NEET 2020

FULL TEST-5 SOLUTIONS

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

(1) **(1).** Enzymes are proteins in nature.

(2) **(1).**

(3) **(4).** Mass of 1 atom = 6.643×10^{-23} g
Atomic weight = mass of N_A atoms
$= 6.643 \times 10^{-23} \times 6.02 \times 10^{23}$
Atomic wt. = 40

$$n = \frac{w}{Aw} = \frac{20 \times 10^3}{40} = 500$$

(4) **(1).** $\frac{E_A}{2.303\,R} = 1.25 \times 10^4$

$E_A = 1.25 \times 10^4 \times 2.303 \times 8.314$
$= 2.393 \times 10^5$

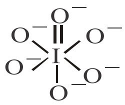
(5) **(3).** Match box = Red P + P_4S_3
Safety matches = $KClO_3$ is used.
Fullerene has no dangling bond ∴ purest

(6) **(2).** $\underset{7}{KMnO_4}$: Mn → +7 (can't be oxidised)

(7) **(2).** $\frac{T_1}{T_2} = \frac{n_1^3}{z_1^2} \times \frac{z_2^2}{n_2^3}$

(8) **(1).** $\frac{r_1}{r_2} = \sqrt{\frac{d_2}{d_1}}$

(9) **(2).** H_5IO_6 or IO_6^{-5}



$6\sigma + 0\ \ell.p. = 6sp^3d^2$

(10) **(4).** By given reaction we can make :
$AgI(s) \rightarrow Ag^+(aq) + I^-(aq)$; $E^o = -0.952V$

$$E^\circ_{cell} = \frac{2.303\,RT}{nF}\log K_{sp}$$

$$-0.952 = \frac{0.059}{1}\log K_{sp}$$

$\log K_{sp} = -16.135$

(11) **(1).** $\Delta T = \frac{1000 \times K_f \times w}{M_w \times W}$

$\Rightarrow\ 10 = \frac{1000 \times 1.86 \times 25}{62 \times W}$

(W_{glycol} remains constant on cooling; only water freezes)

∴ W = 75 g

∴ Ice separated = 100 – 75 = 25 g

(12) **(2).** $r^+ + r^- = \sqrt{3} \times \frac{a}{2}$; $a = \frac{2}{\sqrt{3}} \times 338 = 390.3$ pm

(13) **(2).**

(1) Hybridised orbitals show only head on overlapping and thus form only σ bonds. They never form π bonds.

(3) Head on overlapping is stronger than lateral or sideways overlapping. Therefore, the strength of bonds follows the order

$$\underbrace{\pi_{p-p}}_{\text{lateral overlapping}} < \underbrace{\sigma_{s-s} < \sigma_{s-p} < \sigma_{p-p}}_{\text{head on overlapping of same shell}}$$

(4) s-orbitals are spherically symmetrical and thus show only head on overlapping and form only σ bonds.

(14) **(4).**

a. $HgCl^{\oplus} + Cl^{\ominus} \rightleftharpoons HgCl_2$ ..... K_1

b. $HgCl_2 + Cl^{\ominus} \rightleftharpoons HgCl_3^{\ominus}$ ..... K_2

The eq. constant (k) for the reaction,
$2HgCl_2 \rightleftharpoons HgCl^{\oplus} + HgCl_3^{\ominus}$
Can be obtained by reversing equation (a) and adding to equation (b).

$$K = \frac{1}{K_1} \times K_2 = \frac{K_2}{K_1} = \frac{8.9}{3 \times 10^6} \approx 3 \times 10^{-6}$$

(15) **(2).** $NaCl(s) \rightarrow Na^+(g) + Cl^-(g)$; $\Delta H_1 = 780KJ$
$Na^+(g) + aq \rightarrow Na^+(aq)$; $\Delta H_2 = -406KJ$
$Cl^-(g) + aq \rightarrow Cl^-(aq)$; $\Delta H_3 = -364KJ$
$NaCl(s) + aq \rightarrow Na^+(aq) + Cl^-(aq)$
$\Delta H = \Delta H_1 + \Delta H_2 + \Delta H_3$
$= 780 - 406 - 364 = 10\ KJmol^{-1}$

(16) **(2).**

(17) **(1).** Dettol is an example of antiseptic.

(18) **(2).** $ZnS\ (s) \rightleftharpoons Zn^{+2}\ (aq) + S^{-2}\ (aq)$
Q_{sp} of ZnS = $[Zn^{+2}]\ [S^{-2}]$
$= (0.01)\ (8.1 \times 10^{-21})$
$= 8.1 \times 10^{-23}$
Q_{sp} of ZnS < K_{sp} of ZnS so it will not be precipitated
$CuS \rightleftharpoons Cu^{+2} + S^{-2}$
Q_{sp} of CuS = $[Cu^{+2}]\ [S^{-2}]$
$= (0.01)\ (8.1 \times 10^{-21})$
$= 8.1 \times 10^{-23}$
Q_{sp} of CuS > of K_{sp} of CuS so it will be precipitated.

(19) **(4).** The oxidation number of S are shown below along with the compounds

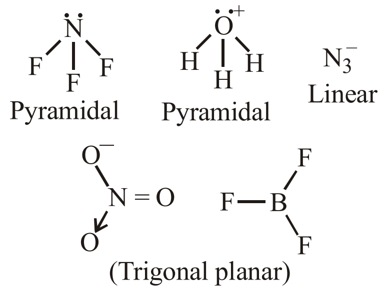
S_8 $S_2O_8^{-2}$ $S_2O_3^{-2}$ $S_4O_6^{-2}$

0 +6 +2 +2.5

Hence the order of increasing oxidation state of S_8 is $S_8 < S_2O_3^{-2} < S_4O_6^{-2} < S_2O_8^{-2}$

(20) **(3).** If n = 4, X = 5 ; Z = 25

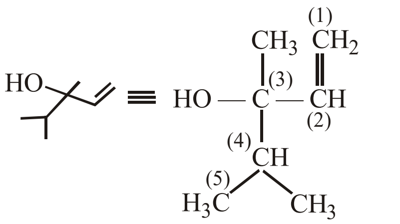
(21) **(3).**



(22) **(2).** $3Mg + 6N_2 \xrightarrow{\Delta} 2Mg_3N_2$

$Mg_3N_2 + 6HOH \rightarrow 3Mg(OH)_2 + 2NH_3$

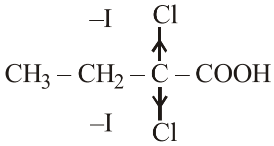
(23) **(1).**



3,4-Dimethyl-1-penten-3-ol

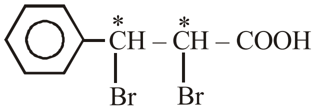
(24) **(3).** II and IV both are different orientation around carbon-carbon double bond, so they are geometrical isomeric pair.

(25) **(2).** Carboxylic acid in water releases proton, so most acidic compound will be the most highly ionized in water, i.e.,



(26) **(3).** Since –Cl gorup is deactivating and o/p directing group so o- and p- products are formed.

(27) **(2).** A is



(28) **(1).**

$$CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}=CH_2 \xrightarrow{KMnO_4} CH_3-\underset{\displaystyle CH_3}{\underset{|}{C}}=O$$

Acetone

$$+ [HCOOH] \xrightarrow{[O]} CO_2$$

(29) **(4).**

(30) **(3).** $\alpha = \dfrac{\Lambda_{eq}^{c}}{\Lambda_{eq}^{\infty}}$

$$\Lambda_{eq}^{c} = \alpha \times \Lambda_{eq}^{\infty} = 0.9 \times 425 = \frac{K \times 1000}{N}$$

$$\text{Normality} = \frac{3.825 \times 1000}{0.9 \times 425} = 10\ N$$

(31) **(1).** $\log\dfrac{x}{m} = \log k + \dfrac{1}{n}\log P$

$y = c + mx$

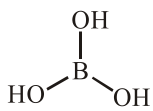
Slope (m) = $\dfrac{1}{n}$ = tan 45° = 1 ; $\dfrac{1}{n} = 1$

Intercept (log K) = 0.30

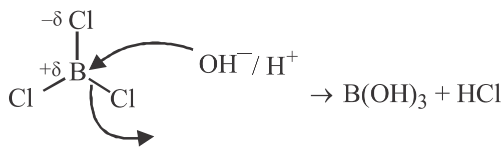
K = Antilog (0.30) = 2

So, $\dfrac{x}{m} = 2 \times (0.2)^1 = 0.4$

(32) **(1).** $BCl_3 + H_2O \rightarrow$



$+ HCl$



(33) **(1).** $Na_2SO_3 + HCl \rightarrow NaCl + SO_2$

$Na_2S + HCl \rightarrow NaCl + H_2S$

$K_2Cr_2O_7 + SO_2 \rightarrow Cr^{+3} + SO_3$

(34) **(1).** $(NH_4)_2Cr_2O_7 \xrightarrow{\Delta} N_2 + Cr_2O_3 + H_2O$

(35) **(4).** $Fe^{+2} = 3d^6$; no. of unpaired $e^- = 4$

$Mn^{+2} = 3d^5$; no. of unpaired $e^- = 5$

$Ti^{+3} = 3d^1$; no. of unpaired $e^- = 1$

$Sc^{+3} = 3d^0$; no. of unpaired $e^- = 0$

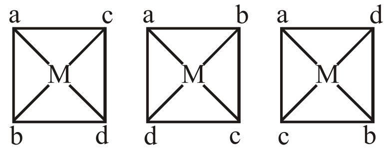
(36) **(2).** $[Pt(C_2H_4)Cl_3]^-$; C_2H_4 = Neutral ligand

x + 0 + 3 – 1 = –1

x = –1 + 3 ⇒ x = +2

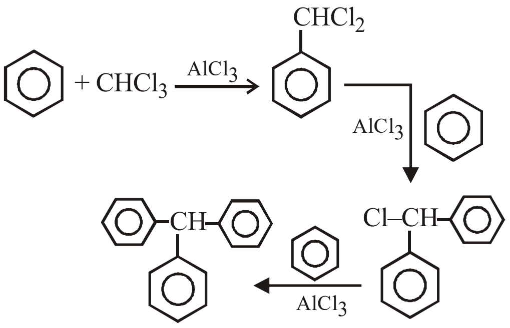
O.S. = +2 ; Co-ordination number = 4

(37) **(3).** $[Cr(NH_3)_6]^{3+}$ in which NH_3 worked as a SFL. So form inner orbital complex.

(38) **(4).** Mabcd 

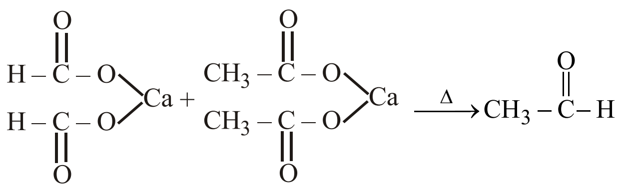
(GI = 3)

(39) **(3).** s-block oxide cannot be reduced by coke due to high reducing power.

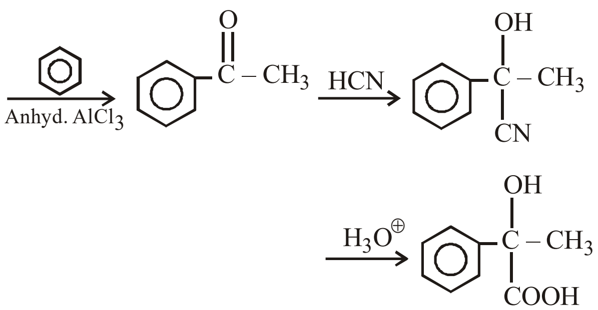
(40) **(4).** 

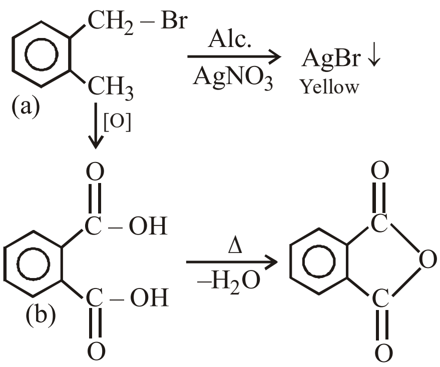
(41) **(2).** $CH_3-CH_2-O-CH_2-CH_3 \xrightarrow[\text{conc. HI}]{\text{Hot \&}} 2CH_3-CH_2-I+H_2O$

(42) **(4).**



(43) **(1).** $CH_3-COOH \xrightarrow{SOCl_2} CH_3-\overset{\overset{\displaystyle O}{||}}{C}-Cl$



(44) **(4).** 

(45) **(2).** $C_2H_5NH_2 \longrightarrow$
- $\xrightarrow{HNO_2} C_2H_5OH$
- $\xrightarrow{Ph-CHO} C_2H_5N{=}CH{-}Ph$
- $\xrightarrow{NOCl} C_2H_5Cl$
- $\xrightarrow{C_6H_5SO_2Cl} C_2H_5NHSO_2C_6H_5$

(46) **(1).** For cyclic process. Total work done

$= W_{AB} + W_{BC} + W_{CA}$

$= \Delta W_{AB} = P\Delta V = 10\,(2-1) = 10J$

and $\Delta W_{BC} = 0$ [as V = constant]

From FLOT, $\Delta Q = \Delta U + \Delta W$

$\Delta U = 0$ (process ABCA is cylic)

$\Rightarrow \Delta Q = \Delta W_{AB} + \Delta W_{BC} + \Delta W_{CA}$

$\Rightarrow 5 = 10 + 0 + \Delta W_{CA} \Rightarrow \Delta W_{CA} = -5$ J.

(47) **(3).** From the figure net resistance

$R_1 = 1$ ohm, $R_2 = 1/2$ ohm, $R_3 = 3$ ohm

It is clear that $R_3 > R_1 > R_2$

$\therefore P_3 < P_1 < P_2$ [As $P = V^2/R$]

(48) **(4).** Time period of mass oscillating on a spring is independent of g.

(49) **(1).** $V = k\sqrt{s}$; $\frac{ds}{dt} = k\sqrt{s}$

$\int_0^S \frac{1}{\sqrt{s}}ds = \int_0^t k\,dt$; $\sqrt{s} = \frac{kt}{2} \Rightarrow V = \frac{k^2t}{2}$

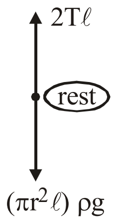
By WET,

$$W = \frac{1}{2}mv^2 = \frac{1}{2}m\left(\frac{k^4t^2}{4}\right) = \frac{1}{8}mk^4t^2$$

(50) **(4).**

$V_A - V_B = 1.5 \times 1$	$V_B - 2.5\times1 + 2 - V_D = 0$
$V_A - V_B = 1.5$	$V_B - V_D - 0.5 = 0$
$V_A - 0 = 1.5$	$0 - V_D = 0.5$
$V_A = 1.5$ V	$V_D = -0.5$ V

(51) **(3).**



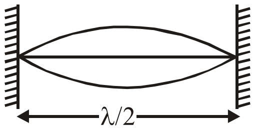
For max. diameter $\cos\theta = 1$

$2T\ell = \pi r^2 \ell \rho g$

$$r = \sqrt{\frac{2T}{\pi \rho g}} = \sqrt{\frac{2\times 0.07}{\pi \times 8 \times 10^4}} = \sqrt{\frac{7\times 10^{-6}}{12.56}} = 0.74 \text{ mm}$$

$d = 2r = 1.48$ mm

(52) **(2).**



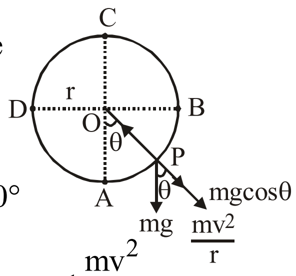
For max. wavelength, $\frac{\lambda}{2} = L \Rightarrow \lambda = 2L$

$\lambda = 80$ cm.

(53) **(3).** $B_{arc} = \frac{\mu_0 I \alpha}{4\pi R}$

(54) **(1).** Force per unit length $f = \frac{\mu_0 I_1 I_2}{2\pi d}$

(55) **(3).** Net force towards centre = centripetal force



$$T - mg\cos\theta = \frac{mv^2}{r}$$

At point C ; $\theta = 180°$

$\therefore \quad T + mg = \frac{mv^2}{r}$ or $mg < \frac{mv^2}{r}$

(56) **(4).** Initially $P \to 4N_0$; $Q \to N_0$

Half life $T_P = 1$ min ; $T_Q = 2$ min

Let after time t number of nuclei of P and Q are equal that is

$$\frac{4N_0}{2^{t/1}} = \frac{N_0}{2^{t/2}} \text{ or } \frac{4}{2^{t/2}} = 1 \text{ or } t = 4 \text{ min}$$

so at t = 4 min

$$N_p = \frac{(4N_0)}{2^{t/1}} = \frac{N_0}{4} \text{ or no. of nuclei of}$$

$$R = \left(4N_0 - \frac{N_0}{4}\right) + \left(N_0 - \frac{N_0}{4}\right) = \frac{9N_0}{2}$$

(57) **(3).** $\alpha = \frac{\tau}{I} = \frac{TR}{\frac{1}{2}MR^2} = \frac{2TR}{MR^2} = \frac{2T}{MR}$

(58) **(3).** $f = \frac{P}{2\ell}\left[\frac{F}{m}\right]^{1/2} \Rightarrow f^2 = \frac{P^2}{4\ell^2}\left[\frac{F}{m}\right]$

$$m \propto \frac{F}{\ell^2 f^2} \Rightarrow [m] = \left[\frac{MLT^{-2}}{L^2T^{-2}}\right] = ML^{-1}T^0$$

(59) **(3).** $L_1 = L_2$

$I\omega - mvR = (I + mR^2)\,\omega'$

$$\omega' = \frac{I\omega - mvR}{I + mR^2}$$

(60) **(4).** Initially,

$$\eta = \frac{T_1 - T_2}{T_1} \Rightarrow 0.5 = \frac{T_1 - (273+7)}{T_1}$$

$$\frac{1}{2} = \frac{T_1 - 280}{T_1} \Rightarrow T_1 = 560 \text{ K}$$

Finally,

$$\eta_1' = \frac{T_1' - T_2}{T_1'} \Rightarrow 0.7 = \frac{T_1' - (273+7)}{T_1'}$$

$T'_1 = 933$ K

Increase in temperature = 933 – 560 = 373K

(61) **(2).** For maxima $\Delta = d\sin\theta = n\lambda$

$\Rightarrow \quad 2\lambda \sin\theta = n\lambda \Rightarrow \sin\theta = n/2$

Since value of $\sin\theta$ can not be greater 1.

$\therefore \quad n = 0, 1, 2$

Therefore only five maximas can be obtained on both side of the screen.

(62) **(3).** As seen from the cart, the projectile moves vertically upward and comes back. The time taken by cart to cover 80m

$$\frac{s}{v} = \frac{80}{30} = \frac{8}{3}\text{s}$$

For a projectile going upward,

$a = -g = -10\text{m/s}^2$, $v = 0$ and

$$t = \frac{8/3}{2} = \frac{4}{3}\text{s}$$

$$v = u + at \Rightarrow 0 = u - 10 \times \frac{4}{3} \Rightarrow u = \frac{40}{3} \text{ m/s}$$

(63) **(3).** $v_e \propto \frac{1}{\sqrt{r}}$ where r is a position of body from the surface.

$$\frac{V_e}{V_e'} = \sqrt{\frac{r_1}{r_2}} = \sqrt{\frac{R+7R}{R}} \Rightarrow V_e' = \frac{V_e}{2\sqrt{2}}$$

(64) **(3).** If monkey move downward with acceleration a then its apparent weight decreases. In that condition.
Tension is string = m (g-a)
This should not be exceed over breaking strength of the rope i.e.
$360 \geq m(g-a) \Rightarrow 360 \geq 60(10-a)$
$\Rightarrow$ $a \geq 4 m/s^2$.

(65) **(4).** Let M_0 = Mass of body in vaccum
Apparent weight of the body in air
= Apparent weight of standard weight in air
$\therefore$ Actual weight – upthrust due to displaced air

$$\Rightarrow M_0 g - \left(\frac{M_0}{d_1}\right) dg = Mg - \left(\frac{M}{d_2}\right) dg$$

$$\Rightarrow M_0 = \frac{M\left[1-\frac{d}{d_2}\right]}{\left[1-\frac{d}{d_1}\right]}$$

(66) **(1).** $v_0 = 36 km/h = 10 m/s$; $v_s = 18 km/h = 5 m/s$

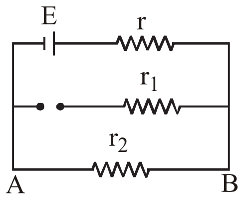
$$f' = f\left[\frac{v+v_0}{v+v_s}\right] = 1392 \times \left(\frac{343+10}{343+5}\right) Hz$$

$$= 1392 \times \frac{353}{348} Hz = 1412 \text{ Hz}$$

(67) **(1).** $_0n^1 \rightarrow {_1H^1} + {_{-1}e^0} + \bar{v} + Q$
$\Delta m = m_n - m_\alpha - m_e$
$= (1.6725 \times 10^{-27} - 1.6725 \times 10^{-27} - 9 \times 10^{-31})$ kg
$= -9 \times 10^{-31}$ kg
Energy $= 9 \times 10^{-31} \times (3 \times 10^8)^2$
$= 0.511$ MeV

(68) **(4).** At steady state current in the circuit

$$I = \frac{E}{r + r_2}$$



Potential difference across AB = Ir_2

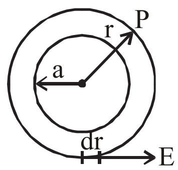
$$= \frac{Er_2}{r+r_2}$$

Charge on capacitor = Q = C $(\Delta V)_{AB}$

$$Q = \frac{CEr_2}{r+r_2}$$

(69) **(2).** Construct a concentric circle of radius r. The induced electric field (E) at any point on the circle is equal to that at P. For this circle

$$\oint \vec{E} \cdot d\vec{\ell} = \left|\frac{d\phi}{dt}\right| = A\left|\frac{dB}{dt}\right|$$

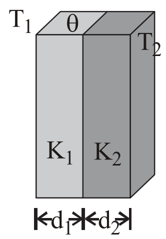


or $$E \times (2\pi r) = \pi a^2 \cdot \left|\frac{dB}{dt}\right|$$

$$\Rightarrow E = \frac{a^2}{2r}\left|\frac{dB}{dt}\right| \Rightarrow E \propto \frac{1}{r}$$

(70) **(1).** $\lambda = \frac{h}{\sqrt{2mE}} \Rightarrow \lambda \propto \frac{1}{\sqrt{E}}$

(71) **(1).** In series both walls have same rate of heat flow. Therefore



$$\frac{dQ}{dt} = \frac{K_1 A (T_1 - \theta)}{d_1} = \frac{K_2 A(\theta - T_2)}{d_2}$$

$$K_1 d_2 (T_1 - \theta) = K_2 d_1 (\theta - T_2)$$

$$\theta = \frac{K_1 d_2 T_1 + K_2 d_1 T_2}{K_1 d_2 + K_2 d_1}$$

(72) **(3).** Energy of incident radiations (in eV)

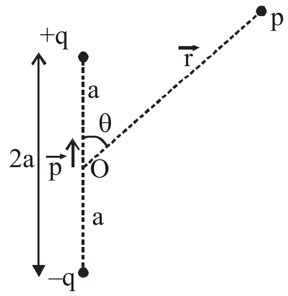
$$= \frac{12375}{4100} = 3.01 \text{ eV}$$

Work functions of metal A and B are less than 3.01 eV, so A and B will emit photo electrons.

(73) **(3).** Loss is K.E. $= \frac{m_1 m_2}{2(m_1 + m_2)}(u_1 - u_2)^2$

$$= \frac{4 \times 6}{2 \times 10} \times (12 - 0)^2 = 172.8 \text{ J}$$

(74) **(4).** An electric dipole is a pair of equal and opposite charges q and –q separated by some distance 2a. Its dipole moment vector $\vec{p}$ has magnitude 2qa and is in the direction of the dipole axis from –q to q.



The electric field due to a dipole at a point p

is $E = \frac{p}{4\pi\varepsilon_0} \frac{\sqrt{3\cos^2\theta + 1}}{r^3}$ (r >> a)

The electric dipole potential falls off at large distance, as $1/r^2$ not as $1/r$, characteristic of the potential due to a single charge.

In a uniform electric field $\vec{E}$, a dipole experiences a torque $\vec{\tau}$ given by $\vec{\tau} = \vec{p} \times \vec{E}$ but experiences no net force.

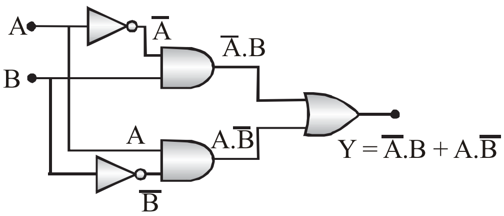
(75) **(4).** The image of object at infinity should be formed at 100 cm from the eye

$$\frac{1}{f} = \frac{-1}{100} + \frac{1}{\infty} = -\frac{-1}{100}$$

So, the power $= \frac{-100}{100} = -1$ D

[Distance is given in cm but P = 1 / f in metres]

(76) **(1).** $Y = \bar{A} \cdot B + A \cdot \bar{B}$



The truth table for the given logic circuit is

A	B	$\bar{A}$	$\bar{B}$	$\bar{A}.B$	$A.\bar{B}$	$Y = \bar{A}.B + A.\bar{B}$
0	0	1	1	0	0	0
0	1	1	0	1	0	1
1	0	0	1	0	1	1
1	1	0	0	0	0	0

(77) **(1).** In balancing condition,

$$\frac{R_1}{R_2} = \frac{\ell_1}{\ell_2} = \frac{\ell_1}{100 - \ell_1}$$

$$\frac{X}{Y} = \frac{20}{80} = \frac{1}{4} \quad \text{....... (1)}$$

and $\frac{4X}{Y} = \frac{\ell}{100 - \ell}$ .... (2)

$$\frac{4}{4} = \frac{\ell}{100 - \ell} \Rightarrow \ell = 50\text{cm}.$$

(78) **(4).** In both cylinders A and B the gases are diatomic (γ = 1.4). Piston A is free to move i.e. it is isobaric process piston B is fixed i.e it is isochoric process. If same amount of heat ΔQ is given to both then

$(\Delta Q)_{isobaric} = (\Delta Q)_{isochoric}$

$\Rightarrow \mu C_p (\Delta T)_A = \mu C_v (\Delta T)_B$

$\Rightarrow (\Delta T)_B = \frac{C_p}{C_v}(\Delta T)_A = \gamma (\Delta T)_A$

$= 1.4 \times 30 = 42$ K.

(79) **(1).** $\alpha = \frac{h_0}{f_0} = \frac{h_0}{100}$; $m_e = \frac{h_i}{h_0} = 1 + \frac{D}{f_e}$

$$\frac{10}{h_0} = 1 + \frac{24}{20} = \frac{44}{20} \text{ ; } h_0 = \frac{50}{11} \text{cm}$$

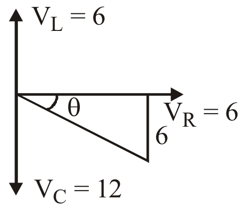
$$\alpha = \frac{h_0}{100} = \frac{50/11}{100} = \frac{1}{22} = 0.0455 \text{ rad}$$

(80) **(3).** $\frac{V}{4L_1} = 3\frac{V}{2L_2}$; $\frac{L_1}{L_2} = \frac{1}{6}$

(81) **(2).** W = MB ($\cos\theta_1 - \cos\theta_2$)
Put $\theta_1 = 0°$, $\theta_2 = 90°$

(82) **(4).** t = 2 sec.

$$I = \frac{\varepsilon}{12}(1 - e^{-t/\tau}) = 1\,(1 - e^{-1})$$

(83) **(4).** 

; V = 10V

$$\cos\theta = \frac{8}{10} = \frac{4}{5}$$

I leads V by θ

(84) **(3).** By COLM : mu + 0 = (m + nm) V_c

$$V_c = \frac{u}{1+n}$$

By COME :

$$\frac{1}{2}mu^2 + 0 = \frac{1}{2}m\,(1+n)\frac{u^2}{(1+n)^2} + mgh$$

$$\frac{1}{2}mu^2\left[1 - \frac{1}{1+n}\right] = mgh \;;\; u = \sqrt{2gh\left(1+\frac{1}{n}\right)}$$

(85) **(4).** Bulk modulus, $B = \frac{P}{\Delta V / V}$

Fractional change in volume, $\frac{\Delta V}{V} = \frac{P}{B}$

Here, P = 10 atm = $10 \times 1 \times 10^5$ N m^{-2}
B = 37×10^9 N m^{-2}

$$\therefore \frac{\Delta V}{V} = \frac{1 \times 10^6\ Nm^{-2}}{37 \times 10^9\ Nm^{-2}} = 0.027 \times 10^{-3}$$

$$= 2.7 \times 10^{-5}$$

(86) **(1).** Potential energy of system

$$U = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r}$$

$$0.5 \times 10^{-6} = \frac{9 \times 10^9 \times 5 \times 10^{-9} \times (-2) \times 10^{-9}}{(x-2) \times 10^{-2}}$$

$\Rightarrow$ x = 20 cm.

(87) **(4).** Here, V_P = 11000 V, V_S = 220 V
N_P = 6000, η = 60%;
P_O = 9 kW = 9×10^3 W

Efficiency, $\eta = \frac{\text{Output power}}{\text{Input power}} = \frac{P_O}{P_i}$

$$P_i = \frac{P_O}{\eta} = \frac{9 \times 10^3}{60/100} = 1.5 \times 10^4 = 15\text{ kW}$$

(88) **(3).** In an electromagnetic wave both electric and magnetic vectors are perpendicular to each other as well as perpendicular to the direction of propagation of wave.

(89) **(3).** In absence of magnetic field the weight added in one pan balances the rectangular coil in the other pan of balance,
∴ $Mg\ell = W_{coil}\,\ell$ or $W_{coil} = Mg = 0.5 \times 9.8$ N
When current I is passed through the coil and the magnetic field is switched on.
Let m mass be added in the first pan to regain the balance.
Then $Mg\ell + mg\ell = W_{coil}\,\ell + IBL \sin 90°\,\ell$
$mg\ell = IBL\ell$

or $m = \frac{IBL}{g} = \frac{9.8 \times 0.4 \times 1.5 \times 10^{-2}}{9.8}$

$= 0.6 \times 10^{-2}$ kg = 6×10^{-3} kg = 6 g

(90) **(3).** For six layers of windings the total number of turns = 6 × 450 = 2700
Now number of turns per unit length

$$n = \frac{N}{\ell} = \frac{2700}{90 \times 10^{-2}} = 3000$$

Then the field inside the solenoid near the centre
$B = \mu_0 nI = 4\pi \times 10^{-7} \times 3000 \times 6$
$= 72\pi \times 10^{-4}$ T = 72πG

(91) **(3).** **(92)** **(2).**
(93) **(2).** **(94)** **(3).**
(95) **(1).** **(96)** **(4).**
(97) **(3).** **(98)** **(3).**
(99) **(4).** **(100)** **(3).**
(101) **(1).** **(102)** **(4).**
(103) **(4).** **(104)** **(4).**
(105) **(4).** **(106)** **(3).**
(107) **(1).** **(108)** **(2).**
(109) **(1).** **(110)** **(3).**

(111) (2). **(112) (4).**

(113) (3).

(114) (2). Diploid cells called spermatogonia differentiate into primary spermatocytes, which undergo the first meiotic division to yield two haploid secondary spermatocytes. These undergo a second meiotic division to become immature spermatids. The spermatids then undergo a series of changes leading to the production of mature sperm, or spermatozoa. The only answer that correctly identifies the sequence of development of a mature sperm cell is seen in (2).

(115) (2). Let's take a look at each choice to determine which one contains a false association. (1) can be eliminated because pancreatic amylase is indeed secreted by the pancreas (as the name indicates). (2) is a red flag; aminopeptidase is secreted by the intestinal glands. Although this means that (2) is the correct answer, for the sake of completion, let's check the last two choices. It is true that both enterokinase and maltase are secreted by the intestinal glands, so (3) and (4) can be eliminated.

(116) (1).

(117) (3). **(118) (2).**

(119) (4). **(120) (3).**

(121) (4). **(122) (2).**

(123) (2). **(124) (4).**

(125) (2). **(126) (4).**

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

(129) (2). **(130) (3).**

(131) (1). **(132) (3).**

(133) (2). **(134) (3).**

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

(137) (3). **(138) (4).**

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

(141) (4). **(142) (2).**

(143) (1). **(144) (3).**

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

(147) (2). **(148) (3).**

(149) (2). **(150) (2).**

(151) (3). **(152) (2).**

(153) (4). Mitochondria are cellular organelles bound by double membranes. They are the sites where respiration occurs, resulting in the production of ATP. Therefore, they are the main sites of energy production for the cell. Both plant and animal cells contain mitochondria, as do most eukaryotic cells. Prokaryotic cells lack membrane-bound organelles and an organized nucleus

(154) (2). Transcription is the synthesis of RNA from a DNA template. Translation is the synthesis of a polypeptide using the genetic information encoded in an mRNA molecule. It involves the conversion of a nucleotide "language" to an amino acid "language."

(155) (4). Coevolution involves evolutionary change in which adaptations in one species act as a selective force on a second species, including adaptations that in turn act as a selective force on the first species.

(156) (3). To draw conclusions about the inheritance of two traits from the results of the breeding experiment presented in the introductory material. First, you should observe that the only traits occurring in the F_1 generation are brown coat color and long tails, whereas all four traits show up among the F_2 progeny. This suggests that brown coat color and long tails are dominant over white coat color and short tails, respectively. The parents must have been homozygous for each trait, as only the dominant traits were present among their offspring. Thus, the parent with a brown coat and short tail must have been homozygous dominant for coat color and homozygous recessive for tail length, whereas the parent with a white coat and long tail must have been homozygous recessive for coat color and homozygous dominant for tail length.

(157) (2). The ratio produced in the F_2 (9:3:3:1) could only have occurred if two different genes control the inheritance of coat color and tail length, and those genes reside on separate chromosomes (i.e., they are not linked). A simple Punnet square derived from intermating the F_1 generation would reveal the 9 genotypes represented by the four phenotypic classes found among the F_2 progeny.

(158) (4). Distinguish between plants that reproduce by spores (ferns) and those that reproduce by seeds (gymnosperms) and thus are more advanced on an evolutionary scale.

(159) (3). Apical meristems are regions of actively dividing tissue in plants that give rise to growth in length. They are typically found in shoot tips and root tips.

(160) (1). A logistic growth model depicts the pattern of idealized population growth that is restricted by limiting factors. The other common growth model listed, an exponential growth model, choice (4), depicts the pattern of idealized population growth that is unregulated.

(161) (4). In the DNA molecule, base pairing occurs between adenine and thymine, which are held together by two hydrogen bonds, and base pairing occurs between guanine and cytosine, which are held together by three hydrogen bonds. Therefore, the percentages of adenine and thymine would be similar, as would the percentages of guanine and cytosine.

(162) (3). The human arm and the wing of a bird are homologous structures—structures that differ in function but have similar anatomy, presumably because the organisms that possess them have a common ancestor.

(163) (4). All enzymes are composed of proteins that form one of two binding sites. One is for the allosteric binder and one is for the substrate, and this enzyme is known as an allosteric enzyme. Also, the more complex the enzyme, the more cofactors—nonprotein parts—it has. If the cofactor is an easily removable cofactor, it is a coenzyme. Vitamins qualify for this designation, but metallic ions do not since they bond quite securely. If the enzyme is without the coenzyme, it ceases to function. Apoenzymes do not exist. Apoenzyme merely refers to the protein portion of the enzyme.

(164) (4). The primary role of free oxygen in respiration is to accept electrons at the end of the ETC following, which it couples with H^+ to produce water at the end of aerobic respiration. Chemiosmosis involves the pumping of hydrogens across the thylakoid membranes in the production of ATP in photosynthesis. Oxygen does not play a role in contributing H^+, nor does it contribute to the synthesis of PGAL, the molecule in the Calvin-Benson cycle of photosynthesis.

(165) (2). In RNA, thymine is replaced by uracil, so the correct choice is (2), where DNA adenine is said to bond to an RNA thymine. All the other choices are incorrect, including the DNA guanine to an RNA cytosine. The testmaker may depend on the student vaguely remembering that a certain base-pairing between DNA and RNA is not possible and may choose choice (3) as being correct. This is not the case.

(166) (3). The first step in solving this problem is to define cardiac output:

Cardiac output = Heart rate × Stroke volume

We are given the stroke volume and the cardiac output, so we can calculate the heart rate, or pulse, according to the following equation:

Heart rate = Cardiac output / Stroke volume

Heart rate = (7,500 mL/min)/(50 mL)

Heart rate = 150 beats/min

The patient thus has a pulse of 150 beats/min.

(167) (2). Coelenterates, such as the jellyfish and the sea anemone, are well known for their radial symmetry and their stinging cells. Porifera have no symmetry. All the rest of the choices have bilateral symmetry—polychaetes are segmented worms that are predominantly marine; molluscs include octopuses and squid, neither of which have stinging cells; and amphibians are chordates with neither radial symmetry nor stinging cells. Some frogs secrete powerful toxins through their skin, but none of the cells in their skin has the ability to sting.

(168) (3). While presented with a veritable hodgepodge of choices here—which just may occur on the exam—the only one that makes sense is choice (3), where the blood leaves the heart through an artery—Arteries Away—to the lungs, back to the heart through a vein, and from the heart, out to the body systems.

Choice (1) looks good on the surface, except a vein is leaving the heart, not an artery. In choice (2), once the blood goes to the lungs, it goes right to the body systems, which erroneously bypasses the heart. Choice (4) also bypasses the heart as the blood returns from the body systems, like choice (2), bypasses the heart.

(169) (3). When a pollen grain lands on the stigma of a compatible flower, it germinates to form a pollen tube that grows down through the style until it reaches the ovary. Two (haploid) sperm cells travel down the pollen tube and enter the ovule through an opening called the micropyle. One sperm cell fuses with the (haploid) egg cell to form a diploid zygote that divides mitotically and grows into the embryo. The other sperm cell fuses with the central cell of the embryo sac. The central cell is formed by the fusion of two haploid nuclei and is, therefore, diploid. Fusion of a sperm cell with the central cell results in the formation of a triploid cell, referred to as the endosperm nucleus, that divides mitotically to form triploid endosperm tissue, which serves as a nutritive source for the developing embryo.

(170) (4). Once fertilization has taken place and the seed begins developing, the tissues of the ovary swell and develop into a fruit. Some fruits are fleshy upon maturity (e.g., a tomato) while others are dry at maturity (e.g., a peanut). In some fruits (e.g., apples), other tissues in addition to the ovary tissue develop into part of the fruit; these are often referred to as accessory fruits.

(171) (4). Choices (1) and (3) are incorrect because there are larger bands present than the original plasmid. While the same size plasmids can travel at different rates based on their conformation (relaxed, coiled, or supercoiled), there is no reason to believe one would not see the band shown in lanes 2 and 3 in lane 1.

(172) (4). Gel electrophoresis draws negatively charged DNA to the positive pole. The smaller molecules will migrate faster through the gel.

(173) (4). Monocots have parallel leaf venation, floral structures in multiples of 3, and fibrous taproots.

(174) (2). CAM plants open their stomates at night. C_4 plants use PEP carboxylase to capture carbon dioxide from the atmosphere.

(175) (4). FSH is secreted early in the cycle. The endometrium builds to its thickest around the third week of the cycle.

(176) (4). Gastrulation is the last event, which is an invagination of the blastula, creating three cell layers.

(177) (1). Nondisjunction results from an incomplete separation of chromosomes or chromatids during meiosis.

(178) (2). Without this ATP, rigor mortis sets in.

(179) (4). During oxidative phosphorylation, energy is harvested from the carrier coenzymes $FADH_2$ and NADH in order to form ATP. As such, one molecule of $FADH_2$ will be oxidized to produce two molecules of ATP. Similarly, one molecule of NADH will be oxidized to produce either two or three molecules of ATP (depending on where the NADH was generated) in the electron transport chain. The only answer that correctly illustrates the amount of ATP generated from one of the high-energy carrier coenzymes is (4).

(180) (4). PTH controls calcium ions levels in the body by either having them conserved in the intestine or not passed in urine or by removing calcium from the bones.