03/04/2026

Code-B

Aakash
Medical | IIT-JEE | Foundations

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MM : 720 Final Test Series(P1)_NEET2026_Test-06B **Time : 180 Min.**

PHYSICS

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CHEMISTRY

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ZOOLOGY

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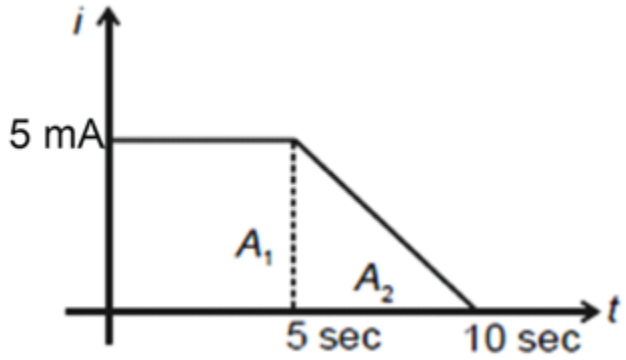
158. (4)

180. (4)

Hints and Solutions

PHYSICS

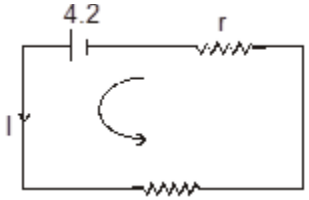
(1) **Answer :** (1)
Solution:
$q = i \times t$ i.e. area under current and time curve will give us charge flown.
$\Rightarrow q = A_1 + A_2$



$q = 5 \times 5 + \frac{1}{2} \times 5 \times 5$ mC
q = 37.5 mC

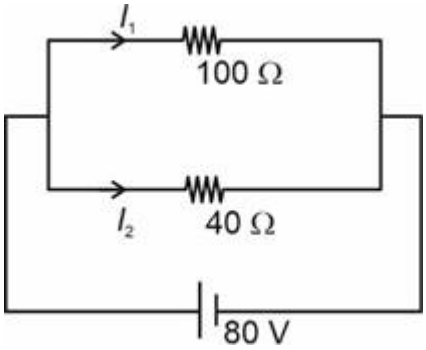
(2) **Answer :** (4)
Solution:
In open circuit $V = E$
In discharging the cell → $V = E - ir$
In charging of the cell → $V = E + ir$

(3) **Answer :** (1)
Solution:



4. 2 – 0.4 r – 10 × 0.4 = 0
4. 2 – 0.4 r – 4 = 0
0. 4 r = 0.2
$r = \frac{1}{2}\ \Omega$

(4) **Answer :** (2)
Solution:



$I_1 = \frac{80}{100} = 0.8$ A

$I_2 = \frac{80}{40} = 2$ A

By KVL :

$V_X + 50 \times (0.8) - (30 \times 2) = V_Y$

$V_X + 40 - 60 = V_Y$

$V_X - V_Y = 20$ V

(5) **Answer :** (1)

Solution:

$R_1\alpha_1 + R_2\alpha_2 = 0$

$(100)\ (4.5 \times 10^{-3}) = R(5 \times 10^{-2})$

$0.9 \times 10 = R$

$R = 9\ \Omega$

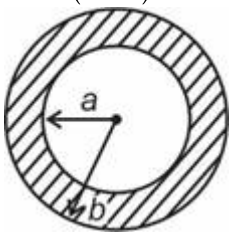
(6) **Answer :** (2)

Hint:

$J = \frac{I}{A}$

Solution:

$A = \pi\left(b^2 - a^2\right)$



$J = \frac{I}{\pi\left(b^2 - a^2\right)}$

(7) **Answer :** (2)

Solution:

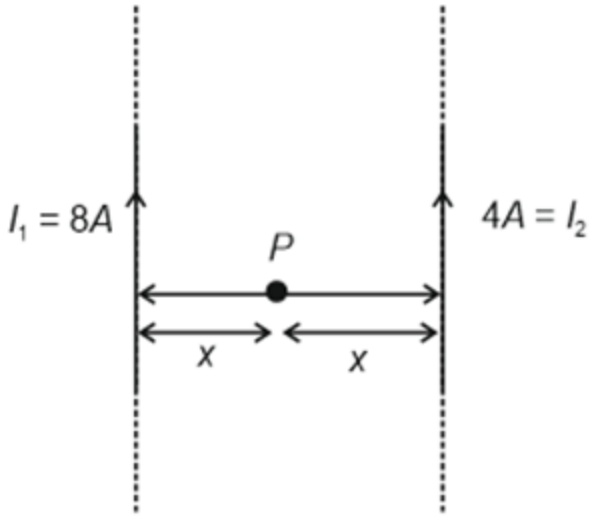
At equilibrium

$ILB = mg$

$I = \frac{mg}{LB} = \frac{0.5 \times 10}{2 \times 1} = 2.5$ A

(8) **Answer :** (3)

Solution:



At P,

$B_P = B_1 - B_2$

$B_P = \frac{\mu_0}{2\pi}\frac{8}{x} - \frac{\mu_0}{2\pi}\frac{4}{x}$

$B_P = \frac{\mu_0}{2\pi}\frac{4}{x}$

If I_2 = 4 A, is switched off, then ... $B_P' = \frac{\mu_0(8)}{2\pi x}$

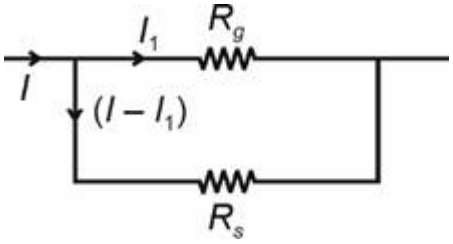
$\therefore\ B_P' = 2B_p = 2 \times 36 = 72\,\mathrm{T}$

(9) **Answer :** (2)
Hint:
Pitch $= \frac{2\pi m}{qB} \times v\cos\theta$
Solution:
$\frac{P_1}{P_2} = \frac{\cos\theta_1}{\cos\theta_2}$
$= \frac{\cos 30^\circ}{\cos 60^\circ}$
$= \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \sqrt{3} : 1$

(10) **Answer :** (1)
Solution:
Lorentz-force → $\vec{F} = q(\vec{E} + \vec{v} \times \vec{B})$
Velocity selector work when $\vec{v}, \vec{E}$ and $\vec{B}$ are mutually perpendicular.
Force on a charge in magnetic field → $\vec{F} = \vec{q}(\vec{v} \times \vec{B})$
Magnetic moment due to moving charge → $\frac{q}{2m}$ times of angular momentum

(11) **Answer :** (1)
Hint:
$B_{axis} = \frac{\mu_0 i r^2}{2(r^2+x^2)^{3/2}},\ B_{centre} = \frac{\mu_0 i}{2r}$
Solution:
$B_{centre} = 5\sqrt{5}\,B_{\text{axis}}$
$\Rightarrow\ \frac{\mu_0 i}{2r} = 5\sqrt{5}\frac{\mu_0 i r^2}{2(r^2+x^2)^{3/2}}$
$\Rightarrow\ \frac{1}{r} = \frac{5\sqrt{5}r^2}{(r^2+x^2)^{3/2}}$
$\Rightarrow\ \left(r^2+x^2\right)^{3/2} = \left(\sqrt{5}r\right)^3$
$\Rightarrow\ \left(r^2+x^2\right)^{1/2} = \sqrt{5}r$
$\Rightarrow\ r^2 + x^2 = 5r^2$
$\Rightarrow x = 2r$
= 30 cm

(12) **Answer :** (1)
Solution:



$I_1 R_g = (I - I_1)R_S$
$I_1\,(R_g + R_S) = I\,R_S$
$\frac{I_1}{I} = \left(\frac{R_s}{R_g+R_s}\right)$
$= \frac{0.3}{60.3}$
$= \left(\frac{1}{201}\right)$

(13) **Answer :** (3)
Solution:
Hysteresis curve is valid for ferromagnets.

(14) **Answer :** (2)

Solution:
Bar magnet creates non-uniform magnetic field. Net force on bar magnet placed in uniform magnetic field is zero because the equal and opposite forces acting on its north and south poles cancel each other out.

(15) **Answer :** (4)
Solution:
The de-magnetising field intensity due to solenoid should be equal to coercivity.
$B = \mu_0 nI \rightarrow B = \mu_0 H$
$H = nI$ (H is coercivity)
$n = \frac{500}{0.2} = 2500$ turns/m
$nI = 4000$
$2500 \times I = 4000$
$I = 1.6$ A

(16) **Answer :** (2)
Hint:
Use $\vec{\tau} = \vec{M} \times \vec{B}$ and $U = -\vec{M} . \vec{B}$
Solution:
$W = MB(\cos\theta_1 - \cos\theta_2)$
$\sqrt{5} = MB\left(1 - \frac{3}{5}\right)$
$MB = \frac{5\sqrt{5}}{2}$
Now $\tau = \text{MBsin}\theta = \frac{5\sqrt{5}}{2} \times \frac{4}{5} = 2\sqrt{5}$ N m

(17) **Answer :** (2)
Hint:
$\varepsilon = -\frac{d\phi}{dt}$
Solution:
$\varepsilon = -\frac{(\phi_2 - \phi_1)}{t}$
$\phi_2 = 0,\ \phi_1 = BA\cos 45^\circ = 0.1 \times 100 \times 10^{-4} \times \frac{1}{\sqrt{2}}$
$= -\frac{\left(0 - \frac{10^{-3}}{\sqrt{2}}\right)}{0.7}$
$= 10^{-3}$ V
= 1 mV

(18) **Answer :** (4)
Solution:
$\frac{1}{L} = \frac{1}{L1} + \frac{1}{L_2} + \frac{1}{L_3}$
$L = \frac{6}{3} = 2$ H

(19) **Answer :** (2)
Solution:
Self inductance of solenoid is $L = \frac{\mu_0 N^2 A}{l}$.

(20) **Answer :** (3)
Solution:
Charge flow
$q_{\text{flow}} = \frac{|\Delta\phi|}{R} = \frac{8-2}{2} = 3$ C

(21) **Answer :** (2)
Solution:
Stored energy $U = \frac{1}{2}LI^2$
$= \frac{1}{2}5 \times 2^2$
= 10 J

(22) **Answer :** (3)
Solution:
The flux is increasing in vertical direction, so to reduce it induced current is anti-clockwise.

$\varepsilon = Bl_{\text{eff}}v$

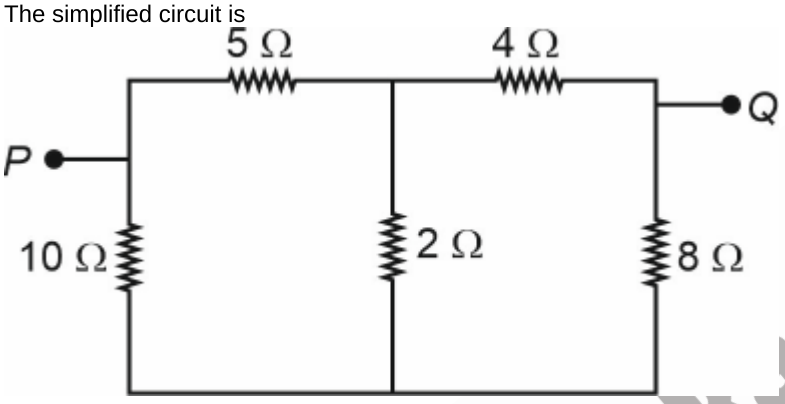
Here l_{eff} is increasing with time, hence current $\left(i = \frac{\varepsilon}{R}\right)$ will also increase.

(23) **Answer :** (1)
Solution:
Doubling the length will double the resistance, therefore current will be halved.
$I = neAV_d \Rightarrow I \propto V_d$
Hence drift velocity will also be halved.

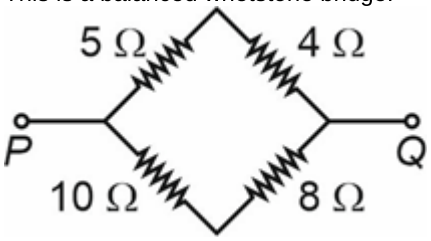
(24) **Answer :** (3)
Solution:
According to maximum power transfer theorem, at $R = r$ power delivered to the external resistance would be maximum.
$\therefore R = r = 3\Omega$
$I = \frac{E}{R_{eq}} = \frac{12}{3+3} = 2\ \text{A}$

Power delivered to the resistance $P = I^2R$
$P_{\max} = 2^2 \times 3 = 12\ \text{W}$

(25) **Answer :** (3)
Solution:
The simplified circuit is

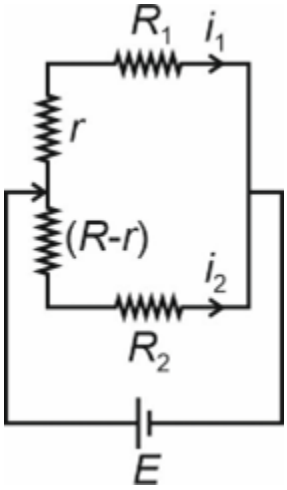


This is a balanced whetstone bridge.



$R_{PQ} = \frac{9.18}{9+18} = 6\ \Omega$
$\therefore R_{\text{eq}} = 6\ \Omega$

(26) **Answer :** (2)
Solution:
Let the total resistance of the uniform resistance be *R*. Then



Since $i_1 = \frac{E}{R_1 + r}$, therefore to increase i_1, *r* should decrease, Hence the contact should move upwards; consequently i_2 decreases.

(27) **Answer :** (1)
Solution:
According to junction rule, 3 A is flowing in 5 Ω and 1 Ω resistors and 1 A is flowing through 2 Ω resistor. Potential difference across 2 μF capacitor is $(5+1)\times 3+(2\times 1)=20\text{ V}$. $U=\frac{1}{2}CV^2=\frac{1}{2}\times 2\times 20^2=400\ \mu\text{J}$

(28) **Answer :** (4)
Solution:
Due to magnetic field, the charged particle moves on a helical path having a circle of constant radius and due to electric field pitch of the helix changes continuously.

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

Ampere's law is useful when symmetry allows easy evaluation of $\oint \vec{B}.\vec{dl}$.

(30) **Answer :** (1)
Solution:
At every point on the circumference of the loop, current element *idl* and magnetic field *B* are perpendicular and their cross-product point in the inward direction.
$d\vec{F} = i\vec{dl}\times\vec{B}$
$F = i\times 2\pi aB$

(31) **Answer :** (2)
Solution:
$\Delta V\times q=\frac{1}{2}mv^2 \Rightarrow 12\times 10^3\times q=\frac{1}{2}\times m\times\left(10^6\right)^2$
$\frac{m}{q}=\frac{12\times 10^3\times 2}{10^{12}}=24\times 10^{-9}\ \text{kg/C}$
Radius of the circular path
$R=\frac{mv}{qB}=\left(\frac{m}{q}\right)\times\frac{v}{B}$
$R=24\times 10^{-9}\times\frac{10^6}{0.2}\times 100\ \text{cm}$
$R=12\ \text{cm}$

(32) **Answer :** (3)
Solution:

- Current $i=\frac{qv}{2\pi r}$ and $r=\frac{mv}{qB}$

$\therefore i=\frac{q}{2\pi}\times\frac{qB}{m}\Rightarrow i=\frac{q^2B}{2\pi m}\Rightarrow i\propto v^0$

- Magnetic dipole moment (μ) = iA

$\mu=\frac{q^2B}{2\pi m}\times\pi r^2$ and $r\propto v$
$\therefore\ \mu\propto v^2$

- Magnetic field at the centre (*B*) = $\frac{\mu\cdot i}{2R}$

$\therefore\ B \propto v^{-1}$

- Radius of the circular path (R) = $\frac{mv}{qB}$

$\therefore\ R \propto v$

(33) **Answer :** (3)
Solution:

Magnetisation ($\mathrm{M} = \frac{\text{magnetic moment}}{\text{Volume}}$) is a material property and depends on applied field, not on size. Similarly, magnetic susceptibility of each half is also a material property.

(34) **Answer :** (1)
Solution:
Potential due to a dipole is given by

$V = \frac{\mu_0 M \cos\theta}{4\pi r^2}$

$1.2 \times 10^{-4} = \frac{10^{-7} \times M \times \cos 0^\circ}{\left(10 \times 10^{-2}\right)^2}$

$M = \frac{1.2 \times 10^{-4} \times 10^{-2}}{10^{-7}} = 12\ \mathrm{A\ m^2}$

(35) **Answer :** (2)
Solution:
Diamagnetism is the universal property. Diamagnetism does not involve permanent magnetic moments; it arises due to induced magnetic moment.

(36) **Answer :** (1)
Solution:

Using formula $T = 2\pi\sqrt{\frac{I}{MB}}$

$2 = 2\pi\sqrt{\frac{I}{0.4 \times 10^{-4} \times 120}}$

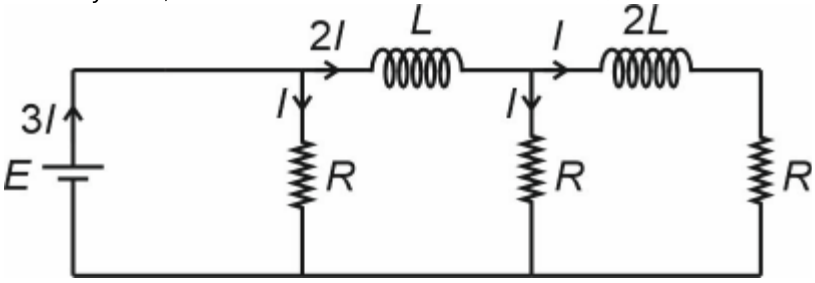
$\frac{1}{\pi^2} = \frac{I}{48 \times 10^{-4}} \Rightarrow I = 4.8 \times 10^{-4}\ \mathrm{kg\ m^2}$

(37) **Answer :** (1)
Solution:

For paramagnetic material $\chi \propto \frac{1}{T}$

$\therefore\ 300 \times 1.2 \times 10^{-5} = T \times 1.5 \times 10^{-5}$
$T = 240\ \mathrm{K}$

(38) **Answer :** (4)
Solution:
At steady state, the inductors will behave like a wire of zero resistance. Therefore,



$3I = \frac{E}{R_{eq}} \Rightarrow 3I = \frac{E}{R/3} \Rightarrow I = \frac{E}{R}$

After opening the switch, the energy stored in both the inductors will be dissipated.

$\therefore H = \frac{1}{2}L \times (2I)^2 + \frac{1}{2} \times 2L \times I^2$

$H = 3LI^2 = 3L \times \frac{E^2}{R^2}$

(39) **Answer :** (1)
Solution:

Induced emf, $\varepsilon = \left|-\frac{d\phi}{dt}\right| = BA\omega\sin\omega t$. No quantity in the given formula depends on the identity of metal.

(40) **Answer :** (2)
Solution:

Case-I:

$V_a - V_b = iR + \frac{Ldi}{dt}$

$18 = (3 \times R) + (L \times 2)$ ...(i)

Case-II:

$V_a - V_b = iR + \frac{Ldi}{dt}$

$6 = 7R + L \times (-2)$

$6 = 7R - 2L$ ..(ii)

Solving equation (i) and (ii), we get

R = 2.4 Ω and L = 5.4 H

(41) **Answer :** (2)

Solution:

According to Lenz's law, the induced current always opposes the change in magnetic flux.

(42) **Answer :** (3)

Solution:

Motional emf $E = Blv$

$\therefore E \propto v$

(43) **Answer :** (3)

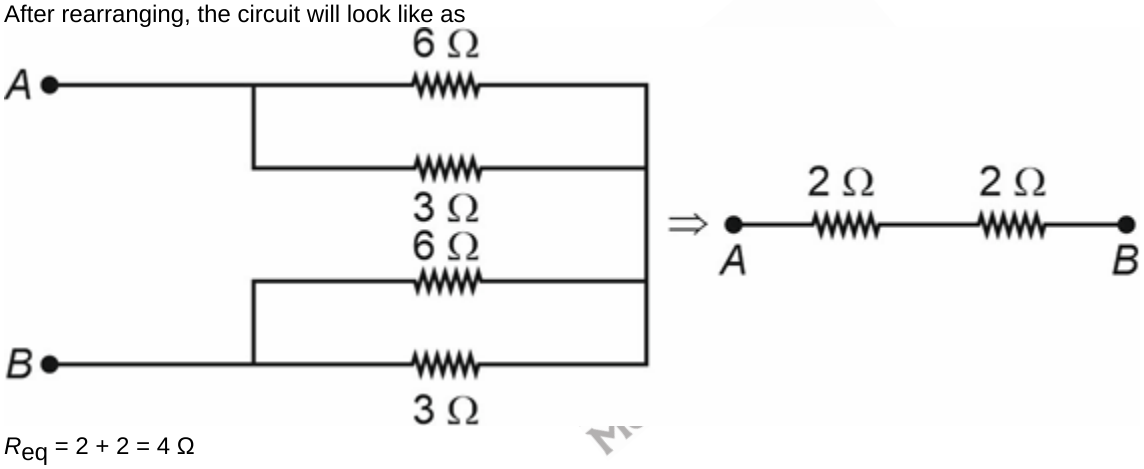
Solution:

Due to mutual inductance, changing current in coil *A* induce emf in coil *B*. Mutual inductance depends on the orientation of conducting rings and it is maximum when flux linkage them is maximum.

(44) **Answer :** (1)

Solution:

After rearranging, the circuit will look like as



R_{eq} = 2 + 2 = 4 Ω

(45) **Answer :** (1)

Solution:

Soln: Force per unit length on wires parallel to each other is given by

$\frac{F}{l} = \frac{\mu_0 i_1 i_2}{2\pi d}$

$\frac{F}{l} = \frac{2 \times 10^{-7} \times 2 \times \frac{3}{2}}{2 \times 10^{-2}} = 3 \times 10^{-5} \frac{\mathrm{N}}{\mathrm{m}}$

CHEMISTRY

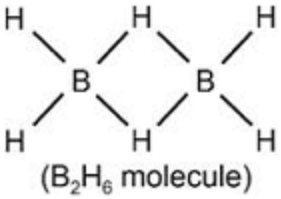
(46) **Answer :** (4)

Solution:

$\mathrm{Sn} + 2\,\mathrm{H_2O} \xrightarrow{\Delta} \mathrm{SnO_2} + 2\,\mathrm{H_2}$

(47) **Answer :** (3)

Hint:



(B_2H_6 molecule)

Solution:
It contains four 2 centre-2 electron bonds and two 3 centre-2 electron bonds
• Diborane is produced on an industrial scale by the reaction of BF_3 with sodium borohydride.

$2BF_3 + 6\ NaH \xrightarrow{450\ K} B_2H_6 + 6\ NaF$

(48) **Answer :** (2)
Solution:

$$Na_2BaO_7.\ 10H_2O \xrightarrow{\Delta} Na_2B_4O_7 \xrightarrow{\Delta} \underbrace{\underset{\text{Sodium metaborate}}{2\,NaBO_2} + \underset{\text{Boric anhydride}}{B_2O_3}}_{\text{Glassy bead}}$$

(49) **Answer :** (4)
Hint:
Reaction of B_2H_6 with NH_3 finally gives borazine.
Solution:

Reaction of ammonia with diborane gives initially $B_2H_6.2NH_3$ which is formulated as $[BH_2(NH_3)_2]^+[BH_4]^-$; further heating gives borazine, $B_3N_3H_6$ known as "inorganic benzene" in view of its ring structure with alternate BH and NH groups.

$3B_2H_6+6NH_3 \rightarrow 3[BH_2(NH_3)_2]^+[BH_4]^- \xrightarrow{Heat} 2B_3N_3H_6 + 12H_2$

(50) **Answer :** (3)
Solution:

$$2Al(s) + 2NaOH(aq) + 6H_2O(aq) \rightarrow 2Na^+[Al(OH)_4]^-(aq) + 3H_2(g)$$

(51) **Answer :** (3)
Hint:
Borax is $Na_2[B_4O_5(OH)_4]\cdot 8\ H_2O$
Solution:
Borax dissolves in water to give alkaline solution.

$$Na_2B_4O_7 + 7H_2O \rightarrow 2NaOH + 4H_3BO_3$$

(52) **Answer :** (2)
Hint:
Silica on reaction with NaOH forms sodium silicate.
Solution:
$SiO_2 + 2NaOH \rightarrow Na_2SiO_3 + H_2O$
$SiO_2 + 4HF \rightarrow SiF_4 + 2H_2O$

(53) **Answer :** (3)
Hint:
Group 13 and group 14 belong to p-block.
Solution:
The group oxidation state of group 13 is +3 and group 14 is +4.
The general outer electronic configuration of group 13 and 14 elements are $ns^2\ np^1$ and $ns^2\ np^2$ respectively.

(54) **Answer :** (3)
Solution:
CCl_4 does not hydrolyse while $SiCl_4$ hydrolyses readily by water

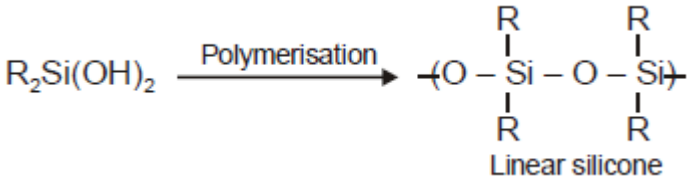
(55) **Answer :** (4)
Hint:
CO forms a stable complex with haemoglobin, this found to be poisonous.
Solution:

Zeolites are widely used as a catalyst in petrochemical industries for cracking of hydrocarbons and isomerisation.
The highly poisonous nature of CO arises due to its ability to form a complex with haemoglobin which is about 300 times more stable than the oxygen-haemoglobin complex.
Being heavy and non-supporter of combustion CO_2 is used as fire extinguisher.

(56) **Answer :** (2)
Hint:
CO + H_2 is syn gas/water gas.
Solution:
CO + N_2 is producer gas, and CO + H_2 is water gas

(57) **Answer :** (2)
Hint:
Fullerenes are cage like molecules.
Solution:
Fullerenes are the only pure form of carbon because they have smooth structure without having 'dangling bonds.

(58) **Answer :** (2)
Solution:



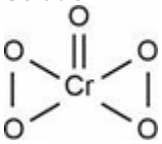
(59) **Answer :** (4)
Solution:
SnO_2 is amphoteric in nature.

(60) **Answer :** (1)
Solution:
Moving down the group 14, covalent radii increases

(61) **Answer :** (3)
Hint:
$Cr_2O_7^{2-} + 3SO_3^{2-} + 8H^+ \rightarrow 2Cr^{3+} + 3SO_4^{2-} + 4H_2O$
Solution:

$$\frac{n_{Cr_2O_7^{2-}}}{n_{SO_3^{2-}}} = \frac{1}{3} = \frac{\left(\frac{2}{3}\right)}{2}$$

(62) **Answer :** (4)
Hint:
Structure of CrO_5 has two peroxy linkages
Solution:



Cr is in +6 oxidation state.

(63) **Answer :** (3)
Hint:
Oxidising agent gets reduced during reaction
Solution:

$$\underset{(RA)}{H_2O_2} + \underset{(OA)}{I_2} \rightarrow H_2O + O_2 + HI$$

$$\underset{(RA)}{H_2O_2} + \underset{(OA)}{Ag_2O} \rightarrow Ag + H_2O + O_2$$

$$\underset{(OA)}{H_2O_2} + \underset{(RA)}{PbS} \rightarrow PbSO_4 + H_2O$$

(64) **Answer :** (1)

Solution:

$TiCl_4 + 2Mg \rightarrow Ti + 2MgCl_2$ (Metal displacement reaction)

$Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$ (Non-metal displacement reaction)

$Cl_2 + 2OH^- \rightarrow ClO^- + Cl^- + H_2O$ (Disproportionation reaction)

$2NaH \xrightarrow{\Delta} 2Na + H_2$ (Decomposition reaction)

(65) Answer : (4)

Solution:

The redox reaction in which same element gets oxidised as well as reduced simultaneously.

$\overset{+2}{2Pb}\,\overset{+5-2}{(NO_3)_2} \xrightarrow{\text{Heat}} \overset{+2-2}{2PbO} + \overset{+4-2}{4NO_2} + \overset{0}{O_2}$

⇒ Not a disproportionation reaction.

$\overset{+2+4-2}{CaCO_3} \xrightarrow{\text{Heat}} \overset{+2-2}{CaO} + \overset{+4-2}{CO_2}$

⇒ Not a redox reaction.

$\overset{-1}{H_2O_2} \xrightarrow{\text{Sunlight}} \overset{-2}{2H_2O} + \overset{0}{O_2}$

It is a disproportionation reaction.

(66) Answer : (1)

Solution:

MnO_4^- acts as self indicator during the estimation of oxalate ions.

(67) Answer : (3)

Solution:

Higher the value of standard reduction potential; higher the oxidising power so correct order is

$Au^{3+} > Ag^+ > Cu^{2+}$

(68) Answer : (4)

Solution:

$2HCl \rightleftharpoons H_2 + Cl_2$

$K' = \frac{1}{K}$

$HCl \rightleftharpoons \frac{1}{2}H_2 + \frac{1}{2}Cl_2$

$K' = \left(\frac{1}{K}\right)^{1/2}$

(69) Answer : (3)

Solution:

Salt of weak acid and strong base.

$K_h = \frac{K_w}{K_a} = \frac{10^{-14}}{10^{-5}} = 10^{-9}$.

(70) Answer : (4)

Solution:

$pOH = pK_b + \log \frac{[Salt]}{[Base]}$

$= 4 + \log \frac{10}{1}$

$= 5$

(71) Answer : (1)

Solution:

$\left(CH_3COO\right)_2 Ca \xrightarrow{H_2O} 2CH_3COO^- + Ca^{2+}$

$pH = 7 + \frac{1}{2}\left(pK_a + \log C\right)$

$= 7 + \frac{1}{2}\left[4.74 + \log 0.04\right]$

$= 7 + \frac{1}{2}\left[4.74 - 1.398\right]$

$= 8.67$

(72) Answer : (4)

Solution:

Salt of strong acid and strong base does not hydrolyse.

(73) **Answer :** (3)
Solution:
All measurable properties remains constant at equilibrium.

(74) **Answer :** (3)
Solution:
$\mathrm{Ca(OH)_2(s) + (aq) \rightleftharpoons Ca^{2+}(aq) + 2\,OH^-(aq)}$ is heterogeneous equilibrium.

(75) **Answer :** (2)
Solution:
$\mathrm{K_p = K_c(RT)^{\triangle ng}}$

$\mathrm{K_c = \frac{K_p}{(RT)^{\triangle ng}}}$

$= \frac{47.9}{0.0831 \times 400}$

$= 1.458$

(76) **Answer :** (3)
Solution:
Catalyst does not affect equilibrium constant.

(77) **Answer :** (2)
Solution:
$\mathrm{NH_3,\ OH^-}$ act as Lewis base.

(78) **Answer :** (3)
Solution:
Conjugate acid of $\mathrm{H_2PO_4^-}$ is $\mathrm{H_3PO_4}$ and conjugate base is $\mathrm{HPO_4^{2-}}$.

(79) **Answer :** (2)
Solution:
Value of $\mathrm{K_p}$ decreases with increase in temperature.

(80) **Answer :** (3)
Solution:
$\mathrm{pH = 3}$
$\mathrm{[H^+] = 10^{-3}}$
$\mathrm{pH = 6,\ [H^+] = 10^{-6}}$.

(81) **Answer :** (2)
Solution:
$\mathrm{\Delta G^\circ = -2.303\,RT\log K}$
$\mathrm{= -2.303 \times 300 \times R \times \log 10^3}$
$\mathrm{= -2.303 \times 900R}$

(82) **Answer :** (4)
Solution:
$\mathrm{K_{sp} = [Ag^+][Cl^-]}$
$\mathrm{1.8 \times 10^{-10} = S \times 0.01}$
$\mathrm{S = 1.8 \times 10^{-8}}$

(83) **Answer :** (3)
Solution:
The higher order ionisation constant of acids are smaller than lower order ionisation constant of polyprotic acid. It is more difficult to remove proton from negatively charged ion.

(84) **Answer :** (4)
Solution:
Common ion effect occurs in the case of weak electrolyte such as HCN.

(85) **Answer :** (3)
Solution:

$NH_2\,COONH_4(s) \rightleftharpoons 2\,NH_3(g) + CO_2(g)$
$2x + x = 6$
$3x = 6 \Rightarrow x = 2$
$P_{NH_3} = 2x = 4 \quad P_{CO_2} = 2$
$Kp = \left(P_{NH_3}\right)^2 \left(P_{CO_2}\right) = (4)^2 \times \left(2\right) = 32$

(86) **Answer :** (2)
Solution:
The higher value of solubility product means higher solubility.

(87) **Answer :** (2)
Solution:
$\left[H^+\right] = \left[OH^-\right] = x$
$2.7 \times 10^{-14} = x^2$
$x = 1.64 \times 10^{-7}$
$\left[H^+\right] = 1.64 \times 10^{-7}$
$pH = -\log[H^+] = 6.78$

(88) **Answer :** (4)
Solution:
$K = \frac{[NO]}{[N_2]^{1/2}[O_2]^{1/2}}$
$K^1 = \frac{[N_2][O_2]}{[NO]^2} = \frac{1}{K^2}$

(89) **Answer :** (1)
Solution:
Salt of weak acid and strong base has maximum pH.

(90) **Answer :** (2)
Solution:
$6\,Fe^{+2} + Cr_2\,O_7^{-2} + 14H^+ \rightarrow 6\,Fe^{+3} + 2\,Cr^{+3} + 7H_2O$

BOTANY

(91) **Answer :** (1)
Solution:
70S ribosomes and circular dsDNA are found in both mitochondria and chloroplast. Oxidative phosphorylation occurs in mitochondria and photophosphorylation occurs in chloroplast.

(92) **Answer :** (1)
Solution:
G_1 phase corresponds to the interval between mitosis and initiation of DNA replication.

(93) **Answer :** (1)
Hint:
Every chromosome has a primary constriction or the centromere on the sides of which disc shaped structure called kinetochores are present.
Solution:
Sometimes a few chromosomes have non-staining secondary constrictions at a constant location. This gives the appearance of a small fragment called the satellite.

(94) **Answer :** (1)
Solution:
In plants, the tonoplast facilitates the transport of a number of ions and other materials against concentration gradients into the vacuole, hence their concentration is significantly higher in the vacuole than in the cytoplasm.

(95) **Answer :** (2)
Solution:

Outer membrane of chloroplasts is more permeable than the inner membrane. Single membrane bound organelles generally do not possess another organelle within them.

(96) **Answer :** (4)
Hint:
This figure is representing the cell in metaphase I.
Solution:
In metaphase I, the microtubules of the spindle fibres from opposite poles attach to the centromere of the chromosome facing towards it.

(97) **Answer :** (4)
Hint:
Organelles which function in co-ordinated manner are included in endomembrane system.
Solution:
The organelles included in endomembrane system are ER, Golgi complex, lysosomes and vacuoles.
Synthetic products of RER pass onto Golgi complex through SER.

(98) **Answer :** (2)
Solution:
At number of places the nuclear envelope is interrupted by minute pores, which are formed by the fusion of its two membranes.

(99) **Answer :** (2)
Solution:
Hint: APC promotes a cell from metaphase to anaphase.
Sol.: If APC stops working then there will be no separation of sister chromatids.

(100) **Answer :** (1)
Hint:
The space around the nucleus is occupied by cytoplasm.
Solution:
The space between the outer and inner nuclear membrane is called perinuclear space.

(101) **Answer :** (2)
Hint:
Cells that have nucleus are called eukaryotic whereas cells that lack nucleus are prokaryotic.
Solution:
Ribosomes are non-membrane bound organelles found in both eukaryotic as well as prokaryotic cells.

(102) **Answer :** (2)
Hint:
Gas vacuole is not a part of an endomembrane system.
Solution:
Gas vacuoles are not bound by any membrane system.

(103) **Answer :** (1)
Solution:
Many ribosomes attached to single mRNA is called polysome. It translates mRNA into proteins.

(104) **Answer :** (2)
Solution:
The shape of mesophyll cell is round and oval.

(105) **Answer :** (4)
Solution:
Cell wall is chitinous in fungi.

(106) **Answer :** (4)
Hint:
Cytoskeleton comprises of micro filaments, micro tubules and intermediate filaments.
Solution:
Cytoskeleton of a cell is not involved in the synthesis of proteins. Protein synthesis is carried out by the ribosomes.

(107) **Answer :** (2)
Solution:
In metaphase I, bivalents arrange themselves at the equatorial plate, in contrast to metaphase II where univalents arrange themselves at the equatorial plate.

(108) **Answer :** (1)
Solution:

Amyloplast stores starch and lysosome is single membrane bound organelle. *Chlamydomonas* is a green alga.

(109) Answer : (2)
Solution:
If the haploid cell contains 40 pg DNA, then the somatic diploid cell will contain 80 pg DNA.

G_1	$\rightarrow$	S	$\rightarrow$	G_2	$\rightarrow$	M I	$\rightarrow$	M II
80 pg		160 pg		160 pg		80 pg		40 pg

(110) Answer : (2)
Solution:
Tail of phospholipids is hydrophobic. Human erythrocyte membrane contains 40% lipids & 52% proteins.

(111) Answer : (1)
Solution:
Number of generations (n) of mitosis for producing X cells is –
$X = 2^n$ (X = 256)
$256 = 2^n$
$2^8 = 2^n$
n = 8

(112) Answer : (2)
Solution:
In oocytes of some vertebrates, diplotene stage of meiosis I can last for months or years.

(113) Answer : (3)
Hint:
Intermediate phase between prophase and metaphase is known as transition phase.
Solution:
Given diagram shows transition to metaphase because chromosomes are going to align at metaphasic plate.

(114) Answer : (4)
Solution:
In the given figure label A, B, C and D represent nucleolus, RER, ribosome and lysosome respectively.
Lysosome are formed by the process of packaging in golgi apparatus. RER is abundant in protein synthesizing cells.

(115) Answer : (1)
Solution:
Cytokinesis can be delayed in the liquid endosperm in coconut. Metacentric chromosome has equal arms. During diakinesis stage, chromosome is fully condensed and the meiotic spindle is assembled to prepare the homologous chromosomes for separation.

(116) Answer : (1)
Solution:
Meiosis is strictly limited to germ cell (2*n*) for producing gametes.

(117) Answer : (2)
Solution:
Meiosis is the mechanism by which conservation of specific chromosome number of each species is achieved across generation in sexually reproducing organism. Mitosis is done for growth in plants.

(118) Answer : (4)
Solution:
The interphase lasts more than 95% of the duration of cell cycle. Interkinesis is a metabolic stage between Telophase-I and prophase-II. During interkinesis, DNA does not replicate. Centriole duplication occurs in both interphase as well as interkinesis.

(119) Answer : (1)
Solution:
The completion of prophase-I is marked by the complete disintegration of nuclear envelope.

(120) Answer : (3)
Solution:
Each chromosome has two kinetochores. Since human has 46 chromosomes, then there will be 92 kinetochores.

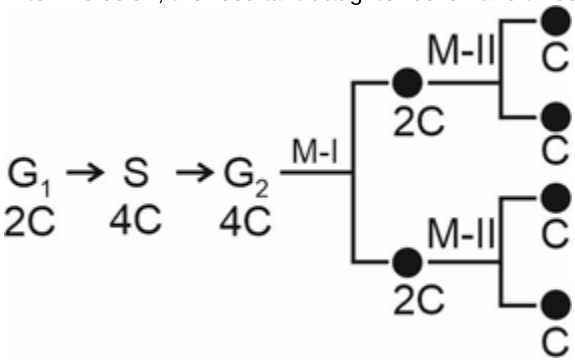
(121) Answer : (4)
Solution:

Centriole forms spindle fibre during cell division and locomotory structure in *Paramoecium* is cilia. Both contain linker proteins to connect adjacent peripheral fibrils.

(122) Answer : (3)
Solution:
Golgi body and ER are the members of endomembrane system.
The golgi cisternae are concentrically arranged near the nucleus with distinct convex *cis* or the forming face and concave *trans* or the maturing face.

(123) Answer : (4)
Solution:
A normal chromosome in a dividing cell cannot have more than four telomeres. During metaphase II, chromosomes appear two threaded at equatorial plate.

(124) Answer : (4)
Solution:
After meiosis-I, the resultant daughter cells have twice the amount of DNA in comparison to haploid gamete.



(125) Answer : (3)
Solution:
Crossing over between homologous chromosome and disappearance of chiasmata, occur in prophase-I of meiosis only.

(126) Answer : (2)
Solution:
Elaioplast stores oil and fats.

(127) Answer : (3)
Solution:
ER divides the intracellular space into two distinct compartments, *i.e.*, luminal (inside ER) and extra luminal (cytoplasm) compartment.

(128) Answer : (1)
Solution:
The ability of materials such as protein to move within the membrane is measured as its fluidity. Fluidity is due to the lipid component of the membrane.

(129) Answer : (4)
Solution:
During anaphase, centromere splits and move towards opposite pole. Trailing of its arms behind them gives the chromosome a characteristic shape.

(130) Answer : (2)
Solution:
Many prokaryotes lack extra chromosomal DNA. Secondary wall is formed on the inner (towards membrane) side of the cell w.r.t. primary cell wall.

(131) Answer : (3)
Solution:
The non-dividing cells enter the quiescent stage or G_0 stage of cell cycle. In this phase, the cell remains metabolically active but does not proliferate unless it is called on to do so.

(132) Answer : (3)
Solution:
The cytoplasm is the main arena of cellular activities in all types of cells.

(133) Answer : (4)
Solution:

The pili are elongated tubular structures made of a special protein. The fimbriae are small bristle like fibres projecting out of the cell. Active transport requires protein pumps. Passive transport occurs from high to low concentration.

(134) Answer : (2)
Solution:
Cisternae are present in endoplasmic reticulum and Golgi apparatus.

(135) Answer : (4)
Solution:
80S ribosomes consist of 60S and 40S subunits.

ZOOLOGY

(136) Answer : (2)
Solution:
Trichomoniasis is caused by *Trichomonas vaginalis*.

(137) Answer : (3)
Hint:
Origin of Universe
Solution:
The Universe is very old-almost 13.8 billion years old. Huge clusters of galaxies comprise the Universe. The Big Bang theory attempts to explain to us the origin of Universe. In the solar system of the Milky way galaxy, Earth was supposed to have been formed about 4.5 billion years back.

(138) Answer : (4)
Hint:
Involvement of ART
Solution:
Fertilisation can occur *in-vitro* or *in-vivo* in case of surrogacy.
Surgical retrieval of ova is not needed during surrogacy.
The surrogate mother is not genetically identical to the foetus.

(139) Answer : (2)
Hint:
Leads to reproductively healthy life
Solution:
Sex education aims to educate people to take informed reproductive choices and not to promote early marriage.
It encourages proper information about reproductive organs, adolescence and related changes, safe and hygienic sexual practices, sexually transmitted diseases (STDs), AIDS, *etc*.

(140) Answer : (3)
Hint:
Spermicidal action
Solution:
Multiload 375 – Cu releasing IUD → Releases Cu ions which suppress sperm motility and fertilising capacity of sperms.
LNG-20 → Hormone releasing IUD → Makes the uterus unsuitable for implantation and the cervix hostile to the sperms.
All IUDs increase phagocytosis of sperms.

(141) Answer : (2)
Solution:
For a human female having 28 days menstrual cycle, ovulation is expected from day 10^{th} to 17^{th}. For a woman who has 32 days menstrual cycle, ovulation will occur on 18^{th} day, and fertile period will range from day 14^{th} to 21^{st}.

(142) Answer : (4)
Solution:
Chlamydiasis is curable, if detected early and treated properly.

(143) Answer : (4)
Solution:
Though the ill-effects of contraceptives such as nausea, abdominal pain, breast cancer, irregular menstrual bleeding and breakthrough bleeding are not very significant, but still should not be totally ignored.

(144) Answer : (3)
Solution:

There was no atmosphere on the early Earth. Water vapour, methane, carbon dioxide and ammonia released from molten mass covered the surface.

(145) Answer : (4)

Hint:

Able to produce more number of progeny.

Solution:

The fitness according to Darwin, refers ultimately and only to reproductive fitness. Hence, those who are better fit in an environment, leave more progeny than others. These individuals, therefore, will survive more and hence are selected by nature. He called it natural selection and implied it as mechanism of evolution.

(146) Answer : (3)

Solution:

• Cranial capacity of *Homo habilis* is 650-800 cc.
• Cranial capacity of *Homo erectus* is 900 cc.
• Cranial capacity of Neanderthal man is 1400 cc.

(147) Answer : (1)

Hint:

Moths survived better in similar colour of their background.

Solution:

Predators will spot a moth against contrasting background. During post-industrialisation period, the tree trunks became dark due to industrial smoke and soots. Under this condition, the white-winged moth did not survive due to predators, but dark-winged or melanised moths survived.

(148) Answer : (3)

Solution:

Gonorrhoea is caused by bacterium *Neisseria gonorrhoeae*. Genital herpes is caused by herpes simplex virus.

(149) Answer : (1)

Solution:

Number of homozygous recessive individuals = 10
So, frequency of homozygous recessive individuals
$q^2 = \frac{10}{1000} = \frac{1}{100}$
$q = \sqrt{\frac{1}{100}} = \frac{1}{10} = 0.1$
According to Hardy-Weinberg equation:
p + q = 1, So, p = 1 – q
p = 1 – 0.1
p = 0.9
Frequency of heterozygous individuals = 2pq
= 2 × 0.9 × 0.1 = 0.18
So, number of heterozygous individuals
= 0.18 × 1000 = 180

(150) Answer : (1)

Hint:

Cranial capacity of modern modern *Homo sapiens* is about is 1350 cc.

Solution:

During the ice age, modern *Homo sapiens* arose.
Both Neanderthal man and *Homo sapiens* have erect posture. The cranial capacity of Neanderthal man was 1400 cc while that of modern *Homo sapiens* is 1350 cc.

(151) Answer : (1)

Solution:

Australian marsupial (Tasmanian tiger cat) and placental mammal (Bobcat) are examples of convergent evolution.

(152) Answer : (3)

Solution:

Molecular homology indicates common ancestry.

(153) Answer : (1)

Hint:

Right after the formation of Earth

Solution:

About 2000 mya, the first cellular forms of life appeared on Earth.

(154) Answer : (2)

Solution:

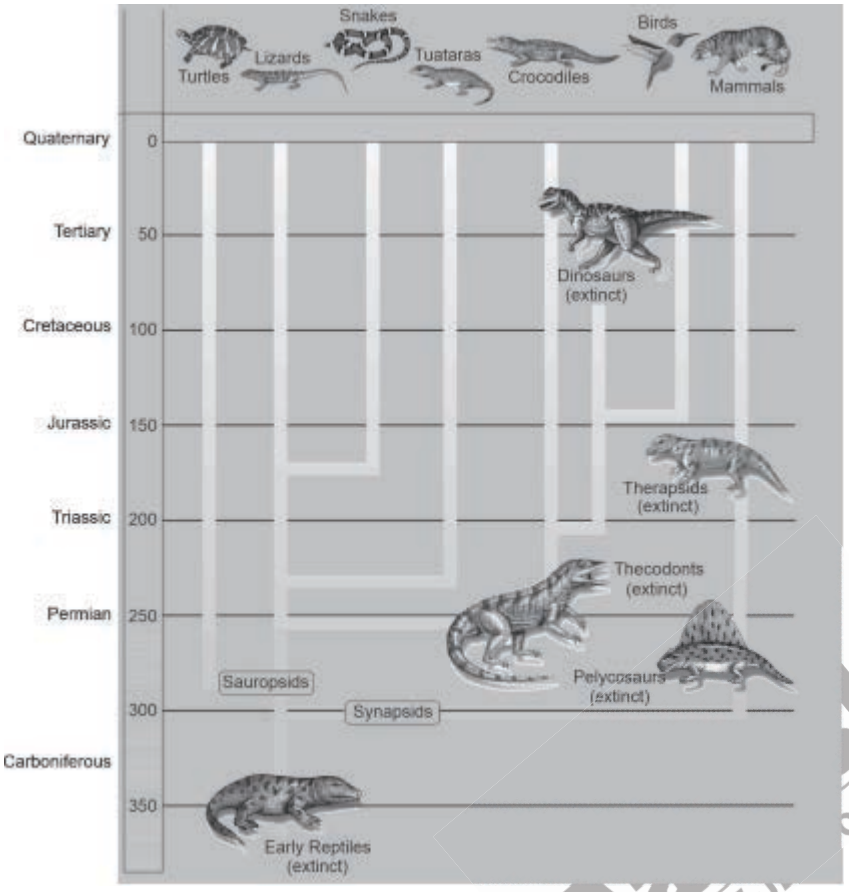
Triceratops had three horns on its head and a collared neck.

(155) Answer : (3)

Hint:

Organisms with flight adaptions evolved from reptiles.

Solution:



(156) Answer : (2)

Hint:

Oparin and Haldane talked about the prebiotic soup.

Solution:

Conventional religious literature tells us about the theory of special creation. This theory has three connotations. One, that all living organisms (species or types) that we see today were created as such. Two, that the diversity was always the same since creation and will be the same in future also. Three, that Earth is about 4000 years old.

Louis Pasteur by careful experimentation demonstrated that life comes from pre-existing life.

Oparin of Russia and Haldane of England proposed that the first form of life could have come from pre-existing non-living organic molecules and that formation of life was preceded by chemical evolution.

(157) Answer : (1)

Solution:

Darwin's finches originally belonged to South America and later, they moved to Galapagos islands. They exhibit divergent evolution/adaptive radiation.

(158) Answer : (4)

Solution:

Embryos formed by *in-vivo* fertilization [fusion of gametes within the females] are used for transfer of gamete to assist females who cannot produce children.

These methods include GIFT [Gamete Intra Fallopian Transfer]

AI – Artificial Insemination

IUI – Intra-Uterine Insemination

(159) Answer : (4)

Solution:

Hepatitis-B and AIDS do not primarily affect the reproductive organs.

HIV affects the immune system of the body and hepatitis-B virus primarily affects the liver.

(160) Answer : (4)

Solution:

Lactational amenorrhea (absence of menstruation) method is based on the fact that as long as the mother breast-feeds the child fully, chances of conception are almost nil.

Prolactin is secreted by pars distalis of pituitary gland and high levels of prolactin shows anti-gonadotropic effect.

(161) Answer : (2)

Solution:

According to the 2011 census report, the population growth rate of India was less than 2% *i.e.*, 20 / 1000 / year, a rate at which our population could increase rapidly. Such an alarming growth rate could lead to an absolute scarcity of even the basic requirements.

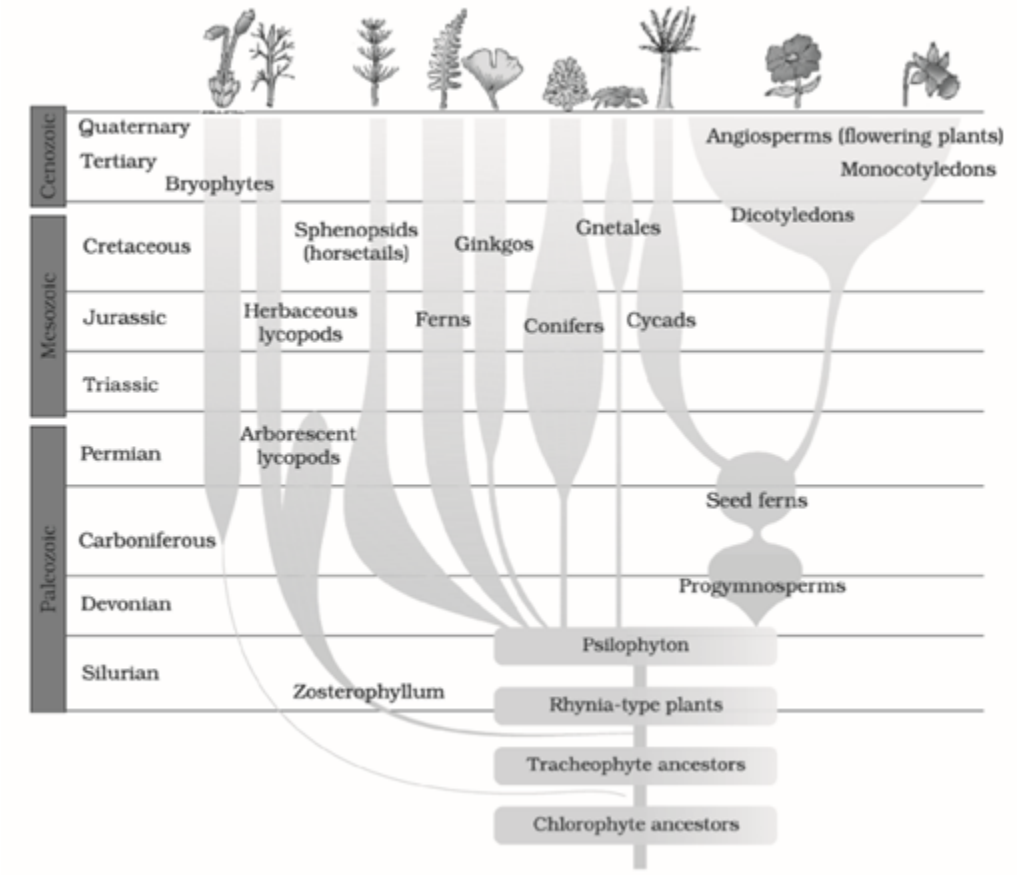
(162) Answer : (2)

Solution:

Tubectomy is a female sterilization method in which a part of the fallopian tube is removed or tied, thereby blocking gamete transport and preventing fertilization. Hormonal cycles remain unaffected, leading to normal menstruation.

(163) Answer : (3)

Solution:



(164) Answer : (1)

Solution:

Infertility could be due to many reasons like physical, congenital, diseases, drugs, immunological or even psychological. In India, often the female is blamed for the couple being childless, but more often than not, the problem lies in the male partner.

(165) Answer : (4)

Solution:

Lippes loop is a non-medicated IUD and Saheli is a non-steroidal pill. They do not contain progestogens or estrogen and are reversible.

(166) Answer : (3)

Solution:

Hormone containing IUDs, implants or oral pills inhibit ovulation and implantation as well as alter the quality of cervical mucus to prevent/retard entry of sperms. Hormonal IUDs make a uterus unsuitable for implantation and the cervix hostile to the sperms.

(167) Answer : (3)

Solution:
Zygote or early embryos upto 8 blastomeres are transferred into the fallopian tube (ZIFT), while embryos with more than 8 blastomeres are transferred into the uterus (IUT).

(168) Answer : (3)
Solution:
Indian population reached closed to one billion mark by 2000.

(169) Answer : (4)
Solution:
According to MTP (Amendment) act (2017) of Government of India, a pregnancy may be terminated, if there is a substantial risk that if the child was born, he/she would suffer from such physical or mental abnormalities as to be seriously handicapped. According to this act, a pregnancy can be terminated on certain considered grounds within the first 12 weeks of pregnancy on the opinion of one registered practitioner. If the pregnancy has lasted more than 12 weeks, but fewer than 24 weeks, two registered medical practitioners are required.

(170) Answer : (3)
Solution:
According to Hugo deVries, mutations are random and directionless while Darwinian variations are small and directional. Evolution for Darwin was gradual while de Vries believed mutation caused speciation and hence called it saltation (single step large mutation).

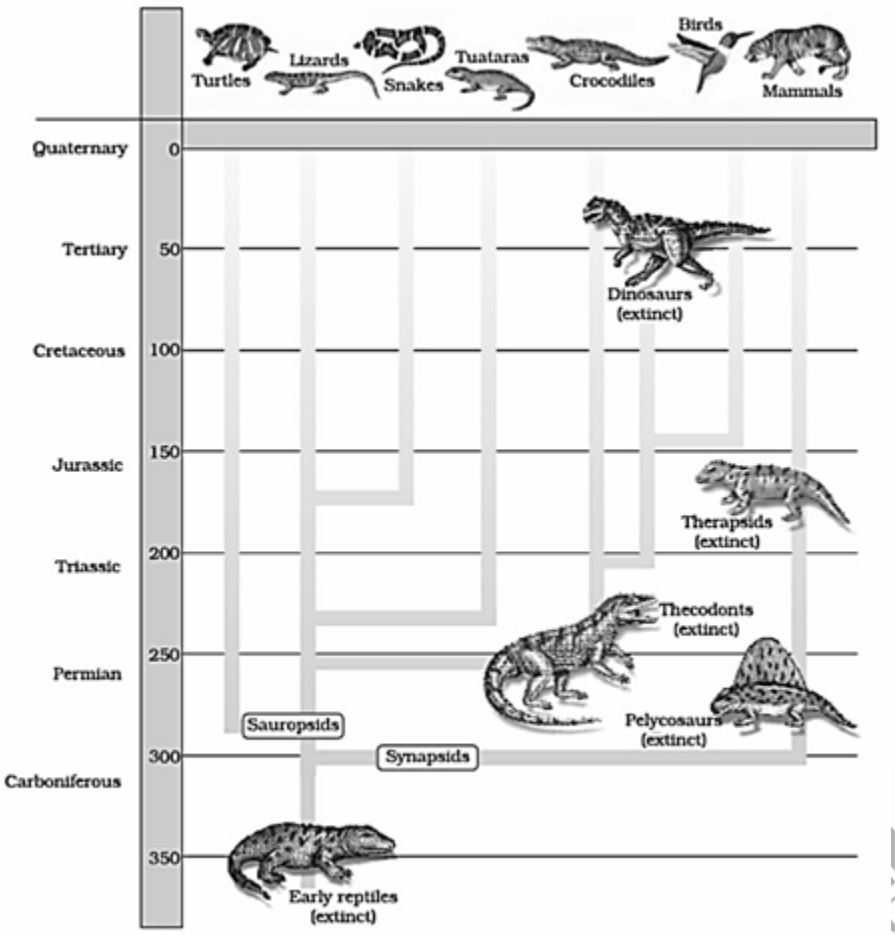
(171) Answer : (2)
Solution:
The Hardy-Weinberg principle describes a non-evolving population where allele frequencies remain constant only when natural selection and other evolutionary forces are absent. Five factors are known to affect Hardy-Weinberg equilibrium. These are gene migration or gene flow, genetic drift, mutation, genetic recombination and natural selection.

(172) Answer : (1)
Solution:
Divergent evolution forms homologous structures. Homology indicates common ancestry, *e.g.*:- Vertebrate forelimbs. Homologous structures perform different functions in these animals, but they have similar anatomical structure. Hence, in these animals, the same structure has developed along different directions due to adaptations to different needs.

(173) Answer : (1)
Solution:
Production of new breeds of dogs, pigeon, *etc*., are examples of artificial selection by anthropogenic action that involves the action of man.

(174) Answer : (3)
Solution:
Cleft lip is a birth defect which cannot be diagnosed by amniocentesis.

(175) Answer : (3)
Solution:



About 65 mya, the dinosaurs suddenly disappeared from the Earth.

(176) Answer : (4)

Solution:

Sugar glider and lemur show similar adaptations due to convergent evolution, not divergence from a common ancestor, hence this group does not represent divergent evolution.

(177) Answer : (2)

Solution:

The variation was already present in the population and the environmental change only favoured its survival and reproduction, thus natural selection acted on pre-existing (pre-adaptive) heritable variations; not on newly induced traits.

(178) Answer : (3)

Solution:

Apes evolved from *Dryopithecus*.

(179) Answer : (1)

Solution:

Embryological support for evolution was proposed by Ernst Heckel based upon the observation of certain features during embryonic stage common to all vertebrates that are absent in adult.

(180) Answer : (4)

Solution:

According to Hardy-Weinberg principle, the allele frequencies in a population are stable and is constant from generation to generation. The gene pool (total genes and their alleles in a population) remains constant. This is called genetic equilibrium. This population is non-evolving and hence there is no speciation.