ANSWER KEY
NEET (FINAL TRACK)
PART TEST-03 (XI)

PHYSICS

Q.1 (1)	**Q.2** (1)	**Q.3** (2)	**Q.4** (3)	**Q.5** (3)	**Q.6** (2)	**Q.7** (4)	**Q.8** (3)	**Q.9** (1)	**Q.10** (4)
Q.11 (1)	**Q.12** (1)	**Q.13** (2)	**Q.14** (4)	**Q.15** (2)	**Q.16** (3)	**Q.17** (1)	**Q.18** (3)	**Q.19** (4)	**Q.20** (3)
Q.21 (3)	**Q.22** (3)	**Q.23** (1)	**Q.24** (3)	**Q.25** (3)	**Q.26** (3)	**Q.27** (2)	**Q.28** (3)	**Q.29** (1)	**Q.30** (3)
Q.31 (3)	**Q.32** (4)	**Q.33** (3)	**Q.34** (1)	**Q.35** (1)	**Q.36** (1)	**Q.37** (1)	**Q.38** (4)	**Q.39** (2)	**Q.40** (4)
Q.41 (1)	**Q.42** (4)	**Q.43** (4)	**Q.44** (4)	**Q.45** (4)	**Q.46** (2)	**Q.47** (2)	**Q.48 (2)**	**Q.49** (1)	**Q.50** (4)

CHEMISTRY

Q.51 (2)	**Q.52** (2)	**Q.53** (1)	**Q.54** (1)	**Q.55** (4)	**Q.56** (4)	**Q.57** (3)	**Q.58** (3)	**Q.59** (3)	**Q.60** (4)
Q.61 (4)	**Q.62** (1)	**Q.63** (3)	**Q.64** (4)	**Q.65** (1)	**Q.66** (2)	**Q.67** (3)	**Q.68** (3)	**Q.69** (2)	**Q.70** (3)
Q.71 (3)	**Q.72** (4)	**Q.73** (2)	**Q.74** (3)	**Q.75** (1)	**Q.76** (3)	**Q.77** (1)	**Q.78** (3)	**Q.79** (2)	**Q.80** (3)
Q.81 (2)	**Q.82** (1)	**Q.83** (2)	**Q.84** (3)	**Q.85** (2)	**Q.86** (4)	**Q.87** (1)	**Q.88** (3)	**Q.89** (2)	**Q.90** (2)
Q.91 (4)	**Q.92** (3)	**Q.93** (3)	**Q.94** (2)	**Q.95** (1)	**Q.96** (3)	**Q.97** (3)	**Q.98** (3)	**Q.99** (3)	**Q.100** (3)

BIOLOGY

Q.101 (2)	**Q.102** (1)	**Q.103** (1)	**Q.104** (2)	**Q.105** (2)	**Q.106** (4)	**Q.107** (1)	**Q.108** (3)	**Q.109** (1)	**Q.110** (1)
Q.111 (1)	**Q.112** (1)	**Q.113** 2)	**Q.114** (1)	**Q.115** (1)	**Q.116** (3)	**Q.117** (3)	**Q.118** (2)	**Q.119** (4)	**Q.120** (4)
Q.121 (1)	**Q.122** (1)	**Q.123** (3)	**Q.124** (2)	**Q.125** (2)	**Q.126** (2)	**Q.127** (4)	**Q.128** (3)	**Q.129** (2)	**Q.130** (3)
Q.131 (2)	**Q.132** (4)	**Q.133** (1)	**Q.134** (2)	**Q.135** (1)	**Q.136** (4)	**Q.137** (3)	**Q.138** (3)	**Q.139** (1)	**Q.140** (3)
Q.141 (2)	**Q.142** (1)	**Q.143** (2)	**Q.144** (3)	**Q.145** (4)	**Q.146** (1)	**Q.147** (1)	**Q.148** (3)	**Q.149** (4)	**Q.150** (1)
Q.151 (4)	**Q.152** (2)	**Q.153** (4)	**Q.154** (1)	**Q.155** (4)	**Q.156** (1)	**Q.157** (3)	**Q.158** (3)	**Q.159** (3)	**Q.160** (1)
Q.161 (1)	**Q.162** (3)	**Q.163** (4)	**Q.164** (3)	**Q.165** (1)	**Q.166** (3)	**Q.167** (4)	**Q.168** (2)	**Q.169** (2)	**Q.170** (4)
Q.171 (3)	**Q.172** (1)	**Q.173** (2)	**Q.174** (1)	**Q.175** (1)	**Q.176** (3)	**Q.177** (4)	**Q.178** (1)	**Q.179 (2)**	**Q.180** (2)
Q.181 (2)	**Q.182** (4)	**Q.183** (1)	**Q.184** (3)	**Q.185** (4)	**Q.186** (1)	**Q.187** (4)	**Q.188** (2)	**Q.189** (2)	**Q.190** (1)
Q.191 (4)	**Q.192** (3)	**Q.193** (3)	**Q.194** (2)	**Q.195** (4)	**Q.196** (2)	**Q.197** (3)	**Q.198** (2)	**Q.199** (2)	**Q.200** (1)

SOLUTIONS

PHYSICS

Q.1 **(1)**

$$\vec{v}_{cm} = \frac{m_1\vec{v}_1 + m_2\vec{v}_2}{m_1 + m_2}$$

$$\Rightarrow \vec{v}_{cm} = \frac{2(5\cos 37°\hat{i} + 5\sin 37°\hat{j}) + 1(10\cos 53°\hat{i} - 10\sin 53°\hat{j})}{2+1}$$

$$\Rightarrow \vec{v}_{cm} = \frac{2\left(4i + 3\hat{j}\right) + 1\left(6\hat{i} - 8\hat{j}\right)}{2+1}$$

$$\Rightarrow \frac{8\hat{i} + 6\hat{j} + 6\hat{i} - 8\hat{j}}{3} = \frac{14\hat{i} - 2\hat{j}}{3}$$

Q.2 **(1)**

$F_{ext} = 0$

$\therefore \vec{p}$ = constant i.e. $\vec{p}_i = \vec{p}_f$

or, $4(4) + 10(v) = 0$

$\therefore v = -1.6$ m/s

Hence, speed = 1.6 m/s

Q.3 (2)

$mv = 2mv'$

$$v' = \frac{v}{2}$$

$$e = \frac{v/2}{v} = \frac{1}{2}$$

Q.4 (3)

We know that impulse equals change in momentum.

$\Rightarrow 6\hat{j} = \vec{P}_f - (2\hat{i} + \hat{j})$

$\Rightarrow \vec{P}_f = 2\hat{i} + 7\hat{j} = m\vec{v}$

$\Rightarrow \vec{v} = 2\hat{i} + 7\hat{j}$

Q.5 (3)

$$F_{avg} = \frac{\Delta p}{\Delta t} = \frac{2mv\cos 30°}{t}$$

$$= \frac{2 \times 40 \times 10^{-3} \times 20}{10^{-2}} \times \frac{\sqrt{3}}{2} = 80\sqrt{3}\ \text{N}$$

Q.6 (2)

For Head on elastic collision

$$V_1\left(\frac{M_1-M_2}{M_1+M_2}\right)u_1+\left(\frac{2M_2}{M_1+M_2}\right)u_2$$

Here $u_1 = u$; $V_1 = \frac{u}{4}$; $M_1 = 2$ kg

$u_2 = 0$ and $M_2 = ?$

$$\frac{u}{4}=\frac{2-M}{2+M}\times u$$

$$\Rightarrow 2+M=8-4M \Rightarrow M=\frac{6}{5}=1.2\text{ kg}$$

Q.7 (4)

$$y_{CM}=\frac{h}{4}=\frac{40}{4}=10\text{cm}$$

Q.8 (3)

Momentum of skater
A = 30 × 1 = 30 kgm/s
Momentum of skater
B = 20 × 2 = 40 kgm/s
They are at right angles to each other.
Resultant momentum = p
$\therefore (p)^2 = (30)^2 + (40)^2 = 900 + 1600 = 2500$
or p = 50 kgm/s

$$\therefore \text{ Final velocity} = \frac{p}{\text{Total mass}}$$

$$=\frac{50}{(30+20)}=\frac{50}{50}=1\text{ m/s}$$

Q.9 (1)

Momentum is a vector quantity
and can be changed by changing

direction only and K.E. $= \frac{p^2}{2m}$ may remain unchanged.

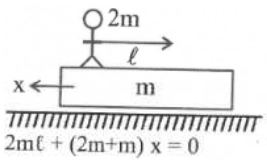
System can have P.E.

Q.10 (4)

$$\vec{r}_{cm}=\frac{m_1\vec{r}_1+m_2\vec{r}_2}{m_1+m_2}$$

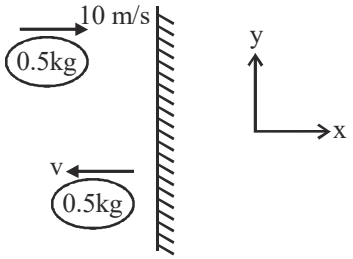
$$=\frac{1\left(-\hat{i}+2\hat{j}+\hat{k}\right)+2\left(-3\hat{i}+2\hat{j}+\hat{k}\right)}{1+2}=\frac{-7\hat{i}+6\hat{j}+3\hat{k}}{3}$$

Q.11 (1)



$$x = \text{west} - \frac{2\ell}{3}$$

Q.12 (1)



Change in linear momentum = $\Delta\vec{p}$

$$\Rightarrow 8 = \vec{p}_f - \vec{p}_i = -0.5V\,\hat{i} - 0.5(10)$$
$$\Rightarrow 8 = 0.5(v+10)$$
$$\Rightarrow -16 = (v+10) \Rightarrow v = -26\text{ m/s}\,\hat{i}$$
$$\Rightarrow |\vec{v}| = 26\text{ m/s}$$

Q.13 (2)

$$X_{cm}=\frac{m_1x_1+m_2x_2}{m_1+m_2}$$

$$=\frac{16\sigma\times1+12\sigma\times5}{16\sigma+12\sigma}=\frac{19}{7}$$

Xcm = 2.71 m from *O*

Q.14 (4)

The practice will be in
equilibrium if force = 0

ie $\frac{df}{dt}=0$

i.e. slope of p – t graph = 0

Q.15 (2)

$$I=\frac{ml^2}{3}\sin^2\theta$$

Q.16 **(3)**

We know,
according to law of conservation
of angular momentum
$L_i = L_f$

$$mvl+0=\left[\frac{3m(2l)^2}{12}+ml^2\right]\omega$$

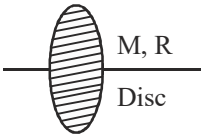
$mvl = (2ml^2)\omega$

$$\therefore \omega=\frac{v}{2l}$$

Q.17 (1)

(1) For ring $I_{cm} = MR^2$ ..... M, R / Ring

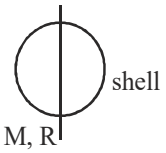
(2) For disc $I_{cm} = \frac{MR^2}{2}$



(3) For solid sphere

$I_{cm} = \frac{2}{5}MR^2$

(4) For spherical shell

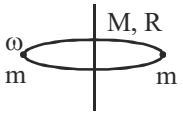


$I_{cm} = \frac{2}{3}MR^2$

Q.18 (3)

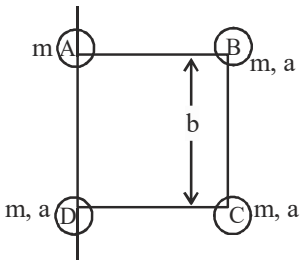
Applying conservation of angular momentum :

$$\frac{MR^2}{2}\omega_1 = \left(\frac{MR^2}{2} + mR^2 + mR^2\right)$$



$$\Rightarrow \omega = \frac{\frac{M}{2}\omega_1}{\left(\frac{M+4m}{2}\right)} = \frac{M\omega_1}{(M+4m)}$$

Q.19 (4)



For sphere at A and D,

$I_A + I_D = \frac{2}{5}ma^2 + \frac{2}{5}ma^2 = \frac{4}{5}ma^2$

For sphere at B and C,

$I_B = I_{cm} + md^2 = \frac{2}{5}ma^2 + mb^2$

$I_C = I_{cm} + md^2 = \frac{2}{5}ma^2 + mb^2$

$I_{axis} = I_A + I_B + I_C + I_D$

$= \frac{8}{5}ma^2 + 2mb^2$

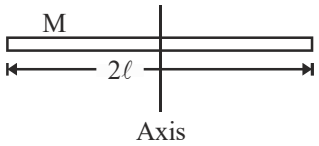
Q.20 (3)

Angular acceleration, $\vec{\alpha} = \frac{\Delta\vec{\omega}}{\Delta t} = \frac{\vec{\omega}_f - \vec{\omega}_i}{\Delta t}$

$$\Rightarrow \alpha = \frac{0 - \frac{50\times 2\pi}{60}}{90} = \frac{\frac{-5\pi}{3}}{90}$$

$$\Rightarrow \alpha = -\frac{\pi}{3\times 18} = \frac{-\pi}{54}\frac{\text{rad}}{\text{s}^2}$$

Q.21 (3)



Torque = Iα

$$\Rightarrow \tau = \frac{m(2\ell)^2}{12}\left(\frac{\Delta\omega}{\Delta t}\right)$$

$$\Rightarrow \tau = \frac{m\ell^2\omega}{3t}$$

Q.22 (3)

Torque, $\vec{\tau} = \vec{r}\times\vec{f}$

$\Rightarrow \vec{\tau} = 3\hat{k}\times 4j$

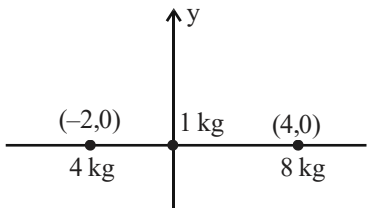
$\Rightarrow \vec{\tau} = -12\hat{i}\,\text{N m}$

Q.23 (1)

$v = \sqrt{\frac{GM}{R}}$

$T = \frac{2\pi R}{v} = \frac{2\pi}{\sqrt{GM}}R^{3/2}$

Q.24 (3)



$$\left|\vec{F}_{net}\right| = \left|\frac{4G}{(2)^2} - \frac{8G}{(4)^2}\right|$$

$$= \left|G - \frac{G}{2}\right| = \frac{G}{2}$$

Q.25 (3)

Orbital velocity, $v = \sqrt{\frac{GM}{r}}$

where r = orbit radius
M = mass of sun

$$\omega = \frac{v}{r} = \frac{\sqrt{GM}}{r\sqrt{r}} = \sqrt{\frac{GM}{r^3}}$$

$$\Rightarrow \omega \propto \frac{1}{r^{3/2}}$$

$$\Rightarrow \frac{\omega'}{\omega} = \left(\frac{r}{4r}\right)^{3/2} = \left(\frac{1}{4}\right)^{3/2}$$

$$\Rightarrow \omega' = \omega\frac{1}{8} = \frac{\omega}{8} \Rightarrow \frac{\omega}{\omega'} = 8$$

Q.26 **(3)**

Acceleration due to gravity, $g = \frac{GM}{R^2}$

where M = mass of the planet
R = radius of the planet

$$\frac{g_x}{g_{earth}} = \frac{M_x}{M_{earth}}\left(\frac{R_{earth}}{R_x}\right)^2$$

$$\Rightarrow \frac{g_x}{g_{earth}} = \left(\frac{M}{80M}\right)\left(\frac{4R}{R}\right)^2 = \frac{16}{80} = \frac{1}{5}$$

$$\Rightarrow g_x = \frac{g_{earth}}{5} = m/s^2$$

Q.27 (2)

$$V_e = \sqrt{\frac{2GM}{R}} = \sqrt{\frac{2G}{R} \times \frac{4}{3}\pi R^3 P}$$

$$\text{or } V_e = \sqrt{\frac{8\pi GP}{3}R^2}$$

$$V_e \propto R \Rightarrow \frac{V_e}{V} = \frac{2R}{R} \Rightarrow V_e = 2V$$

Q.28 (3)

$$\frac{T_2^2}{T_1^2} = \frac{r_2^3}{r_1^3} \Rightarrow T_2 = T_1 \times \left(\frac{r_2}{r_1}\right)^{3/2} = 5 \times \left(\frac{4r}{r}\right)^{3/2}$$

$$\Rightarrow T_2 = 5 \times 8 = 40\ h$$

Q.29 (1)

$$\frac{-GMm}{R} + 0 = \frac{1}{2}mv^2 - \frac{3}{2}\frac{GMm}{R}$$

$$\Rightarrow V = \sqrt{\frac{GM}{R}} \text{ and } V_e = \sqrt{\frac{2GM}{R}} \Rightarrow V = \frac{V_e}{\sqrt{2}}$$

Q.30 **(3)**

From COME,

$$-\frac{GM_e m}{R_e} + \frac{1}{2}m\left(\frac{3}{4}V_{esc}\right)^2 = -\frac{GM_e m}{(R_e + h)} = 0$$

$$\left(\text{where, } v_{esc} = \sqrt{\frac{2GM_e}{R_e}}\right)$$

$$\Rightarrow -\frac{GM_e m}{R_e} + \frac{9}{16}, \frac{GM_e m}{R_e} = -\frac{GM_e m}{(R_e + h)}$$

$$\Rightarrow \frac{1}{R_e} - \frac{1}{(R_e + h)} = \frac{9}{16} \cdot \frac{1}{R_e}$$

$$\Rightarrow 16h = 9(R_e + h) \Rightarrow h = \frac{9}{7}R_e$$

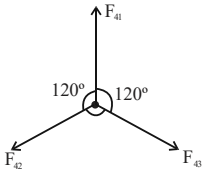
Q.31 (3)

$$g = \frac{Gm}{R^2} = \frac{G}{R^2} \times \frac{4}{3}\pi R^3 \rho = \frac{4}{3}\pi GR\rho$$

If ρ = constant
$g \propto R$

$$\frac{g'}{g} = \frac{R'}{R} = \frac{3R}{R} = 3$$

Q.32 (4)



FBD of particle 4
$F_{41} = F_{42} = F_{43}$
So, particle 4 is in equilibrium.

Q.33 (3)

Q.34 (1)

Q.35 (1)

$$mg = \frac{mGM}{R^2} = \frac{GMm}{R^2} = \frac{Gm}{R^2} \times \frac{4}{3}\pi R^3 \rho$$

$$\propto R$$

So it radius is doubled weight is also doubled.

SECTION-B

Q.36 **(1)**

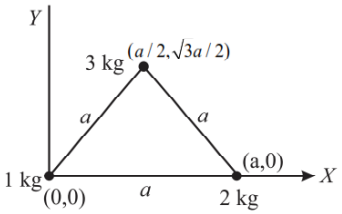
$m_1 + m_2 = 12kg, m_1 : m_2 = 1 : 3$
So, $m_1 = 3kg$ and $m_2 = 9kg$
From COLM $|P_1||P_2|$.....(i)

Given : $KE_1 = \frac{P_1^2}{2m_1} = 216J$

$\Rightarrow P_1^2 = 2\times3\times216$

$\Rightarrow |P_1| = 36$ kg-m/s.....(ii)
Using (i) and (ii), we have
$|P_2| = 36$ kg-m/s

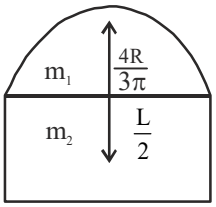
Q.37 (1)



$$X_{cm} = \frac{m_1x_1 + m_2x_2 + m_3x_3}{m_1 + m_2 + m_3}$$

$$= \frac{1\times0 + 2\times a + 3\times\frac{a}{2}}{1+2+3} = \frac{7a}{12}$$

Q.38 (4)



$m_1 \frac{4R}{3\pi} = m_2 \frac{L}{2}$

$\sigma\frac{\pi R^2}{2}\frac{4R}{3\pi} = \sigma(2RL)\frac{L}{2}$

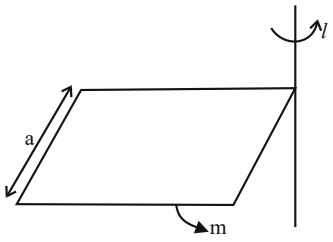
$\Rightarrow \frac{2}{3}R^2 = L^2 \Rightarrow L = \sqrt{\frac{2}{3}}R$

Q.39 (2)

According to parallel axis theorem
$I = I_{com} + md^2$

$I = I_0 + \frac{ML^2}{4}$

Q.40 (4)



According to perpendicular axis theorem

$$l = \frac{ma^2}{3} + \frac{ma^2}{3} = \frac{2ma^2}{3}$$

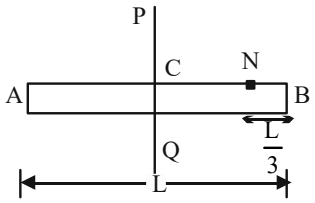
Q.41 (1)

$\tau_R = (300\times40) - (500\times20) = m_1r_1 - m_2r_2$
$= 2000$ gf. cm
Let 200 gf be suspended at x distance
at right hand side.
In balanced condition
$t_R' = m'_1 r'_1 = m_2 r'_2 = 0$
$12000 - 10000 - 200x = 0$
$x = 10$ cm

Q.42 **(4)**

Moment of inertia of a rod
about a perpendicular axis
PQ passing through the centre of the mass C,

$$I_{CM} = \frac{ML^{12}}{12}$$



Let N be the point which divides the length of the rod AB in ratio 1 : 3. This point will be at a distance $\frac{L}{6}$ from C. Thus, the moment of inertia I' about an axis parallel to PQ and passing through the point N.

$$I' = I_{CM} + M\left(\frac{L}{6}\right)^2 = \frac{ML^2}{12} + \frac{ML^2}{36} = \frac{ML^2}{9}$$

If K be the radius of gyration, then

$$K = \sqrt{\frac{I'}{M}} = \sqrt{\frac{L^2}{9}} = \frac{L}{3}$$

Q.43 (4)

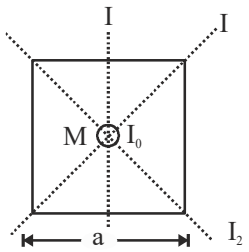
Applying angular momentum
conservation :

$\vec{L}_i = \vec{L}_f$
$0 = I_{disc}\,\omega - 50\times2\times1$
(Anticlockwise is taken positive)
$\Rightarrow 100 = 4000\omega$

$\Rightarrow \omega = \frac{1}{40}$(anticlockwise)

$\Rightarrow \omega = \frac{1}{40}$ rad / s

Q.44 (4)



For square lamina,

$I_0 = \frac{ma^2}{6}$

From perpendicular axis theorem,

$I = \frac{I_0}{2} = \frac{ma^2}{12} \Rightarrow \quad I_1 = I_2 = I_3 = \frac{ma^2}{12}$

Ratio $\frac{I_1 + I_2}{I_3} = \frac{I + I}{I} = \frac{2}{1}$

Q.45 (4)

$K.E. = \frac{GMm}{2r}$

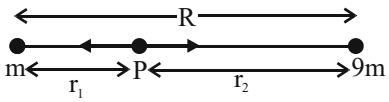
$\Rightarrow$ Kinetic energies are unequal

$T = \frac{2\pi r^{3/2}}{\sqrt{GM}} \Rightarrow$ Time period are equal

$P.E. = -\frac{GMm}{r} \Rightarrow$ Potential energies are unequal

$v = \sqrt{\frac{GM}{r}} \Rightarrow$ Orbital speeds are equal

Q.46 (2)



Position of Neutral poin (Zero Gravitational Field)

$r_1 = \frac{\sqrt{m_1}R}{\sqrt{m_1} + \sqrt{m_2}} = \frac{\sqrt{m}R}{\sqrt{m} + \sqrt{9m}} = \frac{R}{4}$

$r_2 = R - R/4 = 3R/4$

Now Gravitational potential at point P

$V_P = -\frac{GM}{R/4} - \frac{9(GM)}{3R/4} = \frac{-16GM}{R}$

Q.47 (2)

$W = \Delta U = \frac{GMm(h)}{R(R+h)}$

given, $h = 2R$

$W = \frac{GMm2R}{R(R+2R)} = \frac{GMm \times 2R}{3R^2} = \frac{2GMm}{3R}$

Q.48 **(2)**

During path DAB, planet is nearer to sun as compared to path BCD.
Velocity during path DAB will be more, hence time taken will be less.

Q.49 (1)

$g_{eff} = g/2$

$g/2 = \frac{g}{(1 + h/R)^2}$

$1 + \frac{h}{R} = \sqrt{2}$

$\frac{h}{R} = (\sqrt{2} - 1)$

$h = 0.414\,R$

Q.50 (4)

PE of satellite $= \frac{-GMm}{R+h}$

KE of satellite $= \frac{GMm}{2(R+h)}$

$\therefore$ TE of satellite $= \frac{-GMm}{2(R+h)}$

Hence on increasing height of satellite its potential energy increases but KE decreases and orbital velocity of satellite depends upon the density of planet.

CHEMISTRY
SECTION-A

Q.51 (2)

In liquid-gas physical equilibrium,
on increasing pressure;
equilibrium gets shifted towards more densed phase and since density of water is more than steam so on increasing pressure; more water is formed and boiling point increases.

Q.52 (2)

From the given values of K_C at different temperature it is clear that at higher temperature value of K_C is high so reaction is endothermic so energy is absorbed.

Q.53 (1)
Equilibrium constant of any reaction depends only on temperature and does not depend on concentration pressure or addition of inert gas.

Q.54 (1)
$CaCO_3(s) \rightleftharpoons CaO(s) + CO_2(g)$
$Kp = P_{CO_2(g)}$
Unit of kp = unit of pressure i.e. bar

Q.55 (4)
$2X(g) + 3Y(s) \rightleftharpoons 3Z(g) + 110\,kcal$
$\Delta H = -110\,kcal$
Since reaction is exothermic so low temperature favours product formation
$\Rightarrow$ Product side contains more number of gaseous mole so less pressure favours product formation.

Q.56 (4)
$CH_4(g) + 2O_2(g) \rightleftharpoons CO_2(g) + 2H_2O(\ell)$
$$K_p = \frac{\left(P_{CO_2}\right)}{\left(P_{CH_4}\right)\times\left(P_{O_2}\right)^2}$$

Q.57 (3)
Catalyst do not disturb or affect equilibrium so catalyst will not affect the concentration of NH_3.

Q.58 (3)
Value of $K_p = 0.0005 = 5 \times 10^{-4}$
Since value of K_p is very less i.e. less than 10^{-3} so reactant get very less dissociated and product is less stable than reactant.
$\Delta n_g = 2 - 1 = 1$
i.e. +ve; so $K_p > K_C$.

Q.59 (3)
Reaction in which $\Delta ng > 0$ has $K_p > K_c$

Q.60 (4)
Reactions in which value of K is very high (i.e. greater than 10^3) will nearly proceeds to completion.

Q.61 (4)
(1) NaCl is salt of strong acid and strong base so its pH = 7 (approx)
(2) Na_2SO_4 is also the salt of strong acid and strong base soluation its pH = 7 (approx)
(3) NH_4Cl is the salt of strong acid and weak base so pH < 7.
(4) CH_3COONa is the salt of weak acid and strong base so pH > 7.

Q.62 (1)
Common ion effect is shown by weak electrolyte and strong electrolyte having one common ion.

Q.63 (3)
Given $K_b = 2 \times 10^{-5}$
using relation between K_a and K_b
for conjugate acid-base pair $K_a \times K_b = K_w$
$K_a \times K_b = 10^{-14}$
$$K_a = \frac{10^{-14}}{K_b} = \frac{10^{-14}}{2\times10^{-5}} = 5 \times 10^{-10}.$$

Q.64 (4)
$(H_2SO_4 + NaHSO_4)$ solution do not act as buffer solution as it contain strong acid and its salt.

Q.65 (1)
$K_a = 4.5 \times 10^{-4}$
$pK_a = -\log K_a = -\log (4.5 \times 10^{-4})$
pka = 3.34, C = 0.01 = 10^{-2}
$NaNO_2$ is salt of strong base and weak acid so
$$pH = 7 + \frac{1}{2}(pK_a + \log C)$$
$$pH = 7 + \frac{1}{2} \times (3.34 + \log 10^{-2})$$
pH = 7.67

Q.66 (2)
Given K_{sp} of $Ca(OH)_2 = 0.5 \times 10^{-15}$
$Ca(OH)_2(s) \rightleftharpoons \underset{s}{Ca^{2+}}(aq) + \underset{2s}{2OH^-}(aq)$
$$s = \left(\frac{K_{sp}}{4}\right)^{1/3}$$
$$s = \left(\frac{0.5\times10^{-15}}{4}\right)^{1/3} = 5 \times 10^{-6}$$
$[OH^-] = 2 \times 5 \times 10^{-6} = 1 \times 10^{-5}$
$[OH^-] = 10^{-5}$; pOH = 5
pH = 14 – pOH = 9

Q.67 (3)
Given $[H^+] = 5 \times 10^{-4}$
$pH = -\log [H^+]$
$pH = -\log (5 \times 10^{-4})$
pH = 3.3

Q.68 (3)
$$BaCl_2(aq) \rightarrow Ba^{2+}(aq) + 2Cl^-(aq)$$
0.1M 0.1M 0.2M

$$AgCl(s) \rightleftharpoons Ag^+(aq) + Cl^-(aq)$$
s s s + 0.2
≈ 0.2

$(K_{sp})_{AgCl} = [Ag^+][Cl^-]$
$10^{-10} = S \times 0.2$
$S = 5 \times 10^{-10}$

Q.69 (2)

$(K_a)_{CH_3COOH} = 1.8 \times 10^{-5}$

$CH_3COOH + OH^- \rightleftharpoons CH_3COO^- + H_2O$ is the reverse of hydrolysis of CH_3COO^-; so equilibrium constant of this reaction $= \frac{1}{K_H} = \frac{K_a}{K_w} = \frac{1.8\times10^{-5}}{10^{-14}}$

$K = 1.8 \times 10^9$

Q.70 (3)

$\overset{-1}{K}\overset{-1}{I} + \overset{0}{Cl_2} \rightarrow \overset{-1}{K}Cl + \overset{0}{I_2}$

$\Rightarrow$ Neutralisation reactions are non-redox reactions

Q.71 (3)
In $HClO_4$; Cl is present in its highest oxidation state of (+7) so it cannot be further oxidized so cannot disproportionate.

Q.72 (4)

$2HI + H_2\overset{+6}{S}O_4 \rightarrow I_2 + \overset{+4}{S}O_2 + 2H_2O$

In this reaction H_2SO_4 act as oxidizing agent as the oxidation state of S reduced from +6 to +4.

Q.73 (2)
H_2S can act as reducing agent.

Q.74 (3)
$3MnO_2 + 4Al \rightarrow 3Mn + 2Al_2O_3$
a = 3, b = 4 and c = 3

Q.75 (1)
Higher the value of SRP stronger is the oxidizing power; so MnO_4^- is the strongest oxidizing agent.

Q.76 (3)

$\overset{+7}{Mn}O_4^- + 5e^- \longrightarrow Mn^{2+}$

To reduce 1 mol of MnO_4^-;

5 mol e^- is required so to reduce x mol of MnO_4^-;

5x mol e^- is required.

Q.77 (1)

$\overset{+3}{Cr}(OH)_4^- + 4OH^- \rightarrow \overset{+6}{Cr}O_4^{2-} + 4H_2O + 3e^-$

Q.78 (3)

$Cr_2O_7^{2-} + 3SO_3^{2-} + 8H^+ \rightarrow 2Cr^{3+} + 3SO_4^{2-} + 4H_2O$

Coefficient of H+ is 8, SO_4^{2-} is 3.

Q.79 (2)
MnO_4^- oxidize ferrous oxalate (FeC_2O_4) into Fe^{3+} and CO_2 and itself gets reduced to Mn^{2+} in acidic medium n-factor of MnO_4^- is 5 and FeC_2O_4 is 3.
According to law of equivalent

$(mol \times VF)_{MnO_4^-} = (mol \times VF)_{FeC_2O_4}$

$mol \times 5 = 1 \times 3$

MnO_4^- mol $= \frac{3}{5} = 0.6$

Q.80 (3)
Oxidising agent has a tendency to gain electrons

Q.81 (2)

Oxidation

$I_2^{\,0} + H_2O_2^{\,-1} + 2OH^- \rightarrow 2I^- + H_2O + O_2$

Reduction

In this reaction H_2O_2 reduce I_2 into I^-, so H_2O_2 is a reducing agent

Q.82 (1)

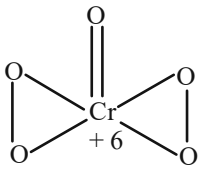
$\overset{-2}{O} = \overset{+2}{C} = \overset{0}{C} = \overset{+2}{C} = \overset{-2}{O}$

Q.83 (2)

$\overset{-1}{H_2O_2} + \overset{0}{O_3} \rightarrow \overset{-2}{H_2O} + \overset{0}{2O_2}$

Here O_3 is oxidizing agent and H_2O_2 is reducing agent
$PbS + H_2O_2 \rightarrow PbSO_4 + H_2O$
Here H_2O_2 act as oxidizing agent.

Q.84 (3)



Q.85 (2)
N_2O_5; O.S of N is $+5$
NH_4OH; O.S of N is -3

HN_3 O.S of N is $-\frac{1}{3}$

N_2H_4 O.S of N is -2

SECTION-B

Q.86 (4)
For homogeneous equilibrium all the reactants and products should be in same phase.

Q.87 (1)

$\Delta G^\circ = -2.303\, RT \log K_C$

$\log K_C = \frac{-\Delta G^\circ}{2.303RT} = \frac{-(-4.606)\times 1000}{2.303\times 2\times 500}$

$\log K_C = 2$

$\therefore K_C = 10^2$

Q.88 (3)

$N_2 + 3H_2 \rightleftharpoons 2NH_3; K_1$ .....(i)

$N_2 + O_2 \rightleftharpoons 2NO; K_2$ .....(ii)

$H_2 + \frac{1}{2}O_2 \rightleftharpoons H_2O; K_3$ .....(iii)

applying $3 \times$ (iii) + (ii) – (i);
we get:

$2NH_3 + \frac{5}{2}O_2 \rightleftharpoons 2NO + 3H_2O$

$K = \frac{K_3^3 \times K_2}{K_1}$

Q.89 (2)

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$ $K = 1.7 \times 10^{-2}$
given at an instant

$[N_2] = \frac{1}{20}\frac{mol}{L}, [H_2] = \frac{2}{20} = \frac{1}{10}$

$[NH_3] = \frac{8}{20} = \frac{2}{5}$

$Q_C = \frac{[NH_3]^2}{[N_2]\times[H_2]^3} = \frac{\left(\frac{2}{5}\right)^2}{\frac{1}{20}\times\left(\frac{1}{10}\right)^3} = 3200$

Since $Q_C > K$; so net direction of reaction is backward.

Q.90 (2)

$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
at equilibrium;

$P_{H_2} = 0.8$, $P_{N_2} = 1.6$

$P_{total} = 3.2$, $P_{NH_3} = 3.2 - (0.8+1.6) = 0.8$

$K_p = \frac{P_{NH_3}^2}{P_{H_2}^3 \times P_{N_2}}$

$K_p = \frac{0.8^2}{0.8^3 \times 1.6} = 0.78$

Q.91 (4)

Mixture of ammonia and ammonium chloride is basic buffer solution;

$pOH = pK_b + \log \frac{[salt]}{[base]}$

$pOH = 5 + \log \frac{1}{0.1} = 6$

$pH = 14 - pOH = 14 - 6 = 8$

Q.92 (3)

$pH = 2$; so $[H^+] = 10^{-2}$ mol L^{-1}
if solution is diluted twice
new vol. = 2 × initial volume
$M_1V_1 = M_2V_2$
$10^{-2} \times V_1 = M_2 \times 2V_2$

$M_2 = \frac{10^{-2}}{2} = 5 \times 10^{-3}$

new pH = 3 – log 5 = 2.3 ($\therefore$ Assertion $\rightarrow$ incorrect)
$\Rightarrow$ On dilution, pH of strong acid increases. as conc. of $[H^+]$ decrease as vol. of soluation increases
($\therefore$ Reason $\rightarrow$ correct)

Q.93 (3)

Ammonium formate is the salt of weak acid and weak base.

$pH = 7 + \frac{1}{2}(pK_a - pK_b)$

$pH = 7 + \frac{1}{2}(3.8 - 4.8)$

$pH = 6.5$

Q.94 (2)

HSO_4^- is the conjugate base of H_2SO_4.

$\underset{\text{acid}}{HSO_4^-} \rightleftharpoons \underset{\substack{\text{conjugate}\\ \text{base}}}{HSO_4^-} + H^+$

Q.95 (1)

$AlCl_3$ act a Lewis acid because central atom at has incomplete octet.

Q.96 (3)

$CH_3COONa_{(aq)} + HCl_{(aq)} \rightarrow CH_3COOH_{(aq)} + NaCl_{aq}$

0.5	0.2	0	0
0.3	0	0.2	-

after reaction we get acidic buffer solution:

$pH = pK_a + \log \frac{[salt]}{[acid]}$

$pH = 4.74 + \log \frac{0.3}{0.2} = 4.916$

Q.97 (3)

(a) $2Cu^+ \rightarrow Cu^{2+} + Cu^0$ (Disproportionation)

(b) $2\overset{+7}{K}\overset{+6}{Mn}O_4^{-2} \rightarrow K_2\overset{+6}{Mn}O_4^{-2} + \overset{+4}{Mn}O_2^{-2} + O_2^0$

This is not disproportionation reaction.

(c) $2\overset{+7}{K}\overset{+4}{Mn}O_4^- + 3Mn^{2+} + 2H_2O \rightarrow 5\overset{+4}{Mn}O_2 + 4H^+$

This is comproportionation reaction.

(d) $\overset{+6}{MnO_4^{2-}} + 4H^+ \rightarrow 2\overset{+7}{MnO_4^-} + \overset{+2}{MnO_2} + 2H_2O$

(d is proportionation)

Q.98 (3)

$3Br_2 + 6CO_3^{2-} + 3H_2O \rightarrow \overset{-1}{5Br^-} + \overset{+5}{BrO_3^-} + 6HCO_3^-$

In this reaction Bromine reduced to –1 as well as oxidized to +5.

Q.99 (3)

$Cl_2 + OH^- \rightarrow \overset{+1}{ClO^-} + \overset{-1}{Cl^-} + H_2O$

In this reaction Cl is reduced to –1 as well as oxidized to +1 so it is disproportionation reaction.

Q.100 (3)

(1) $\overset{+5}{KClO_3}$ (2) $\overset{+3}{ClO_2^-}$ (3) $\overset{+7}{HClO_4}$ (4) KCl

BIOLOGY-I
SECTION-A

Q.101 (2)

New NCERT Pg. No. 88

The question asks us to identify the incorrectly matched pair among the given options related to cell theory. Let us evaluate each pair:

1. Schwann: This statement correctly reflects Schwann's contribution. Schwann concluded that the presence of the cell wall is a unique characteristic of plant cells, distinguishing them from animal cells, which he observed to lack a cell wall. Hence, this is correctly matched.

2. Schleiden: This statement is incorrectly matched. Schleiden, a German botanist, is known for his conclusion that all plants are composed of cells. However, the statement that he reported cells had a thin outer layer (plasma membrane) is incorrect. The plasma membrane was not clearly identified in Schleiden's work.

3. Rudolf Virchow: This is a correct match. Rudolf Virchow is credited for his theory that cells arise from pre-existing cells through the process of division, a key tenet of cell theory.

Thus, the incorrectly matched pair is option 2, Schleiden.

Q.102 (1)

New NCERT Pg. No. 91

A bacterial flagellum is a long, whip-like structure that enables bacteria to move. It consists of three main parts - Basal body, Hook and Filament.

Q.103 (1)

New NCERT Pg. No. 96

The Golgi apparatus is an organelle responsible for modifying, packaging, and sorting proteins and lipids.

It has two distinct faces: Cis face (forming face) and Trans face (maturing face)

The other options are incorrect:

Option (2) is incorrect because the cis and trans faces are interconnected through the Golgi cisternae.

Option (3) is incorrect because the receiving face is the cis face, not the trans face.

Option (4) is incorrect because the trans face is not closely appressed with the ER.

Q.104 (2)

New NCERT Pg. No. 94

Plasmodesmata are microscopic channels that traverse the cell walls of plant cells, allowing for transport and communication between adjacent cells.

These channels connect the cytoplasm of one plant cell with the cytoplasm of the next, facilitating the movement of ions, small molecules, and some larger molecules like proteins and RNA.

Q.105 (2)

New NCERT Pg. No. 98, 99, 100

The matching pairs between Column-I (structures) and Column-II (their descriptions):

- Thylakoids (iv): These are flat membranous sacs found within the chloroplasts in the stroma. They play a key role in photosynthesis.
- Centriole (iii): Centrioles form the basal body of cilia or flagella and are involved in organizing microtubules during cell division.
- Chromatin (ii): Chromatin is highly extended and elaborate nucleoprotein fibers found in the nucleus. It condenses to form chromosomes during cell division.
- Cristae (i): Cristae are the infoldings of the inner membrane of mitochondria, increasing the surface area for ATP production.

Q.106 (4)

New NCERT Pg. No.

The cytoskeleton is a network of protein fibers in the cytoplasm that helps in:

- Cell division: It forms the mitotic spindle that segregates chromosomes.
- Mechanical support: It maintains the cell shape and structure.
- Motility: It is involved in cell movement, including the movement of organelles within the cell.

Q.107 (1)
New NCERT Pg. No. 93
The membrane of Red Blood Cells (RBCs) is primarily composed of proteins and lipids.
In human RBCs, the protein content is approximately 52%, and the lipid content is around 40%. The lipid bilayer forms the basic structure of the membrane, while proteins provide functions such as ion transport and cell recognition.

Q.108 (3)
New NCERT Pg. No. 88
Statement-I: "Cytoplasm is the main arena of cellular activities in only plant cells" -
This is incorrect because the cytoplasm is the site of most metabolic activities in both plant and animal cells, not just in plants.
Statement-II: "Ribosomes are non-membrane bound organelles" - This is correct. Ribosomes are indeed non-membrane-bound structures found in both prokaryotic and eukaryotic cells, where they synthesize proteins.
Therefore, the correct interpretation is that Statement-I is incorrect while Statement-II is correct.

Q.109 (1)
New NCERT Pg. No. 91
Statement-I: "Animal cells have centrioles which are absent in almost all plant cells" -
This is true. Animal cells possess centrioles, which play a role in organizing the spindle fibers during cell division, while they are usually absent in plant cells.
Statement-II: "Plant cells possess cell walls, plastids, and a large central vacuole which are absent in animal cells" - This is also true. Plant cells have these unique structures that animal cells lack, which provides structural support (cell wall), storage (vacuole), and photosynthesis (plastids).

Q.110 (1)
New NCERT Pg. No. 91
Ribosomes, including those found in polysomes (clusters of ribosomes), perform the critical function of translating messenger RNA (mRNA) into proteins. Polysomes are structures that enable a single mRNA to be translated by multiple ribosomes simultaneously, increasing the efficiency of protein synthesis.

Q.111 (1)
New NCERT Pg. No. 91
Sol. Inclusion bodies in prokaryotes, such as bacteria, are reserve storage structures that lie freely in the cytoplasm and are not bound by any membrane, making the statement "they are bound by a single membrane system" incorrect.

Q.112 (1)
New NCERT Pg. No. 96
Assertion: "Concentration of ions and other materials is significantly higher in vacuole than in the cytoplasm" - This is true. The vacuole serves as a storage center, and its concentration of ions, sugars, and other materials is higher than in the surrounding cytoplasm.
Reason: "In plants, the tonoplast facilitates the transport of a number of ions and other materials against concentration gradients into the vacuole" - This is also true. The tonoplast is the membrane that surrounds the vacuole and actively transports ions and molecules into the vacuole, often against their concentration gradients.

Q.113 (2)
New NCERT Pg. No. 100
The nucleolus is a non-membrane-bound structure found in the nucleus of eukaryotic cells. It is the site of ribosomal RNA (rRNA) synthesis and ribosome assembly. However, its contents are not continuous with the cytoplasm, making this statement incorrect.

Q.114 (1)
New NCERT Pg. No. 87
Assertion: "Cell is called the fundamental structural and functional unit of all living organisms" - This is correct. The cell is the smallest unit of life capable of performing all essential life functions.
Reason: "Anything less than a complete structure of a cell does not ensure independent living" - This is also true. Subcellular structures, like organelles, cannot function independently outside the context of a complete cell.

Q.115 (1)
New NCERT Pg. No. 109
The correct matches between Column-I (molecules) and Column-II (descriptions) are:
Inulin (iv): Polymer of fructose.
Collagen (iii): Intercellular ground substance.
Glycogen (ii): Storage polysaccharide.
RuBisCO (i): Most abundant protein in the biosphere.

Q.116 (3)
New NCERT Pg. No. 105
The elemental composition of living tissue is primarily made up of hydrogen, oxygen, and carbon, among other elements. Alcohol is not an element but a

Q.117 (3)
New NCERT Pg. No. 106, 109
Statement-I: "All amino acids are essential for humans" - This is

incorrect because only 9 out of 20 amino acids are essential, meaning they must be obtained through diet.
Statement-II: "Tyrosine and phenylalanine are examples of aromatic amino acids" - This is correct. Both are aromatic due to their benzene ring structure.

Q.118 (2)
New NCERT Pg. No. 110
The correct statements regarding polysaccharides are:
Cellulose is a homopolymer of glucose.
Starch gives blue color and glycogen gives red color with iodine.
Cellulose gives no color with iodine.
Inulin is not a homopolymer of glucose; it is a polymer of fructose, making statement (ii) incorrect.

Q.119 (4)
New NCERT Pg. No. 113, 114
- The activity of carbonic anhydrase declines below and above its optimum pH/temperature.
- The active site of an enzyme is where the substrate binds.
- Enzymes remain unchanged after the reaction, serving as catalysts.

Statement (b) is incorrect because proteins can have both right- and left-handed helices.

Q.120 (4)
New NCERT Pg. No. 112
Sol. In adult human hemoglobin, four polypeptide chains come together to form the quaternary structure, which is essential for its function of oxygen transport.

Q.121 (1)
New NCERT Pg. No. 106
Lecithin is a phosphorylated glyceride (phospholipid) found in the cell membrane, where it helps maintain membrane structure and function.

Q.122 (1)
New NCERT Pg. No. 105
Amino acids are unique due to the ionizable nature of both the amine group ($–NH_2$) and the carboxyl group (–COOH), which allows them to participate in acid-base chemistry. This ionization plays a crucial role in their behavior in different pH environments.

Q.123 (3)
New NCERT Pg. No. 112
Ribozymes are RNA molecules that function as enzymes, catalyzing specific biochemical reactions. Unlike most enzymes, which are made of proteins, ribozymes are composed of RNA.

Q.124 (2)
New NCERT Pg. No. 111
When a protein is imagined as a straight line, the right end represents the last amino acid (the C-terminal), which has a free carboxyl group (–COOH).
The left end represents the first amino acid (N-terminal), with a free amine group ($–NH_2$).

Q.125 (2)
New NCERT Pg. No. 121
Assertion: After the S phase, the number of chromosomes remains the same because only the DNA content doubles, not the chromosome number.
Reason: During the S phase, the DNA content doubles in preparation for cell division.
Both statements are correct and the reason explains the assertion.

Q.126 **(2)**
New NCERT Pg. No. 126
The diplotene stage of meiosis can last for an extended period in certain vertebrates, especially in oocytes, where it can persist for months or even years.

Q.127 (4)
New NCERT Pg. No. 126
Statement-I: Chiasmata form during diplotene, not diakinesis.
Statement-II: By the end of prophase, structures like the Golgi complex, ER, nucleolus, and nuclear envelope are no longer visible.

Q.128 (3)
New NCERT Pg. No. 121, 127
The correct statements are:
- Cytokinesis marks the end of cell division.
- Cells exit the G_1 phase to enter the G_0 stage.
- Mitochondria and plastids double in the G_2 phase and are distributed between daughter cells during cytokinesis.

Q.129 (2)
New NCERT Pg. No. 121, 122
The correct matches are:
- Synthesis of RNA and protein (iv): G_2-phase.
- Centriole duplicates (i): S-phase.
- Interval between mitosis and initiation of DNA replication (iii): G_1-phase.
- Cells remain metabolically active but do not proliferate (ii): G_0-phase.

Q.130 (3)
New NCERT Pg. No. 121
Assertion: "Interphase is also called theresting phase." - This is true.

However, the term "resting" refers to the absence of cell division, not metabolic inactivity.
Reason: "In interphase, cells are metabolically inactive." - This is false. Cells are highly metabolically active during interphase, performing various processes like DNA replication, protein synthesis, and growth.
Thus, the assertion is correct, but the reason is incorrect.

Q.131 (2)
New NCERT Pg. No.
- G_1 phase: The cell has 16 chromosomes.
- S phase: The amount of DNA doubles, but the number of chromosomes remains 16. Each chromosome now consists of two sister chromatids, so there are 32 chromatids.
- M phase: After cell division, each daughter cell receives 16 chromosomes.

Q.132 (4)
New NCERT Pg. No. 122
- In prophase, the chromosomal material condenses into tightly packed, visible chromosomes. This is one of the first steps of mitosis.
- Spindle fibers attaching to kinetochores occur in metaphase.
- Chromatids separate and move to opposite poles during anaphase.

Q.133 (1)
New NCERT Pg. No. 126
Recombination (crossing over) between homologous chromosomes is completed by the end of the pachytene stage of prophase I in meiosis. This ensures genetic variation.

Q.134 (2)
New NCERT Pg. No. 128
The mechanism ensuring that the chromosome number remains constant across generations is meiosis, specifically meiosis I, where homologous chromosomes are separated, reducing the chromosome number by half.

Q.135 (1)
New NCERT Pg. No. 126
Sol. In the leptotene stage of prophase I, the chromatin material begins to condense, making chromosomes visible under a microscope.

SECTION-B

Q.136 (4)
New NCERT Pg. No. 90
The glycocalyx is the outermost layer of a bacterial cell, providing a sticky, gelatinous covering that helps bacteria adhere to surfaces. It also offers protection from the WBCs.

Q.137 (3)
New NCERT Pg. No. 90
- Typical bacteria (S): 1-2 μm in size.
- PPLO (R): 0.1 μm
- Viruses (Q): 0.02-0.2 μm.
- Typical eukaryotic cell (P): 10-20 μm in size.

Q.138 (3)
New NCERT Pg. No. 94
- The Na^+/K^+ pump is a classic example of active transport, where sodium (Na^+) ions are pumped out of the cell, and potassium (K^+) ions are pumped in, against their concentration gradients. This process requires energy in the form of ATP.
- Passive transport does not require energy.
- Osmosis involves water movement, not ions.
- Simple diffusion occurs without the use of energy or carrier proteins.

Q.139 (1)
New NCERT Pg. No. 95
The diameter of Golgi cisternae, which are flattened membrane-bound sacs, ranges from 0.5 to 1.0 μm. These structures are involved in the modification, sorting, and packaging of proteins and lipids.

Q.140 (3)
New NCERT Pg. No. 95
The endoplasmic reticulum (ER) divides the intracellular space into luminal (inside the ER) and extra-luminal (cytoplasmic) compartments. The ER is involved in the synthesis of proteins (rough ER) and lipids (smooth ER).

Q.141 (2)
New NCERT Pg. No. 115
In an enzyme-catalyzed reaction, the substrate diffuses to the enzyme's active site and forms an enzyme-substrate (ES) complex, which is necessary for catalysis.

Q.142 (1)
New NCERT Pg. No. 118
Many coenzymes are derived from vitamins, which are essential for the function of enzymes. Examples include NAD (derived from niacin) and FAD (derived from riboflavin).

Q.143 (2)
New NCERT Pg. No. 112
Statement-I: Almost all enzymes are proteinaceous in nature, meaning they are made of proteins. This is correct.
Statement-II: Secondary structure (e.g., alpha helices and beta sheets) is crucial for the function of many proteins, including enzymes. This is also correct.

Q.144 (3)
New NCERT Pg. No. 118
The correct matches are:
Prosthetic group (IV): Haem part of catalase.
Cofactor (III): Non-protein part of holoenzyme.

Apoenzyme (II): Protein part of holoenzyme.
Coenzyme (I): NAD (Nicotinamide adenine dinucleotide).

Q.145 (4)
New NCERT Pg. No. 114, 115
This statement is incorrect because as the substrate concentration increases, the velocity of the reaction initially increases and only plateaus when the enzyme becomes saturated (i.e., when all active sites are occupied).

Q.146 (1)
New NCERT Pg. No. 124
Statement-I: In some organisms, karyokinesis is not followed by cytokinesis, leading to a multinucleate condition called syncytium - This is correct.
Statement-II: Cell growth can disturb the ratio between the nucleus and cytoplasm, necessitating cell division - This is also correct.

Q.147 (1)
New NCERT Pg. No. 126
The synaptonemal complex dissolves during the diplotene stage of prophase I, allowing homologous chromosomes to begin separating, though they remain connected at the chiasmata.

Q.148 (3)
New NCERT Pg. No. 121
The interphase includes G_1, S, and G_2 phases. The M phase (mitosis) is separate from interphase and includes the process of cell division.

Q.149 (4)
New NCERT Pg. No. 127
In anaphase II of meiosis II, sister chromatids are finally separated and move to opposite poles of the cell. This is similar to anaphase in mitosis but occurs during meiosis II.

Q.150 (1)
New NCERT Pg. No. 124
In telophase, the nuclear envelope reforms around the separated chromosomes, marking the end of nuclear division.

BIOLOGY-II
SECTION-A

Q.151 (4)
New NCERT Pg. No. 102
Some chromosomes contain a secondary constriction that is non-staining and constant in position. This secondary constriction leads to the formation of a small fragment called a satellite, often seen near the ends of the chromosomes.

Q.152 (2)
New NCERT Pg. No. 88
Ribosomes are unique because they are found in both the cytoplasm and within two organelles: mitochondria and chloroplasts. Both of these organelles are thought to have evolved from prokaryotic ancestors and possess their own ribosomes for protein synthesis. These ribosomes are involved in synthesizing proteins.

Q.153 (4)
New NCERT Pg. No. 95
The endomembrane system includes organelles that are involved in the transport of materials within the cell. This system includes the endoplasmic reticulum (ER), Golgi apparatus, lysosomes, and vesicles. Lysosomes are membrane-bound organelles that contain digestive enzymes to break down cellular waste and are part of this system.

Q.154 (1)
New NCERT Pg. No. 93
Statement-I: The electron microscope studies showed that the cell membrane is composed of lipids that are arranged in a bilayer. This is correct and reflects the fluid mosaic model of the membrane.
Statement-II: Lipids are arranged with their hydrophilic (polar) heads facing the aqueous external and internal environments, and their hydrophobic tails facing inward. This arrangement creates a bilayer structure, ensuring selective permeability.
Both statements correctly describe the structure of the cell membrane.

Q.155 (4)
New NCERT Pg. No. 98
The cytoskeleton is a network of protein filaments that help maintain the shape of the cell, assist in cell division, and enable movement. It includes structures like microtubules, actin filaments, and intermediate filaments, all of which contribute to the structural integrity of the cell.

Q.156 (1)
New NCERT Pg. No. 99
The axoneme is the core of cilia and flagella, consisting of microtubules arranged in a 9+2 structure (nine doublet microtubules surrounding two central singlet microtubules). This arrangement is essential for the movement of these structures.

Q.157 (3)
New NCERT Pg. No. 99
In the diagrammatic representation of the internal structure of cilia/flagella:
A is the plasma membrane that surrounds the entire structure.
B is the interdoublet bridge connecting microtubules.
C is the central microtubule.
D is the radial spoke, which connects the outer microtubules to the central pair.
This arrangement supports the typical 9+2 microtubule structure of axonemes.

Q.158 (3)
New NCERT Pg. No. 96
Statement-I: In plant cells, the vacuoles can occupy up to 90% not 10% of the cell volume, especially in mature plant cells, where they store water, ions, and nutrients. This is incorrect.
Statement-II: The vacuole is bound by a membrane called the tonoplast, which regulates the movement of substances into and out of the vacuole. This is also correct.

Q.159 (3)
New NCERT Pg. No. 98
Assertion: "In prokaryotes, ribosomes are associated with the plasma membrane of the cell" - This is true. In prokaryotes, ribosomes are often attached to the plasma membrane where protein synthesis occurs.
Reason: "Only one type of ribosomes having 40S and 30S subunits are found in prokaryotes" - This is false. Prokaryotes have 70S ribosomes, composed of 50S and 30S subunits, not 40S.
Thus, the assertion is correct, but the reason is false.

Q.160 (1)
New NCERT Pg. No. 91
Plant cells differ from animal cells by having:
A large central vacuole, which maintains turgor pressure.
Plastids, such as chloroplasts, responsible for photosynthesis.
A rigid cell wall made of cellulose that provides structural support.
Animal cells lack these structures, making this the correct answer.

Q.161 (1)
New NCERT Pg. No. 94
Assertion: "Polar molecules require a carrier protein to facilitate their transport across the membrane" - This is true. Polar molecules cannot pass through the nonpolar lipid bilayer without assistance.
Reason: "Polar molecules cannot pass through the nonpolar lipid bilayer" - This is also true. The hydrophobic core of the lipid bilayer prevents polar molecules from crossing freely.
Since the reason explains the assertion, option (1) is correct.

Q.162 (3)
New NCERT Pg. No. 98
Assertion: "The eukaryotic ribosomes are 80s and made up of two subunits" - This is true.
Eukaryotic ribosomes are 80s, consisting of 60s and 40s subunits.
Reason: "The two subunits of 80s ribosomes are 50s and 30s" - This is false. 50s and 30s are the subunits of prokaryotic 70s ribosomes, not eukaryotic ribosomes.
Thus, the assertion is correct, but the reason is incorrect.

Q.163 (4)
New NCERT Pg. No. 95, 96
The cis and trans faces of the Golgi apparatus are not exactly the same.
The cis face is the receiving side, close to the endoplasmic reticulum, while the trans face is the maturing side that sends out vesicles. These faces are functionally distinct, and while they are connected by the Golgi cisternae, they are not identical.

Q.164 (3)
New NCERT Pg. No. 100
The nucleolus is a membraneless, spherical structure found within the nucleus of eukaryotic cells. It is responsible for synthesizing ribosomal RNA (rRNA) and assembling ribosomes.

Q.165 (1)
New NCERT Pg. No. 109
Lipids are not strictly macromolecules like proteins or nucleic acids, but they are present in large quantities in tissues and remain in the retentate after chemical analysis.

Q.166 (3)
- Glycine is the simplest amino acid, having just a hydrogen atom as its side chain (R group).
- Rubber is a secondary metabolite, not primary.
- Carbonic anhydrase is a lyase, not a hydrolase.
- Adenine and cytidine are nucleotides, not nucleosides.

Q.167 (4)
New NCERT Pg. No. 109
Proteins constitute a higher percentage of total cellular mass than lipids but less than nucleic acids, making them more abundant than lipids but not as much as nucleic acids in the cell.

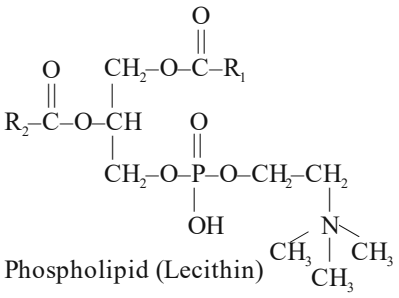
Q.168 (2)
New NCERT Pg. No. 117
Lyases are enzymes that catalyze the removal of groups from substrates through mechanisms other than hydrolysis, such as elimination reactions or the breaking of chemical bonds by means other than hydrolysis and oxidation.

Q.169 (2)
New NCERT Pg. No. 118
The enzyme catalase, which catalyzes the breakdown of hydrogen peroxide (H_2O_2), has a haem group as its prosthetic group. This haem group is essential for the enzyme's activity.

Q.170 (4)
New NCERT Pg. No. 110
Cellulose does not give a positive test with iodine, whereas starch, glycogen, and amylopectin do, because cellulose has a different structure that doesn't form a complex with iodine.

Q.171 (3)
New NCERT Pg. No. 108
Primary metabolites include compounds directly involved in growth, development, and reproduction, such as sugars and amino acids. These are essential for the basic functioning of an organism. Secondary metabolites, like alkaloids and drugs, are not directly involved in primary metabolic processes.

Q.172 (1)
New NCERT Pg. No. 107
The formula shown in the diagram represents lecithin.



Phospholipid (Lecithin)

Q.173 (2)
New NCERT Pg. No. 107
The chemical formula $CH_3(CH_2)_{14}$–COOH corresponds to palmitic acid, a 16-carbon saturated fatty acid commonly found in animals and plants.

Q.174 (1)
New NCERT Pg. No. 108
The correct matches are:
Lectins (ii): Concanavalin-A.
Drugs (iii): Vinblastine.
Polymeric substance (iv): Rubber.
Alkaloids (i): Codeine.

Q.175 (1)
New NCERT Pg. No. 126
A pair of synapsed homologous chromosomes is known as a bivalent.
Each bivalent consists of two homologous chromosomes that align side by side during meiosis I.

Q.176 (3)
New NCERT Pg. No. 125
Mitosis is primarily responsible for growth, repair, and maintaining the chromosome number. It does not introduce genetic variation, which is a function of meiosis.

Q.177 (4)
New NCERT Pg. No. 121
The movement of chromatids to opposite poles occurs during anaphase, not the first stage of karyokinesis. The first stage of karyokinesis is prophase, where chromosomes condense, and the mitotic apparatus begins to form.

Q.178 (1)
New NCERT Pg. No. 123
Statement-I: Complete disintegration of the nuclear envelope marks the start of metaphase - This is correct.
Statement-II: Chromosomes are spread throughout the cytoplasm - This is correct.

Q.179 **(2)**
New NCERT Pg. No. 121
Statement-I: In the S phase, the amount of DNA per cell doubles as DNA is replicated.
Statement-II: The G_2 phase is the interval between the completion of DNA replication and the start of mitosis. Therefore, it is incorrect.

Q.180 (2)
New NCERT Pg. No. 121, 125, 126
The M phase is actually a relatively short phase of the cell cycle. The majority of the cell cycle is spent in interphase (G_1, S, G_2 phases), where growth and DNA replication occur.

Q.181 (2)
New NCERT Pg. No. 126
Crossing over occurs between non-sister chromatids of homologous chromosomes within a bivalent during prophase I of meiosis, allowing for genetic recombination.

Q.182 (4)
New NCERT Pg. No. 121
After DNA replication in the S phase, the amount of DNA remains at 4C during G_2 and M phases, before being halved in daughter cells after cytokinesis.

Q.183 (1)
New NCERT Pg. No. 126, 127
During anaphase I of meiosis, homologous chromosomes (not sister chromatids) are separated and move to opposite poles of the cell.

Q.184 (3)
New NCERT Pg. No. 123
In anaphase, sister chromatids are pulled apart to opposite poles and are then referred to as daughter chromosomes, which will form the chromosomes of the daughter nuclei.

Q.185 (4)
New NCERT Pg. No. 123
During anaphase, chromatids separate and Splitting of centromere occurs.

SECTION-B

Q.186 (1)
New NCERT Pg. No. 90, 91
The mesosome is a bacterial structure involved in DNA replication, cell wall formation, and distribution of DNA during cell division. It is not involved in food synthesis, which is why option (1) is incorrect.

Q.187 (4)
New NCERT Pg. No. 94
Algal cell walls contain cellulose, galactans, and mannans, but hemicellulose is typically found in the cell walls of land plants, not algae.

Q.188 (2)
New NCERT Pg. No. 101
The correct matches between the types of chromosomes and the positions of their centromeres are:
Metacentric (IV): Middle centromere.
Submetacentric (III): Centromere slightly away from the center.
Acrocentric (II): Centromere very close to the end.
Telocentric (I): Terminal centromere.

Q.189 (2)
New NCERT Pg. No. 99
Statement-I: "Cilia and flagella are hair-like outgrowths of the cell membrane" - This is correct. Both structures protrude from the cell membrane and are involved in movement.
Statement-II: "Prokaryotic flagella is structurally similar to eukaryotic flagella" - This is incorrect. Prokaryotic flagella have a simpler structure and work differently from eukaryotic flagella, which have a 9+2 microtubule arrangement.

Q.190 (1)
New NCERT Pg. No. 100
The nucleoplasm is the substance within the nucleus, containing the nucleolus, where ribosomes are synthesized, and chromatin, which is the complex of DNA and protein that makes up chromosomes.

Q.191 (4)
New NCERT Pg. No. 108
Lipids are not polymers. They are composed of fatty acids and glycerol but do not form long chains like proteins, nucleic acids, or polysaccharides.

Q.192 (3)
New NCERT Pg. No. 106
Uridine is a nucleoside, not a nucleotide, because it lacks a phosphate group. Nucleotides like adenylic acid, guanylic acid, and cytidylic acid contain a phosphate group.

Q.193 (3)
New NCERT Pg. No. 117
Hydrolases are enzymes that catalyze the hydrolysis of bonds, including ester, ether, peptide, and glycosidic bonds.

Q.194 (2)
New NCERT Pg. No. 106
Arachidonic acid has 20 carbon atoms and is a polyunsaturated fatty acid.

Q.195 (4)
New NCERT Pg. No. 105
When a tissue is fully burnt, nucleic acids are not found in the remaining ash because they are composed of organic molecules that are oxidized during combustion.

Q.196 (2)
New NCERT Pg. No. 123
In metaphase, spindle fibers attach to the kinetochores of chromosomes, aligning them at the metaphase plate.

Q.197 (3)
New NCERT Pg. No. 126
The enzyme recombinase catalyzes the crossing over and exchange of genetic material between homologous chromosomes during meiosis, specifically in prophase I.

Q.198 (2)
New NCERT Pg. No. 121
During the S phase, DNA content doubles because DNA is replicated.
The incorrect part of the statement is the claim that there is no change in DNA content.

Q.199 (2)

New NCERT Pg. No. 121, 126

a: Diakinesis represents the final stage of prophase I, not the transition to telophase I - This is incorrect.

b: The leptotene and zygotene stages are relatively short-lived compared to pachytene - This is incorrect.

d: The centriole duplicates during the G_2 phase in animal cells - This is correct.

Q.200 (1)

New NCERT Pg. No. 120

The cell cycle refers to the sequence of events by which a cell duplicates its genome, synthesizes cellular components, and divides into two daughter cells.