17/04/2026

Code-A&B

Aakash
Medical | IIT-JEE | Foundations

Corporate Office : AESL, 3rd Floor, Incuspaze Campus-2, Plot No. 13, Sector-18,
Udyog Vihar, Gurugram, Haryana - 122015, ***Ph.***+91-1244168300

MM : 720 Final Test Series(P1)_NEET2026_Test-10A&B **Time : 180 Min.**

PHYSICS

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CHEMISTRY

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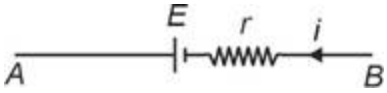
Hints and Solutions

PHYSICS

(1) **Answer :** (2)
Solution:
L.C = MSD – VSD ...(1)
given : (*N* + 1) VSD = *N* MSD
$\text{VSD} = \left(\frac{N}{N+1}\right)\ \text{MSD}$ ...(2)
From (1) and (2)
$L.C = (\text{MSD}) - \frac{N}{N+1}\left(\text{MSD}\right)$
$= \text{MSD}\ \left(1 - \frac{N}{N+1}\right) = \frac{\text{MSD}}{N+1}$
$= \frac{0.01}{N+1} = \frac{1}{100(N+1)}$

(2) **Answer :** (3)
Solution:
At central point on screen, path difference is zero for all wavelength. So, central bright fringe is white and other fringes depend on wavelength as $\beta = \frac{\lambda D}{d}$.
Therefore, other fringes will be coloured.

(3) **Answer :** (3)
Solution:
In the question, the cell is discharging and we need to calculate the terminal potential difference.
⇒ During discharging, $V_A - V_B = E - ir$

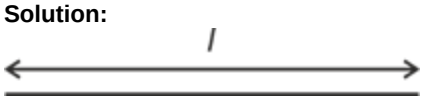


$\Rightarrow\ i = \frac{E}{R+r} = \frac{10}{R+r} = \frac{10}{5} = 2$ A
⇒ $V_A - V_B$ = 10 – 2(1) = 8 V

(4) **Answer :** (4)
Solution:

Time period of Oscillation, $T = 2\pi\sqrt{\frac{I}{MB}}$
$\Rightarrow \frac{1}{4} = 2\pi\sqrt{\frac{9.8\times10^{-6}}{M\times0.049}}$
$\Rightarrow \frac{1}{16} = 4\pi^2 \times \frac{9.8\times10^{-6}}{M\times49\times10^{-3}}$
$\Rightarrow M = \frac{4\pi^2\times9.8\times10^{-6}}{49\times10^{-3}} \times 16$
$= \frac{4\pi^2\times9.8\times16\times10^{-3}}{49}$
$= 12.8\pi^2 \times 10^{-3} \times 10^{-2} \times 10^2$
$= 1280\pi^2 \times 10^{-5}$ Am^2

(5) **Answer :** (2)
Solution:



Divided into 10 parts
$R = \frac{\rho l}{A}$
$R' = \frac{\rho l}{10A} = \frac{R}{10}$
$R_S = 5 \times \frac{R}{10}$ [series]
R_S = 50 Ω

$R_P = \frac{R}{50}$ [parallel]

$R_{eq} = R_S + R_P = 52\ \Omega$

(6) **Answer :** (3)
Solution:
$F = (M_1 + M_2)a$

$a = \frac{10}{2+3} = 2\ ms^{-2}$

$F' = M_2(2) = 3 \times 2\ N = 6\ N$

(7) **Answer :** (2)
Solution:
According to transformer ratio,

$\frac{V_S}{V_P} = \frac{N_S}{N_P} = 2:1$

(8) **Answer :** (4)
Solution:
de-Broglie wavelength $\lambda = \frac{h}{p} = \frac{h}{mv} = \frac{h}{\sqrt{2\,mE}}$

where $E = \frac{1}{2}mv^2$

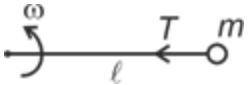
Squaring both sides,

$\lambda^2 = \frac{h^2}{2mE} \Rightarrow \frac{1}{\lambda^2} = \text{(constant)}\ E$

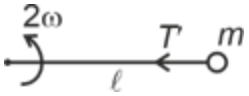
Graph passes through origin with constant slope.

(9) **Answer :** (3)
Solution:
Statement I is true as atoms are electrically neutral because they contain equal number of positive and negative charges.
Statement II is wrong as atom of most of the elements are stable and emit characteristic spectrum. But this statement is not true for every atom.

(10) **Answer :** (2)
Solution:



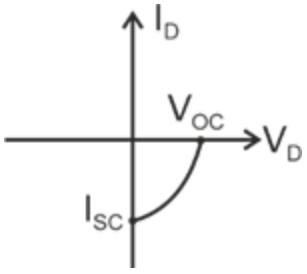
$T = ml\omega^2$



$T' = ml(2\omega)^2$

$T' = 4T$

(11) **Answer :** (1)
Solution:
A: Solar cell characteristics



B: In reverse biased *pn* junction diode, the current measured in (μA), is due to minority charge carrier.

(12) **Answer :** (1)
Solution:
Path *bc* is an isochoric process.
∴ Work done by gas along path *bc* is zero.

(13) **Answer :** (4)
Solution:
For uniformly charged spherical shell,

$V = \frac{kq}{R}$ (For $r \le R$)

$\therefore V_C = V_P$

$V_C - V_P$ = Zero

(14) Answer : (1)

Solution:

Moment of inertia of rod = $I = \frac{ml^2}{12}$

$\Rightarrow 2400 = 400\frac{l^2}{12}$

$\Rightarrow 72 = l^2$

$\Rightarrow l = \sqrt{72} = 8.48$ cm $\simeq 8.5$ cm

(15) Answer : (4)

Solution:

A particle moving with uniform speed in a circular path maintains varying velocity and varying acceleration. It is because direction of both velocity as well as acceleration will change continuously.

(16) Answer : (2)

Solution:

(A) If c is the velocity of light

so, $E = h\nu$ (Energy of photon)

(B) Velocity of photon is equal to velocity of light i.e. c.

(C) $\lambda = \frac{h}{p}$

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

$p = \frac{h\nu}{c}$

(D) In photon-electron collision both total energy and total momentum are conserved.

(17) Answer : (1)

Solution:

$x = 2t - 1$

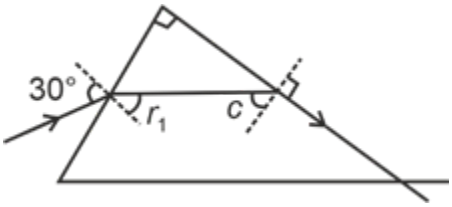
$v = \frac{dx}{dt} = 2$ m s^{-1}

$P = F.v$

$= 2 \times 5 = 10$ W

(18) Answer : (2)

Solution:



$A = 90°$

In prism, $r_1 + c = A$

$r_1 = 90° - c$ …(1)

$\sin c = \frac{1}{\mu} \Rightarrow \cos c = \frac{\sqrt{\mu^2 - 1}}{\mu}$

⇒ Apply Snell's law, on incidence surface

$1 \cdot \sin 30° = \mu \sin(r_1) \Rightarrow 1 \times \frac{1}{2} = \mu \times \sin(90^\circ - c)$

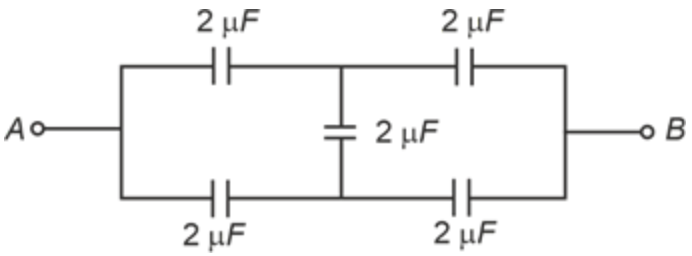
$\frac{1}{2} = \mu \times \frac{\sqrt{\mu^2 - 1}}{\mu}$

On squaring $\frac{1}{4} = \mu^2 - 1$

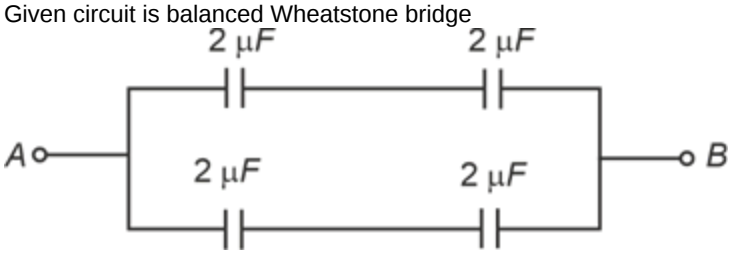
$\Rightarrow \mu^2 = \frac{5}{4} \Rightarrow \mu = \frac{\sqrt{5}}{2}$

(19) Answer : (1)

Solution:

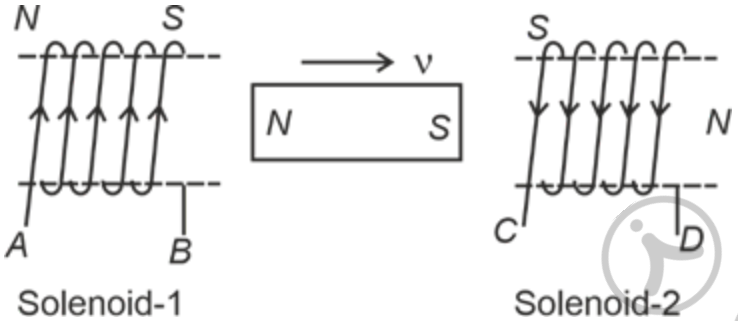


Given circuit is balanced Wheatstone bridge



C_{AB} = 1 + 1 = 2 μ*F*

(20) **Answer :** (1)
Solution:



North of magnet is moving away from solenoid 1 so end *B* of solenoid 1 is South and as south of magnet is approaching solenoid 2 so end *C* of solenoid 2 is South.

(21) **Answer :** (4)
Solution:

$g' = \frac{GM'}{R^2} = \frac{GM}{10\left(\frac{R}{2}\right)^2} = \frac{4}{10}\frac{GM}{R^2} = 0.4 \times 9.8$

= 3.92 m s^{-2}

(22) **Answer :** (2)
Solution:

Energy difference Δ*E* = $\frac{hc}{\lambda}$

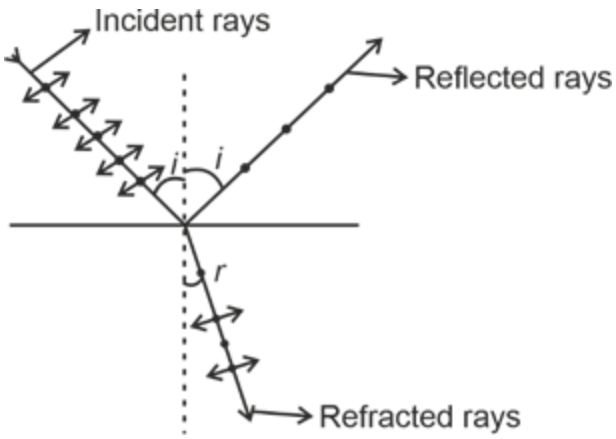
$\therefore \lambda \propto \frac{1}{\Delta E}$

$(\Delta E)_{6-2} > (\Delta E)_{5-2} > (\Delta E)_{4-2} > (\Delta E)_{3-2}$

$\lambda_{6-2} < \lambda_{5-2} < \lambda_{4-2} < \lambda_{3-2}$

A-III, B-IV, C-II, D-I

(23) **Answer :** (4)
Solution:



According to Brewster's law, reflected rays are completely polarized and refracted rays are partially polarized.

(24) **Answer :** (1)
Solution:

(Material)		**(Susceptibility (χ))**
Diamagnetic	(II)	$0 > \chi \geq -1$
Ferromagnetic	(III)	$\chi >> 1$
Paramagnetic	(IV)	$0 < \chi < \varepsilon$
Non-magnetic	(I)	$\chi = 0$

(25) **Answer :** (2)
Solution:
Before collision ⇒

It undergoes completely inelastic collision
Using conservation of linear momentum
Initial momentum = Final momentum
⇒ $mv_1 = mv_2 + mv_2$
⇒ $mv_1 = 2mv_2$
⇒ $\frac{v_1}{v_2} = \frac{2}{1}$

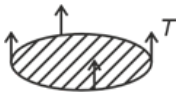
(26) **Answer :** (4)
Solution:

$^{290}_{82}X \xrightarrow{\alpha} {}^{286}_{80}Y \xrightarrow{e^+} {}^{286}_{79}Z \xrightarrow{\beta^-} {}^{286}_{80}P \xrightarrow{e^-} {}^{286}_{81}Q$
$A \rightarrow 286$
$Z = 81$

(27) **Answer :** (2)
Solution:

$x = 5\sin\left(\pi t + \frac{\pi}{3}\right)$ m
Amplitude = 5 m
$\omega = \pi = \frac{2\pi}{T}$
$T = \frac{2\pi}{\pi} = 2$ s

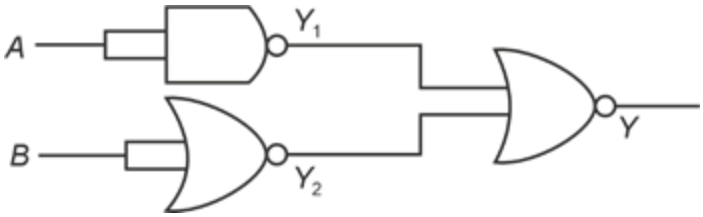
(28) **Answer :** (1)
Solution:



Excess force = $T \times 2\pi R$
$= \frac{7}{100} \times 2 \times 3.14 \times \frac{4.5}{100}$
$= 197.82 \times 10^{-4}$

= 19.8 × 10^{-3} N
= 19.8 mN

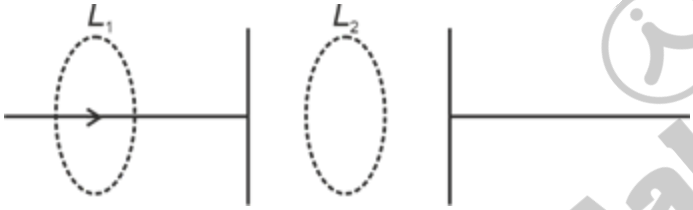
(29) Answer : (4)
Solution:



$Y_1 = \overline{A \cdot A} = \overline{A}$
$Y_2 = \overline{B + B} = \overline{B}$
$Y = \overline{Y_1 + Y_2} = \overline{\overline{A} + \overline{B}} = \overline{\overline{A}} \cdot \overline{\overline{B}}$
= *A*.*B* is similar to output of AND Gate

(30) Answer : (3)
Solution:
The potential *V* at any point, at distance *r* from centre of dipole $= \frac{KP\cos\theta}{r^2}$
At axial point where θ = 0°,
$V = \frac{KP}{r^2} = \frac{9 \times 10^9 \times 4 \times 10^{-6}}{2^2} = 9 \times 10^3$ V at axial point where θ = 0°,
$V = \frac{-KP}{r^2} = -9 \times 10^3$ V at axial point where θ = 180°

(31) Answer : (2)
Solution:



According to modified Ampere's law
$\oint B.\ dl = \mu_0(I_C + I_D)$
for Loop L_1 $I_C \neq 0$ and $I_D = 0$
For Loop L_2 $I_C = 0$ and $I_D \neq 0$
Due to KCL $I_C = I_D$

(32) Answer : (4)
Solution:
The EM waves originate from an accelerating charge. The charge moving with uniform velocity produces steady state magnetic field.

(33) Answer : (2)
Solution:
f_0 = 140 cm and f_e = 5 cm
For distant object,
$m = \frac{f_0}{f_e} = \frac{140}{5} = 28$

(34) Answer : (2)
Solution:
Power Consumed = $P = \frac{V^2}{R}$
$\frac{P_A}{P_B} = \frac{R_B}{R_A}$
$R_A = 2R_B$
For Series Combination
$P_S = \frac{V^2}{3R_B}$

For Parallel Combination

$P_P = \frac{3V^2}{2R_B}$

$\frac{P_S}{P_P} = \frac{2}{9}$

(35) Answer : (4)

Solution:

At same temperature, curve with higher volume corresponds to lower pressure.

$V_3 > V_2 > V_1$

$\Rightarrow P_1 > P_2 > P_3$

(We draw a straight line parallel to volume axis to get this)

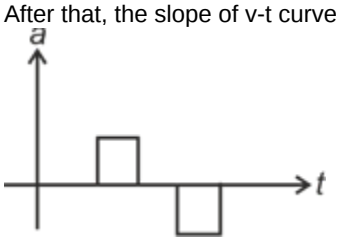
(36) Answer : (3)

Solution:

Initially, the body has zero velocity and zero slope. Hence the acceleration would be zero initially. After that, the slope of v-t curve is constant and positive.

After some time, velocity becomes constant and acceleration is zero.

After that, the slope of v-t curve is constant and negative.



(37) Answer : (1)

Solution:

In option (1),

$\frac{10}{15} = \frac{10}{5+R_D}$

The diode can conduct and have resistance R_D = 10 Ω because diode have dynamic resistance. In that case bridge will be balanced.

(38) Answer : (2)

Solution:

$T' = 2\pi\sqrt{\frac{l'}{g}}$ where $l' = \frac{l}{2}$

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

$T' = \frac{x}{2}T$

$2\pi\sqrt{\frac{l}{2g}} = \frac{x}{2}2\pi\sqrt{\frac{l}{g}}$

$\frac{1}{\sqrt{2}} = \frac{x}{2} \quad \Rightarrow \quad x = \sqrt{2}$

(39) Answer : (1)

Solution:

Apply energy conservation,

$U_i + K_i = U_f + K_f$

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

$\Rightarrow -\frac{GMm}{R} + K_i = -\frac{GMm}{3R} + \frac{1}{2} \times m \times \frac{GM}{3R}$

$\Rightarrow K_i = -\frac{1}{6}\frac{GMm}{R} + \frac{GMm}{R}$

$K_i = \frac{5}{6}\frac{GMm}{R}$

(40) Answer : (2)

Solution:

A. A magnetic pole will repel or attract magnetic sheet so force is needed.

B. If sheet is non-magnetic, no force needed.

C. If it is conducting, then there will be eddy currents in sheet, which opposes the motion. So forces is needed to move sheet with uniform speed.

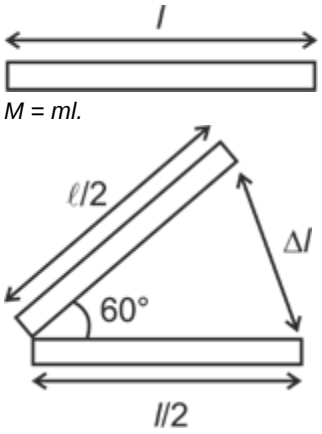
D. The non-conducting and non-polar sheet do not interact with magnetic field of magnet.

(41) Answer : (2)

Solution:
Capacitive Reactance
$X_C = \frac{1}{\omega C} = \frac{1}{2\pi f C} = \frac{1}{2\times 3.14\times 50\times 10\times 10^{-6}}$
$= \frac{1000}{3.14}$
V_{rms} = 210 V
$i_{rms} = \frac{V_{rms}}{X_C} = \frac{210}{X_C}$
Peak current $= \sqrt{2} i_{rms} = \sqrt{2} \times \frac{210}{1000} \times 3.14 = 0.932$
$\simeq 0.93\ A$

(42) Answer : (2)
Solution:
Thermal strain = Longitudinal strain = α Δ *T*
⇒ Longitudinal strain, δ = $10^{-5} \times 10^2 = 10^{-3}$
⇒ Compressive stress = δ × Young's Modulus
= $10^{-3} \times 0.5 \times 10^{11}$
= 0.5×10^8
⇒ Compressive force = $0.5 \times 10^8 \times 10^{-3} = 0.5 \times 10^5$
= $5 \times 10^4 \times \frac{10}{10}$
= 50×10^3 N

(43) Answer : (2)
Solution:



M = ml.

$\Delta l = 2\frac{l}{2}\sin 30^\circ$
$= \frac{l}{2}$
M′ = ml/2
= *M*/2

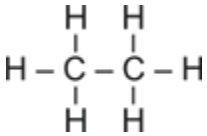
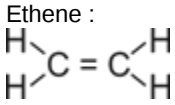
(44) Answer : (2)
Solution:
Given *V′* = *V* = Constant
(i) $C' = \frac{\varepsilon_0 A}{d'}$, $C = \frac{\varepsilon_0 A}{d}$
d′ < d
C′ > C
Hence, final capacitance greater than initial capacitance,
(ii) $U' = \frac{1}{2}C'V^2$, $U = \frac{1}{2}CV^2$
U′ > U
Hence final energy is greater than initial energy
(iii) $\frac{Q'}{V'} = C'$ and $\frac{Q}{V} = C$
$\frac{Q'}{V'} \neq \frac{Q}{V}$
(iv) Product of charge and voltage
X′ = Q′V = C′V^2
X = QV = CV^2

$X' > X$

(45) Answer : (2)
Solution:
From principle of homogeneity
$[F] = [\alpha t^2] = [\beta t]$
$[\alpha] = \frac{[F]}{[t^2]}$ and $[\beta] = \frac{[F]}{[t]}$
$\therefore [\alpha]\,[t] = [\beta]$
$\therefore \frac{\alpha t}{\beta} =$ dimensionless

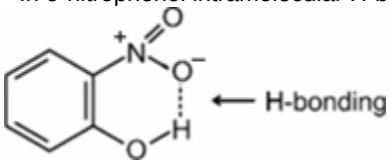
CHEMISTRY

(46) Answer : (3)
Solution:

	Ethane :	
(A)		one (C – C) σ bond
	Ethene :	
(B)		one (C – C) σ and one (C – C) π bond
(C)	C_2 : $(\sigma 1s)^2(\sigma^* 1s)^2(\sigma 2s)^2$ $(\sigma^* 2s)^2$ $(\pi 2p_x^2 = \pi 2p_y^2)$:	two (C – C) π bonds
(D)	Ethyne : H – C ≡ C – H	two (C – C) π bonds and one (C – C) σ bond

(47) Answer : (2)
Solution:
Value of Henry's law constant $\propto \frac{1}{\text{Solubility of gas}}$
Higher the value of K_H at a given pressure, lower is the solubility of the gas in the liquid.
K_H value of gases (given) : A > C > B
$\therefore$ Order of solubility of gases in water : B > C > A

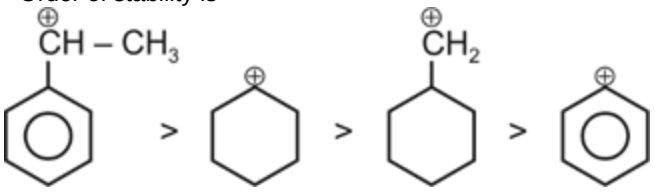
(48) Answer : (1)
Solution:
• **Statement I** is correct, because boiling point of hydrides of group 16 follows the order
• $H_2O > H_2Te > H_2Se > H_2S$
• **Statement II** due to intermolecular H-bonding H_2O shows higher boiling point than respective hydrides of group 16.
• (Both Statement are true)
Order from H_2Te to H_2S is due to decreasing molecular mass.

(49) Answer : (1)
Solution:
• In o-nitrophenol intramolecular H-bonding is present.


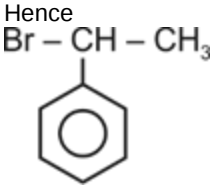
(50) Answer : (1)
Solution:
• Both statement I and statement II are correct.
• Boiling point of n-pentane = 309 K

isopentane = 301 K
neopentane = 282.5 K
• As branching increases molecules attain the shape of a sphere results in smaller area of contact thus weak intermolecular forces between spherical molecules, which are overcome at relatively lower temperature. Leading to decrease in boiling point.

(51) Answer : (4)
Solution:
• Reactivity towards S_N1 depends upon stability of carbocation.
• Order of stability is



Hence



is most reactive

(52) Answer : (4)
Solution:
• Tertiary alcohols react instantaneously with Lucas reagent and gives immediate turbidity.
• In case of tertiary alcohols, they form halides easily with Lucas reagent (conc. HCl and $ZnCl_2$)

(53) Answer : (2)
Solution:

Mole of HCl $= \frac{0.75 \times 25}{1000}$

$\therefore$ Mass of HCl = $\left(\frac{0.75 \times 25}{1000} \times 36.5\right)$ g

$$HCl + NaOH \rightarrow NaCl + H_2O$$

36.5 g 40 g
According to stoichiometry
36.5 of HCl reacts with 40 g of NaOH

$\therefore$ Given mass of HCl $\left(\frac{0.75 \times 25 \times 36.5}{1000}\right)$ reacts

$\equiv \frac{40 \times 0.75 \times 25 \times 36.5}{36.5 \times 1000} = 0.75$ g of NaOH

So, Left amount of NaOH = 1 – 0.75 = 0.25 g
= 250 mg

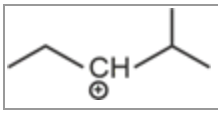
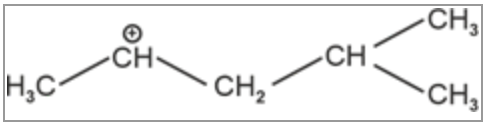
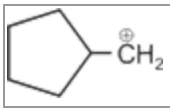
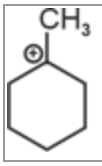
(54) Answer : (2)
Solution:
• Increasing order of first ionization enthalpy is Li < B < Be < C < N

Element	First ionization enthalpy ($\Delta_i H$/kJ mol^{-1})
Li	520
Be	899
B	801
C	1086
N	1402

• **Explanation:** It is easier to remove the 2*p* electron from boron as compared to 2*s* electron from beryllium because 2*p* electron of boron is more shielded by nuclear charge than 2*s* electrons of beryllium and hence boron has less ionization enthalpy as compared to beryllium.

(55) Answer : (4)
Solution:

• The stability of carbocation can be described by the hyperconjugation. Greater the extent of hyperconjugation, more is the stability of carbocation.

(1)		→ 3 α-H
(2)		→ 5 α-H
(3)		→ 1 α-H
(4)		→ 7 α-H

Stability order of carbocations = (4) > (2) > (1) > (3)

(56) **Answer :** (1)
Solution:
• Aniline does not undergo Friedel-Crafts alkylation reaction due to salt formation with aluminium chloride, the Lewis acid, which is used as a catalyst.
• Aniline (aromatic primary amine) cannot be prepared by Gabriel phthalimide synthesis because aryl halides do not undergo nucleophilic substitution with anion formed by phthalimide.

(57) **Answer :** (1)
Solution:
• Electronegativity increases across the period on moving left to right. It decreases on moving down the group.
• The correct option is Si < C < N < O < F

(58) **Answer :** (1)
Solution:
$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$
for 2 mole of H_2O = 4F charge is required
for 1 mole of H_2O = $\frac{4F}{2}$ = 2F required

$\overset{+7}{M}nO_4^- \rightarrow \overset{+2}{M}n$
for 1 mole MnO_4^- = 5F charge is required

$Ca^{2+} \xrightarrow{+2e^-} Ca$
for 1 mole Ca^{2+} ion required = 2F
1.5 mole Ca^{2+} ion required = $\frac{2}{1} \times 1.5$ = 3F

$\overset{+2}{F}eO \rightarrow \overset{+3}{F}e_2O_3$
for 1 mole FeO, 1F charge is required.

(59) **Answer :** (1)
Solution:
A. $[Co(NH_3)_5(NO_2)]Cl_2$ – Linkage isomerism due to 'N' and 'O' linkage by NO_2
B. $[Co(NH_3)_5(SO_4)]Br$ – Ionization isomerism
C. $[Co(NH_3)_6][Cr(CN)_6]$ – Coordination isomerism
D. $[Co(H_2O)_6]Cl_3$ – Solvate isomerism

(60) **Answer :** (1)
Solution:
NH_3 ⇒ sp^3 hybridised with 1 lone pair.
Structure will be Trigonal Pyramidal.
BrF_5 ⇒ sp^3d^2 hybridised with 1 lone pair.
Structure will be Square Pyramidal.

$XeF_4 \Rightarrow sp^3d^2$ with two lone pairs.
Structure will be Square Planar.
$SF_6 \Rightarrow sp^3d^2$ with no lone pair.
Structure will be Octahedral.
A-I, B-IV, C-II, D-III

(61) Answer : (1)
Solution:

$E_n = -R_H\left(\frac{Z^2}{n^2}\right)$ J

for He^+ (n = 1),

$E_n = -x = -R_H\left(\frac{2^2}{1^2}\right) = -4R_H$

$\therefore\ R_H = \frac{x}{4}$

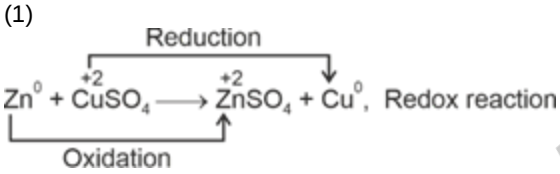
for Be^{3+} (n = 2),

$E_n = -R_H\left(\frac{Z^2}{n^2}\right)$ J

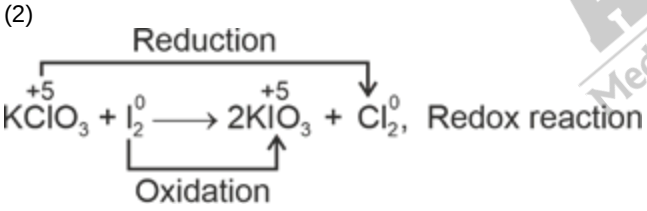
$= -\frac{x}{4} \times \left(\frac{4\times4}{2\times2}\right) = -x$ J

(62) Answer : (3)
Solution:
When a liquid evaporates to vapour, entropy increases.
$2NaHCO_3(s) \rightarrow Na_2CO_3(s) + CO_2(g) + H_2O(g)$
Number of gaseous product molecules increases so entropy increases.
$Cl_2(g) \rightarrow 2Cl(g)$
1 mole $Cl_2(g)$ form 2 mol Cl(g). So entropy increases.

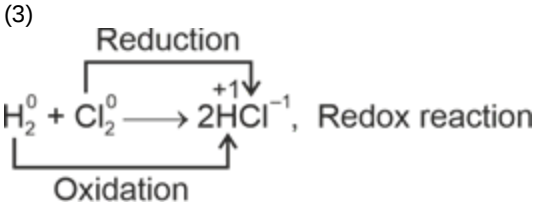
(63) Answer : (4)
Solution:
(1)



(2)



(3)



(4) $\overset{+2}{Ba}Cl_2^{-1} + \overset{+1}{Na_2}SO_4 \rightarrow \overset{+2}{Ba}SO_4 + 2\overset{+1}{Na}Cl^{-1}$
This is not a redox reaction as there is no change in oxidation state.

(64) Answer : (2)
Solution:
- Magnetic quantum number (m_ℓ) informs about orientation of orbital.
- Spin quantum number (m_S) informs about orientation of spin of electron.
- Azimuthal quantum number (ℓ) informs about shape of orbital
- Principal quantum number (n) informs about size of orbital

(65) Answer : (1)
Solution:

Ions	No. of unpaired	Configuration
Ti^{3+}	1	$3d^1$
Cr^{2+}	4	$3d^4$
Mn^{2+}	5	$3d^5$
Fe^{2+}	4	$3d^6$
Sc^{3+}	0	$3d^0$

Spin only magnetic moment is given by $\sqrt{n(n+2)}$ BM where n is number of unpaired electrons.

$\therefore$ Cr^{2+} and Fe^{2+} will have same spin only magnetic moment.

(66) **Answer :** (1)
Solution:
(1) 4 mol of He = 4 N_A He atoms

(2) 4 u of He = $\frac{4u}{4u} = 1$He atom

(3) 4 g of Helium = $\frac{4g}{4g}$ mole = 1 mole = N_A He atom

(4) 2.2710982 of He at STP = $\frac{2.271}{22.710982}$ mole
= 0.1 mole
= 0.1 N_A He atom

(67) **Answer :** (4)
Solution:
Oxygen shows –2, –1, +1 and +2 oxidation states
Selenium shows –2, +2, +4 and +6 oxidation states
Tellurium shows –2, +2, +4 and +6 oxidation states
Polonium shows +2 and +4 oxidation states

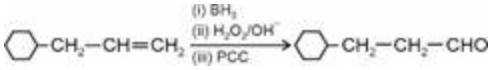
(68) **Answer :** (3)
Solution:

$E^{\circ}_{Mn^{3+}/Mn^{2+}} > E^{\circ}_{Cr^{3+}/Cr^{2+}}$ *or* $E^{\circ}_{Fe^{3+}/Fe^{2+}}$

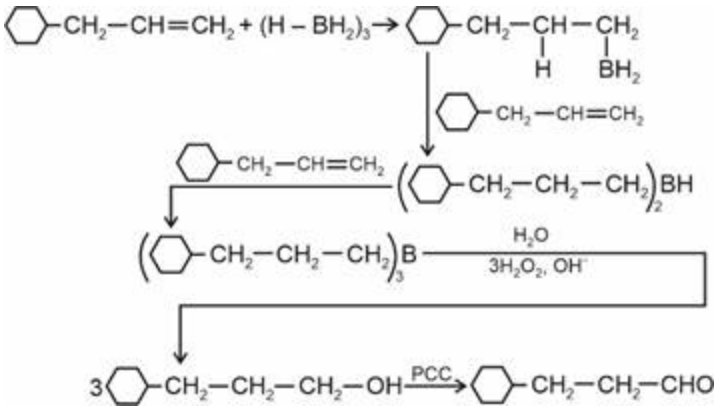
Electronic configuration of Mn^{3+} = [Ar]$3d^4$
Electronic configuration of Mn^{2+} = [Ar]$3d^5$
Electronic configuration of Cr^{3+} = [Ar]$3d^3$
Electronic configuration of Cr^{2+} = [Ar]$3d^4$
As Mn^{3+} from d^4 configuration goes to more stable d^5 configuration (Half filled), due to more exchange energy in d^5 configuration.

(69) **Answer :** (3)
Solution:
Despite having the aldehyde group glucose does not give Schiff's test and it does not form the hydrogen sulphite addition product with $NaHSO_3$.

(70) **Answer :** (2)
Solution:

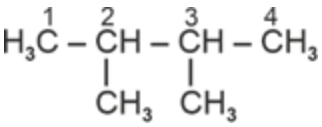


Mechanism:



(71) **Answer :** (1)
Solution:
$K_p = K_c(RT)^{\Delta n_g}$
for $K_p \neq K_c$,
$\Delta n_g \neq 0$
$\Delta n_g = n_p - n_r$
(1) $\Delta n_g = 2 - 1 = 1$
(2) $\Delta n_g = 2 - 2 = 0$
(3) $\Delta n_g = 2 - 2 = 0$
(4) $\Delta n_g = 2 - 2 = 0$

(72) **Answer :** (3)
Solution:



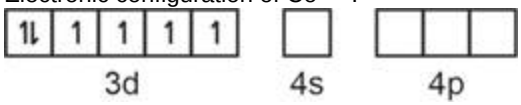
has two tertiary carbon
(2, 3-Dimethylbutane)

(73) **Answer :** (1)
Solution:
Fehling solution 'A' = Aqueous copper sulphate
Fehling solution 'B' = Alkaline sodium potassium tartarate (Rochelle salt)

(74) **Answer :** (4)
Solution:
(A) Isothermal process ⇒ Temperature is constant throughout the process
(B) Isochoric process ⇒ Volume is constant throughout the process
(C) Isobaric process ⇒ Pressure is constant throughout the process
(D) Adiabatic process ⇒ No exchange of heat (q) between system and surrounding

(75) **Answer :** (1)
Solution:
In $[Co(NH_3)_6]^{3+}$, Co^{3+} ion is having $3d^6$ configuration.

Electronic configuration of Co^{3+} :



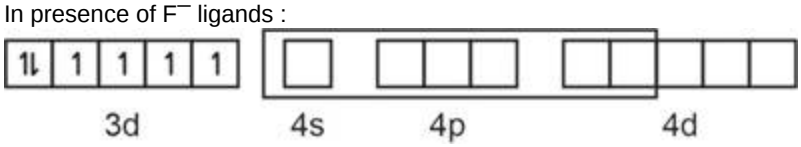
In presence of NH_3 ligand, pairing of electrons takes place and it becomes diamagnetic complex ion.
In presence of NH_3 ligand :

$\therefore$ $[Co(NH_3)_6]^{3+}$ is octahedral with d^2sp^3 hybridisation and it is diamagnetic in nature.

In case of $[CoF_6]^{3-}$, Co is in +3 oxidation state and it is having $3d^6$ configuration.

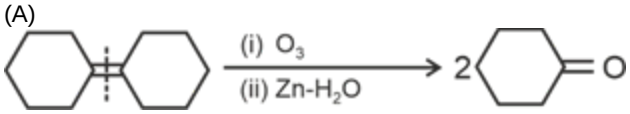
In presence of weak field F^- ligand, pairing does not take place.

In presence of F^- ligands :

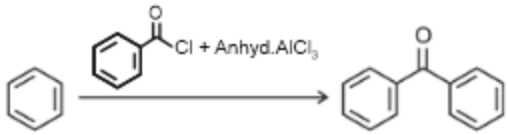


$\therefore$ In $[CoF_6]^{3-}$, Co^{3+} is sp^3d^2 hybridised with four unpaired electrons, so it is paramagnetic in nature.

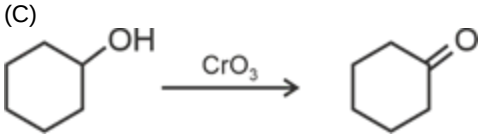
(76) Answer : (3)
Solution:
(A)



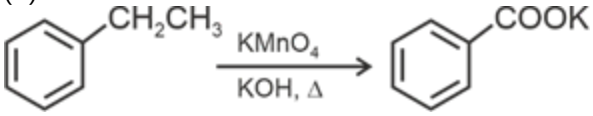
It is reductive ozonolysis
(B)



It is Friedel-Crafts acylation reaction.
(C)



Secondary alcohols are oxidised to ketones by CrO_3
(D)



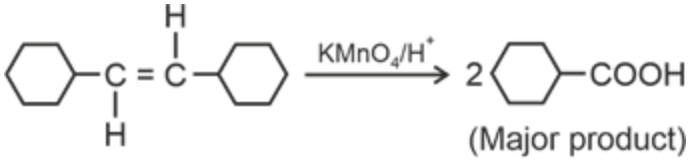
(77) Answer : (1)
Solution:

- Ce^{4+} → $[Xe]4f^0$; μ = 0, diamagnetic
- Yb^{2+} → $[Xe]4f^{14}$; μ = 0, diamagnetic
- Ce^{3+} → $[Xe]4f^1$; $\mu = \sqrt{1(1+2)} = \sqrt{3}$, paramagnetic
- Eu^{2+} → $[Xe]4f^7$; $\mu = \sqrt{7(9)} = \sqrt{63}$, paramagnetic
- Gd^{3+} → $[Xe]4f^7$; $\mu = \sqrt{7(7+2)} = \sqrt{63}$, paramagnetic
- Eu^{3+} → $[Xe]4f^6$; $\mu = \sqrt{6(6+2)} = \sqrt{48}$, paramagnetic
- Pm^{3+} → $[Xe]4f^4$; $\mu = \sqrt{4(4+2)} = \sqrt{24}$, paramagnetic
- Sm^{3+} → $[Xe]4f^5$; $\mu = \sqrt{5(5+2)} = \sqrt{35}$, paramagnetic

(78) Answer : (1)
Solution:

- $[Co(NH_3)_6]^{3+}$ is a homoleptic complex as only one type of ligands (NH_3) is coordinated with Co^{3+} ion. While $[Co(NH_3)_4Cl_2]^+$ is a heteroleptic complex in which Co^{3+} ion is ligated with more than one type of ligands, *i.e.*, NH_3 and Cl^-.

(79) Answer : (2)
Solution:



(80) **Answer :** (4)
Solution:
• These reactions are preparation of haloalkanes from alcohols.

$3ROH + PCl_3 \rightarrow 3RCl + \underset{(A)}{H_3PO_3}$

$ROH + PCl_5 \rightarrow RCl + HCl + \underset{(B)}{POCl_3}$

A and B are H_3PO_3 and $POCl_3$ respectively.

(81) **Answer :** (1)
Solution:

• $\log\left(\frac{k_2}{k_1}\right) = \frac{E_a}{2.303R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$

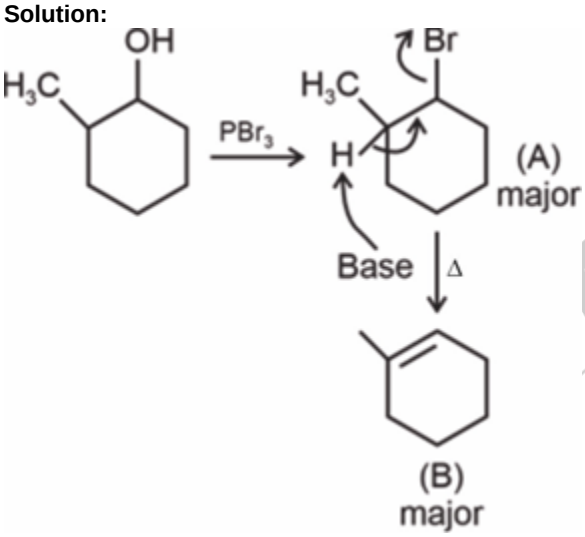
$\log\left(\frac{4}{1}\right) = \frac{E_a}{2.303R}\left(\frac{1}{300} - \frac{1}{330}\right)$

$E_a = \frac{(\log(4)) \times 2.303 \times 8.314 \times 300 \times 330}{30}$

= 3.804×10^4 J/mol
= 38.04 kJ/mol

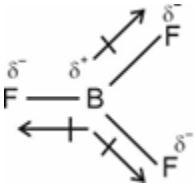
(82) **Answer :** (4)
Solution:
• During the preparation of Mohr's salt, dilute sulphuric acid is added to prevent the hydrolysis of Fe^{2+} ion.

(83) **Answer :** (1)
Solution:



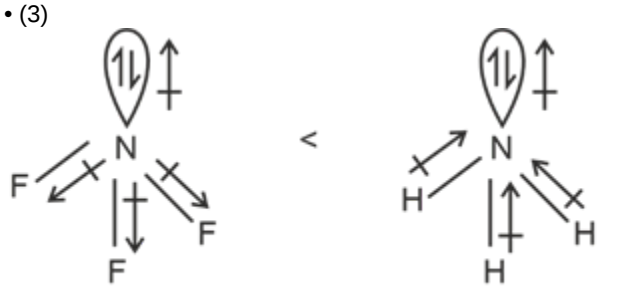
(84) **Answer :** (1)
Solution:
•π = CRT
Slope = RT
25.73 = 0.083 × T
$T = \frac{25.73}{0.083} = 309.47 \approx 310\ K$
∴ Temperature in °C = 310 – 273 = 37°C

(85) **Answer :** (4)
Solution:
• (1) In ozone; there are two resonating structures.
• (2) BF_3 i.e.,



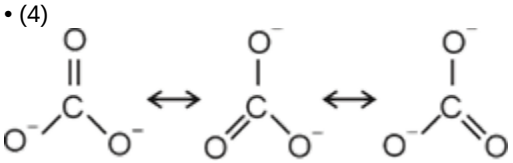
; Dipole moment = 0

• (3)



(0.80 × 10^{-30} Cm) (4.90 × 10^{-30} Cm)

• (4)

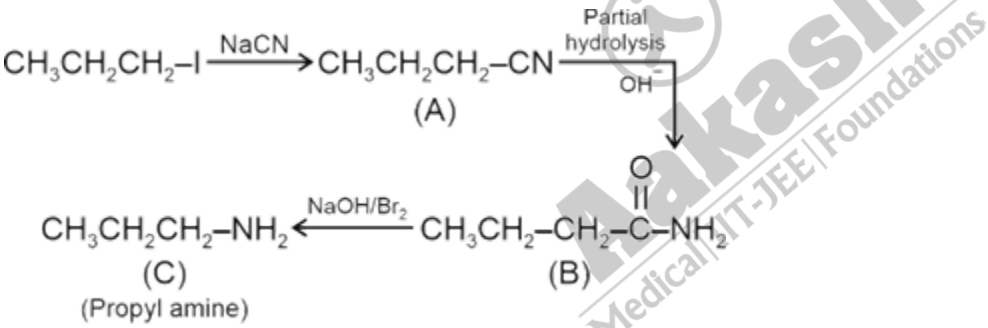


(3 canonical forms)

(86) **Answer :** (1)

Solution:

•



• Step-I is nucleophilic substitution
• Step-II will give amide.
• Step-III is Hoffmann bromamide degradation reaction.

(87) **Answer :** (1)

Solution:

Group	Cations
Group-II	Cu^{2+}
Group-III	Al^{3+}
Group-IV	Co^{2+}
Group-V	Ba^{2+}
Group-VI	Mg^{2+}

The correct order of group number of ions is

$\underset{(B)}{Cu^{2+}} < \underset{(A)}{Al^{3+}} < \underset{(D)}{Co^{2+}} < \underset{(C)}{Ba^{2+}} < \underset{(E)}{Mg^{2+}}$

∴ The correct order is B, A, D, C, E

(88) **Answer :** (2)

Solution:

$W_{rev,\ iso} = -2.303\ nRT \log \frac{P_i}{P_f}$

= –2.303 × 1 × 2 × 298 × log 2
= –2.303 × 1 × 2 × 298 × 0.301
= –413.14 calories

(89) Answer : (4)
Solution:

$$2\,NO(g) \rightleftharpoons N_2(g) + O_2(g)$$

0.1	0	0
$0.1-2x$	x	x

$\frac{1.05\times10^{-3}\times4.2\times10^{-3}}{\left(2.8\times10^{-3}\right)^2}\frac{x^2}{(0.1-2x)^2}$

$\frac{2\times1.05}{2.8}=\frac{x}{0.1-2x}\Rightarrow x=0.03$

$\alpha=\frac{2\times0.03}{0.1}=\frac{0.06}{0.1}=0.6$

(90) Answer : (2)
Solution:

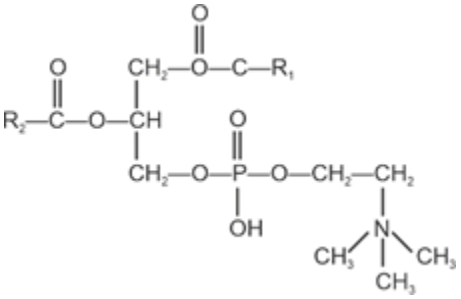
Element	Mass percentage %	Number of mole(s)	Simplest whole number
A	32%	$\frac{32}{64}=\frac{1}{2}$	= 1
B	20%	$\frac{20}{40}=\frac{1}{2}$	= 1
C	48%	$\frac{48}{32}=\frac{3}{2}$	= 3

So, empirical formula of X = $\begin{matrix}A & : & B & : & C\\ 1 & : & 1 & : & 3\end{matrix}$

∴ The correct empirical formula of compound X is ABC_3

BIOLOGY

(91) Answer : (2)
Solution:
Option (2) is the correct answer as lecithin is an example of phospholipid and it is composed of a molecule of glycerol having a phosphate group joined to one of its outer –OH groups, two fatty acid molecules linked to the other two –OH groups and a nitrogen-containing choline molecule, bound to the phosphate group.
The structure of lecithin is as follows:



(92) Answer : (4)
Solution:
For fixation of 1 molecule of CO_2 in Calvin cycle, 3 ATP molecules and 2 NADPH molecules are required.

(93) Answer : (1)
Solution:
Rhizopus is a bread mould fungus. *Ustilago* is smut fungus. *Puccinia* is known as rust fungus. *Agaricus* is commonly called mushroom.
A-III
B-II
C-IV
D-I

(94) Answer : (2)
Solution:

The type of conservation in which threatened species are taken out from their natural habitat and placed in special setting where they can be protected and given special care is called *ex-situ* conservation. This is a type of biodiversity conservation.

(95) Answer : (4)
Solution:
Flowers of *Vallisneria* are not colourful and do not produce nectar. Waterlily is pollinated by insect or wind. In water-pollinated species, pollen grains are protected from wetting by a mucilaginous covering. In some hydrophytes such as *Vallisneria* pollen grains are carried passively by water current.

(96) Answer : (3)
Solution:
• The *y* gene in *lac* operon codes for permease enzyme, which increases the permeability of cell to β-galactosides.
• So, the lactose present in the growth medium of bacteria is transported into the cell by the action of permease.

(97) Answer : (3)
Solution:
A. *Clostridium butylicum* - Butyric acid
B. *Saccharomyces cerevisiae* - Ethanol
C. *Trichoderma polysporum* - Cyclosporin-A
D. *Streptococcus sp.* - Streptokinase

(98) Answer : (3)
Solution:
In the equation $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$, K represents carrying capacity.

(99) Answer : (3)
Solution:
Auxin does not affect mature monocot plants. In monocots, especially grasses show limited translocation and cause rapid degradation of external auxin.

(100) Answer : (3)
Solution:
Radicle is destined to form root.
In the given diagram 'C' represent radicle

(101) Answer : (4)
Solution:
Collenchyma is also living tissue.
Gymnosperm lack xylem vessels but presence of xylem vessels is the characteristic of angiosperm.

(102) Answer : (4)
Solution:
Major causes of biodiversity losses are
(1) Habitat loss and fragmentation
(2) Over-exploitation
(3) Alien species invasions
(4) Co-extinctions
Hence correct option is A, B and D only.

(103) Answer : (4)
Solution:
If gynoecium is situated in the centre and other parts of the flower are located on the rim of the thalamus almost at the same level, it is called perigynous.
Both diagram shows perigynous condition

(104) Answer : (4)
Solution:
List of endangered species was released by – IUCN.

(105) Answer : (2)
Solution:
According to Law of Dominance
(1) Characters are controlled by discrete units called factors
(2) Factors occur in pairs
(3) In a dissimilar pair of factors one member of the pair dominates (dominant) the other (recessive)
The law of dominance is used to explain the expression of only one of the parental characters in a monohybrid cross.
Law of segregation is based on the fact that the alleles do not show any blending and both the characters are recovered as such in the F_2 generation.

(106) Answer : (3)

Solution:

The phenomenon of formation of interfascicular cambium from fully differentiated parenchyma cells is called dedifferentiation.

(107) Answer : (2)

Solution:

Spindle fibers attach to kinetochores of chromosome in metaphase stage.

(108) Answer : (1)

Solution:

Only statement B is incorrect because tropical environments unlike temperate ones, are less seasonal, relatively more constant and predictable.

Thus, statements A, C, D and E are correct

(109) Answer : (1)

Solution:

During leptotene stage, the chromosomes become gradually visible under the light microscope.

The beginning of diplotene is recognised by the dissolution of the synaptonemal complex and the tendency of the recombined homologous chromosomes of the bivalents to separate from each other except at the site of crossover.

Thus both statement I and II are correct.

(110) Answer : (1)

Solution:

• Nucleolus is a site for active ribosomal RNA synthesis
• Both the centrioles in a centrosome lie perpendicular to each other in which each has an organisation like the cartwheel.
• Leucoplasts are the colourless plastids of varied shapes and sizes with stored nutrients.
• Golgi apparatus is the important site for formation of glycoproteins and glycolipids.

(111) Answer : (1)

Solution:

In grasses, certain adaxial epidermal cells along the veins modify themselves into large, empty, colourless cells. These are called bulliform cells. When the bulliform cells in the leaves have absorbed water and are turgid, the leaf surface is exposed. When they are flaccid due to water stress, they make the leaves curl inwards to minimise water loss.

(112) Answer : (2)

Solution:

• Pink colour flower in snapdragon have genotype **Rr**
• Red flowered snapdragon have genotype **RR** when they both are crossed

♂\♀	R	R	Phenotype
R	RR	RR	Red : Pink : White
r	Rr	Rr	2 : 2 : 0

• So, the progeny that we get are red and pink flowered plants only.

(113) Answer : (4)

Solution:

• A transcription unit of DNA is defined primarily by the three regions in the DNA:
(i) A promoter
(ii) The structural gene
(iii) A terminator
• The promoter is said to be located towards 5′-end (upstream) of the structural gene (the reference is made with respect to the polarity of coding strand)
• The terminator is located towards 3′-end (downstream) of the coding strand.

(114) Answer : (2)

Solution:

To determine the genotype of a black seed colour at F_2, the black seed from F_2 is crossed with the white seed colour. This is called a test cross.

∴ To determine the genotype of (BB/Bb) black seed we need to cross them with white seed *i.e.,* bb.

(115) Answer : (3)

Solution:

For dark reaction of photosynthesis there are the requirement of

$$\left.\begin{matrix} CO_2 \\ ATP \\ NADPH \end{matrix}\right]$$

(116) Answer : (3)

Solution:

A. Two or more alternative forms of gene are called alleles.

B. Cross of F_1 progeny with homozygous recessive parent is a test cross.

C. Cross of F_1 progeny with any of the parents is a back cross.

D. Number of chromosome sets in plant is called ploidy.

(117) Answer : (2)

Solution:

• Robert May places the global species diversity at about 7 million.
• Alexander von Humboldt gave species-area relationship.
• Paul Ehrlich used an analogy “Rivet popper hypothesis” to explain the role of species in the ecosystem.
• David Tilman performed long term ecosystem experiments using out door plots.

(118) Answer : (1)

Solution:

Rose flower have half-inferior ovary, thus it is known as perigynous flower.
In pea, the placenta form a ridge along the ventral suture of the ovary and ovules are borne on this ridge forming two rows.
In cotton, twisted aestivation is present.
In Mango, fruit is drupe.

(119) Answer : (4)

Solution:

In prokaryotes, like *E. coli* during replication, the DNA dependent DNA polymerase catalyse polymerization only in one direction, that is 5' → 3'

(120) Answer : (1)

Solution:

The given diagram shows a wind pollinated plant showing compact inflorescence and well exposed stamens.
Stamens are exposed so complete autogamy does not occur.

(121) Answer : (2)

Solution:

• Citric acid cycle occurs in mitochondrial matrix.
• Glycolysis occurs in cytosol in most of the organisms.
• Electron transport system is present in the inner mitochondrial membrane.
• Proton gradient is formed across the intermembrane space of mitochondria

(122) Answer : (3)

Solution:

In members of Phaeophyceae sexual reproduction is by oogamous, isogamous or anisogamous methods.
Therefore correct set of statements are A, C, D and E.

(123) Answer : (3)

Solution:

NPP at first trophic level would be the GPP for second trophic level. NPP at second trophic level would be GPP for third trophic level. Therefore, 100x (kcal/m^2/yr) would be GPP at second trophic level and 100x × 10% (kcal/m^2/yr) *i.e.*, 10x (kcal/m^2/yr) energy would be GPP at third trophic level.

(124) Answer : (1)

Solution:

Option (1) is the correct answer because
GLUT-4 is a transport protein that enables glucose transport into cells,
Insulin is a proteinaceous hormone,
Trypsin is an enzyme that digests proteins and breaks them into smaller molecules,
Collagen acts as intercellular ground substance

(125) Answer : (3)

Solution:

• Oxidation involves the loss of electrons (often as part of hydrogen) from a molecule, leaving to an increase in its oxidation state. This process is typically associated with the transfer of electrons to an electron acceptor which is reduced in the process.
• The conversion of succinyl CoA to succinic acid does not involve oxidation of substrate.

(126) Answer : (3)

Solution:

In C_3 plant, some O_2 bind to RuBisCO, and hence CO_2 fixation is decreased. Photorespiration does not occur in C_4 plants as they lack RuBisCO in mesophyll. Hence statement I is the only correct statement.

(127) Answer : (1)

Solution:

• In China rose monoadelphous androecium is present.
• Diadelphous androecium is found in pea plant.
• Polyadelphous androecium is found in citrus.
• Epiphyllous androecium is found in lily.

(128) Answer : (2)

Solution:

• Frederick Griffith's series of experiments witnesses miraculous transformation in the bacteria.
• The elucidation of *lac* operon was a result of a close association between geneticist, Francois Jacob and a biochemist, Jacque Monod.
• Meselson and Stahl gave semi-conservative mode of DNA replication.
• Har Gobind Khorana developed chemical method to define combination of bases in genetic code.

(129) Answer : (3)

Solution:

Option (3) is the correct answer because isolated protoplasts from two different varieties of plants; each having a desirable character are fused to get hybrid protoplasts in the process called somatic hybridization

(130) Answer : (1)

Solution:

Option (1) is the correct answer because SAN generates an action potential which is conducted to the ventricular side by the AVN and AV bundle from where the bundle of His transmits it through the entire ventricular musculature by minute fibers called Purkinje fibers

(131) Answer : (2)

Solution:

Option (2) is the correct answer because anal cerci are a pair of jointed filamentous structures present on the 10^{th} segment of both the sexes in cockroaches.

(132) Answer : (3)

Solution:

Option (3) is the correct answer because flippers of the penguins and Dolphins are analogous structures which have similar functions (helps in swimming) but have different origin and analogous structures are the result of convergent evolution.

(133) Answer : (1)

Solution:

Option (1) is the correct answer because uterine fundus is not the part of fallopian tubes. It is the dome-shaped, rounded superior part of the uterus.

(134) Answer : (4)

Solution:

• Option (4) is the correct answer because the first human-like being the hominid were *Homo habilis,* after that about 1.5 mya, *Homo erectus* were present. Their fossils were discovered in Java in 1891. Around 1,00,000 – 40,000 years back Neanderthal man or *Homo neanderthalensis* were present and then modern *Homo sapiens* arose. So, the correct sequence of human evolution (past to recent) is:
Homo habilis – Homo erectus – Homo neanderthalensis – Homo sapiens

(135) Answer : (4)

Solution:

Option (4) is the correct answer because glucagon is a peptide hormone, secreted from pancreas and plays an important role in maintaining the normal blood glucose levels

(136) Answer : (3)

Solution:

Option (3) is the correct answer as
• *cryIAb* codes for toxin which controls corn borer.
• *cryIAc* controls the cotton bollworms
• α-1 antitrypsin is a transgenic product produced for the treatment of emphysema.
Enzyme replacement theory is one of the treatment options available for ADA deficiency

(137) Answer : (4)

Solution:

• The correct sequence of stages of cell division is

Gap 1 phase→	Synthesis phase→	Gap 2 phase→	Karyokinesis→	Cytokinesis
(E)	(C)	(A)	(D)	(B)

The correct sequence will be: E → C → A → D → B

(138) Answer : (4)

Solution:

Option (4) is the correct answer because constant gene pool will not disturb the genetic equilibrium and frequency of alleles in a population would remain constant from generation to generation

(139) Answer : (2)

Solution:

Option (2) is the correct answer because

•Myasthenia gravis is an auto-immune disorder affecting neuromuscular junction.

•Rheumatoid arthritis is a chronic auto-immune disease that affects mostly joints.

•Systemic Lupus Erythematosus is an auto-immune disease affecting skin, brain, lungs, joints, kidneys *etc*.

•Gout is the inflammation of joints due to deposition of uric acid crystals.

(140) Answer : (2)

Solution:

Option (2) is the correct answer because

•Typhoid is caused by a pathogenic bacterium, *Salmonella typhi*.

•Leishmaniasis is caused by a protozoan parasite from over 20 *Leishmania* species.

•Ringworm is one of the most common infectious diseases in man caused by fungi belonging to the genera *Microsporum*, *Trichophyton* and *Epidermophyton*.

•Filariasis is caused by filarial worms, *Wuchereria bancrofti* and *W*. *malayi*.

(141) Answer : (1)

Solution:

The correct answer is option (1) as :-

(I) Expiratory capacity → Total volume of air a person can expire after a normal inspiration. This includes tidal volume and expiratory reserve volume (TV + ERV).

(II) Functional residual capacity → Volume of air that will remain in the lungs after a normal expiration. This includes (ERV + RV).

(III) Vital capacity → The maximum volume of air a person can breathe in after a forced expiration. This includes ERV, TV and IRV or the maximum volume of air a person can breathe out after a force inspiration.

(IV) Inspiratory capacity → Total volume of air a person can inspire after a normal expiration. This includes tidal volume and inspiratory reserve volume (TV + IRV).

(142) Answer : (3)

Solution:

Down's syndrome is due to presence of an additional copy of chromosome number 21. Klinefelter's syndrome is caused due to presence of an additional copy of X-chromosome. α-Thalassemia is controlled by two closely linked genes on chromosome 16 of each parent. β-Thalassemia is controlled by a single gene HBB on chromosome 11 of each parent

(143) Answer : (4)

Solution:

The correct answer is option (4) as Follicular Stimulating Hormone (FSH) stimulates the growth and development of the ovarian follicles in females. It does not act on the Leydig cells in males. Leydig cells synthesise and secrete testicular hormones called androgens under the effect of Luteinizing hormone. Androgens, in turn, stimulate the process of spermatogenesis. FSH acts on the Sertoli cells and stimulates secretion of some factors which help in the process of spermiogenesis. Growing ovarian follicles secrete estrogen under the effect of LH and FSH during the follicular phase of the menstrual cycle

(144) Answer : (2)

Solution:

•The correct answer is option (2) as *Pleurobrachia* is a member of the phylum Ctenophora.

•Radula is a file-like rasping organ present in the mouth of molluscs for feeding.

•Hemichordates have a rudimentary structure in the collar region called stomochord, a structure similar to notochord.

•Air bladder is present in the organisms belonging to the class Osteichthyes

(145) Answer : (3)

Solution:

(A) Diakinesis – Completion of terminalisation of chiasmata

(B) Pachytene – Appearance of recombination nodules

(C) Zygotene – Synaptonemal complex formation

(D) Leptotene – Chromosomes look like thin threads

(146) Answer : (3)

Solution:

•The correct answer is option (3) as 'Ti plasmid' stands for tumor inducing plasmid.

•When the bacterium contacts a damaged plant cell, it delivers a T-DNA (Transferred DNA) fragments from plasmid into host cell that integrates at a random position in plant cells' chromosome. Disarming of Ti plasmid involves replacement of harmful T-DNA of Ti plasmid of original *A*. *tumefaciens* by gene of interest. Options (1), (2) and (4) are incorrect

(147) Answer : (4)

Solution:

The correct answer option is (4) as

•Cocaine, also called coke or crack is obtained from the plant *Erythroxylum coca*. It has a potent stimulating action on the central nervous system, producing a sense of euphoria and increased energy.

•Heroin is obtained by the acetylation of morphine.

•Morphine is extracted from the latex of poppy plant *Papaver somniferum.*

•Morphine is a very effective sedative and painkiller, and is useful in patients who have undergone surgery.

•Marijuana belongs to the category of Cannabinoids which are obtained from the plant *Cannabis sativa*.

(148) Answer : (1)

Solution:

Template DNA is :

•3'TACATGGCAAATATCCATTCA5'

•5'AUGUACCGUUUAUAGGUAAGU3' m-RNA

(149) Answer : (2)

Solution:

The correct answer is option (2) as

•Pons consists of fibre tracts that interconnect different regions of the brain.

•Hypothalamus contains several groups of neurosecretory cells which secrete hormones called hypothalamic hormones.

•Medulla contains centres which control respiration, cardiovascular reflexes and gastric secretions.

•Cerebellum has very convoluted surface in order to provide the additional space for many more neurons. The cerebellum does not initiate the movements of the body but modulates or reorganize the moto commands. Its most important function is to coordinate locomotor activity in the body which is actually initiated by the impulses arising in the motor areas of the forebrain

(150) Answer : (3)

Solution:

•The correct answer is option (3) as:-

•Lipase digests fats. Fats and oils are classified under the category of lipids. Lipids possess ester bonds.

•Nucleases are enzymes that cleave nucleic acids. Phosphodiester bonds make up the backbone of DNA and RNA, thus nucleases will digest them.

•Proteases are enzymes that catalyze proteolysis, *i.e*., breakdown of proteins into their monomeric forms. The monomeric units of proteins are amino acids which are joined to each other by peptide bond.

•Amylase is a digestive enzyme. It breaks down starch and converts it into the simplest sugars.

$$\text{Polysaccharides (Starch)} \xrightarrow[(pH\ 7.01-8.3)]{Amylase} \text{Disaccharides (Maltose)}$$

•Since, starch is a carbohydrate and it contains glycosidic bonds, amylase will act on them.

(151) Answer : (4)

Solution:

•The correct answer is option (4) as

•Vault is a barrier method of contraception. It is a barrier made of rubber that are inserted into the female reproductive tract to cover the cervix during coitus. It prevents conception by blocking the entry of sperms through the cervix.

•Option (1), (2) and (3) are incorrect as they fall under the category of natural methods of contraception.

(152) Answer : (2)

Solution:

The correct answer is option (2) as

•Figure (a) represents skeletal muscle fibres. They remain closely attached to bones. In a typical muscle such as biceps, striated skeletal muscle fibres are bundled together in a parallel fashion.

•Figure (b) represents smooth muscle fibres that are fusiform in shape and do not show striations. The wall of internal organs such as the blood vessels, stomach and intestine contain this type of muscle tissue.

•Figure (c) represents cardiac muscle fibres which are contractile tissue exclusively present in the heart and these are branched and striated muscles.

(153) Answer : (3)

Solution:

•Correct answer is option (3) as it is an incorrect statement.

•Bioreactors were developed to produce large volumes (100 – 1000 litres) of culture of the desired products.

•Small volume cultures cannot yield the appreciable quantities of products.

•Option (1), (2) and (4) represent correct statements w.r.t bioreactors.

(154) Answer : (1)

Solution:

Option (1) is the answer because, breast feeding during the initial period of infant growth helps in development of resistance in new born babies from various diseases as. Colostrum contains several antibodies that play major role in providing passive immune response

(155) Answer : (2)
Solution:
Option (2) is the correct answer because, high pO_2 and lesser H^+ concentration (increased pH), favor for the formation of oxyhaemoglobin.

(156) Answer : (3)
Solution:
• Option (3) is the correct answer because, Rhinoviruses represent one such group of viruses which cause one of the most infectious human ailments; the common cold.
• In malaria, the rupture of RBCs is associated with release of a toxic substance, haemozoin which is responsible for the chills and fever. Malaria is caused by a protozoan; *Plasmodium.*
• Widal test is a diagnostic test for typhoid fever.
• Dust mites are common allergens present in the atmosphere

(157) Answer : (2)
Solution:
• Options (2) is the correct answer because, Aschelminths are pseudocoelomates. Poriferans and platyhelminths are acoelomates.
• Annelids are true coelomates.

(158) Answer : (4)
Solution:
• Option (4) is the correct answer because,
• Multiload 375 is a copper releasing IUD
• Progestogens are used in implants
• Lippes loop is a non-medicated IUD
• LNG -20 is a hormone releasing IUD

(159) Answer : (2)
Solution:
• Option (2) is the correct answer because
• In the nephron, the descending limb of loop of Henle is permeable to water but almost impermeable to electrolytes. This concentrates the filtrate as it moves down.
• PCT is lined by simple cuboidal brush bordered epithelium which increases the surface area for reabsorption.

(160) Answer : (2)
Solution:
Option (2) is the correct answer because 'X' represents ori and 'Y' represents rop.
• Any piece of DNA when linked to ori sequence can be made to replicate within the host cells. This sequence is also responsible for controlling the copy number of the linked DNA.
• rop codes for the proteins involved in the replication of the plasmid.

(161) Answer : (4)
Solution:
• Axoneme is seen in cilia and flagella
• Centriole shows cartwheel appearance
• Crista is found in mitochondria
Satellite is present in chromosomes

(162) Answer : (2)
Solution:
Option(2) is the correct answer because,
• *Pterophyllum* (Angel fish) is a bony fish.
• *Myxine*(Hagfish) is a cyclostome
• *Pristis* (Saw fish) belongs to class Chondrichthyes
Exocoetus (Flying fish) belongs to class Osteichthyes

(163) Answer : (4)
Solution:
Option (4) is the correct answer because
• **Fibrous joints** do not allow any movement. This type of joint is shown by flat skull bones which fuse end-to-end with the help of dense fibrous connective tissues in the form of futures.
• **Cartilaginous joints** permit limited movements. Example: Joint between the adjacent vertebrae in the vertebral column.
Hinge joint and Ball and socket joint are types of synovial joints that allow considerable movement.

• **Ball and socket joint** present between Humerus and Pectoral girdle, allows rotational movement.
• **Hinge joint** is present at knee joint and helps in locomotion.

(164) Answer : (3)
Solution:
• Option (3) is the correct answer because, the presence or absence of hymen is not a reliable indicator of virginity or sexual experience.
• The hymen is often torn during the first coitus (sexual intercourse). However, it can also be broken by a sudden fall or jolt, insertion of a vaginal tampon, active participation in some sports like horseback riding, cycling, *etc*. In some women, the hymen persists even after first coitus.

(165) Answer : (4)
Solution:
• Gause's competitive exclusion principle states that two closely related species competing for the same resources cannot exist indefinitely and the competitively inferior one will be eliminated eventually. This may be true if resources are limiting.

(166) Answer : (1)
Solution:
Option (1) is the correct answer because,
• Crop is a sac-like structure used for storing of food.
• A ring of 6-8 blind tubules called hepatic or gastric caeca is present at the junction of foregut and midgut.
• At the junction of midgut and hindgut is present another ring of 100-150 yellow coloured thin filamentous Malpighian tubules.
• Gizzard helps in grinding the food particles.

(167) Answer : (3)
Solution:
The correct answer is option (3).
• Option (3) is the correct answer as the stated features *i.e.*, absence of notochord (statement B), dorsal heart (statement D) and absence of post-anal tail (statement E) are true for non-chordates.
• Statements A and C hold true for chordates as chordates have a dorsal, hollow and single central nervous system and their pharynx is perforated by gill slits.

(168) Answer : (3)
Solution:
The correct answer is option (3) as the loop of Henle of juxta medullary nephrons is very long and runs deep into the medulla.

(169) Answer : (3)
Solution:
The correct answer is option (3) as Statement I is correct but Statement II is incorrect.
• In human brain, a deep cleft divides the cerebrum longitudinally into two halves, which are termed as the left and right cerebral hemispheres.
• These hemispheres are connected by a tract of nerve fibres called corpus callosum.
• Three major regions make up the brain stem *i.e*., mid brain, pons and medulla oblongata.
• Cerebrum is a part of forebrain. It forms the major part of the human brain.

(170) Answer : (1)
Solution:
Option (1) is the correct answer because both statements I and II are correct *i.e*., the bone marrow is the main lymphoid organ where all blood cells including lymphocytes are produced. Also, both bone marrow and thymus, provide the micro-environments for the development and maturation of T-lymphocytes.

(171) Answer : (1)
Solution:
Option (1) is the correct answer because the correct sequence of steps w.r.t. the catalytic cycle of an enzyme is as follows:-
• First, the substrate binds to the active site of the enzyme, fitting into the active site
• The binding of substrate to the active site of the enzyme leads to the formation of enzyme-substrate (ES) complex.
• The active site of the enzyme, breaks the chemical bond of the substrate and the new enzyme-product (EP) complex is formed.
• The enzyme releases the product of the reaction
• The free enzyme is ready to bind to another molecule of substrate and run through the catalytic cycle once again.

(172) Answer : (1)
Solution:
• Option (1) is the correct answer, because the increased levels of GnRH acts on anterior pituitary gland and stimulates the secretion of LH and FSH. LH acts at the Leydig cells and stimulate the secretion of androgens, which stimulates the process of spermatogenesis. FSH acts on Sertoli cells and stimulates secretion of some factors which help in the process of spermiogenesis.

(173) Answer : (4)

Solution:
Option (4) is the correct answer because
• Mesozoic era was the age of reptiles and during this era birds also evolved.
• Proterozoic era was the time of lower invertebrates. Proterozoic rocks contain many definite traces of primitive life forms.
• Cenozoic era is called the 'Age of mammals' because the largest land animals have been mammals during that time.
• During Paleozoic era, fishes became diversified and the major groups of amphibians developed.

(174) Answer : (3)
Solution:
Option (3) is the correct answer because
• Goblet cells of the alimentary canal are unicellular and isolated glandular cells.
• Compound epithelium covers the moist surface of buccal cavity and provide protection against chemical and mechanical stresses.
• Salivary glands are multicellular glandular structure consisting of cluster of cells.
• Pancreas is an endocrine as well as exocrine gland *i.e.*, heterocrine gland.

(175) Answer : (4)
Solution:
• In eukaryotes, RNA polymerase III codes for snRNAs, tRNA and 5S rRNA.
• Splicing of exons is performed by snRNPs.
• TATA box is present in promoter region of transcription unit.
• Rho factor is responsible for termination of transcription.

(176) Answer : (1)
Solution:
• Genotype of father with blood group $B^+ = I^Bi/iI^B$
• Genotype of mother with blood group $A^+ = I^Ai/iI^A$
• Genotype of child with blood group $O^+ = ii$
• Hence only 'A' is correct.

(177) Answer : (2)
Solution:
Option (2) is the correct answer because
• P-wave represents the electrical excitation (depolarisation) of the atria which leads to the contraction of both the atria.
• QRS complex represents the depolarisation of ventricles which initiates the ventricular contraction.
• T-wave represents the return of the ventricles from excited to normal state (repolarisation).
T-P gap represents that heart muscles are electrically silent.

(178) Answer : (3)
Solution:
• Both mitochondria and chloroplasts are double membrane bound cell organelles.
• Transport of ions occurs across the inner membrane of mitochondria. The inner membrane of chloroplast is impermeable to ions and metabolites. Therefore, it is said that inner membrane of mitochondria is relatively more permeable to that of chloroplast

(179) Answer : (4)
Solution:
Option (4) is the correct answer because
• Exophthalmic goitre is caused due to the hyper secretion of thyroid hormone and is characterised by protruding eye balls.
• Acromegaly is caused due to the excessive secretion of growth hormone in adults especially in middle age.
• Cushing's syndrome is result of excess secretion of cortisol from adrenal cortex. It is characterised by hyperglycemia and moon faced appearance.
• Cretinism is caused due to hyposecretion of thyroid hormone and is characterised by stunted growth.

(180) Answer : (4)
Solution:
The cloaca is a small, median chamber that is used to pass faecal matter, urine and sperms to the exterior.