ANSWER KEY

AITS FINAL TRACK
MAJOR TEST-11
PHYSICS

SECTION-A

Q.1 (2)	**Q.2** (4)	**Q.3** (2)	**Q.4** (1)	**Q. 5** (3)	**Q.6** (3)	**Q.7** (4)	**Q.8** (4)	**Q.9** (1)	**Q. 10** (3)
Q.11 (3)	**Q.12** (1)	**Q.13** (3)	**Q.14** (2)	**Q.15** (2)	**Q.16 (2)**	**Q.17** (3)	**Q.18** (4)	**Q.19** (3)	**Q.20** (3)
Q.21 (3)	**Q.22** (3)	**Q.23** (3)	**Q.24** (2)	**Q.25** (3)	**Q.26** (3)	**Q.27 (1)**	**Q.28 (3)**	**Q.29** (1)	**Q.30** (4)
Q.31 (1)	**Q.32** (1)	**Q.33** (4)	**Q.34** (4)	**Q.35** (1)					

SECTION-B

Q.36 (2)	**Q.37** (1)	**Q.38** (1)	**Q.39** (2)	**Q.40** (2)	**Q.41** (4)	**Q.42** (3)	**Q.43** (4)	**Q.44** (4)	**Q.45** (3)
Q.46 (3)	**Q.47** (1)	**Q.48** (1)	**Q.49** (1)	**Q.50** (2)					

CHEMISTRY

SECTION-A

Q.51 (3)	**Q.52** (4)	**Q.53** (2)	**Q.54** (2)	**Q.55** (3)	**Q.56** (1)	**Q.57** (2)	**Q.58** (3)	**Q.59** (1)	**Q.60** (3)
Q.61 (3)	**Q.62** (2)	**Q.63** (4)	**Q.64** (3)	**Q.65** (2)	**Q.66** (4)	**Q.67** (1)	**Q.68** (4)	**Q.69** (3)	**Q.70** (2)
Q.71 (4)	**Q.72** (4)	**Q.73** (1)	**Q.74** (3)	**Q.75** (3)	**Q.76** (3)	**Q.77** (2)	**Q.78** (1)	**Q.79 (2)**	**Q.80** (1)
Q.81 (1)	**Q.82** (3)	**Q.83** (1)	**Q.84** (3)	**Q.85** (4)					

SECTION-B

Q.86 (4)	**Q.87** (4)	**Q. 88** (4)	**Q.89** (4)	**Q.90** (3)	**Q.91** (1)	**Q.92** (2)	**Q.93** (2)	**Q.94** (2)	**Q.95** (3)
Q.96 (1)	**Q.97** (2)	**Q.98** (3)	**Q.99** (2)	**Q.100** (2)					

BOTANY

SECTION-A

Q.101 (4)	**Q.102** (4)	**Q.103** (2)	**Q.104** (1)	**Q.105** (3)	**Q.106** (3)	**Q.107** (1)	**Q.108** (4)	**Q.109** (2)	**Q.110** (3)
Q.111 (3)	**Q.112** (4)	**Q.113 (3)**	**Q.114** (2)	**Q.115** (2)	**Q.116** (2)	**Q.117** (1)	**Q .118** (3)	**Q.119** (4)	**Q.120** (1)
Q.121 (3)	**Q.122** (1)	**Q.123** (1)	**Q.124** (2)	**Q.125** (4)	**Q.126** (3)	**Q.127** (2)	**Q.128** (1)	**Q.129 (2)**	**Q.130** (2)
Q.131 (1)	**Q.132** (2)	**Q.133** (4)	**Q.134** (2)	**Q.135** (3)					

SECTION-B

Q.136 (4)	**Q.137** (4)	**Q.138** (3)	**Q.139** (1)	**Q.140** (4)	**Q.141** (4)	**Q.142** (2)	**Q.143** (1)	**Q.144** (4)	**Q.145** (3)
Q.146 (2)	**Q.147 (2)**	**Q.148** (2)	**Q.149**-(4)	**Q.150** (2)					

ZOOLOGY

SECTION-A

Q.151 (3)	**Q.152** (4)	**Q.153** (4)	**Q.154** (3)	**Q.155** (2)	**Q.156** (4)	**Q.157** (3)	**Q.158** (1)	**Q.159** (1)	**Q.160** (4)
Q.161 (4)	**Q.162** (1)	**Q.163** (2)	**Q.164** (2)	**Q.165** (2)	**Q.166** (4)	**Q.167** (3)	**Q.168** (1)	**Q.169** (4)	**Q.170** (3)
Q.171 (2)	**Q.172** (1)	**Q.173** (1)	**Q.174** (2)	**Q.175** (3)	**Q.176** (4)	**Q.177** (3)	**Q.178** (1)	**Q.179** (4)	**Q.180** (4)
Q.181 (2)	**Q.182 (1)**	**Q.183** (1)	**Q.184** (1)	**Q.185** (4)					

SECTION-B

Q.186 (2)	**Q.187** (2)	**Q.188** (4)	**Q.189** (2)	**Q.190** (3)	**Q.191** (4)	**Q.192** (1)	**Q.193 (1)**	**Q.194** (2)	**Q.195 (3)**
Q.196 (4)	**Q.197** (4)	**Q.198** (3)	**Q.199** (1)	**Q.200** (3)					

PHYSICS
SECTION-A

Q.1 (2)

20 V.S.D. = 18 M. S. D.

$1 \text{V. S. D.} = \frac{18}{20}\text{M.S.D.} = 0.9\text{M.S.D.}$

L.C. = 1 MSD – 1VSD

= 1 MSD – 0.9 MSD

$= 0.1 \text{ MSD} \left[1\text{MSD} = \frac{1}{10}\text{cm}\right]$

$\boxed{\text{L.C.} = 0.01 \text{ cm}}$

Q.2 (4)

$P = A + B^4$

$dP = dA + 4B^3 dB = 0.01 + 4(1)^3(0.02) = 0.09$

$P = 4 + 1^4 = 5$

$P = (5 \pm 0.09)$

Q.3 (2)

$F = Av + \frac{Bt}{C+L} \quad [C] = L$

$[Av] = [F] \quad \Rightarrow A = \frac{MLT^{-2}}{LT^{-1}} = MT^{-1}$

$\frac{B}{L} = MLT^{-2} \quad \Rightarrow [B] = ML^2T^{-2}$

$[A][C] = MLT^{-1}$

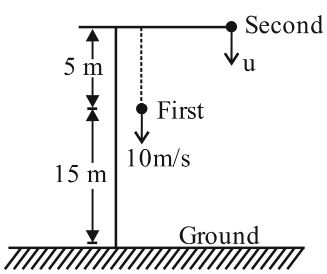
$\frac{[A][C]}{[B]} = \frac{MLT^{-1}}{ML^2T^{-2}} = \frac{1}{LT^{-1}}$ $\frac{1}{\text{चाल की विमा}}$

Q.4 (1)

$\vec{c} = \vec{a} + \vec{PR}$; $\vec{c} = \vec{b} + \vec{QR}$

As $\vec{PR} = -QR$ $\therefore \vec{a} + \vec{b} = 2\vec{c}$

Q. 5 (3)



Let time taken by first chestnut to reach ground be t then

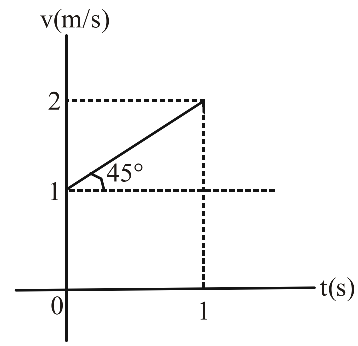
$15 = 10t + \frac{1}{2}(10)t^2$

$\Rightarrow = t^2 + 2t - 3 = 0 \Rightarrow t^2 + 3t - t - 3 = 0 \Rightarrow t = 1 \text{ s}$

In this time second chestnut must have to reach ground.

Therefore $20 = u(1) + \frac{1}{2}(10)(1)^2 \Rightarrow u = 15\text{m/s}$

Q.6 (3)



$v_{avg} = \frac{\text{distance}}{\text{time}}$

$v_{avg} = \frac{\frac{1}{2}(1+2)\times 1}{1} = \frac{3}{2} = 1.5\text{m/s}$

Q.7 (4)

$\vec{v}_A = 50\hat{j}$

$\vec{v}_B = 30\hat{j}$

$\vec{v}_{B.A} = \vec{v}_B - \vec{v}_A = 30\hat{i} - 40\hat{j}$

$\vec{v}_{B.A} = 50\text{km/hr}$

at $\tan^{-1}\left(\frac{3}{4}\right)$ east of south

Q.8 (4)

$h_{max} = \frac{u^2}{2g} = 10$

$u^2 = 200$ ....(1)

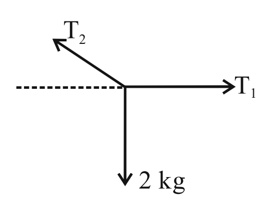
$R_{max} = \frac{u^2}{g} = 20\text{m}$

Q.9 (1)

$F_C = \frac{mv^2}{r} = \frac{mr^2\omega^2}{r} = mr\omega^2 \qquad T_{max} = 10 \text{ N}$

$T_{max} = F_{cp} \Rightarrow 10 = mr\omega^2 \Rightarrow \omega^2 = 400 \Rightarrow \omega = 20 \text{ rad/sec.}$

Q. 10 (3)



$T_2 \cos 30° = T_1$

$T_2 \sin 30° = 2\text{kg-w.t.}$

$T_2 = 4\text{kg-wt}$

$\therefore T_2 \times \frac{\sqrt{3}}{2} = T_1 \Rightarrow 4 \times \frac{\sqrt{3}}{2} = T_1$

$T_1 = 2\sqrt{3}\text{kg} - \text{wt}$

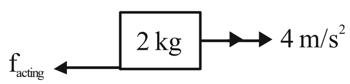
Q.11 (3)

Vertical displacement is same in both cases so both will reach simultaneously if both are released together.

Q.12 (1)

Acceleration of system $= \frac{24}{4+2} = 4 \text{ m/s}^2$

For upper block w.r.t lower block



$f_{max} = \frac{1}{2} \times 20 = 10\text{N}$

$f_{acting} = 8\text{N}$

$f = F_1 + ma = 2 + 2(3) = 8 \text{ N}$

Q.13 (3)

Power given to turbine $= \frac{mgh}{t}$

$= 20 \times 10 \times 50$

$= 10 \text{ kW}$

Frictional losses mount to 20%, efficiency of turbines is 80%

so power generated by turbine = 80% of 10 kW

$P_{out} = \frac{80}{100} \times 10 \ = 8 \text{ kW}$

Q.14 (2)

From work energy theorem

$W = \Delta K$

$\frac{1}{2} \times 4 \times 1 + 4 \times 1 \ + 2 \times 1 + 1 \times -2 + \frac{1}{2} \times 4 \times 1 = \frac{1}{2} mv^2$

$2 + 4 + 2 - 2 + 2 = \frac{1}{2} \times 1 \times v^2$

$16 = v^2$

$v = 4 \text{ m/s}$

Q.15 (2)

From conservation of energy

$\frac{1}{2} mv^2 = \frac{1}{2} mu^2 + mgh$

$\therefore v^2 + u^2 + 2gh = (10)^2 + 2 \times 10 \times 10$

$\therefore v = 10\sqrt{3} \text{ m/s}$

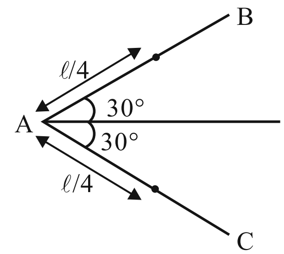
Q.16 (2)

Applying the law of conservation of momentum

$mv + 0 = (2m) v' \, ; \, v' = v/2$

$K.E = \frac{1}{2}(2m)v'2 = \frac{mv^2}{4}$

Q.17 (3)



COM of rod AB is at $\frac{\ell}{4}\left(\cos 30°\hat{i} + \sin 30°\hat{j}\right)$

COM of rod AC is at $\frac{\ell}{4}\left(\cos 30°\hat{i} - \sin 30°\hat{j}\right)$

$\vec{r}_{cm} = \frac{m_1\vec{r}_1 + m_2\vec{r}_2}{m_1 + m_2} = \frac{\ell}{4}\cos 30°\hat{i}$

$|\vec{r}_{cm}| = \frac{\sqrt{3}\ell}{8}$

Q.18 (4)

Moment of forces about point A, $M_A = 0$

$-10 \times 0.3 + R_B \times 1 = 0$

$R_B = 3\text{N}$

Summation of all vertical forces is zero

$R_A - 10 + R_B = 0$

$R_A = 10 - 3 = 7 \text{ N}$

Q.19 (3)

$I = MR^2 = 0.32 \text{ kg} \times \text{m}^2$

$\tau = I\alpha = 0.96 \text{ Nm}$

But $F = \frac{\tau}{R} = \frac{0.96}{0.2} = 4.8 \text{ N}$

Q.20 (3)

Let the area of the ellipse be A.

As per Kepler's 2nd law, areal velocity of a planet around the sun is constant, i.e., $\frac{dA}{dt}$ =constant.

$\therefore \frac{t_1}{t_2} = \frac{\text{Area of abcsa}}{\text{Area of adcsa}} = \frac{\frac{A}{2} + \frac{A}{4}}{\frac{A}{2} - \frac{A}{4}} = \frac{\frac{3A}{4}}{\frac{A}{4}} = 3 \Rightarrow t_1 = 3t_2$

Note : Here ab is the major axis of the ellipse, not semi-major axis and ca is the minor axis of the ellipse, not semi-minor axis.

Q.21 (3)

$\frac{X - (-125)}{500} = \frac{Y - (-70)}{40}$

For $Y = 50$

$X = 1375.0°X$

Q.22 (3)

Heat lost by A = Heat gain by B

$m_A s_A [T_A - T_f] = m_B s_B [T_t - T_B]$

$$\frac{m_A}{m_B} \times \frac{s_A}{s_B}[75 - T_f] = [T_f - 15]$$

$$\frac{2}{3} \times \frac{3}{4} \times [75 - T_f] = [T_f - 15]$$

$\Rightarrow 75 - T_f = 2T_f - 30 \Rightarrow T_f = 35^oC$

Q.23 (3)

$P \propto T^4$

so $\frac{10}{10^5} = \frac{(427+273)^4}{T_S^4} \Rightarrow T_S = 7000\text{ K}$

Q.24 (2)

$PV^2 = C$

and $PV = nRT$

$\therefore \frac{1}{V} = \frac{nR}{C} \times T$

or VT = constant

if $V \uparrow$ then $T \downarrow$

Q.25 (3)

The work does not characterize the thermodynamic state of matter.

Q.26 (3)

$F = \frac{YAx}{\ell}$

and $f^1 = \frac{Y(3A)x}{(\ell/3)} = 9F$

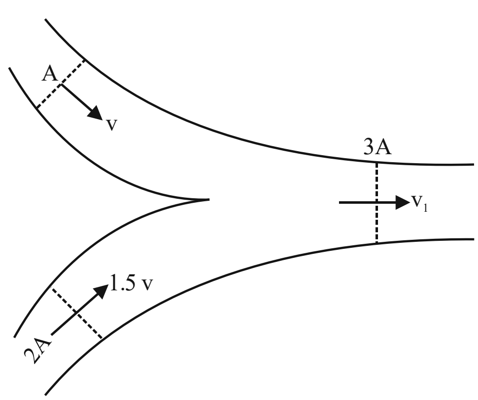
Q.27 **(1)**

$\frac{P}{\alpha\Delta\theta} = Y$

$P = Y\alpha\Delta\theta = 2 \times 10^{11} \times 1.1 \times 10^{-5} \times 100$

$= 2.2 \times 10^8$ Pa

Q.28 **(3)**



$AV + 2A(1.5\text{ v}) = 3Av_1 \Rightarrow v_1 = 4v/3$

Now $\frac{v_1}{1.5v} = \frac{4v \times 2}{3v \times 3} = \frac{8}{9}$

Q.29 (1)

$V_T \propto r^2$

radius or diameter is half. So uniform or terminal speed is $\frac{1}{4}$th

Q.30 (4)

P.E. is maximum at extreme position and minimum at mean position

Time to go from extreme position to mean position is,

$t = \frac{T}{4}$; where T is time period of SHM. Given that

$= \frac{T}{4} = 5s$

$\Rightarrow T = 20$ s

Q.31 (1)

Particle acceleration a = $a = \frac{\partial^2 y}{\partial t^2}$

$$\frac{\partial^2 y}{\partial t^2} = 0.2 \times \frac{\pi}{2} \times 10 \cos\frac{\pi}{2}(50t - x)$$

$$a = \frac{\partial^2 y}{\partial t^2} = -0.2 \times \frac{\pi}{2} \times 10 \times \frac{\pi}{2} \times 10 \sin\frac{\pi}{2}(50t - x)$$

$$a_{max} = -0.2 \times \frac{\pi}{2} \times 10 \times \frac{\pi}{2} \times 10$$

$= -5\pi^2$

Q.32 (1)

$v = \sqrt{\frac{T}{m}}$, $T = 0.1 \times 10 = 1N$, $m = \frac{0.1}{2.5}$

Velocity at upper point $v = \sqrt{1 \times 25}$

v = 5 m/s

Now velocity at 0.5 m distance from lower point -

$v = \sqrt{\frac{T}{m}}$ $T = \frac{1}{2.5} \times 0.5 = \frac{1}{5}N$, $m = \frac{1}{25}$

$v = \sqrt{\frac{1}{5} \times \frac{25}{1}} = \sqrt{5} = 2.24\text{ m/s}$

Q.33 (4)

Fundamental frequency of closed pipe

$v = \frac{v}{4L} \Rightarrow v = 800\text{ L}$

New fundamental frequency $\Rightarrow$ $v' = \dfrac{v}{4\left[\dfrac{L}{2}\right]} = \dfrac{V}{2L}$

Second overtone

$= 5v' = \dfrac{5v}{2L} = \dfrac{5}{2L} \times 800\,L = 2000\text{ Hz.}$

Q.34 **(4)**

Moment of inertia of disc = $\dfrac{MR^2}{2}$

a $\rightarrow$ (ii)

For ring = MR^2

b $\rightarrow$ (iv)

For rod = $\dfrac{ML^2}{12}$

c $\rightarrow$ (iii)

For solid sphere = $\dfrac{2}{5}MR^2$

d $\rightarrow$ (i)

Q.35 (1)

Both are true but reason is not correct explaination of assertion.

Work done in moving a body against a conservative force is independent of the path followed.

Q.36 (2)

$a = v\left(\dfrac{dv}{dx}\right) = \left(3x^2 - 2x\right)\left(6x - 2\right)$

at $x = 2$, $a = 8 \times 10$

$a = 80\text{ m/s}^2$

Q.37 (1)

The time of flight of given by

$T = \dfrac{2u\sin\theta}{g} = \dfrac{2 \times 30 \times 1}{10 \times 2} = 3\,\text{sec}$

Thus, after 1.5 sec the body is at the highest point. As the direction of motion is horizontal after 5 seconds, the angle with the horizontal is 0°.

Q.38 (1)

$v = \sqrt{\mu R g}$

$\mu = \dfrac{v^2}{Rg}$ $\qquad \left\{\begin{array}{l} v = 72 \times \dfrac{5}{8} \\ v = 20\text{m/s} \end{array}\right\}$

$\mu = \dfrac{400}{80 \times 10} = 0.5$

Q.39 **(2)**

Work done is displacing the particle

$W = \vec{F}\,.\,\vec{r}$

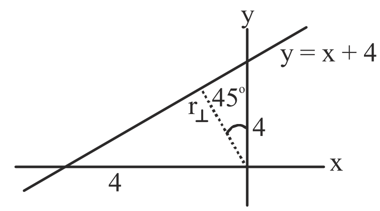
$= (5\hat{i} + 3\hat{j} + 2\hat{k}).(2\hat{i} - \hat{j})$

$= 5 \times 2 + 3 \times (-1) + 2 \times 0$

$= 10 - 3$

$= 7\text{ J}$

Q.40 (2)



$r_\perp = 4\cos 45^\circ$

magnitude of angular momentum

$L = mv\,r_\perp = 5 \times 3\sqrt{2} \times 4 \times \dfrac{1}{\sqrt{2}} = 60\text{ unit}$

Q.41 (4)

Initially, total energy $E_i = \dfrac{GMm}{2R}$

Final total energy,

$E_f = -\dfrac{GM(m/2)}{2(R/2)} - \dfrac{GM(m/2)}{2(3R/2)} = -\dfrac{2GMm}{3R}$

Required difference in energies = $E_f - E_i$

$= -\dfrac{GMm}{R}\left(\dfrac{2}{3} - \dfrac{1}{2}\right) = -\dfrac{GMm}{6R}$

Q.42 (3)

Here, $K_1 = K_2$, $l_1 = l_2 = 1\text{m}$,

$A_1 = 2A$, $\quad A_2 = A$

$T_1 = 100^\circ C$, $\qquad T_2 = 70^\circ C$

$\therefore$ Temperature at C be T, then

$\dfrac{\Delta Q}{\Delta t} = \dfrac{K2A(100 - T)}{1} = \dfrac{KA(T - 70)}{1}$

or $\;T = 90^\circ C$

Q.43 (4)

$v_{rms} = \sqrt{\dfrac{RT}{M}}$;

$\therefore \;(v_{rms})_{O_2} = (v_{rms})_{H_2}$

or $\sqrt{\dfrac{273 + 47}{32}} = \sqrt{\dfrac{T}{2}}$

$\Rightarrow \;T = 20\text{ K}$

Q.44 (4)

Let T_1 be the initial temperature of the source, then,

using, $\eta = 1 - \dfrac{T_2}{T_1}$

We have, $\frac{40}{100} = 1 - \frac{(273+27K)}{T_1}$

or $T'_1 = 500\,K$

For the efficiency to be 50%, let T'_1 be the new temperature of the sink,

then, $\frac{50}{100} = 1 - \frac{(273+27K)}{T'_1}$

or $T'_1 = 600\,K$

The required increase in the temperature of the source

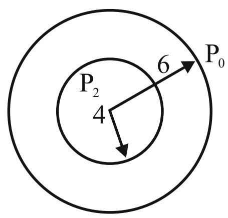
$T'_1 - T = 600\,K - 500\,K = 100\,K$

Q.45 (3)

$$B = \frac{-P}{\left(\frac{\Delta v}{v}\right)} \Rightarrow \frac{-\Delta V}{V} = \frac{P}{B} = \frac{10^5}{1.25\times10^{11}} = 8\times10^{-7}$$

Q.46 (3)

$$P_0 + \frac{4T}{r_1} + \frac{4T}{r_2} = P_2$$



$$\frac{4T}{6} + \frac{4T}{4} = P_2 - P_0$$

$$\frac{5T}{3} = P_2 - P_0$$

$$P_2 - P_0 = \frac{4T}{R} = \frac{5T}{3}$$

$$R = \frac{12}{5} = 2.4\text{cm}$$

Q.47 (1)

$$T = 2\pi\sqrt{\frac{\ell}{g}}$$

$$T' = 2\pi\sqrt{\frac{\ell}{g+g/4}}$$

$$T' = 2\pi\sqrt{\frac{4\ell}{5g}} = \frac{2T}{\sqrt{5}}$$

Q.48 (1)

On comparing with $y = A\sin(\omega t - kx + \phi)$

$\omega = 800, k = 2$

$$v = \frac{\omega}{k} = \frac{800}{2} = 400\text{ m/s}$$

Q.49 (1)

Q.50 **(2)**

A reference frame attached to the earth is can not be an inertial frame because the earth is revolving around the sun and rotating about its own axis.

CHEMISTRY
SECTION-A

Q.51 (3)

	E.F. Ratio	moles	mole Ratio	Emperical Formula and mass	W. Ratio	Mol. F.
C	9	0.75	3	C_3H_4N	$\frac{108}{54}$	$(C_3H_4N)_2$
H	1	1.0	4	(36+4+14)=54		$=C_6H_8N_2$
N	3.5	0.25	1		=2	

Q.52 (4)

Minimum mol. wt. compound with oxygen = M O

Let At. wt. of M = X

$\therefore$ mol. wt. of compound = (X+16)

Acc. to Q

$$\frac{16}{(x+16)}\times100 = 3.2$$

On solving value of X = 484

$\therefore$ mol. wt. = 484 + 16 = 500

Ans. = 500

Q.53 (2)

Let % abundance of Heavier isotopes = x %

$$\therefore \frac{(Z+2)x+(Z-1)(100-x)}{100} = Z$$

$Zx + 2x + 100Z - 100 - Zx + x = 100Z$

$2x - 100 + x = 0$

$3x = 100$

$$x = \frac{100}{3} = 33.3\%$$

Ans. 33.3%

Q.54 (2)

(1) Designate 3d orbital

(2) Designate 4f orbital

(3) Designate 4p orbital

(4) Designate 5s orbital

4f orbital has highest energy.

Q.55 (3)

In 4 dzx and 3pz orbitals probability of finding e^- is zero.

Q.56 (1)

$$\lambda = \frac{h}{p} = \frac{h}{mv}$$

$$\lambda = \frac{6.6\times10^{-34}\,kg\,m^2s^{-1}}{25\times10^{-3}\,kg\times6.6\times10^2\,ms^{-1}}$$

$$\lambda = \frac{1}{25}\times10^{-33}\,m = \frac{100\times10^{-33}}{25}\,cm = 4\times10^{-33}\,cm$$

Ans. 4×10^{-33} cm

Q.57 (2)

$$r_H = \frac{0.529n^2}{Z} = \frac{0.529(3)^2}{1} = 0.529 \times 9$$

(For 2nd excited state n = 3)

$$r_{Li^{2+}} = \frac{0.529(2)^2}{3} = \frac{0.529 \times 4}{3}$$

$$\text{Ratio} = \frac{9 \times 3}{4} = \frac{27}{4} \text{ Ans.}$$

Q.58 (3)

[S - F] Bond length < [S - Cl] Bond length

$\therefore x < y$

Q.59 (1)

(1) In XeF_4 hybridisation $\rightarrow sp^3d^2$

(2) In XeO_3F_2 hybridisation $\rightarrow sp^3d$

(3) In SO_3 hybridisation $\rightarrow sp^2$

(4) In ClO_4^- hybridisation $\rightarrow sp^3$

So Ans. – 1

Q.60 (3)

(1) In XeO_4 – No lone – pair e^-

(2) In XeF_4 – 2 lone – pair

(3) In XeF_2 – 3 lone – pair

(4) In XeO_3 – 1 lone – pair

Q.61 (3)

Both BCl_3 and $AlCl_3$ have sp2 hybridisation and are trigonal planner shape, and same bond angle

Q.62 (2)

(i) $BaCl_2(s) + aq \longrightarrow BaCl_2(aq)$ $\Delta H_1 = -20.6$ kJ/mol

(ii) $BaCl_2 . 2H_2O(s) + aq \longrightarrow BaCl_2(aq) + 2H_2O$ $\Delta H = 8.8$ kJ/mol

Substract eq (ii) from (i)

$BaCl_2 - BaCl_2 . 2H_2O \longrightarrow -2H_2O$ $\Delta H = -20.6 - 8.8 = -29.4$ kJ/mol

$BaCl_2 + 2H_2O \longrightarrow BaCl_2 . 2H_2O$ $\Delta H = -29.4$ kJ/mol

Q.63 (4)

Enthalpy of formation of NH_3

$$\frac{1}{2}N_2(g) + \frac{3}{2}H_2(g) \rightarrow NH_3(g) \quad \Delta H = -46 \text{ kJ/mol}$$

Given Eq. $2NH_3(g) \rightarrow N_2(g) + 3H_2(g)$ $\Delta H = 2 \times 46 = 92$ kJ/mol

$\Delta H = \Delta U + \Delta ng\, RT$

$\Delta U = \Delta H - \Delta ng\, RT = +92 - 2 \times 8.314 \times 300$

$\Delta U = 92 - 4.988 = 87.012$

Q.64 (3)

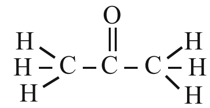
For Adsorption $\Delta H = -ve$ and $\Delta S = -ve$

And adsorption occur at low temperature

So

Q.65 (2)

In formation of Acetone



6 (C–H) Bond formed = 99 × 6 = 594 Kcal

2 (C – C) Bond formed = 83 × 2 = 166 Kcal

1 (C = O) Bond formed = 180 × 1 = 180 Kcal

Total = 940 Kcal

Q.66 (4)

	A	+ B	$\rightleftharpoons$ 2C
Initial	3	1	0
At Eq.	(3 – x)	(1 – x)	2x

2x = 1.5

x = 0.75

$$K_C = \frac{[C]^2}{[A][B]} = \frac{(1.5)^2}{(2.25)(0.25)} = \frac{2.25}{2.25 \times 0.25} = 4$$

Q.67 (1)

$2NH_3 \rightleftharpoons N_2 + 3H_2$

$K_p = K_c (RT)^{\Delta ng}$ Here $\Delta n = 4 - 2 = 2$

So K_p is greater than K_c

Q.68 (4)

Hint: pH of salt of weak base and strong acid is

$$\left\{7 - \frac{1}{2}(pK_b + \log C)\right\}$$

$$NH_4OH + HCl \rightarrow NH_2Cl + H_2O$$

$$\begin{Bmatrix} \text{Initial mol,} & 0.1V & 0.1V & \\ \text{Final mol,} & 0 & 0 & 0.1V \end{Bmatrix}$$

$$\text{Concentration of } NH_4Cl = \frac{0.1}{2} = 5 \times 10^{-2}$$

$$pH = 7 - \frac{1}{2}\left(4.75 + \log\left(5 \times 10^{-2}\right)\right)$$

$$= 7 - \frac{1}{2}(4.75 - 2 + \log 5)$$

$$= 5.2755 \simeq 5.28$$

Q.69 (3)

For conjugate base remore 1 proton

$$\underset{\text{Acid}}{H_2PO_4^-} \rightarrow \underset{\text{C.Base}}{HPO_4^{-2}} + H^+$$

Q.70 (2)

$\overset{+7}{IO_4^-} \rightarrow I_2 \quad \therefore$ v.f. of $IO_4^- = 7$

$\therefore$ Eq. wt = M/7

Q.71 (4)

$5BiO_3^- + 14H^+ + 2Mn^{2+} \rightarrow 5Bi^{3+} + 7H_2O + 2MnO_4^-$

Q.72 (4)

Q.73 (1)

$$\text{Radius} \propto \frac{1}{Z_{eff}}$$

$$L \rightarrow R \;\; Z_{eff} \uparrow \text{Radius} \downarrow$$

Q.74 (3)

(1) Size of M^{+4} will be smaller than $M^{+2} \rightarrow$ not correct

(2) I.E. of M^{+4} will be more than $M^{3+} \rightarrow$ not correct

(3) $M^{+}(g)$ ion will attract incomming e^{-} more so its electron affinity will be more $\rightarrow$ It is correct

(4) Z/e ratio $M^{+3}(g)$ will be more $\rightarrow$ not correct

Q.75 (3)

Ionic radii of cation decrease. More (+ve) charge more small is ionic radi

And as the (–ve) charge increase ionic radii increases

Q.76 (3)

In $B_2H_6 \rightarrow 3C - 2e^{-}$ bond is present

Q.77 (2)

NH_3 has lone Pair, So it has maximum lewis base character.

Q.78 (1)

$$S^{2-} + \left[Fe(CN)_5 NO\right]^{2-} \longrightarrow \underset{\text{Violet color}}{\left[Fe(CN)_5 NOS\right]^{4-}}$$

Q.79 **(2)**

$W = 0.30g \qquad V_1 = 50\,ml$

$P_1 = (P - a) = 715 - 15 = 700$ mm of Hg

$T_1 = 300\,K$

Where a = aqueous tension

$$\text{Now,} \frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

$$V_2 = \frac{P_1V_1 \times T_2}{T_1 \times P_2} = \frac{700 \times 50 \times 273}{300 \times 760}$$

$V_2 = 41.9\,ml$

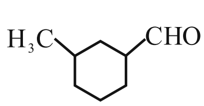
$$\%\text{ of nitrogen} == \frac{28}{22400} \times \frac{41.9}{0.3} \times 100 = 17.46\%$$

Q.80 (1)

Electrophiles are e^{-} defficient species

$\therefore \overset{+}{Br}$ and : CCl_2 both are e^{-} defficient species

Q.81 (1)



3-methyl cycloHexane carbaldehyde

Q.82 (3)

In the compound 3 (C = C) with different substituent so total G. Isomer = 6

Q.83 (1)

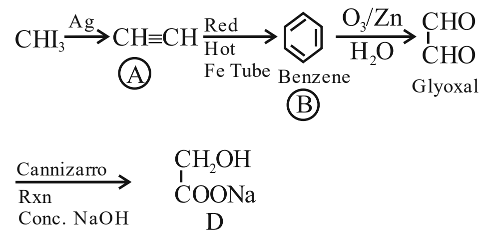
Electron difficient site is nucleophillic site So in BH_4^{-} species B has complete octes and no vacant orbital present so it is not a electrophilic site.

Q.84 (3)

Reactivity of SN^1 reaction depend on stability of carbocation.

Rate of $SN^1 \propto$ stability of C^{+}

Q.85 (4)



Q.86 (4)

Rxn.

$$3BaCl_2 + 2Na_3PO_4 \longrightarrow Ba_3(PO_4)_2 + 6NaCl$$

$$\left.\begin{array}{l}\text{given mole of } BaCl_2 = 9\\ \text{given mole of } Na_3PO_4 = 8\end{array}\right] \rightarrow \text{So L.R.} = BaCl_2$$

$$\therefore \text{ moles of } Ba_3(PO_4)_2 \text{ for mol} = \frac{9}{3} = 3 \text{ moles}$$

Q.87 (4)

$\ell = 3$ designate f-orbital

and f- orbital has maximum no. of $e^{-} = 14\,e^{-}$

Q. 88 (4)

In BF_3, B is sp^2 hybridised

In $C–Cl_3$, C is sp^2 hybridised

In $N(SiH_3)_3 – N$ is sp^2 hybridised

So Ans. is All

Q.89 (4)

In $XeO_3 - d\pi - p\pi$ bond is present

Q.90 (3)

To Find $C_8H_{18} + \frac{17}{2} O_2 \rightarrow 8CO_2 + 9H_2O \;\; \Delta H_C = ?$

Given $8C + 9H_2 \rightarrow C_8H_{18} \;\; \Delta H_f = –250$ kJ/mol (1)

$8C + 8O_2 \rightarrow 8CO_2 \;\; \Delta H_f = –394 \times 8 = –3152$ kJ/mol (2)

$9H_2 + \frac{9}{2} O_2 \rightarrow 9H_2O \;\; \Delta H_f = –286 \times 9 = –2574$ kJ/mol

(3)

Add eq. 2 and 3 we get

$8C + 9H_2 + \frac{17}{2} O_2 \rightarrow 8CO_2 + 9H_2O \;\; \Delta H = –3152 – 2574 =$

$–5726$ kJ/mol (4)

Substract (1) from (4)

$$C_8H_{18} + \frac{17}{2} O_2 \rightarrow 8CO_2 + 9H_2O \ \Delta H = -5726 - (-250)$$
$$\therefore \Delta H = -5476 \text{ kJ/mol}$$

Q.91 (1)
$\Delta G = -2.303 \ RT \log K_c$
$= -2.303 \times 2 \times 300 \ [\log 10^{-8}]$
$= -2.303 \times 600 \times (-8) = 11054.4$ cal
$= 11.054$ Kcal

Q.92 (2)
Hint: K_{sp} of $Al(OH)_3 = [Al^{3+}][OH^-]^3$

$$Al(OH)_3(s) \rightleftharpoons \underset{S}{Al^{3+}}(aq) + \underset{3S}{3OH^-}(aq)$$

$\because$ pH = 9, Hence, pOH = 5 $\Rightarrow$ $[OH^-] = 10^{-5}$M

$$3S = 10^{-5} \Rightarrow S = \frac{10^{-5}}{3} M$$

$$K_{sp}(Al(OH)_3) = S(3S)^3 = 27S^4 = 27\left(\frac{10^{-5}}{3}\right)^4$$

$$= \frac{27 \times 10^{-20}}{27 \times 3} = \left(\frac{10^{-20}}{3}\right)$$

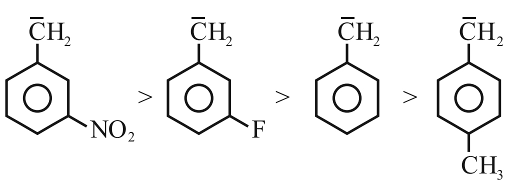
Q.93 (2)
Ionic size of $Li^+ = 60$ pm, $Cs^+ = 181$ pm
$F^- = 136$ pm, $I^- = 219$ pm
So, lowest cation to anion size ratio will be in LiI.

Q.94 (2)
Cd belong to group 12
And group 12 elements are Zn, Cd and Hg
And Atomic No. of Zn = 30, and Hg = 80

Q.95 (3)
Fullerene is the purest form of carbon

Q.96 (1)
Hint: Organic compound, which may decompose on or before its boiling point is purified by vacuum distillation. Glycerol decomposes before its boiling point.

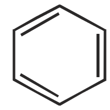
Q.97 (2)
Stability order



presence of [–I] group will increase the stability of carbanion.

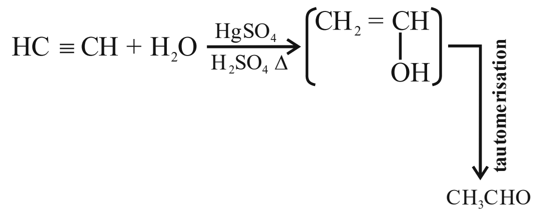
Q.98 (3)
IUPAC name – Chlorophenyl methane

Q.99 (2)



Formed only one ozonized product that is $\begin{matrix} CHO \\ | \\ CHO \end{matrix}$

Q.100 (2)
Hint: Acetylene on hydration gives acetaldehyde.



BIOLOGY-I

SECTION-A

Q.101 (4)
The statement in option (d) is correct. Rest statements are incorrect and can be corrected as
- Cellular organisation of the body is the defining feature of living forms.
- All living organisms have the ability to sense their surroundings and respond to various stimuli and are thus aware of their surroundings, i.e. show consciousness.
- A patient with dead brain has no consciousness (as brain is the main controlling organ of the body) and hence is considered to be dead.

Q.102 (4)

Q.103 (2)
Chemosynthetic autotrophic bacteria.
Chemosynthetic autotrophic bacteria oxidises various inorganic substances such as nitrate, nitrites and ammonia and use the released energy for their ATP production. They plays a great role in recycling nutrients like nitrogen, phosphorus, iron and sulphur

Q.104 (1)
Q.105 (3)
Q.106 (3)
Q.107 (1)
Q.108 (4)
Q.109 (2)
Q.110 **(3)**
Q.111 **(3)**
Region of maturation give rise to root hairs.

Q.112 (4)
(4) Assertion is false, but Reason is true. Assertion can be corrected as
In marginal placentation, one or two alternate rows of the ovules occur longitudinally along the ridge in the

wall of the ovary in the area of fusion of its two margins or ventral suture. A true placenta is believed to be absent.
Ovary is unilocular. Marginal placentation is found in monocarpellary pistils of Leguminosae (e.g. pea, Cassia, Acacia) and other plants (e.g. Larkspur).

Q.113 **(3)**
Hint: Scutellum is a large, shield shaped cotyledon.
Sol.: Scutellum is mainly seen in monocot seeds.

Q.114 (2)
Q.115 **(2)**
Q.116 **(2)**
Q.117 (1)
(a) Option (a) is the incorrect match and can be corrected as
Vessels are cells with lignifLed cell wall. Mature vessels are dead and with out nucleu_s.
These long cylindrical tube- like structures made up of many cells called vessel members and a large central cavity. The vessel cells are also devoid of protoplasm. Vessel members are interconnected through perforations in their common walls.
Rest options contain correctly matched pairs.

Q .118 (3)
Q.119 (4)
There are usually more than six (polyarch) xylem bundles in the monocot root. Pith is large and well developed.

Q.120 (1)
Q.121 (3)
NCERT Page No. 93/94

The major lipids are phospholipids that are arranged in a bilayer.
In human beings, the membrane of the erythrocyte has approximately 52 percent protein and 40 per cent lipids
According to this, the quasi-fluid nature of lipid enables lateral movement of proteins within the overall bilayer. This ability to move within the membrane is measured as its fluidity
An improved model of the structure of cell membrane was proposed by Singer and Nicolson (1972) widely accepted as fluid mosaic model

- Quasi-fluid nature of lipid enables lateral movement of proteins within the bilayer.
- Lipid component of plasma membrane mainly consists of phosphoglycerides. These are glycerol based phospholipids.

Q.122 (1)
Only flagella help in motility of bacterial cell Pili help in conjugation.

Q.123 (1)
Hint: Cells of onion peel are plant cells.
Both plant and animal cells have double membrane bound nucleus, 70S and 80S ribosomes which are not bound by any membrane. Cells of higher plants lack centrioles which are also nonmembrane bound organelles but are present in animal cells.
A plant cell has its outer boundary as cell wall which is absent in an animal cell.

Q.124 (2)
Q.125 (4)
Q.126 (3)
Q.127 (2)
Q.128 (1)
Q.129 **(2)**
Q.130 (2)
Q.131 **(1)**
Q.132 (2)
Q.133 (4)
Q.134 (2)
Weedicide $\rightarrow$ Auxin i.e., 2, 4, D
Bolting $\rightarrow$ GA
Thinning of cotton $\rightarrow$ Ethylene
Lateral shoot growth $\rightarrow$ Cytokinin (Stimulate shoot formation)

Q.135 (3)
Q.136 (4)
Q.137 (4)
Q.138 (3)
Assertion is true, but Reason is false and it can be corrected as
Production of two different types of spores is called heterospory. It is an important pre-requisite of evolutionary development in the vascular plants. It ultimately leads to seed development. In pteridophytes, *Selaginella* plant (not *Lycopodium)* is the precursor of the seed habit, as it is well-marked in them. In *Lycopodium*, homosporous spores are produced, i.e. all spores are of similar kind.

Q.139 (1)
'A' represents a pinnately compound leaf m which a number of leaflets occur around a common axis, e.g. neem.
'B' represents a palmately compound leaf in which leaf-lets are attached to a common point, e.g. silk cotton.

Q.140 (4)
The statement in option (d) is incorrect and can be corrected as
The outside of the epidermis is often covered with waxy thick layer called cuticle, which prevents the loss of water.
Rest of the statements are correct.

Q.141 (4)
Q.142 (2)
Q.143 (1)
Karyokinesis is the first step of M-phase of cell cycle. It brings about division of nucleus to form two daughter nuclei.

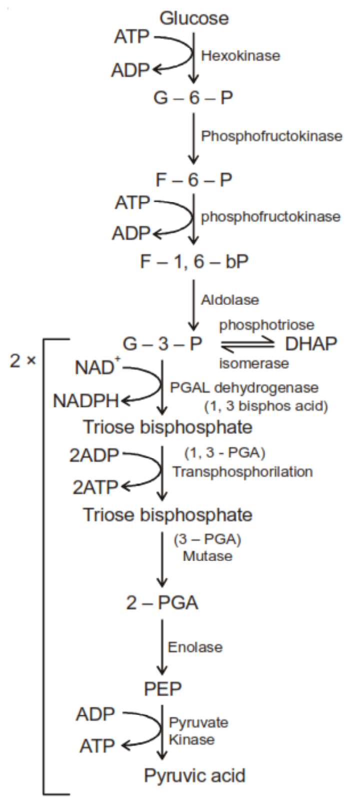
Q.144 (4)
Meiotic cell division is also termed as reduction division since it reduces the chromosome number by half while making the ganetes.

Q.145 (3)

Q.146 (2)

Q.147 **(2)**

Q.148 (2)



Q.149 (4)

Q.150 (2)
The formation of meristems, i.e. interfascicular cambium and cork cambium, from fully differentiated parenchyma cells in dicot stem and root at the time of secondary growth is an example of dedifferentiation.

Q.151 (3)

Q.152 (4)
Arthropods have open circulatory system, possess true coelom and are schizocoelomate (body cavity is formed by splitting of mesoderm). Arthropods have segmented body, fertilisation is usually internal in Arthropods.

Q.153 (4)

Q.154 (3)

Q.155 **(2)**

Q.156 (4)
The female reproductive organ include a pair of ovaries. The ovaries are situated near Kidneys and there is no functional connection with Kidneys.

Q.157 **(3)**
NCERT Pg. # 103

Q.158 (1)

Q.159 (1)
The given compound is a nucleotide referred as adenylic acid.

Q.160 (4)

Q.161 (4)

Q.162 **(1)**

Q.163 **(2)**
Hint: It lifts up the ribs and sternum.
Sol.: During inspiration:
- Diaphragm contracts, leading to an increase in the volume of thoracic chamber in antero-posterior axis.
- External intercostal muscles contract, leading to an increase in the volume of thoracic chamber in dorso-ventral axis.

Q.164 (2)

Q.165 (2)

Q.166 (4)

Q.167 **(3)**

Q.168 (1)

Q.169 **(4)**
Reptiles, birds, land snails and insects excrete nitrogenous wastes as uric acid in the form of pellet or paste with a minimum loss of water and are called uricotelic animals.

Q.170 (3)

Q.171 (2)

Q.172 (1)
Hint : Accumulation of urea in blood.
Sol. : Renal calculi – Stone or insoluble masses of crystallised salts within the kidney
Glomerulonephritis – Inflammation of glomeruli of kidney
Gout – Accumulation of uric acid in joints
Uremia – Increased accumulation of urea in blood

Q.173 (1)
Hint : Z-lines come close to each other
Sol. : Effects of muscle contraction :
(a) Length of A-band remains same
(b) Length of I-band decreases
(c) Length of sarcomere decreases
(d) Z-lines come close to each other
(e) M-line almost disappears
(f) H-zone almost disappears

Q.174 (2)

Q.175 **(3)**
Hint : Active ATPase enzyme
Sol. : Each myosin is a polymerised protein.
Globular head with a short arm is called HMM while tail is called LMM.

Q.176 **(4)**

Q.177 **(3)**
Hint : It is an age-related disorder.

Tetany	Rapid spasms (wild contractions) in muscle due to low calcium in body fluids
Gout	Inflammation of joints due to accumulation of uric acid crystals
Osteoporosis	It is an age-related disorder characterised by decreased bone mass and increased chances of fracture. Its common cause is decreased levels of estrogen
Myasthenia gravis	It is an auto-immune disorder affecting neuro-muscular junction

Q.178 (1)

Q.179 **(4)**

Node of ranvier occurs where myelin sheath is discontinuous.

Q.180 (4)

Q.181 (2)

Somatic neural system : CNS to voluntary muscles (skeletal)

Autonomic neural system : CNS to involuntary muscles

Q.182 **(1)**

Q.183 (1)

Q.184 (1)

Q.185 (4)

Set of hormones given in option (4) contain only peptide hormones. These are insulin, glucagon and prolactin (a pituitary hormone).

Rest sets are incorrect and can be corrected as Progesterone, oestradiol, cortisol, testosterone are steroid hormones.

Thyroid hormones, e.g. T3 and T4 are iodothyronincs and epinephrine is an amino acid derivative hormone.

Q.186 (2)

Diaphragm is not a characteristic feature of all chordates. Body of mammals is internally divided into two portion thorax and abdomen by transverse circular partition called diaphragm. Incomplete diaphragm between thorax and abdomen is present in crocodiles. However diaphragm is not observed in other members of phylum chordate.

Q.187 (2)

Q.188 (4)

Lymph is another media which flawn in the vessels and capillaries. However, lymph is the blood minus its RBCs and plasma proteins.

Q.189 (2)

Amino acids are organic amino acids containing an amino group and an acidic group pas substituents on the same carbon, i.e., the α-carbon. Hence, they are called α-amino acids

Q.190 (3)

Q.191 (4)

Alveoli in human lungs arc thin-walled, vaseularised irregular walled bag-like structure at tlie terminal ends of bronchioles. These are the functional unit of lungs and are supplied with blood.

Q.192 (1)

Option (a) is incorrect pair and it can be corrected as During ventricular diastole, the semilunar valves get closed and this produces the second heart sound. Dupp.

Q.193 **(1)**

Since no antigens are present on the RBC of person with blood group 'O' so antibody A and B can't affect it and the person becomes universal donor.

Q.194 (2)

Q.195 **(3)**

Q.196 (4)

Q.197 (4)

Q.198 (3)

Q.199 (1)

This section will have 15 questions. Candidate can choose to attempt any 10 question out of these 15 questions. In case if candidate attempts more than 10 questions, first 10 attempted questions will be considered for marking.

Q.200 **(3)**