ANSWER KEY
NEET (FINAL TRACK)
PART TEST-07 (XII)

PHYSICS

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

CHEMISTRY

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

BIOLOGY

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

SOLUTIONS

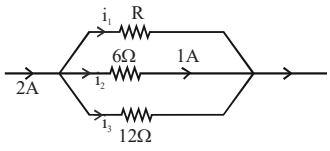
PHYSICS
SECTION-A

Q.1 (1)

$\vec{J} = ne\vec{V}$

$\vec{J} = \rho\vec{V}$

Q.2 (3)



$i_1 = i_2 = i_3 = \frac{1}{R} = \frac{1}{6} = \frac{1}{12}$

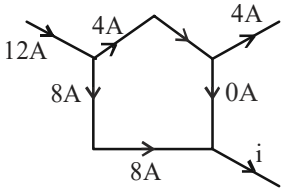
$i_2 = \frac{\frac{1}{6}}{\frac{1}{R}+\frac{1}{6}+\frac{1}{12}} \times 2 = 1$

$\frac{1}{3} = \frac{1}{R}+\frac{1}{6}+\frac{1}{12}$

$\frac{1}{R} = \left(\frac{1}{3}-\frac{1}{6}\right)-\frac{1}{12} = \frac{1}{6}-\frac{1}{12} = \frac{1}{12}$

$R = 12\,\Omega$

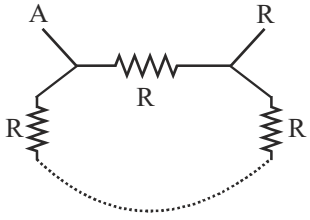
Q.3 (4)

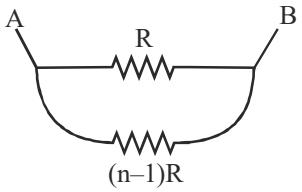


$i = 8 + 0$

$= 8A$

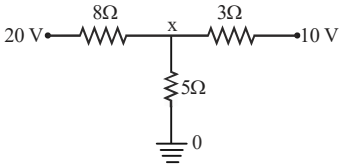
Q.4 (3)





$$R_{AB} = \frac{(n-1)R.R}{(n-1)R+R} = \frac{n-1}{n}R$$

Q.5 (1)



$$\frac{x-0}{5}+\frac{x-20}{8}+\frac{x-10}{3}=0$$

$$x\left(\frac{1}{5}+\frac{1}{8}+\frac{1}{3}\right)=\frac{20}{8}+\frac{10}{3}=\frac{140}{24}$$

$$x\left(\frac{(8+5)}{40}+\frac{1}{3}\right)=\frac{140}{24}$$

$$x\left(\frac{79}{40\times3}\right)=\frac{140}{24}$$

$$x=\frac{140\times40\times3}{24\times79}$$

$$i=\frac{x}{5}=\frac{140\times40\times3}{24\times79\times5}=1.77A$$

Q.6 (1)

$$i=\frac{10}{6}=\frac{5}{3}A$$

Q.7 (4)

$$\frac{P}{N}=20$$

$NP=2000$

$N(20N)=2000$

$N^2=100$

$N=10$

Q.8 (3)

$I=neAV_d$

$$\frac{(V_d)_1}{(V_d)_2}=\frac{I_1}{I_2}=\frac{4I}{3I}$$

$$(V_d)_2=\frac{3}{4}V_d$$

Q.9 (2)

$V_d=\mu E$

$$\mu=\frac{V_d}{E}=\frac{25\times10^{-6}}{5}$$

$=5\times10^{-6}\ m^2\ V^{-1}\ s^{-1}$

Q.10 (2)

$$<i>=\frac{\int idt}{\int dt}=\frac{\text{Area under } i-t \text{ curve}}{\Delta t}$$

$$=\frac{\frac{1}{2}(8+4)\times8-\frac{1}{2}\times8\times2}{10}$$

$$=\frac{48-8}{10}=\frac{40}{10}=4A$$

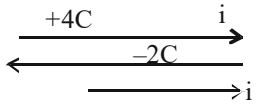
Q.11 (1)

Work of voltmeter to measure the voltage so, it should not draw the current from the circuit

$\therefore R=\infty$ (for ideal voltmeter)

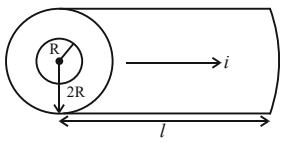
$\therefore$ for galvanometer $\Rightarrow$ R = High connected in series with it

Q.12 (2)



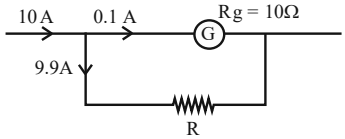
$$i=\frac{2+4}{2}=\frac{6}{2}=3A$$

Q.13 (4)



$$R=\frac{\rho l}{A}=\frac{\rho\times1}{\pi\left((2R)^2-R^2\right)}=\frac{\rho l}{3\pi R^2}$$

Q.14 (3)



From the figure

$0.1\times10=9.9\times R$

$$R=\frac{10}{99}\ \Omega$$

Q.15 (1)

$\Delta R = R_0(\alpha \Delta T)$

$15 - 10 = 10 \times \alpha \times 200$

$5 = 10 \times \alpha \times 200$

$\Rightarrow \alpha = \frac{1}{400}\,°C^{-1}$

Q.16 (4)

The resistance of an ideal voltmeter is infinite.

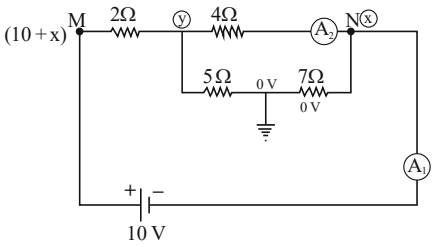
Q.17 (2)

Work done by battery = εIt

$540 = \varepsilon \times 2 \times 3 \times 60$

$\varepsilon = \frac{540}{6\times60} = \frac{540}{360} = \frac{3}{2}$ V

Q.18 (1)



using nodal analysis

$\frac{y-(10+x)}{2} + \frac{y-0}{5} + \frac{y-x}{4} = 0$

$\Rightarrow -15x + 19y = 100$ ..... (1)

$\frac{y-0}{5} = \frac{0-x}{7}$

$7y = -5x$

$5x + 7y = 0$ ..... (2)

on solving (1) and (2)

$x = -3.5$ v

$y = 2.5$ v

Now, (ii) reading of $A_2 = \frac{y-x}{4}$

$= \frac{(2.5)-(-3.5)}{4} = 1.5A$

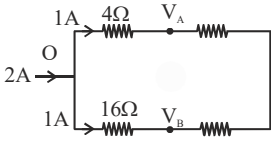
potential of M = 10 + x

= 10 + (–3.5) = 6.5 v

potential of N = x = – 3.5 v

Q.19 (4)

Q.20 (1)



$V_A - 0 = -4V$

$V_B = -16V$

$V_A - V_B = 12V$

Q.21 (4)

$B_0 = \frac{\mu_0 i}{2R}$

$B' = \frac{n \times \mu_0 i}{2R'}; 2\pi R' \times R \times n = 2\pi R \Rightarrow R' = \frac{R}{n}$

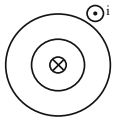
$B' = \frac{n \times \mu_0 i}{2\frac{R}{n}} = \frac{n^2 \mu_0 i}{2R} = n^2 B_0$

Q.22 (3)

$F = q\left(\vec{V} \times \vec{B}\right)$

If V = 0 = charge is at rest then F = 0

Q.23 (1)

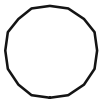


Outside the cable

$\oint \vec{B}.d\vec{l} = \mu(i - i)$

$B = 0$

Q.24 (2)



$L = 2\pi r \Rightarrow r = \frac{L}{2\pi}$

$M = IA = (I)\pi\left(\frac{L}{2\pi}\right)^2 = \frac{IL^2}{4\pi}$

Q.25 (1)

$M = NiA = 10 \times 0.5 \times 2 \times 10^{-4} = 10^{-3}\,Am^2$

$B = \mu_0 ni = 4\pi \times 10^{-7} \times 10^3 \times 3$

$= 12\pi \times 10^{-4}$ T

$\tau = MB \sin 90°$

$= 10^{-3} \times 12\pi \times 10^{-4} = 12\pi \times 10^{-7}$ N–m

Q.26 (1)

$T = \frac{2\pi m}{qB} \Rightarrow f = \frac{qB}{2\pi m}$

Frequency is independent of speed

$\therefore f_1 = f_2$

Q.27 (3)

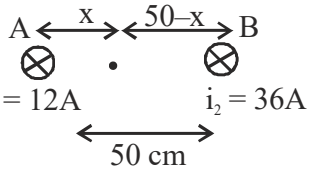
$\frac{1}{2}mV_f^2 = \frac{1}{2}\left(\frac{1}{2}mV_i^2\right)$

$$V_f = \frac{V_i}{\sqrt{2}}$$

$$\therefore r = \frac{mV}{qB} \Rightarrow r \propto v$$

$$r_f = \frac{r_i}{\sqrt{2}}$$

Q.28 (4)

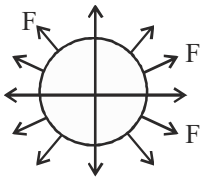


$$\frac{\mu_0 i_1}{2\pi x} = \frac{\mu_0 i_2}{2\pi(50-x)}$$

$$\frac{12}{x} = \frac{36}{50-x}$$

$$3x = 50 - x \quad \Rightarrow x = \frac{50}{4} = 12.5\,\text{cm}$$

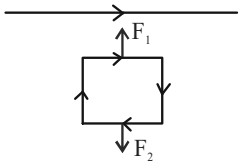
Q.29 (2)



$$F = i\left(\vec{l} \times \vec{B}\right)$$

It will have tendency to expand

Q.30 (1)



$F_1 > F_2$

$F_{net} = F_1 - F_2$ = Net attractive force towards conductor

Q.31 (3)

Q.32 (3)

$$B = \frac{\mu_0 i}{2R}, \quad M = iA$$

$$\frac{B}{M} = \frac{\mu_0}{2AR} = \frac{\mu_0}{\left(2\pi R^2\right)R} = \frac{\mu_0}{2\pi R^3} = x$$

$$\text{Now } I' = 2I,\ r' = \frac{R}{2}$$

$$\frac{B}{M} = \frac{\mu_0}{2\pi(R/2)^3} = 8x$$

Q.33 (2)

$$r = \frac{mV}{qB} = \sqrt{\frac{2mK.E}{qB}}$$

$$\frac{r_P}{r_D} = \sqrt{\frac{m_p}{m_D}} \times \frac{q_D}{q_P} = \sqrt{\frac{m}{2m}} \times \frac{e}{e} = \frac{1}{\sqrt{2}}$$

Q.34 (2)

$$B = \frac{\mu_0 i}{4\pi R}\left(\frac{\pi}{2}\right)\odot + \frac{\mu_0 i}{4\pi(2R)}\left(\frac{\pi}{2}\right)\odot + \frac{\mu_0 i\pi}{4\pi(3R)}\otimes$$

$$= \left(\frac{\mu_0 i}{8R} + \frac{\mu_0 i}{16R}\right)\odot + \frac{\mu_0 i}{12R}\otimes$$

$$= \left(\frac{\mu_0 i}{8R} + \frac{\mu_0 i}{16R} - \frac{\mu_0 i}{12R}\right)\odot$$

$$= \frac{6\mu_0 i + 3\mu_0 i - 4\mu_0 i}{48R}\odot = \frac{5\mu_0 i}{48R}\odot$$

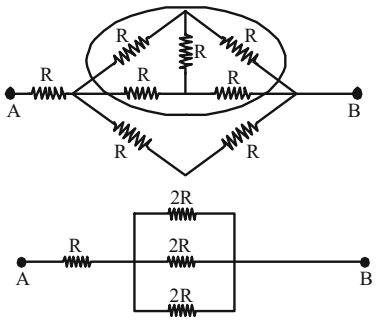
Q.35 (3)

In the formula $\oint \vec{B}.\vec{dl} = \mu_0 I_{endosed}$ the magnetic field $\left(\vec{B}\right)$ is due to current elements which are inside as well as outside the loop.

SECTION-B

Q.36 (3)

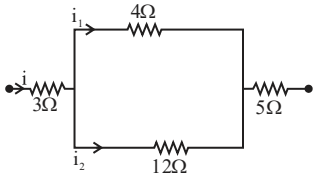
Balanced W.S.B.



$$R_{AB} = R + \frac{2R}{3} = \frac{5R}{3}$$

Q.37 (3)

$P_{12} = 12\text{W}$



$$i_2 = \frac{4}{16} \times i = \frac{1}{4} i$$

$\because P_{12} = i_2^2 \times 12$

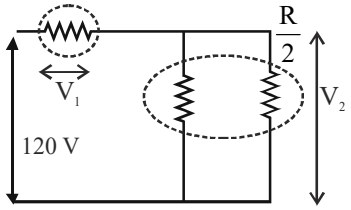
$12 = \left(\frac{i}{4}\right)^2 \times 12$

$i^2 = 16$

$i = 4A$

so $P_3 = i^2 \times 3 = (4)^2 \times 3 = 48W$

Q.38 (3)



$V_1 = \frac{R}{R + \frac{R}{2}} \times 120 = \frac{2}{3} \times 120 = 80V$

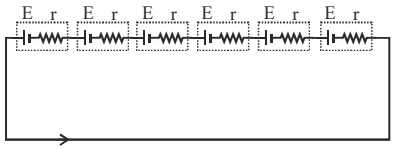
$V_2 = \frac{\frac{R}{2}}{R + \frac{R}{2}} V = \frac{1}{3} \times 120 = 40V$

$R = \frac{V^2}{P} = \frac{120 \times 120}{60} = 240\,\Omega$

$P = \frac{V_1^2}{R} + 2\frac{V_2^2}{R} = \frac{80 \times 80}{240} + \frac{2 \times 40 \times 40}{240}$

$= \frac{80}{3} + \frac{40}{3} = \frac{120}{3} = 40W$

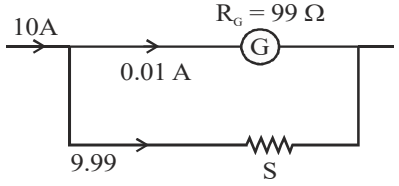
Q.39 (2)



$i = \frac{5E - E}{6r} = \frac{4E}{6r} = \frac{2E}{3r}$

$\Delta V_A = E + ir = E + \left(\frac{2E}{3r}\right) r = \frac{5E}{3}$

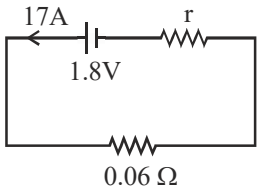
Q.40 (1)



$99 \times 0.01 = S \times 9.99$

$S = \frac{99 \times 0.01}{9.99} = 0.1\Omega$ (In parallel)

Q.41 (1)



$17 \times 0.06 = 1.8 - 17r$

$17r = 0.78$

$r = 0.046\,\Omega$

Q.42 (4)

$i = neAV_d$

$1.6 = n \times 1.6 \times 10^{-19} \times 4 \times 10^{-6} \times \frac{2}{40 \times 10^3}$

$n = \frac{40}{8} \times 10^{28} = 5 \times 10^{28}\,m^{-3}$

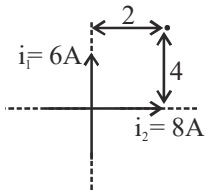
Q.43 (4)

This is a case of balanced wheat stone bridge so no current is drawn by 20Ω.

Q.44 (4)

$B_{net} = B_1 - B_2$

$= \frac{\mu_0 i_1}{2\pi r_1} - \frac{\mu_0 i_2}{2\pi r_2}$

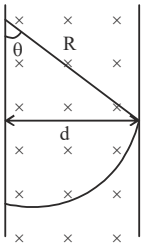


$= \frac{\mu_0}{2\pi}\left(\frac{i_1}{r_1} - \frac{i_2}{r_2}\right) = \frac{4\pi \times 10^{-7}}{2\pi}\left(\frac{6}{2} - \frac{8}{4}\right) = 2 \times 10^{-7}\,T$

Q.45 (2)

$r = \frac{P}{qB} = \frac{\sqrt{2mk}}{qB}$

Given they have same kinetic energy



$r \propto \frac{\sqrt{m}}{q}$

$\frac{r_1}{r_2} = \frac{\sqrt{4}}{2} \times \frac{3}{\sqrt{16}} = \frac{3}{4}$; $r_2 = \frac{4r_1}{3}$

(r_2 is for hearier ion and r_1 is for lighter ion)

$\sin\theta = \frac{d}{R}$

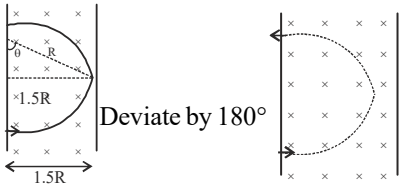
$\theta \rightarrow$ Deflection

$\theta \propto \frac{1}{R}$

(R → Radius of path)

$\because R_2 > R_1 \Rightarrow \theta_2 < \theta_1$

Q.46 (4)



Q.47 (4)

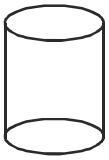
Ampere's circuital law states that line integral of the magnetic field around any closed path in free space or vacuum is equal to μ_0 times of the net current or the total current which is crossing through the area bounded by the closed path. Mathematically

$\oint \vec{B}.\vec{d\ell} = \mu_0 \Sigma I$

In this case, $\Sigma I = (I_1 + I_2 + I_3)$

Hence, $\oint \vec{B}.\vec{dl} = \mu_0 (I_1 + I_2 + I_3)$

Q.48 (3)

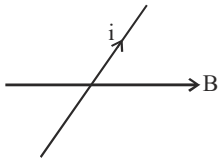


Inside : $\oint \vec{B}.\vec{dl} = \mu_0(0), B = 0$

Outside : $B = \frac{\mu_0 i}{2\pi r} \neq 0$

$\underset{\text{outside}}{E = 0}$ ($\because$ no. of e^- = no. of proton)

Q.49 (2)



$F = i(\vec{l} \times \vec{B}) = iIB \sin 45°$

$= 10 \times l \times 0.2 \times \frac{1}{\sqrt{2}}$

$\frac{F}{l} = \frac{2}{\sqrt{2}} N/m$

Q.50 (1)

$B = \frac{\mu_0 I}{4\pi R}\theta$ (For an arc)

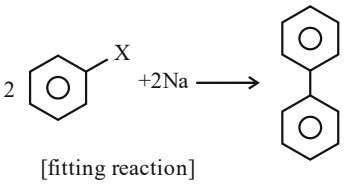
$B_{net} = \frac{\mu_0 I}{4\pi R}\left(\frac{\pi}{3}\right)\otimes + \frac{\mu_0 I}{4\pi(2R)}\left(\frac{\pi}{3}\right)\odot$

$= \frac{\mu_0 I}{4\pi R}\left(\frac{\pi}{3}\right) - \frac{\mu_0 I}{4\pi R}\left(\frac{\pi}{6}\right)\otimes$

$= \frac{\mu_0 I}{4\pi R} \times \left(\frac{\pi}{6}\right)\otimes = \frac{\mu_0 I}{24R}\otimes$

CHEMISTRY
SECTION-A

Q.51 (2)



[fitting reaction]

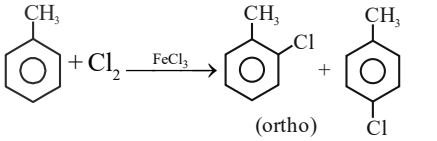
Q.52 (1)

In S_N1 reaction intermediate is carbocation.

Q.53 (1)

Facts

Q.54 (1)



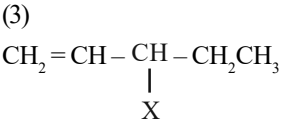
Q.55 (2)

Enantiomers are non superimposable on mirorr images.

Q.56 (2)

The benzylic and allylic positions are good for nucleophilic substitution due to formation of stable intermediate and transition state.

Q.57 (3)

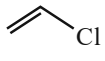


(Allylic halide)

Q.58 (3)
Benzyl halide is aliphatic halide.

Q.59 (4)

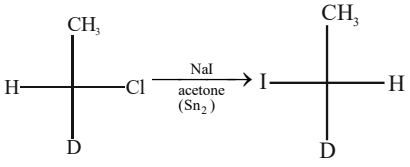
Rate of reaction for $S_N2 \propto \frac{1}{\text{Steric hindrance}}$

$CH_3 - Cl >$  $>$ 

[Due to double bond character in C – Cl bond]

Q.60 (1)
For isomeric alkyl halides order of boiling point is
$1° > 2° > 3°$.

Q.61 (3)



In S_N2 inversion of configuration will take place.

Q.62 (1)
Alkyl fluoride are generally prepared by Swartz reaction.

$R - X \xrightarrow[H_2O]{AgF} R.F$

Q.63 (3)
Alkyl halides are more reactive towards nucleophilic substitution reaction than arylhalides.

Q.64 (1)

Reactivity towards $S_N2 \propto \frac{1}{\text{Steric hindrance}}$

Q.65 (2)
According to rate law rate $\propto [NO]^2 [Cl_2]$ rate is depended on concentration of NO and Cl_2 but rate constant is a fix quantity for a reaction which depend on temperature not on concentration.

Q.66 (3)

$X + 2Y \xrightarrow{K} 3Z$

for this elementary reaction:

rate $= K [X] [Y]^2$ ....(i)

$$\text{rate} = \frac{-d[X]}{dt} = \frac{-1}{2}\frac{d[Y]}{dt} = \frac{1}{3}\frac{d[Z]}{dt} \quad \text{....(ii)}$$

So; we can say from equal (i) and (ii)

$$\frac{-d[X]}{dt} = \frac{-1}{2}\frac{d[Y]}{dt} = \frac{1}{3}\frac{d[Z]}{dt} = K [X] [Y]^2$$

Q.67 (2)
A reaction involving two different reactants can never be a unimolecular reaction because at least two molecule will collide each other in the reaction.

Q.68 (2)
If concentration of (X) doubles, rate of reaction also doubles means concentration of (X) has power one.
So, order w.r.t. (x) = 1.
Hence, over all order = 3 so, w.r.t. (Y) order = 2
$r = K[X]^1[Y]^2$

Q.69 (4)

$$\log_{10} K = \log_{10} A - \frac{E_a}{2.303R} \times \left(\frac{1}{T}\right)$$

On comparing above equation by a straight line equation; we get slope $= \frac{-E_a}{2.303R}$

Q.70 (1)
Given $K = 10^{-1}\ s^{-1}$ for first order reaction

$$t = \frac{2.303}{K} \times \log \frac{A_0}{A_b}$$

$$t = \frac{2.303}{10^{-1}} \times \log \frac{100}{25}$$

$t = 13.86$ sec

Q.71 (1)
Given rate law:
$rate_i = k [A_i] [B_i]$ ....(i)
on decreasing volume of container by 8 time new concentration of A and B becomes 8 times of initial.
So, new rate is given as
$r_{new} = K [8Ai] [8Bi]$ ....(ii)
On comparing (i) and (ii):
$r_{new} = 64\ r_{initial}$

Q.72 (3)
Unit of A will be same as that of rate constant (k); and for first order reaction unit of k is sec^{-1}.
So unit of A is S^{-1}.

Q.73 (1)
Given $r_2 = 3r_1$ so
$k_2 = 3k_1$, $T_1 = 300\ k$
$E_a = ?$ $T_2 = 310\ k$

$$\log \frac{k_2}{k_1} = \frac{E_a}{2.3R} \times \left(\frac{T_2 - T_1}{T_1 T_2}\right)$$

$$\log \frac{3k_1}{k_1} = \frac{E_a}{2.3 \times 2 \times 10^{-3}} \times \left(\frac{310 - 300}{310 \times 300}\right)$$

$E_a = 20.41\ kCal\ mol^{-1}$

Q.74 (3)

Given rate constant (k) = 1.5 M min^{-1}

from the unit of rate constant the reaction is of zero order

$A_t = A_0 - k_t$

$k = \frac{A_0 - A_t}{t}$ for 75% completion of reaction;

$A_t = 25\% A_0$

$A_{t_1} = 0.25 A0$

$$\frac{A_0 - A_{t_1}}{t_1} = \frac{A_0 - A_{t_2}}{t_2}$$

$$\frac{A_0 - 0.25A_0}{50} = \frac{A_0 - A_{t_2}}{100}$$

$1.5 A_0 = A_0 - A_{t_2}$

$A_t = -0.5 A_0$

since A_t is negative; so no reactant will left after 100 min.

Q.75 (4)

$t_{87.5\%} = 3t_{1/2}$ (for first order reaction)

$t_{\frac{1}{2}} \propto (R_0)$ (for zero order reaction)

Q.76 (4)

$2A \rightarrow B + 3C$

$$\frac{1}{2} \times \left(\frac{d[A]}{dt}\right) = \frac{d[B]}{dt} = \frac{1}{3} \times \frac{d[C]}{dt}$$

$$\frac{1}{2} \times k_1[A]^2 = k_2[A]^2 = \frac{1}{3} \times k_3[A]^2$$

$$\frac{1}{2} \times k_1 = k_2 = \frac{1}{3} k_3$$

Q.77 (2)

rate = $k [A]^x [B]^y [C]^z$

$5 \times 10^{-3} = k [0.01]^x [0.005]^y [0.01]^z$ .....(i)

$5 \times 10^{-3} = k [0.01]^x [0.005]^y [0.015]^z$ .....(ii)

$1 \times 10^{-2} = k [0.01]^x [0.01]^y [0.01]^z$ .....(iii)

$2.5 \times 10^{-2} = k [0.05]^x [0.05]^y [0.01]^z$ .....(iv)

From (i) and (ii); $z = 0$

from (ii) and (iii); $y = 1$

from (ii) and (iv); $x = 1$

Q.78 (2)

Effect of temperature on rate of reaction is given by Arrhenius equation.

Q.79 (4)

Since concentration of reactant becomes half when reactant becomes 0.25M from 0.5M in 10 sec; so half life period is 10 sec.

Q.80 (2)

By powdering the lumps of coal surface area of carbon increases which result in increase in rate of reaction.

Q.81 (2)

For first order reaction

$$k = \frac{2.303}{k} \log \frac{[A_0]}{[A_t]}$$

$$\text{or } k = \frac{-2.303}{t} \log \frac{[A_t]}{[A_0]}$$

rate = k [A]

Q.82 (2)

$N_2 + 3H_2 \rightarrow 2NH_3$

$$\frac{1}{3} \times \left(\frac{-\Delta[H_2]}{\Delta t}\right) = \frac{1}{2} \times \frac{\Delta[NH_3]}{\Delta t}$$

$$\frac{-\Delta[H_2]}{\Delta t} = \frac{3}{2} \times \frac{\Delta[NH_3]}{\Delta t}$$

$= \frac{3}{2} \times 2 \times 10^{-4} = 3 \times 10^{-4}$ mol L^{-1} s^{-1}

Q.83 (2)

A catalyst catalyse the forward as well as backward reaction to the same extent but donot alter Gibb's energy and also a small amount of catalyse the large amount of reactants.

Q.84 (2)

$\Rightarrow$ Rate of reaction directly proportional to temperature so on increasing temperature rate of reaction increases

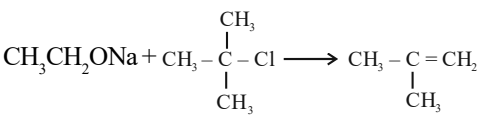
$\Rightarrow$ On increasing temperature fraction of molecules having energy greater than activation energy increases.

Q.85 (3)

Number of collision per second per unit volume of the reaction mixture is known as collision frequency.

SECTION-B

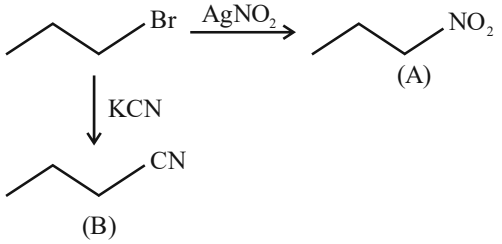
Q.86 (2)



Q.87 (3)

Recemisation will take place in S_N1 reaction.

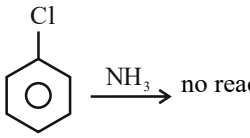
Q.88 (1)



Q.89 (4)

Phenol cannot prepared by sandmeyer reaction.

Q.90 (3)



There is double bond characteristic in C – Cl bond.

Q.91 (2)

Rate law for the given elementary reaction is rate = $K[H_2][I_2]$

rate = $K\left(\frac{mol}{vol}\right)_{H_2} \times \left(\frac{mol}{vol}\right)_{I_2}$ if volume is increased by two times concentration of H_2 and I_2 decreased by 2 times; so new rate will decreased by four time.

Q.92 (3)

From slow step:

rate = $K^1[N_2O_2][O_2]$ ....(i)

here N_2O_2 is intermediate; so it has to be elliminated by using fast step

$$K_C = \frac{[N_2O_2]}{[NO]^2}$$

$[N_2O_2] = K_C[NO]^2$

from equation (i)

rate = $K^1[N_2O_2][O_2]$

= $K^1K_C[NO]^2[O_2]$

rate = $K[NO]^2[O_2]$

Q.93 (4)

At high pressure all the surface available for adsorption gets covered with gas molecules so rate of reaction becomes independent of concentration of gas so order becomes zero.

Q.94 (2)

For completion of reaction $[A_t] = 0$ for zero order reaction

$$t = \frac{A_0 - A_t}{k}$$

$$t = \frac{A_0 - 0}{k}$$

$$t = \frac{a}{k}$$

Q.95 (2)

For $\frac{1}{4}$th completion of reaction $[A_t] = \frac{3}{4}A_0$

For 1st order reaction

$$t = \frac{2.303}{k}\log\frac{A_0}{A_t}$$

$$t = \frac{2.303}{k}\log\frac{A_0}{\frac{3}{4}A_0}$$

$$t = \frac{2.303}{k}\log\frac{4}{3}$$

$$t = \frac{0.287}{k}$$

Q.96 (4)

(1) $r = k[SO_2][SO_3]^{\frac{-1}{2}}$

Overall order = $1 - \frac{1}{2} = \frac{1}{2}$

(2) rate $\propto \frac{1}{[SO_3]^{1/2}}$

(3) order with respect to SO_2 is 1

(4) unit of k = $\frac{\text{unit of rate}}{(\text{unit of conc.})^{1/2}} = \frac{mol\,L^{-1}s^{-1}}{\left[mol\,L^{-1}\right]^{\frac{1}{2}}}$

= $mol^{\frac{1}{2}}L^{-\frac{1}{2}}s^{-1}$

Q.97 (2)

For $t_{75\%}$; A_t = 25% of A_0

$A_t = 0.25\,A_0$

$$k = \frac{A_0 - A_t}{t} = \frac{A_0 - 0.25A_0}{30} = \frac{0.75A_0}{30}$$

For $t_{50\%} = \frac{A_0}{2k} = \frac{A_0 \times 30}{2 \times 0.75A_0}$

= 20 min

Q.98 (3)

(A) Thermal decompostion of HI on gold surface is zero order reaction.

(B) Inversion of cane sugar is pseudo first order reaction.

(C) Hydrogenation of ethene is an example of first order reaction.

(D) Decomposition of gaseous NH_3 on hot platinum surface at high pressure is zero order reaction.

Q.99 (4)

$$\log k = \log A - \frac{E_a}{2.3R} \times \left(\frac{1}{T}\right)$$

above equation represents equation of straight line with negative slope when log k vs $\frac{1}{T}$ graph is plotted.

Q.100 (2)

$2A \rightarrow 3B$

$\frac{1}{2} \times$ rate of disappearance of $A = \frac{1}{3} \times$ rate of appearance of B.

rate of appearance of $B = \frac{3}{2} \times$ rate f disappearance of A.

BIOLOGY-I
SECTION-A

Q.101 (3)

New NCERT Pg. No. 61

The human ABO blood group system is determined by three alleles: I^A, I^B, and i. These alleles can form six different genotypes: IA^AAIA^AA, IA^AAi, IB^BBIB^BB, IB^BBi, IA^AAIB^BB, and ii. These six genotypes give rise to four different phenotypes: blood groups A, B, AB, and O.

Q.102 (4)

New NCERT Pg. No. 76

Down's syndrome occurs due to non-disjunction of chromosome 21 during gamete formation, leading to a trisomy (three copies of chromosome 21). This extra chromosome results in the characteristic features of Down's syndrome.

Q.103 (1)

New NCERT Pg. No. 61

The assertion is true because individuals with AB blood group express both A and B antigens on the surface of their red blood cells. The reason is also true since AB blood groups show codominance, meaning both alleles are expressed equally, making the reason a correct explanation for the assertion.

Q.104 (4)

New NCERT Pg. No. 56

The incorrect statement is that "a homozygous parent produces two kinds of gametes." A homozygous individual (e.g., AA or aa) produces only one kind of gamete (either A or a). In contrast, a heterozygous individual (e.g., Aa) produces two types of gametes, one carrying each allele.

Q.105 (2)

New NCERT Pg. No. 61

The assertion is correct because multiple allelism refers to the existence of more than two alleles for a gene in a population. The reason is also correct, but it does not fully explain the concept of multiple allelism, which involves more than two forms of the gene being present in the population, not just in an individual.

Q.106 (3)

New NCERT Pg. No. 74

The incorrect statement is "The disease/defect is caused by substitution of valine by glutamic acid." In fact, sickle cell anaemia occurs due to the substitution of glutamic acid by valine at the 6th position of the beta-globin chain, which causes the red blood cells to assume a sickle shape, leading to various health complications.

Q.107 (4)

New NCERT Pg. No. 68

In Drosophila, yellow body, white eyes, and miniature wings are all recessive traits. For these traits to be expressed in an individual, the organism must be homozygous recessive for each of these traits.

Q.108 (2)

New NCERT Pg. No. 76

Down's syndrome is caused by trisomy 21, where there is an extra copy of chromosome 21, resulting in a total of three copies of this chromosome. This is due to non-disjunction during gamete formation, leading to developmental abnormalities and the characteristic features of Down's syndrome.

Q.109 (4)

New NCERT Pg. No. 74

Sickle cell anaemia is caused by a point mutation in the beta-globin gene, where the codon for glutamic acid (GAG) is changed to the codon for valine (GUG). This single nucleotide substitution alters the protein's structure, causing red blood cells to take on a sickle shape under low oxygen conditions.

Q.110 (1)
New NCERT Pg. No. 63
This is a dihybrid cross involving two traits: plant height (Tt) and seed colour (Yy). The possible combinations of the alleles give a phenotypic ratio of 3 tall and green plants to 1 dwarf and green plant.

Q.111 (1)
New NCERT Pg. No. 61
The man has blood group A and is heterozygous (I^Ai), and the woman has blood group B and is also heterozygous (I^Bi). The possible offspring genotypes from this cross are I^AI^B, I^Ai, I^Bi, and ii. The chances of having a child with blood group AB (I^AI^B) are 25%.

Q.112 (4)
New NCERT Pg. No. 72
The incorrect statement is "Change in a single base pair of DNA does not cause mutation." In fact, a change in a single base pair, known as a point mutation, can lead to significant changes in an organism's genetic code and potentially cause diseases like sickle cell anaemia.

Q.113 (3)
New NCERT Pg. No. 73
Since the man is normal but his father was colour-blind, he carries a normal X chromosome and a Y chromosome. The woman also has a normal vision but her father was colour-blind, making her a carrier (XhX). Their daughter gets Xh chromosome from her mother, making her a carrier of colour blindness. Therefore 0% chances of being colourblind.

Q.114 (1)
New NCERT Pg. No. 89
If hybrid DNA is allowed to replicate for two generations in N^{14} medium (light nitrogen), after the second generation, 75% of the DNA will be light ($N^{14}N^{14}$), and 25% will be hybrid (N^{14} N^{14} N^{15}). No heavy DNA (N^{15} N^{15}) will remain after two generations of replication.

Q.115 (3)
New NCERT Pg. No. 81
The base pairing between two strands of polynucleotide chains is a hallmark feature of double helix model of DNA.

Q.116 (2)
New NCERT Pg. No. 84
Heterochromatin is the part of chromatin that is tightly packed and stains darkly in microscopic observations. It is typically transcriptionally inactive, meaning that the genes in these regions are not being expressed.

Q.117 (1)
New NCERT Pg. No. 95, 100
The presence of introns is reminiscent of antiquity, and the process of splicing represents the dominance of RNA-world. In recent times, the understanding of RNA and RNA-dependent processes in the living system have assumed more importance.

Q.118 (1)
New NCERT Pg. No. 80
Adenine is a purine, not a pyrimidine. The pyrimidines in DNA and RNA are cytosine, thymine, and uracil (which replaces thymine in RNA). Pyrimidines are characterized by a single ring structure, while purines, including adenine and guanine, have a double ring structure.

Q.119 (3)
New NCERT Pg. No. 83
Approximately 200 base pairs (bp) of DNA are wrapped around a histone octamer to form a nucleosome, which is the fundamental unit of chromatin structure in eukaryotic cells. This packaging allows long DNA molecules to fit into the relatively small space of the nucleus.

Q.120 (3)
New NCERT Pg. No. 82
Transduction is the process by which foreign DNA is introduced into a cell by a virus or viral vector. It is not part of the central dogma of molecular biology, which involves the processes of replication, transcription, and translation.

Q.121 (2)
New NCERT Pg. No. 100
The lac y gene in the lac operon codes for permease, a protein that increases the permeability of the cell membrane to β-galactosides (such as lactose), allowing lactose to enter the bacterial cell for metabolism.

Q.122 (2)
New NCERT Pg. No. 95
Aminoacylation of tRNA is the process by which an amino acid is attached to its corresponding tRNA molecule. This is not a part of post-transcriptional modification, which includes processes like capping, splicing, and tailing of the mRNA transcript.

Q.123 (3)
New NCERT Pg. No. 103
Expressed Sequence Tags (ESTs) are short sub-sequences of cDNA (complementary DNA) that are used to identify genes that are expressed as RNA. All the genes that are

transcribed to RNA are referred to as expressed sequence tags, and they play a crucial role in gene identification and mapping.

Q.124 (2)
New NCERT Pg. No. 106

The correct sequence of steps in DNA fingerprinting is:
1. Isolation of DNA (II),
2. Digestion of DNA by restriction endonucleases (VI),
3. Separation of DNA fragments by electrophoresis (V),
4. Transferring (blotting) of separated DNA fragments to synthetic membranes (III),
5. Hybridisation using labeled VNTR probe (I),
6. Detection of hybridisation DNA fragments by autoradiography (IV).

Q.125 (1)
New NCERT Pg. No. 90

Statement I is correct as DNA polymerases catalyze DNA synthesis in the 5' to 3' direction. Statement II is also correct because DNA replication is continuous on the leading strand and discontinuous on the lagging strand, forming short fragments called Okazaki fragments.

Q.126 (3)
New NCERT Pg. No. 80

The matching of organisms with their genome sizes is:
• Bacteriophage φ × 174 (a) has a genome size of 5386 nucleotides (ii).
• Bacteriophage lambda (b) has a genome size of 48502 base pairs (i).
• Escherichia coli (c) has a genome size of 4.6×10^6 base pairs (iv).
• Haploid content of human DNA (d) has 3.3×10^9 base pairs (iii).
Thus, the correct match is a(ii), b(i), c(iv), d(iii).

Q.127 (1)
New NCERT Pg. No. 84

The S strain of Streptococcus pneumoniae produces smooth colonies because it has a polysaccharide coat that protects it from the host immune system. The R strain, which lacks this coat, forms rough colonies and is avirulent (non-pathogenic).

Q.128 (1)
New NCERT Pg. No. 106

Statement I is correct because even a small amount of DNA from a single cell is sufficient for DNA fingerprinting. However, Statement II is incorrect because DNA from different tissues of the same individual shows the same degree of polymorphism; polymorphic regions are identical in every cell of an individual.

Q.129 (3)
New NCERT Pg. No. 119

According to Darwin, evolution is driven by small, directional variations that accumulate over time. These variations provide certain individuals with advantages in survival and reproduction, leading to changes in the population. Darwin emphasized gradual changes rather than large, sudden mutations (saltations).

Q.130 (1)
New NCERT Pg. No. 124, 125

The correct chronological order of human evolution is:
i. Ramapithecus (an early hominid),
ii. Australopithecines (early bipeds),
iii. Homo habilis (the first tool-user),
iv. Homo erectus (the first to use fire and travel long distances),
v. Homo sapiens (modern humans).

Q.131 (4)
New NCERT Pg. No. 115, 116

Analogous structures are a result of convergent evolution - different structures evolving for the same function and hence having similarity.

Q.132 (1)
New NCERT Pg. No. 115

The forelimbs of all mammals have a similar underlying anatomical structure (homologous organs) but perform different functions. This is explained by the concept of divergent evolution, where a common ancestral structure evolves to serve different purposes due to adaptation to different environmental needs.

Q.133 (1)
New NCERT Pg. No. 115

Correct statements:
• Sweet potato and potato are analogous structures (ii), meaning they perform similar functions but have different evolutionary origins.
• Homology indicates a common ancestry (iii), as seen in the forelimbs of vertebrates.
• Wings of butterflies and birds perform similar functions but are not anatomically similar structures, making them analogous (v).

Q.134 (3)
New NCERT Pg. No. 120

Disruptive selection occurs when individuals at both extremes of a trait distribution are favored, leading to a bimodal distribution. Over time, this can result in the divergence of a population into two distinct forms, each adapted to different environmental conditions.

Q.135 (1)
New NCERT Pg. No. 125
The Neanderthal man had a brain size of about 1400 cc, which is slightly larger than the modern human brain.

SECTION-B

Q.136 (1)
New NCERT Pg. No. 62
The genotype RrYy represents a dihybrid cross involving two pairs of alleles: R and r for one trait, and Y and y for the other. The types of gametes produced depend on the combinations of these alleles. By applying the law of independent assortment, the alleles segregate independently, resulting in four combinations: RY, Ry, rY, and ry.

Q.137 (2)
New NCERT Pg. No. 57
The Punnett square is a diagram used in genetics to predict the possible genotypes of offspring from a cross between two parents. It helps visualize the combination of alleles from each parent and shows the likelihood of different genotypes appearing in the offspring. This tool is essential in studying inheritance patterns like dominance, recessiveness, and codominance.

Q.138 (2)
New NCERT Pg. No. 60
The cross between a pink-flowered Antirrhinum plant and a white-flowered plant is an example of incomplete dominance. In the F1 generation, pink and red flowers are produced. When F1 plants are selfed, the F2 generation will have 1 pink (Rr), and 1 white (rr). Thus, 0% of the F2 plants will have red flowers.

Q.139 (4)
New NCERT Pg. No. 56
DNA is not a polypeptide; it is a nucleic acid composed of nucleotides.
It stores genetic information in the form of sequences of bases (adenine, thymine, cytosine, and guanine).

Q.140 (4)
New NCERT Pg. No. 67
Alfred Sturtevant, a student of T.H. Morgan, used the frequency of recombination between linked genes to map their positions on chromosomes. He developed the first genetic linkage map, showing that genes are arranged linearly on chromosomes, and the distance between them can be measured in recombination units (centiMorgans).

Q.141 (4)
New NCERT Pg. No. 75
In phenylketonuria (PKU), there is a deficiency of the enzyme phenylalanine hydroxylase, which normally converts phenylalanine to tyrosine. As a result, phenylalanine accumulates, leading to a variety of health problems including intellectual disabilities.

Q.142 (1)
New NCERT Pg. No. 95, 98
The roles of different types of RNA are as follows:
- tRNA (a) brings amino acids during translation (iii).
- rRNA (b) forms the ribosome and is essential for protein synthesis (i).
- hnRNA (c) is a primary transcript and precursor to mRNA (iv).
- mRNA (d) provides the template for translation (ii).

Thus, the correct match is a(iii), b(i), c(iv), d(ii).

Q.143 (4)
New NCERT Pg. No. 96
Severo Ochoa's enzyme is a template-independent RNA polymerase, which means it can synthesize RNA without the need for a DNA or RNA template. This enzyme, known as polynucleotide phosphorylase, was instrumental in early studies of RNA synthesis.

Q.144 (3)
New NCERT Pg. No. 95
In eukaryotes, RNA polymerase II transcribes hn-RNA (heterogeneous nuclear RNA), which is the precursor to mRNA. After processing, including splicing, capping, and polyadenylation, hn-RNA becomes mature mRNA, which is translated into proteins.

Q.145 (4)
New NCERT Pg. No. 103
In genomics, sequence annotation involves identifying different regions of the genome and assigning functions to them. This process includes marking genes, regulatory sequences, and other important regions within a genome sequence.

Q.146 (2)
New NCERT Pg. No. 112
The first cellular forms of life are believed to have appeared on Earth around 2000 million years ago. These early life forms were likely prokaryotic cells, such as bacteria, which arose in the oceans.

Q.147 (1)
New NCERT Pg. No. 122
The correct match of ancient organisms with their time periods:
- Invertebrates appeared about 500 million years ago (A–1).
- Jawless fish appeared around 350 million years ago (B–3).
- Seaweeds emerged 320 million years ago (C–2).
- Ichthyosaurs lived about 200 million years ago (D–4).

Q.148 (1)
New NCERT Pg. No. 116
Evolution is a stochastic process, meaning it is influenced by random chance events, such as genetic mutations and environmental changes. It is not deterministic or directed toward a specific goal, and instead, evolves based on natural selection and genetic drift.

Q.149 (1)
New NCERT Pg. No. 111
The theory of spontaneous generation proposed that life could arise from non-living matter, such as decaying organic material. This theory was disproved by experiments such as those by Louis Pasteur, who showed that life comes only from pre-existing life.

Q.150 (3)
New NCERT Pg. No. 117
When because of the competition for food and living space, a single ancestral species evolves into different species which occupy different habitats, it is called adaptive radiation.

BIOLOGY-II
SECTION-A

Q.151 (3)
New NCERT Pg. No. 67
Drosophila melanogaster (fruit fly) is an ideal organism for genetic studies due to its short life cycle, ease of cultivation, and visible hereditary variations such as eye color and wing shape. These variations can be observed under a low-power microscope, making it an excellent model for studying inheritance patterns.

Q.152 (2)
New NCERT Pg. No. 60
- In a cross between red-flowered (RR) and white-flowered (ww) plants of Antirrhinum, the F_1 generation produces pink flowers (Rw) due to incomplete dominance. Selfing F1 plants yields a 1:2:1 ratio in the F_2 generation-1 red (RR), 2 pink (Rw), and 1 white (ww). Therefore, red flowers will be produced in 25% of the F_2 plants.

Q.153 (3)
New NCERT Pg. No. 53
Terminally placed flowers in pea plants are a recessive trait and cannot express themselves in a heterozygous condition (Tt), where the dominant allele for axial flowers will mask the recessive trait. Remaining traits are dominant traits.

Q.154 (3)
New NCERT Pg. No. 69
Pleiotropy occurs when a single gene influences multiple phenotypic traits. For example, the gene responsible for sickle cell anemia affects the shape of red blood cells and also impacts other physiological systems, such as oxygen transport and resistance to malaria.

Q.155 (4)
New NCERT Pg. No. 68
In T.H. Morgan's experiment with Drosophila, the probability of males having miniature wings in the F_2 generation was calculated based on the recombination frequencies between the genes for eye color and wing size. The recombination frequency between linked genes gives an estimate of the proportion of offspring with recombinant phenotypes, such as males with miniature wings.

Q.156 (3)
New NCERT Pg. No. 72
In pedigree analysis, a diamond symbol represents an individual whose sex is unspecified. Other standard symbols include circles for females and squares for males.

Q.157 (2)
New NCERT Pg. No. 70
- The ZW sex determination system is found in birds, some reptiles, and butterflies. In this system, females are heterogametic (ZW), while males are homogametic (ZZ). This contrasts with the XX-XY system found in humans and other mammals, where males are heterogametic (XY).

Q.158 (4)
New NCERT Pg. No. 71
In honeybees, males (drones) develop from unfertilized eggs through parthenogenesis. This means they are haploid and carry only one set of chromosomes, while female bees (workers and queens) are diploid.

Q.159 (1)
New NCERT Pg. No. 56, 57, 62
A recessive trait is expressed only when both alleles are recessive

(homozygous). The given statement is incorrect because it contradicts the fact that a recessive trait can only be expressed in the homozygous condition, not in heterozygous.

Q.160 (2)
New NCERT Pg. No. 56, 57

• Statements (a), (b), and (c) are true for alleles:
(a) Alleles code for a pair of contrasting traits.
(b) Alleles are slightly different forms of the same gene.
(c) A true breeding line will have homozygous alleles, either dominant (RR) or recessive (rr).
• Statement (d) is false because alleles are contributed by both parents, not just one.

Q.161 (1)
New NCERT Pg. No. 60, 62, 69

The correct matches are:
• Pleiotropy - (ii) Phenylketonuria,
• Polygenic inheritance - (i) Human skin color,
• Incomplete dominance - (iv) Gene for starch grain size in pea,
• Co-dominance - (iii) Blood group AB.

Q.162 (1)
New NCERT Pg. No. 73, 74

• Statement-I: A daughter will not be colorblind unless she inherits the colorblind gene from both parents, meaning the mother must at least be a carrier and the father must be colorblind.
• Statement-II: A colorblind man cannot pass the trait to his sons, as sons inherit the Y chromosome from their father, but he can pass it to his daughters, who may pass it on to their sons.

Q.163 (2)
New NCERT Pg. No. 59

The Law of Dominance states that in a heterozygous individual, one allele (the dominant one) masks the effect of the other (recessive) allele. However, it is not universally applicable because there are exceptions like incomplete dominance and co-dominance where both alleles influence the phenotype. Thus, the incorrect statement is that this law is universally applicable.

Q.164 (2)
New NCERT Pg. No. 106

Variable Number Tandem Repeats (VNTRs) are short sequences of DNA that are repeated a variable number of times in a genome. Their size typically ranges from 0.1 to 20 kilobases, and they are used in DNA profiling and forensic analysis.

Q.165 (2)
New NCERT Pg. No. 84

Nirenberg is credited with deciphering the genetic code. He discovered the relationship between mRNA codons and their corresponding amino acids, providing a deeper understanding of how genetic information is translated into proteins.

Q.166 (3)
New NCERT Pg. No. 95

The dominance of the RNA world is represented by splicing. RNA splicing involves the removal of introns from a pre-mRNA transcript and the joining of exons to produce a mature mRNA that can be translated into a protein.

Q.167 (4)
New NCERT Pg. No. 104

The Human Genome Project (HGP) was an international scientific research project aimed at mapping all the genes in the human genome. One of the most significant findings was the identification of 1.4 million single nucleotide polymorphisms (SNPs). These are variations in a single nucleotide that occur at specific positions in the genome, and they help in understanding genetic differences between individuals and their susceptibility to diseases.
Incorrect statements include: most of the human genome does not code for proteins, and the average gene consists of approximately 3,000 bases, not 30,000.

Q.168 (4)
New NCERT Pg. No. 81

Friedrich Miescher discovered "nuclein" in 1869, which was later identified as DNA. He isolated this acidic substance from the nuclei of white blood cells, and it was found to be rich in phosphorus. Nuclein was later recognized as the carrier of genetic information.

Q.169 (4)
New NCERT Pg. No. 94

The matching between the components of the transcription machinery:
• Rho factor (a): Involved in termination of transcription (iii).
• Sigma factor (b): Confers specificity for the initiation of transcription (iv).
• Core enzyme (c): Responsible for the elongation process (ii).
• RNA polymerase (d): Helps in the opening of the DNA helix (i).
Thus, the correct match is a(iii), b(iv), c(ii), d(i).

Q.170 (1)
New NCERT Pg. No. 100
In the lac operon, the z-gene codes for the enzyme β-galactosidase, which is primarily responsible for the hydrolysis of lactose into glucose and galactose. This enzyme enables the bacterium to utilize lactose as an energy source when glucose is not available.

Q.171 (4)
New NCERT Pg. No. 85
The Hershey-Chase experiment, conducted by Alfred Hershey and Martha Chase in 1952, conclusively proved that DNA, and not protein, is the genetic material in bacteriophages. They used radioactive labeling to track the movement of DNA and proteins during the infection of E. coli by bacteriophages and found that only DNA entered the bacterial cells and directed the production of new viruses.

Q.172 (3)
New NCERT Pg. No. 91
The transcription unit in DNA includes a promoter, a structural gene, and a terminator. The repressor is not part of the transcription unit but acts as a regulatory protein that can bind to the operator region to prevent transcription of the structural gene.

Q.173 (2)
New NCERT Pg. No. 99
The untranslated regions (UTRs) at both the 5' and 3' ends of mRNA do not code for proteins but play critical roles in the regulation of mRNA translation. They help in the stability of mRNA, its transport out of the nucleus, and the efficiency of translation.

Q.174 (1)
New NCERT Pg. No. 87
The assertion is true as DNA is chemically more stable than RNA. This stability is partly due to the absence of a hydroxyl group (-OH) at the 2' position of the sugar in DNA, which in RNA makes it more prone to hydrolysis. Thus, the reason is the correct explanation for the assertion.

Q.175 (4)
New NCERT Pg. No. 81
In the DNA double helix model proposed by Watson and Crick, the two strands are held together by hydrogen bonds between complementary base pairs. Guanine (G) forms three hydrogen bonds with cytosine (C), while adenine (A) forms two hydrogen bonds with thymine (T).

Q.176 (3)
New NCERT Pg. No. 96
The genetic code is nearly universal, meaning that with few exceptions, all organisms use the same codons to specify amino acids. For example, the codon UUU codes for the amino acid phenylalanine in both bacteria and humans, illustrating the universality of the genetic code.

Q.177 (3)
New NCERT Pg. No. 101
In the lac operon of *E.coli*, lactose acts as an inducer by binding to the repressor protein. This binding causes the repressor to change its shape and release from the operator region, allowing transcription of the structural genes (lacZ, lacY, and lacA) to proceed.

Q.178 (3)
New NCERT Pg. No. 111
The Big Bang Theory explains the origin of the universe as a massive explosion that occurred about 13.8 billion years ago. This theory suggests that all matter and energy were once concentrated in a single point before expanding outward, leading to the formation of galaxies, stars, and planets.

Q.179 (1)
New NCERT Pg. No. 125, 126
The evolution of modern humans (*Homo sapiens*) is closely associated with the development of the human brain and language. This evolution involved several intermediate species, such as Homo erectus and Homo habilis, leading to the eventual emergence of anatomically modern humans.

Q.180 (4)
New NCERT Pg. No. 118
Convergent evolution occurs when unrelated species evolve similar traits due to similar environmental pressures. Examples include:
- Wolf and Tasmanian wolf (a): Both are predators with similar body shapes, although the Tasmanian wolf is a marsupial and the wolf is a placental mammal.
- Anteater and Numbat (b): Both have elongated snouts and long tongues to feed on ants and termites, but they belong to different orders.
- Lemur and Spotted cuscus (c): Both are tree-dwelling animals that exhibit similar traits due to living in similar environments, despite being from different evolutionary lineages.
- Koalas and bandicoots (d) do not fit this example of convergent evolution.

Q.181 (1)

New NCERT Pg. No. 118, 121

Both statements are correct. Branching descent refers to the process by which species diverge from common ancestors, and natural selection can act in various ways: stabilizing (favoring average traits), directional (favoring one extreme), or disruptive (favoring both extremes).

Q.182 (2)

New NCERT Pg. No. 118, 119

The French naturalist Lamarck proposed the theory of inheritance of acquired characteristics, suggesting that traits developed during an organism's lifetime could be passed on to its offspring. For example, Lamarck believed that giraffes developed longer necks by stretching to reach higher leaves, and this trait was inherited by subsequent generations.

Q.183 (3)

New NCERT Pg. No. 115, 116

The assertion is true: Before industrialization, light-colored moths were more common because they were camouflaged against light-colored tree trunks. The reason, however, is false: The dark color in moths was due to a mutation that occurred naturally, not induced by industrial smoke. Industrial melanism became prevalent because the dark moths were better camouflaged against soot-darkened trees after industrialization.

Q.184 (3)

New NCERT Pg. No. 121

The Hardy-Weinberg equilibrium describes a population that is not evolving. Five factors are known to affect Hardy-Weinberg equilibrium. These are gene migration or gene flow, genetic drift, mutation, genetic recombination and natural selection.

Q.185 (1)

New NCERT Pg. No. 119

Thomas Malthus proposed that populations tend to remain stable in size over time, except for temporary fluctuations due to factors like food supply and seasonal changes. He suggested that population growth is limited by available resources, leading to competition and natural selection.

SECTION-B

Q.186 (4)

New NCERT Pg. No. 74, 75, 76

The correct matches are:

- Klinefelter syndrome - (i) Gynaecomastia (enlarged breast tissue in males),
- Turner syndrome - (ii) Rudimentary ovaries (underdeveloped ovaries),
- Haemophilia - (iv) Sex-linked recessive disease (caused by a defective gene on the X chromosome),
- Down's syndrome - (iii) Trisomy of chromosome 21 (having an extra copy of chromosome 21).

Q.187 (2)

New NCERT Pg. No. 62

Starch is synthesised effectively by BB homozygotes and therefore, large starch grains are produced. In contrast, bb homozygotes have lesser efficiency in starch synthesis and produce smaller starch grains. Heterozygotes produce starch grains produced are of intermediate size in Bb seeds. So if starch grain size is considered as the phenotype, then from this angle, the alleles show incomplete dominance.

Q.188 (3)

New NCERT Pg. No. 59, 60

AB blood group is an example of codominance, not incomplete dominance. In codominance, both alleles (A and B) are equally expressed in the phenotype. In contrast, incomplete dominance involves blending of traits, as seen in the cross between red and white flowers resulting in pink offspring.

Q.189 (4)

New NCERT Pg. No. 74

Haemophilia is a sex-linked recessive disorder. If a carrier woman (XhX) marries a normal man (XY), 50% of their sons will inherit the Xh chromosome from their mother and will be haemophilic (XhY), while the other 50% will be normal (XY). None of the daughters will have haemophilia, though they may be carriers.

Q.190 (2)

New NCERT Pg. No. 75

β-thalassemia is caused by mutations in the HBB gene, which is located on chromosome 11. This genetic disorder affects the production of the β-globin chain of hemoglobin, leading to reduced oxygen transport in the blood.

Q.191 (2)

New NCERT Pg. No. 92

The coding strand of DNA is 5'-ATGCCGAT-3'. In transcription, RNA polymerase uses the template (non-coding) strand

to synthesize mRNA, which has a sequence complementary to the template strand and identical to the coding strand, except for the substitution of uracil (U) in place of thymine (T). Therefore, the mRNA sequence is 5'-AUGCCGAU-3'.

Q.192 (1)

New NCERT Pg. No. 100

The lac operon consists of several genes that encode proteins for lactose metabolism in E. coli:

- i gene (a) encodes the repressor protein (iii), which blocks transcription by binding to the operator.
- z gene (b) encodes β-galactosidase (i), which breaks down lactose into glucose and galactose.
- a gene (c) encodes transacetylase (iv), which is involved in the removal of toxic by-products of lactose digestion.
- y gene (d) encodes permease (ii), which facilitates the entry of lactose into the cell.

Thus, the correct match is a(iii), b(i), c(iv), d(ii).

Q.193 (3)

New NCERT Pg. No. 106

DNA fingerprinting relies on Variable Number Tandem Repeats (VNTRs), which are short, repeating sequences of DNA. The number of these repeats varies significantly between individuals, making VNTRs useful in distinguishing between different people's DNA for forensic or parental testing.

Q.194 (3)

New NCERT Pg. No. 86

In the Hershey-Chase experiment, bacteriophages with radioactive sulfur (marking proteins) and radioactive phosphorus (marking DNA) were used to infect E. coli. The resulting viruses produced inside the bacteria contained non-radioactive protein capsids (since proteins were not transferred into the bacterial cell) and radioactive genetic material (since DNA was the genetic material that entered the cell and directed viral reproduction).

Q.195 (2)

New NCERT Pg. No. 83

Histones are rich in the basic amino acids lysine and arginine, which help them bind to the negatively charged DNA. This interaction is crucial for the packaging of DNA into nucleosomes, which are the basic units of chromatin structure in eukaryotic cells.

Q.196 (2)

New NCERT Pg. No. 113

Karl Ernst von Baer disapproved of Ernst Haeckel's theory of embryological development, which claimed that "ontogeny recapitulates phylogeny" (i.e., the development of an organism reflects its evolutionary history). Von Baer demonstrated that embryos do not pass through stages representing adult forms of their ancestors.

Q.197 (2)

New NCERT Pg. No. 116

Before industrialization, the tree trunks were light in color, and white-winged moths were better camouflaged, giving them a survival advantage. After industrialization, pollution darkened the tree trunks, favoring melanised moths (dark-winged).

Q.198 (4)

New NCERT Pg. No. 111

In Stanley Miller's experiment to simulate the conditions of early Earth, the mixture was heated to about 800°C. This experiment demonstrated the formation of amino acids, the building blocks of life, under prebiotic conditions. He created electric discharge in a closed flask containing CH_4, H_2, NH_3 and water vapour.

Q.199 (1)

New NCERT Pg. No. 118, 199

Lamarckism posits that evolution occurs through the use and disuse of organs, where organs used more frequently become stronger and are passed on to offspring. This theory has since been largely discredited, but Lamarck's ideas laid the groundwork for further evolutionary studies.

Q.200 (3)

New NCERT Pg. No. 113, 116, 119

Mutations are random and non-directional, meaning they occur without regard for the organism's needs or environmental conditions. Some mutations may provide a survival advantage, but they do not occur with the intent to adapt to the environment.