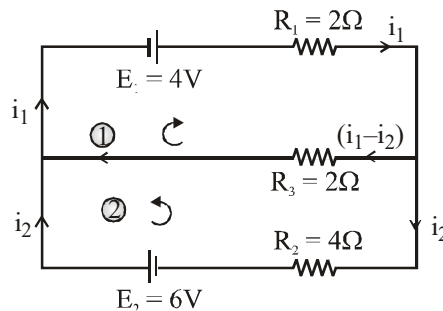$\dfrac{eV}{4} = \dfrac{hc}{2\lambda} - \dfrac{hc}{\lambda_0}$ .... (2)

From eq. (1) and (2),

$4 = \dfrac{\dfrac{1}{\lambda} - \dfrac{1}{\lambda_0}}{\dfrac{1}{2\lambda} - \dfrac{1}{\lambda_0}}$ on solving $\lambda_0 = 3\lambda$

(49) **(4).** Potential due to dipole in general position is given by

$$V = \frac{k.p\cos\theta}{r^2} = \frac{k.p\cos\theta\, r}{r^3} = \frac{k\cdot(\vec{p}\cdot\vec{r})}{r^3}$$

(50) **(2).** Applying Kirchhoff's law for the loops (1) and (2) as shown in figure

For loop (1)
$-2i_1 - 2(i_1 - i_2) + 4 = 0$
$2i_1 - i_2 = 2$ .....(i)
For loop (2)
$-2(i_1 - i_2) + 4i_2 - 6 = 0$
$-i_1 + 3i_2 = 3$ .....(ii)
On solving equation (i) and (ii), $i_1 = 1.8\,A$.

(51) **(1).**
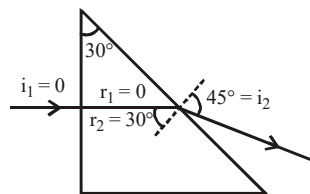
$\sqrt{2} \times \sin 30° = 1 \times \sin i_2$

$i_2 = 45°$

$\delta = i_1 + i_2 - A = 0° + 45° - 30° = 15°$

(52) **(3).** Use, $t = \sqrt{\dfrac{2h}{g}}$

(53) **(4).** $a = 1\,ms^{-2}$ $20 \longleftarrow \boxed{M} \longrightarrow T$
$F - T = m.a$
$20 - T = 6 \times [1]$; $T = 14\,N$

(54) **(1).** Temperature on any scale can be converted into other scale by $\dfrac{x - LFP}{UFP - LFP}$

$= Constant$ for all scales $\dfrac{x - 20}{150 - 20} = \dfrac{60}{100}$

$\Rightarrow x = 98°C$

(55) **(1).**

$$\frac{E_2}{E_1} = \left(\frac{T_2}{T_1}\right)^4 \Rightarrow \frac{T_2}{T_1} = \left(\frac{E_2}{E_1}\right)^{1/4} = \left(\frac{10^9}{10^5}\right)^{1/4} = 10$$

$$\Rightarrow \quad T_2 = 10T_1 = 10 \times (273 + 227) = 5000 \text{ K}$$

(56) **(1).** $F_{net} = 0$

(57) **(3).** $r = \dfrac{\sqrt{2mqV_{acc.}}}{qB}$

(58) **(3).** When KE is doubled, the stopping distance will be doubled for the same retarding force F.
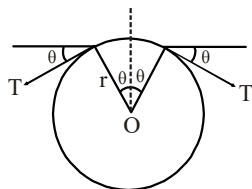
(59) **(1).**

(60) **(1).** For the small element shown $2T\theta = dm.\omega^2 r$

$2T\theta = \rho A (2r\theta) \omega^2 r$

$$\frac{T}{A} = \rho\omega^2 r^2 = \sigma$$

$$\Rightarrow \quad \omega = \frac{1}{r}\sqrt{\frac{\sigma}{\rho}} = 2 \text{ rad/s}$$
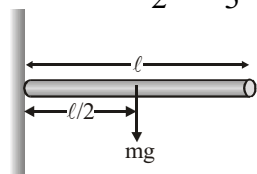
By $\omega = \omega_0 + \alpha t$

$$\Rightarrow \quad t = \frac{\omega - \omega_0}{\alpha} = \frac{2-0}{1/1800} = 3600s = 1 \text{ h}$$

(61) **(4).** Weight of the rod will produce the torque.

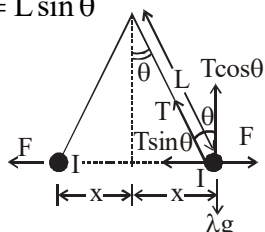$$\tau = I\alpha \Rightarrow mg \times \frac{\ell}{2} = \frac{m\ell^2}{3} \times \alpha$$

Angular acceleration, $\alpha = \dfrac{3g}{2\ell}$

(62) **(4).** $n = \dfrac{1}{2\pi}\sqrt{\dfrac{K_{eq}}{m}} = \dfrac{1}{2\pi}\sqrt{\dfrac{K_1 K_2}{(K_1 + K_2)m}}$

(63) **(2).** $F = \dfrac{\mu_0 I^2}{2\pi \cdot 2x}$; $x = L\sin\theta$

$$F = \frac{\mu_0 I^2}{4\pi L \sin\theta}$$

For equation, In equilibrium

$$T\sin\theta = \frac{\mu_0 I^2}{4\pi L\sin\theta} \qquad \text{..... (1)}$$

and $T\cos\theta = \lambda g$ $\qquad$ .....(2)

Dividing (1) & (2) we get

$$\tan\theta = \frac{\mu_0 I^2}{4\pi L\sin\theta \lambda g}$$

$$I^2 = \frac{4\pi L\sin^2\theta \lambda g}{\mu_0 \cos\theta}$$

$$I = 2\sin\theta\sqrt{\frac{\pi L\lambda g}{\mu_0 \cos\theta}}$$

(64) **(3).** $\mu = \dfrac{v^2}{rg} = \dfrac{(4.9)^2}{4 \times 9.8} = 0.61$

(65) **(3).** Distance of jeep $x = \dfrac{D \times d}{1.22 \times \lambda}$

D = Diameter of lens,

d = separation between sources.

$$\Rightarrow \quad x = \frac{(2\times 10^{-3}) \times 1.2}{1.22 \times 5896 \times 10^{-10}} \text{ m}$$

$$\Rightarrow \quad x = 3336 \text{ m or } x = 3.34 \text{ km.}$$

(66) **(1).** Since diode in upper branch is forward biased and in lower branch is reversed biased.

So current through circuit $i = \dfrac{V}{R + r_d}$

Here, r_d = diode resistance in forward biasing $= 0$

$$\Rightarrow \quad i = \frac{V}{R} = \frac{2}{10} = 0.2A.$$

(67) **(4).** $n' = \dfrac{v + v_0}{v - v_s} = 600\left(\dfrac{360}{300}\right) = 720 \text{ Hz}$

(68) **(1).**

$$\frac{4}{3}\pi (R^3 - r^3)\rho g = \frac{4}{3}\pi R^3 \rho_w g$$

$$9(R^3 - r^3) = R^3 \; ; \quad r^3 = \frac{8R^3}{9}$$

(69) (3). Resistance of the circuit,
$R = R_1 + R_2 = 40\Omega + 40\Omega = 80\Omega$
Impedance of the circuit,

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

$$= \sqrt{(80)^2 + (100 - 40)^2} = \sqrt{(80)^2 + (60)^2}$$

$$= 100\ \Omega$$

Power factor, $\cos\phi = \dfrac{R}{Z} = \dfrac{80}{100} = 0.8$

(70) (3). Interference, diffraction and polarisation is the powerful evidence in support of wave theory of light, further do according to options.

(71) (2). Here, $\dfrac{N}{N_0} = \left(\dfrac{1}{2}\right)^n = \left(\dfrac{1}{2}\right)^{1/3}$

where n = Number of half lives = 1/3

$$\dfrac{N}{N_0} = \dfrac{1}{1.26} \Rightarrow \dfrac{N_U}{N_{Pb} + N_U} = \dfrac{1}{1.26}$$

$$\Rightarrow \quad N_{Pb} = 0.26\ N_U \Rightarrow \dfrac{N_{Pb}}{N_U} = 0.26$$

(72) (1). Average angular speed $= \dfrac{78 + 0}{2} = 39$ rev/min

As the turn table stops in 30s, hence revolutions

made by it in this time $= 39 \times \dfrac{1}{2} = 19.5$

(73) (4). As $I_E = \dfrac{n_E \times e}{t}$

$$I_C = \dfrac{n_C \times e}{t} = \dfrac{(98/100)\,n_E \times e}{t} = \dfrac{98}{100} \times I_E$$

Current transfer ratio,

$$\alpha = \dfrac{I_C}{I_E} = \dfrac{98}{100} = 0.98$$

Current amplification factor,

$$\beta = \dfrac{\alpha}{1-\alpha} = \dfrac{0.98}{1-0.98} = 49$$

(74) (4). End correction $= \dfrac{L_2 - 3L_1}{2}$

$$= \dfrac{101.8 - 3 \times 33.4}{2} = \dfrac{1.6}{2} = 0.8\ \text{cm}$$

Speed of sound
$v = 2v\,(L_2 - L_1) = 2 \times 256 \times (1.018 - 0.334)$
$= 2 \times 256 \times 0.684 = 350.2\ \text{m s}^{-1}$

(75) (1). $M = 1 + \dfrac{D}{F}$; $M = 1 + \dfrac{25}{5} = 6$

(76) (1). In solar cell bond breakage becomes at depletion region.

(77) (1). $v_{max} = A\omega = A\sqrt{\dfrac{k}{m}} = \dfrac{10}{100}\sqrt{\dfrac{100}{4}} = 0.5\,\text{m/s}$

(78) (2). Given $y = a \sin(\omega t - kx)$
and $y = a \cos(\omega t - kx)$
Here, the phase difference between the two waves is $\pi/2$.
So, the resultant amplitude,

$$A = \sqrt{a_1^2 + a_2^2 + 2a_1 a_2 \cos\phi}$$

Here, $a_1 = a$, $a_2 = a$, $\phi = \pi/2$.

$$\therefore \quad A = \sqrt{a^2 + a^2 + 2a^2 \cos\dfrac{\pi}{2}}$$

or $A = \sqrt{a^2 + a^2 + 0} \Rightarrow A = \sqrt{2}\,a$

(79) (1). Charge on nucleus $= + Ze$
Total negative charge $= - Ze$
(atom is electrical neutral)
Negative charge density,

$$\rho = \dfrac{\text{charge}}{\text{volume}} = \dfrac{-Ze}{\dfrac{4}{3}\pi R^3} \quad \text{i.e.,} \quad \rho = -\dfrac{3}{4}\dfrac{Ze}{\pi R^3}$$

$$\text{...... (i)}$$

Consider a Gaussian surface with radius r.
By Gauss's theorem,

$$E(r) \times 4\pi r^2 = \dfrac{q}{\varepsilon_0} \qquad \text{...... (ii)}$$

Charge enclosed by Gaussian surface,

$$q = Ze + \dfrac{4\pi r^3}{3}\rho = Ze - Ze\dfrac{r^3}{R^3}\ \text{(Using (i))}$$

From (ii),

$$E(r) = \dfrac{q}{4\pi\varepsilon_0 r^2} = \dfrac{Ze - Ze\dfrac{r^3}{R^3}}{4\pi\varepsilon_0 r^2}$$

$$= \dfrac{Ze}{4\pi\varepsilon_0}\left[\dfrac{1}{r^2} - \dfrac{r}{R^3}\right]$$

(80) **(1).** The two condensers with K and with air are in parallel. With air, $C_1 = \dfrac{\varepsilon_0}{d}\left(\dfrac{3A}{4}\right) = \dfrac{3\varepsilon_0 A}{4d}$

With medium, $C_2 = \dfrac{\varepsilon_0 K}{d}\left(\dfrac{A}{4}\right) = \dfrac{\varepsilon_0 AK}{4d}$

$C' = C_1 + C_2$

or $\quad C' = \dfrac{3\varepsilon_0 A}{4d} + \dfrac{\varepsilon_0 AK}{4d} = \dfrac{\varepsilon_0 A}{d}\left[\dfrac{3}{4} + \dfrac{K}{4}\right]$

or $\quad C' = \dfrac{C}{4}(K+3) \qquad \left[\because C = \dfrac{A\varepsilon_0}{d}\right]$

(81) **(3).** The acceleration due to gravity is the same for both balls, despite the fact that they have different velocities.

(82) **(1).** The net external force acting on the ball/earth system is zero. The gravitational forces that the ball and earth exert on each other are internal forces, or forces that the objects within the system exert on each other. The space probe is also an isolated system, since there are no external forces acting on it.

(83) **(3).** The net external force acting on the two objects during the collision is zero, so the total momentum of the system is conserved. In two dimensions this means that the y component of the initial total momentum (0 kg.m/s) is equal to the y-component of the final total momentum. Since the y-component of the final momentum of object 1 is –5 kg.m/s, then the y-component of the final momentum of object 2 must be +5kg.m/s.

(84) **(2).** The rotational kinetic energy of a rotating body is $KE_R = \dfrac{1}{2}I\omega^2$, where I is the moment of inertia and ω is the angular speed. We also know that her angular momentum, $L = I\omega$ is conserved.

$KE_R = \dfrac{1}{2}I\omega^2 = \dfrac{1}{2}\left(\dfrac{L}{\omega}\right)\omega^2 = \dfrac{1}{2}L\omega$.

Since, L is constant, the final rotational kinetic energy increases as ω increases.

(85) **(3).** According to $F = Y\left(\dfrac{\Delta L}{L_0}\right)A$, the force F required to stretch a piece of material is proportional to Young's modulus Y, the amount of stretch ΔL, and the cross-sectional area A of the material, but is inversely proportional to the initial length L_0 of the material. Solving this equation for the amount of stretch gives

$\Delta L = \dfrac{FL_0}{YA}$. Thus, the greater the cross-sectional area, the smaller is the amount of stretch, for given values of Young's modulus, the initial length, and the stretching force. Thus, B stretches more than A, because B has the smaller cross-sectional area of solid material.

(86) **(1).** The ranking is E > A > B = D = 0 > C.
The emf is given by the negative of the time derivative of the magnetic flux. We pick out the steepest downward slope at instant E as marking the moment of largest emf. Next comes A. At B and at D the graph line is horizontal so the emf is zero. At C the emf has its greatest negative value.

(87) **(4).** (c) > (a) > (b) > (d).
The average vector velocity is zero in a sample macroscopically at rest. The asymmetric distribution of molecular speeds makes the average speed greater than the most probable speed, and the rms speed greater still. The most probable speed is $(2RT/M)^{1/2}$, the average speed is $(8RT/\pi M)^{1/2} \cong (2.55\,RT/M)^{1/2}$, and the rms speed is $(3RT/M)^{1/2}$.

(88) **(3).** Ranking C > A > D > B. We add the electric potential energies of all possible pairs. They are:

A. $3\dfrac{K_e Q^2}{d}$

B. $-2\dfrac{K_e Q^2}{d} + \dfrac{K_e Q^2}{d} = -\dfrac{K_e Q^2}{d}$

C. $4\dfrac{K_e Q^2}{d} + 2\dfrac{K_e Q^2}{\sqrt{2}d} = (4+\sqrt{2})\dfrac{K_e Q^2}{d}$

D. $2\dfrac{K_e Q^2}{d} + \dfrac{K_e Q^2}{\sqrt{2}d} - 2\dfrac{K_e Q^2}{d} - \dfrac{K_e Q^2}{\sqrt{2}d} = 0$

(89) **(2).** For the first line of Balmer series,

$\dfrac{1}{\lambda_1} = R\left(\dfrac{1}{2^2} - \dfrac{1}{3^2}\right) = \dfrac{5R}{36}$

For the second line of Balmer series.

$$\frac{1}{\lambda_2} = R\left(\frac{1}{2^2} - \frac{1}{4^2}\right) = \frac{3R}{16}$$

$$\therefore \quad \frac{\lambda_2}{\lambda_1} = \frac{5R/36}{3R/16} = \frac{20}{27}$$

or $\lambda_2 = \frac{20}{27}(6561\text{Å}) = 4860\text{Å}$

(90) **(2).** Number of fission per sec. $= \dfrac{\text{total power}}{\text{energy/fission}}$

Here, total power $= 100$ W

Energy/fission $= 200$ MeV

$= 200 \times 10^6 \times 1.6 \times 10^{-19}\text{J} = 3.2 \times 10^{-11}$ J.

$\therefore$ Fission rate $= \dfrac{100}{3.2 \times 10^{-11}} = 3.1 \times 10^{12}\,\text{s}^{-1}$

(91) **(4).**   **(92)** **(1).**

(93) **(4).**   **(94)** **(3).**

(95) **(4).** Ethylene promotes the ripening of fruit and the production of flowers. Auxins promote the elongation of certain cells and helps in the growth of the plant, mainly in the tips of shoots and roots. Gibberellins promote cell growth and fruit development—not ripening—and seed development. Cytokinins stimulate cell division. Abscissic acid delays seed germination and bud development.

(96) **(3).**

(97) **(3).**   **(98)** **(4).**

(99) **(2).**   **(100)** **(3).**

(101) **(1).**

(102) **(4).** Using Hardy-Weinberg equilibrium conditions, the frequency for the recessive allele (q) can be found by taking the square root of q^2. The square root of 0.09 is 0.3.

(103) **(3).**   **(104)** **(2).**

(105) **(1).**   **(106)** **(2).**

(107) **(2).**   **(108)** **(2).**

(109) **(2).**   **(110)** **(3).**

(111) **(2).**   **(112)** **(2).**

(113) **(1).**   **(114)** **(3).**

(115) **(2).**   **(116)** **(2).**

(117) **(2).**   **(118)** **(2).**

(119) **(1).**   **(120)** **(4).**

(121) **(3).**   **(122)** **(4).**

(123) **(2).**   **(124)** **(3).**

(125) **(2).**   **(126)** **(1).**

(127) **(1).**   **(128)** **(2).**

(129) **(1).**   **(130)** **(1).**

(131) **(3).**   **(132)** **(2).**

(133) **(1).**   **(134)** **(4).**

(135) **(4).**   **(136)** **(1).**

(137) **(3).**   **(138)** **(2).**

(139) **(4).**   **(140)** **(1).**

(141) **(3).**

(142) **(1).** (1) is correct because enzymes are proteins. Proteins are composed of amino acids linked together by peptide bonds. The other choices are not bonds that would be found in proteins. (2) is a type of bond found in polysaccharides. (3) is a chemical bond formed through electrostatic interaction between positive and negative ions. (4) may be formed between secondary or tertiary structures but is not as good an option as (1).

(143) **(2).**   **(144)** **(1).**

(145) **(2).**   **(146)** **(4).**

(147) **(4).**   **(148)** **(4).**

(149) **(4).**

(150) **(3).** The given floral diagram is of Family Fabaceae. The characteristic of family is flower - zygomorphic, bisexual, sepals - five, fused, petals - five, polypetalous, papillionaceous corolla, androecium - ten, diadelphous and gynoecium - ovary superior, monocarpellary, unilocular, marginal placentation, with many ovules.

(151) **(1).**

(152) **(4).** The yearly growth of secondary xylem is distinct in the area which experiences two seasons, one favourable (spring or rainy season) and the other unfavourable (autumn, winter and dry summer). The wood formed in a single year consists of two types of wood, spring wood and autumn wood. The spring or early wood is much wider than the autumn or late wood. It is lighter in colour and of lower density. Spring wood consists of larger and wider xylem elements. The autumn or late wood is dark coloured and of higher density. It contains compactly arranged smaller and narrower elements which have comparatively thicker walls. In autumn wood, tracheids and fibres are more abundant than those found in the spring wood.

(153) (2). In a woody stem, due to secondary growth, secondary xylem constitutes the bulk of the stem and is commonly called wood. The secondary xylem consists of vessels, tracheids, wood parenchyma and wood fibres. Width of secondary xylem increases continuously with the age of the plant. In older stems, the wood (or secondary xylem) gets differentiated into two zones - the outer light coloured younger sapwood and the inner darker older heartwood. The xylem vessels and tracheids of heartwood become non-functional because they get filled with resins, tannins, gums etc. produced by adjacent living parenchymatous cells and due to tyloses. Changes in the nature of sapwood occur with the death of parenchyma cells and with the completion of these changes, heartwood is formed. Thus, the conversion of sapwood into heartwood is a progressive phenomenon which continues throughout the life of the plant. Initially, both sapwood and heartwood increase in size but as a tree reaches a certain age, amount of heartwood increases continuously and the amount of sapwood remains almost constant.

(154) (2). Blood circulates from the right side of the heart (1), to the lungs (3), to the left side of the heart (2), to the body (4), and back to the heart (1). The left side of the heart is thicker and stronger than the right because it must pump blood to the entire body.

(155) (2). Only one of the females in generation II, individual II-8, had children. She passed the disorder on to two of these children.

(156) (3). Adding both enzymes to the DNA resulted in three segments, as seen in the Eco RI and Hind III lane. This means that the linear DNA was cut in three places.

(157) (3). The amount of DNA is amplified by engineering the DNA into a plasmid and cloning the plasmid in cell culture, as well as by performing PCR on the original DNA sample. Gel electrophoresis is a method for analyzing DNA, which often must be amplified first.

(158) (1). Guard cells, which make up the stomata of the epidermis, are classified as dermal tissue. Palisade mesophyll cells, which carry out photosynthesis, are classified as ground tissue. Sieve-tube members, which make up the phloem, are classified as vascular tissue.

(159) (2). Parathyroid hormone (PTH) is secreted in response to low blood calcium levels. This hormone acts on the kidneys to take up more calcium and causes bones to release calcium into the blood.

(160) (1). Voluntary muscle movements are carried out by the contraction and relaxation of opposing muscles. To carry out the movement shown, the triceps muscle 2 must contract while the biceps 1 relaxes.

(161) (3). a - Photosystem I (PS I)
b - Photosystem II (PS II)
c - e$^-$ acceptor
d - LHC (Light Harvesting Complex).

(162) (2). The C_4 plants are adapted to dry tropical regions and have greater productivity of biomass. They have special type of leaf anatomy known as Kranz anatomy. In this type of anatomy the bundle sheath cells form several layers around the vascular bundles; they are characterized by having a large number of chloroplasts, thick walls impervious to gaseous exchange & no intercellular spaces.

(163) (4). CO_2 acceptor molecule in C_4 plants is phosphoenol pyruvate (PEP). C_4 plants are more efficient in picking up CO_2 even when it is found in low concentration because of high affinity of PEP. PEP carboxylase (PEPcase) is the key enzyme which catalyses the primary fixation of CO_2.

(164) (3).

(165) (4). Abscisic acid (ABA) is a growth inhibitor. Both auxins and cytokinins are essential for morphogenesis or differentiation of tissues and organs. Auxins stimulate root formation however when cytokinins are in excess stem buds develop.

(166) (4).

(167) (2).

(168) (1). Parietal cells (or oxyntic cells) secrete hydrochloric acid (HCl) and Castle's intrinsic factor. Chief cells (or peptic cells) secrete gastric digestive enzymes as proenzymes - pepsinogen and prorennin. HCl helps in converting pepsinogen to pepsin. Goblet cells secrete mucus which helps to neutralise acid in stomach and protects stomach wall against HCl action.

(169) (2). RBCs contain haemoglobin. It has four polypeptide chains and four haem groups attached to it or 4 atoms of iron in ferrous form (Fe^{2+}), thus it can react with 4 molecules of oxygen to form oxyhaemoglobin.

(170) (3). Glucose and amino acids are reabsorbed in PCT by secondary active transport. Water, sodium and chloride ions are reabsorbed in DCT. It is permeable to water. Maximum reabsorption takes place within the PCT. Humans are ureotelic and excrete out 25-30gm of urea per day.

(171) (2). The spindle apparatus interacts with the kinetochore fibers in order to align the chromosomes on the equatorial plate during metaphase.

(172) (3). Oxytocin is released by posterior pituitary. Vasopressin decreases the amount of urine by increasing reabsorption of water from DCT and collecting tubules. It also stimulates the contraction of walls of blood vessels, thereby raising the blood pressure. Glucagon stimulates liver to convert stored glycogen into glucose and thus raises the blood sugar level. Thymus releases thymosin which aids in proliferation of T-lymphocytes.

(173) (3).

(174) (4). Seminal vesicles produce an alkaline secretion which forms 60% of the volume of semen. The secretion of the seminal vesicles contains fructose, prostaglandins, citrate, inositol, and clotting proteins. Prostate gland produces a milky and slightly alkaline secretion which forms 25% of the volume of semen. It possesses calcium, phosphate, bicarbonate, enzymes prefibrolysin, clotting enzymes, and prostaglandins. Bulbourethral glands or Cowper's glands also secrete an alkaline fluid which neutralises acids from urine in the urethera. Their secretion contributes the least to semen but is very important.

(175) (1). Total DNA = 3.2 Kbp = 3200 bp
Adenine = 820
According to Chargaff's rule
$\quad$ [A] = [T], [G] = [C]
So, Thymine = 820
Therefore, total A + T content
$\qquad\qquad$ = 820 + 820 = 1640
Also, A + T = 3200 – (G + C)
So, G + C content = 3200 – 1640 = 1560
So, cytosine = $\dfrac{1560}{2}$ = 780

(176) (3). The first fossil birds found in the rocks of Jurassic period belonged to genera *Archaeopteryx* and *Archaeornis*. These are considered as reptilian ancestors of birds. It was about the size of a crow and possessed feathers and wings but had a long reptilian tail very much unlike the modern birds and a toothed beak. Fossils of *Hesperornis*, an aquatic diving bird, and *Ichthyornis*, a powerful flying bird, have been found from Cretaceous.

(177) (1). AIDS is caused by HIV virus. Gonorrhoea is caused by bacteria *Neisseria gonorrhoeae*. Diphtheria is caused by bacteria *Corynebacterium diphtheria*. Ringworm disease is caused by fungus *Trichophyton, Epidermophyton* and *Microsporum.* Tuberculosis is caused by a bacterium called *Mycobacterium tuberculosis*.

(178) (2). The DNA used as a carrier for transferring a fragment of foreign DNA into a suitable host is called vehicle DNA or cloning vector or gene carrier. The Ti plasmid (tumour inducing plasmid) is present in *Agrobacterium tumefaciens*, a Gram negative soil bacterium that infects a wide range of plants and causes tumorous growth specially at the root stem junction (crown gall). The Ti plasmid comprises the gene responsible for the tumorous growth, gets incorporated into the genome of infected plant cells.

This property is of interest for genetic engineering as Ti plasmid can be used as DNA vector by replacing the tumour inducing genes with the gene of interest and a marker gene to enable selection of transformed cells. The Ti plasmid, is widely used in plant genetic engineering as a vector, novel plant genes being spliced into the plasmid sequence by gene manipulation and thus carried into the host plant cells. This provides the opportunity to develop new and better species.

(179) (2). When sewage, having biodegradable organic matter is released in water body, microorganisms involved in biodegradation of organic matter in the receiving water body consume a lot of oxygen to decompose the sewage and as a result there would be a sharp decline in dissolved oxygen downstream from the point of sewage discharge, and biological oxygen demand (BOD) would increase. Presence of large amount of nutrients in water causes excessive growth of planktonic (free-floating) algae, called algal bloom. Algal bloom causes deterioration of water quality and fish mortality.

(180) (1). Amensalism is an interaction between two living individuals or populations of different species in which one organism or population does not allow, other organism or population to grow or live near it. Inhibition is achieved through the secretion of chemicals called allochemics. E.g., the roots and hulls of black walnut (Juglans nigra) produce a chemical called juglone. It is toxic to apple, tomato and alfalfa.