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 NCERT Revision Test for NEET-2026_CF+OYM-NRT-01A_(Phase-1&2) **Time : 180 Min.**

PHYSICS

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CHEMISTRY

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ZOOLOGY

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Hints and Solutions

PHYSICS

(1) **Answer :** (3)
Solution:
A charged body can attract a neutral body or an oppositely charged body.

(2) **Answer :** (3)
Solution:
$90 = 9 \times 10^9 \frac{q}{1^2}$

$q = \frac{90}{9\times10^9} = 10^{-8}\text{C}$

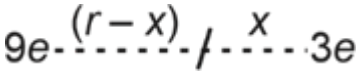
$q = 10 \times 10^{-9}$ C
= 10 nC

(3) **Answer :** (1)
Solution:
$\phi_{\text{curved}} + \phi_P = 0$

$\phi_{\text{curved}} = -\ \phi_P = -E\pi R^2 \cos 180°$

$\phi_{\text{curved}} = E\pi R^2$

(4) **Answer :** (1)
Solution:



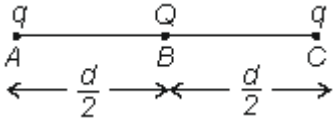
$\frac{K(9e)}{(r-x)^2} = \frac{K(3e)}{x^2}$

$\Rightarrow \quad \sqrt{3}x = r - x$

$\Rightarrow \quad x = \frac{r}{\sqrt{3}+1}$

(5) **Answer :** (1)
Solution:
Comb polarises piece of paper.

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



F_{net} on $q = \frac{kqQ}{\left(\frac{d}{2}\right)^2} + \frac{kq^2}{d^2} = 0$

$\Rightarrow Q = \frac{-q}{4}$

(7) **Answer :** (3)
Solution:
$\vec{F}_{21} = \frac{q_1 q_2}{4\pi\varepsilon_0 \left|\vec{r_2} - \vec{r_1}\right|^3} \left(\vec{r_2} - \vec{r_1}\right)$

$= \frac{q_1 q_2}{4\pi\varepsilon_0 \left|2\hat{i} - j - 3\hat{k}\right|^3} \left(2\hat{i} - \hat{j} - 3\hat{k}\right)$

$= \frac{q_1 q_2}{56\sqrt{14}\pi\varepsilon_0} \left(2\hat{i} - \hat{j} - 3\hat{k}\right)$

(8) **Answer :** (1)
Hint:
$F = \frac{kq_1 q_2}{r^2}$
Solution:
$\frac{F}{F'} = \frac{k(4)(16)d^2}{d^2(10)(10)}$

$\frac{F}{F'} = \frac{16}{25}$

$F' = \frac{25}{16}F$

(9) **Answer :** (1)
Solution:

$dq = \rho dV = kr4\pi r^2 dr = 4\pi k r^3 dr$

$q = \int dq = 4\pi k \int_0^R r^3 dr = \pi k R^4$

$E(4\pi r^2) = \frac{q}{\varepsilon_0}$

$E = \frac{\pi k R^4}{4\pi\varepsilon_0 r^2} = \frac{k}{4\varepsilon_0}\frac{R^4}{r^2}$

(10) **Answer :** (1)
Solution:
Maximum extension of spring = x

$\frac{1}{2}Kx^2 = qEx$

$x = \frac{2qE}{K}$

Extension in equilibrium $x' = \frac{qE}{K}$

Amplitude of oscillation $A = x - x' = \frac{qE}{K}$

(11) **Answer :** (3)
Solution:

Electric field inside uniformly charged sphere, $\vec{E} = \frac{1}{4\pi\varepsilon_0}\frac{q}{R^3}\vec{x}$

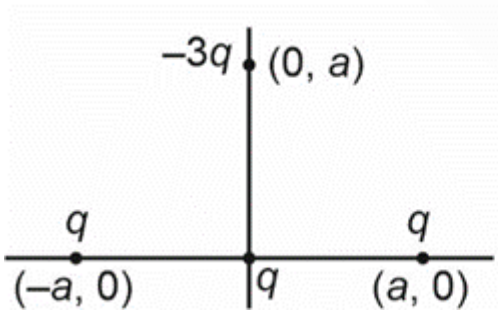
$\vec{E} \propto \vec{x}$

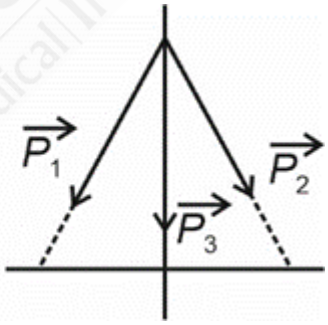
Out side electric field $\vec{E} = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^3}\vec{r}$

$E \propto \frac{1}{r^2}$

(12) **Answer :** (2)
Solution:
Tangent at any point on electric field line gives direction of electric field.

(13) **Answer :** (2)
Solution:





$\left|\vec{P_1}\right| = \left|\vec{P_2}\right|$

$\left|\vec{P_{net}}\right| = q\left(a\sqrt{2}\right)\cos 45^\circ + q\cdot a + q\left(a\sqrt{2}\right)\cos 45^\circ$

$= qa + qa + qa$
$= 3qa$

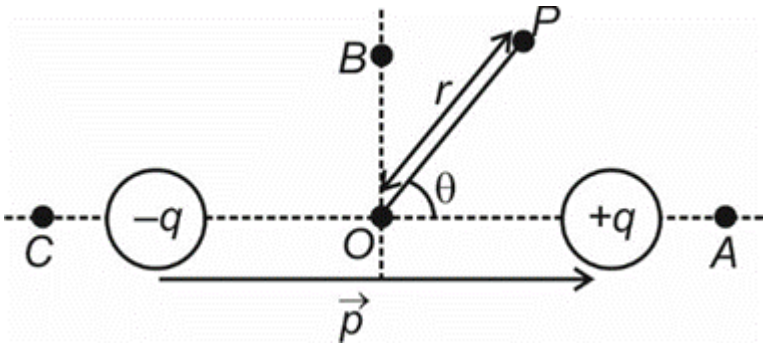
(14) **Answer :** (4)
Solution:
• If no net electric flux passes through any closed surface, then electric field may or may not be zero in the region.
• Electric field is a vector quantity while electric flux is a scalar quantity.

(15) **Answer :** (1)
Solution:
Body is given a positive charge means that electrons are removed from the body. Thus, the mass of the body decreases.

(16) **Answer :** (2)
Solution:
In uniform electric field, field lines are equidistant and point in one direction.

(17) **Answer :** (4)
Solution:
Potential due to an electric dipole at a general point *P*(*r*, θ) is

$$\boxed{V_P = \frac{kp\cos\theta}{\left(r^2 - a^2\cos^2\theta\right)}}$$



For axial point on +*q* side : θ= 0° ⇒ cos 0 = 1

$$\boxed{\therefore \quad V_A > 0}$$

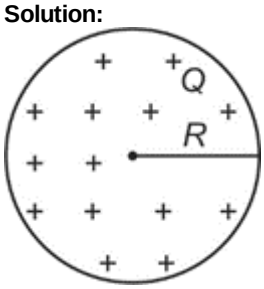
For axial point on –*q* side :
θ = 180° cos 180° = –1

$$\boxed{\therefore \quad V_C < 0}$$

For equatorial point : $\boxed{\theta = 90^\circ}$ ⇒ cos 90° = 0

$$\boxed{\therefore \quad V_B = 0}$$

(18) **Answer :** (2)
Solution:



$$E(r \geq R) = \frac{Q}{4\pi\varepsilon_0 r^2}$$

$$E(r < R) = \frac{Qr}{4\pi\varepsilon_0 R^3}$$

(19) **Answer :** (2)
Solution:

$$a = \frac{qE}{m}$$

$$\int v dv = \int \frac{qE}{m} dx$$

$$\frac{v^2}{2} = \frac{qE}{m}x$$

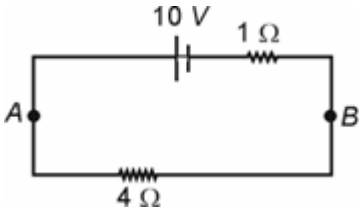
$$k = \frac{1}{2}mv^2 = qEx$$

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

Electric field due to a short dipole is dependent on $\vec{r}$ as well as angle between $\vec{r}$ and $\vec{p}$

$V = \frac{Kp\cos\theta}{r^2} \quad \Rightarrow \quad V \propto \frac{1}{r^2}$

(21) **Answer :** (4)
Solution:
At steady state, capacitor behave as an infinite resistance.
∴ Circuit can be redrawn as



$i = \frac{10}{4+1} = 2$ A

V_{AB} = 8 V

Charge stored $Q = C\,V_{AB}$

= 2 × 8 = 16 μC

(22) Answer : (4)

Solution:

$C_{eq} = \frac{4\times2}{4+2} = \frac{4}{3}\mu$F

V = 12 V

$\therefore Q = C_{eq} \times V = \frac{4}{3} \times 12 = 16\mu$C

(23) Answer : (1)

Solution:

As $C \propto R$, the radius of new drop

$r = (8)^{1/3} R$

So, capacitance is 2C.

(24) Answer : (3)

Solution:

$\Delta U = \frac{1}{2}\left(\frac{C_1C_2}{C_1+C_2}\right)(V_1 - V_2)^2$

$= \frac{1}{2}\left(\frac{C}{2}\right)V^2$

$= \frac{1}{4}CV^2$

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

$= \frac{1}{2} \times 2 = 1.0\,J$

(25) Answer : (1)

Solution:

$V(x,y,z) = 6xy - y + 2yz$

$E_x = -\frac{\partial V}{\partial x} = -6y = -6$

$E_y = -\frac{\partial V}{\partial y} = -6x + 1 - 2z = -5$

$E_z = -\frac{\partial V}{\partial z} = -2y = -2$

$\vec{E} = E_x\hat{i} + E_y\hat{j} + E_z\hat{k}$

$\vec{E} = -(6\hat{i} + 5\hat{j} + 2\hat{k})$

(26) Answer : (4)

Solution:

$C_{\text{system}} = \frac{C_1C_2}{C_1+C_2} = \frac{\frac{\varepsilon_0AK_1}{d_1}\times\frac{\varepsilon_0AK_2}{d_2}}{\frac{\varepsilon_0AK_1}{d_1}+\frac{\varepsilon_0AK_2}{d_2}}$

$= \frac{\frac{\varepsilon_0AK_1}{d_1}\times\frac{K_2}{d_2}}{\frac{K_1}{d_1}+\frac{K_2}{d_2}}$

Use $d_2 = 1.5d_1$

$K_1 = 2K_2$

We will have

$C = \frac{\varepsilon_0Ak_2}{2d_1}$

$q = CE$

$q = \frac{\varepsilon_0Ak_2E}{2d_1}$

(27) Answer : (1)

Solution:

$V = \frac{Q}{4\pi\varepsilon_0\sqrt{R^2+x^2}} = \frac{\lambda\times 2\pi R}{4\pi\varepsilon_0\sqrt{R^2+3R^2}}$

$= \frac{\lambda}{4\varepsilon_0}$

(28) Answer : (2)
Hint:

Electric potential $= \frac{\text{Potential energy}}{\text{Charge}}$

Solution:

$\left[v\right] = \frac{[ML^2T^{-2}]}{[AT]} = \left[\mathrm{ML^2\,T^{-3}A^{-1}}\right]$

(29) Answer : (4)
Solution:

$V = \frac{kq}{R} = \frac{1}{4\pi\varepsilon_0}\frac{q}{R}$

(30) Answer : (4)
Solution:

$U = -\vec{P}.\vec{E}$

(31) Answer : (2)
Solution:
Hint: Properties of conductors
Sol.: In electrostatic condition, the electric field inside conductor is zero and potential is non zero and uniform.

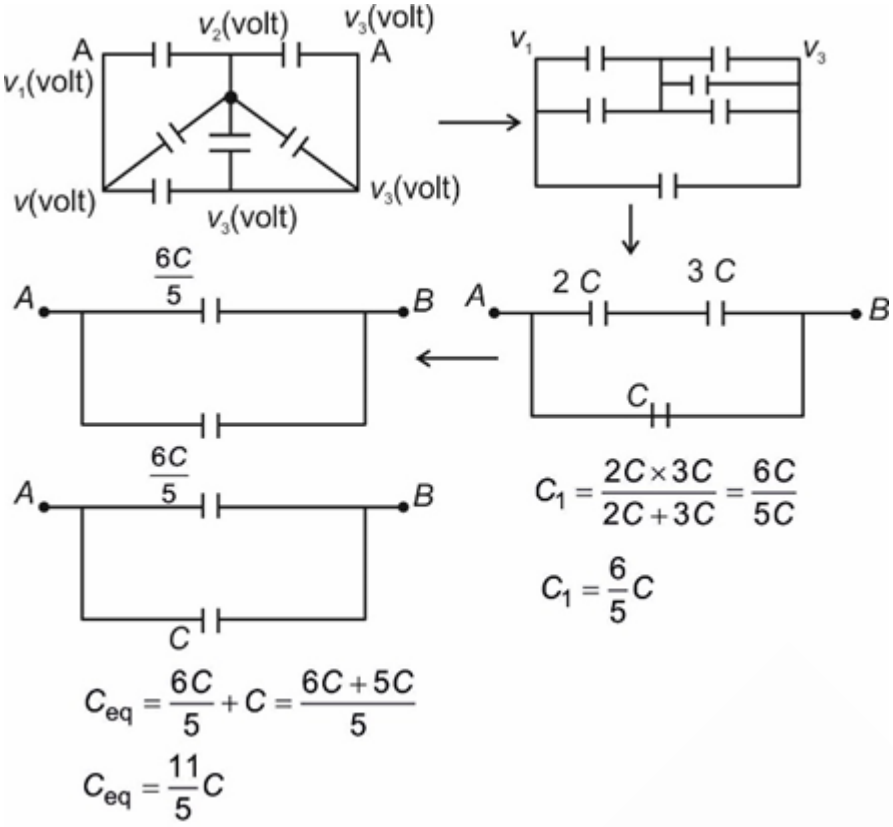
(32) Answer : (4)
Solution:
$\Delta U = q(\Delta V)$
$U_{\text{initial}} = e(7V) = 7$ eV
$U_{\text{final}} = e(10V) = 10$ eV
$\therefore \Delta U = 10$ eV $- 7$ eV $= 3$ eV

(33) Answer : (3)
Solution:

$V_B - V_A = -\vec{E}\cdot\left(\vec{r_B} - \vec{r_A}\right)$

$= -40 \times (4) = -160$ V

(34) Answer : (4)
Solution:



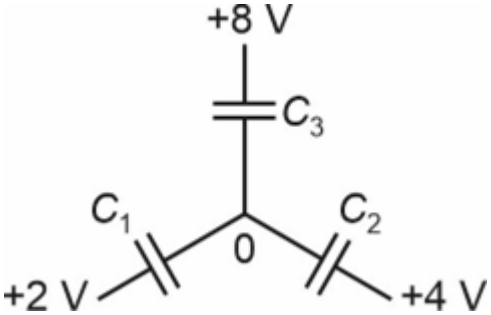
(35) **Answer :** (1)
Solution:
$\Delta U = q\,\Delta V$
Here q is –ve and ΔV is also –ve
$\therefore \Delta U$ will be +ve

(36) **Answer :** (2)
Solution:
$\int dv = -\int E_x dx$
$\int_0^v dv = -10\int_{10}^0 x dx = 10 \times \frac{10^2}{2} = 500\ \text{V}$

(37) **Answer :** (1)
Solution:
$W = \vec{F} \cdot \vec{S}$
Since electric field $\vec{E}$ is perpendicular to equipotential surface and the displacement is along the equipotential surface only, hence $\vec{F}$ and $\vec{S}$ are perpendicular and therefore work done will be zero.

(38) **Answer :** (2)
Solution:
In direction of electric field lines the potential decreases.

(39) **Answer :** (3)
Hint:
Use K.C.L.
Solution:
Let v_0 be potential of unction 0



$(8 - v_0)30 + (4 - v_0)20 + (2 - v_0)10 = 0$

$\Rightarrow v_0 = \frac{17}{3}$

(40) Answer : (4)
Hint:
$W = \Delta U + \Delta k$
Solution:
$W_{\text{external agent}} = \Delta U + \Delta k$
$W_{\text{external agent}} = U_f + U_i$
$= -PE\cos180° - (-PE\cos0°)$
$= -5 \times 10 (-1) + 5 \times 10 \times 1$
$= +100$ J

(41) Answer : (2)
Solution:

$$C' = \frac{\varepsilon_0 A}{d - \frac{d}{2}} = \frac{2\varepsilon_0 A}{d} = 2 \times \left(\frac{\varepsilon_0 A}{d}\right) = 2 \times 4C = 8C$$

(42) Answer : (4)
Solution:
$U = K\frac{q_1 q_2}{r}$
$U = K\frac{-2q^2}{r} + K\frac{-2q^2}{r} + K\frac{4q^2}{r} = 0$

(43) Answer : (3)
Solution:
$F = Q.\left(\frac{E}{2}\right)$
$= 10 \times 10^{-6} \times 1 \times 10^5$
$= 1$ N

(44) Answer : (2)
Solution:
According to Kirchoff's voltage law
$10 - \frac{q}{2C} - \frac{q}{C} = 0$

$\frac{3q}{2C} = 10$

$q = \frac{2C}{3} \times 10 = \frac{2}{3} \times 6 \times 10$
$q = 40$ μC

(45) Answer : (3)
Solution:
At steady state, the potential difference across the capacitor will be equal to E.
If $V_0 = E$, then no charge will flow in the circuit, hence no energy dissipation will happen.
If $V_0 > E$, then charge will flow from positive plate to negative plate of capacitor through cell i.e. capacitor will discharge, hence potential energy stored in the capacitor will decrease. Also resistor will dissipate energy.
If $V_0 < E$, then charge will flow from negative plate to positive plate of capacitor through cell i.e. capacitor will charge, hence potential energy stored in the capacitor will increase. Also resistor will dissipate energy.

CHEMISTRY

(46) Answer : (1)
Hint:
$(\mathrm{T_b})_{\text{solution}} = (\mathrm{T_b})_{\text{solvent}} + \mathrm{iK_b\,m}$
Solution:
$(\mathrm{T_b})_{\text{solution}} \propto \mathrm{im}$

- NaCl : im = 2 × 0.1 = 0.2
- $CaCl_2$: im = 3 × 0.01 = 0.03
- Glucose : im = 1 × 0.1 = 0.1
- NaOH : im = 2 × 0.05 = 0.1

(47) Answer : (3)
Hint:
$\frac{\Delta T_b}{\Delta T_f} = \frac{K_b}{K_f}$

Solution:

$\Delta T_f = \Delta T_b \times \frac{K_f}{K_b} = 0.52 \times \frac{1.86}{0.52} = 1.86$

$\Delta T_f = T_f^o - T_f = 1.86$

$T_f = -1.86°C$

(48) Answer : (1)

Hint:

$\Delta T_f = i \times K_f \times \ Molality$

Solution:

For NaCl, i = 1 + α = 1 + 0.8 = 1.8

$\Delta T_f = 1.8 \times 1.86 \times 0.75 = 2.51 \ K$

(49) Answer : (2)

Hint:

$\Delta T_b = i \times K_b \times m$

$T_b = T_b^\circ + \Delta T_b$

Solution:

$i = 1 + (n - 1)\alpha$

$= 1 + (4 - 1)0.8$

$= 1 + 2.4 = 3.4$

$\Delta T_b = 3.4 \times 0.52 \times 0.2$

$= 0.35$

$T_b = T_b^\circ + \Delta T_b$

$= 100 + 0.35 = 100.35°C$

(50) Answer : (2)

Hint:

van't Hoff factor, $i = 1 + (n - 1)\alpha$ and $\Delta T_f = iK_f m$

Solution:

$i = 1 + (2 - 1)0.4 = 1.4$

$\Delta T_f = 1.4 \times 0.2 \times 1.86 = 0.52$

$\Delta T_f = T_f^o - T_f = 0.52$

$\because \ T_f^o = 0^\circ C$

so, $T_f = -0.52°C$

(51) Answer : (2)

Solution:

4 g urea = 4/60 = 1/15 moles

36 g H_2O = 2 mole

$\therefore \ X_{urea} = \frac{\frac{1}{15}}{\frac{1}{15}+2} = \frac{\frac{1}{15}}{\frac{31}{15}} = \frac{1}{31}$

(52) Answer : (3)

Hint:

$\text{van 't Hoff factor (i)} = \frac{\text{Observed freezing point}}{\text{Calculated freezing point}}$

Solution:

$\text{Moles of } CH_3COOH = \frac{0.6 \text{ mL} \times 1.06 \text{ g mL}^{-1}}{60 \text{ g mol}^{-1}}$

= 0.0106 mol

Molality = $\frac{0.0106}{1000 \times 1}$ = 0.0106 mol kg^{-1}

$\Delta T_f = 1.86 \times 0.0106 = 0.0197$ K

$i = \frac{0.0205}{0.0197} = 1.041$

(53) Answer : (3)

Hint:

Mixing of two liquids is a spontaneous process.

Solution:

For an ideal solution,

- $\Delta_{mix}V = \Delta_{mix}H = 0$
- $\Delta_{mix}G < 0$
- $\Delta_{mix}S > 0$

(54) Answer : (4)

Hint:
Azeotropic solution has the same composition in vapour as well as in solution phase.
Solution:
For solution with positive deviation from ideal behaviour.
• $\Delta H_{mix} > 0$
• $\Delta V_{mix} > 0$
• $\Delta G_{mix} < 0$
• $\Delta S_{mix} > 0$
•Will form minimum boiling azeotrope.

(55) Answer : (1)
Hint:
π = iCRT
Osmotic pressure depends upon the product of iC at constant temperature.
Solution:
i = Van't Holf factor
C = Concentration

	Solution	iC product
A.	0.1 M sucrose	0.1
B.	0.2 M glucose	0.2
C.	0.01 M NaCl	0.02
D.	0.05 M $CaCl_2$	0.15

(56) Answer : (4)
Solution:
For two isotonic solutions, $\pi_1 = \pi_2$
As, π = CST
So, for isotonic solutions, $C_1 = C_2$
$\frac{20}{60} = \frac{10}{M \times 100 \times 10^{-3}}$
∴ M = 300 g

(57) Answer : (4)
Solution: $K_b = \frac{R \times M \times T_b^2}{1000 \times \Delta_{vap} H}$

Sol.: K_b is independent of molality of the solution.

(58) Answer : (3)
Solution:
Ethanol + water shows positive deviation from Raoult's law.
The solutions which show large positive deviation from Raoult's law form minimum boiling azeotrope at specific composition.

(59) Answer : (1)
Solution:
Raoult's law, $\frac{P^o - P}{P^o} = \frac{n}{n+N}$

$\frac{0.1}{100} = \frac{\left(\frac{1}{m}\right)}{\left(\frac{1}{m}\right)+\left(\frac{180}{18}\right)} \Rightarrow m = 99.9$

(60) Answer : (2)
Solution:
For depression in freezing point
$\Delta T_f = \frac{1000 \times K_f \times w}{m \times W_{(H_2O)}}$
ΔT_f = 9.3, w = 65, $K_f = 1.86$ m_{Glycol} = 62
$9.3 = \frac{1000 \times 1.86 \times 65}{62 \times W}$
W_{water} = 209.67 g
The mass of ice separated = 250 – 209.67 = 40.33 g

(61) Answer : (2)
Solution:
π = icRT
π ∝ i
$\frac{0.38}{0.16} = \frac{i_{AB_2}}{1} \Rightarrow i_{AB_2} = 2.37$

(62) Answer : (2)
Hint:
$M_1V_1 + M_2V_2 = M_3V_3$
Solution:
$M_3 \times (800 + 800) = 800 \times 4 + 800 \times 1$
or, $M_3 = \frac{4000}{1600} = 2.5$

(63) Answer : (3)
Solution:
Hint:
$P_{total} = x_A P_A^o + x_B P_B^o$
Sol.: Mole fraction of A
$\left(x_A\right) = \frac{4}{4+6} = \frac{2}{5}$
Mole fraction of B
$\left(x_B\right) = \frac{6}{4+6} = \frac{3}{5}$
$P_{total} = \frac{2}{5} \times 100 + \frac{3}{5} \times 140$
$= 40 + 84$
$= 124$ torr

(64) Answer : (3)
Solution:
Hint: Magnitude of osmotic pressure is large even for very dilute solutions.
Sol.: Solubility of polymers in solvent is very poor hence their solution is very dilute. Osmotic pressure is used to determine the molecular mass of such compounds.

(65) Answer : (4)
Solution:
Aquatic species are more comfortable in cold water rather than in warm water.

(66) Answer : (3)
Hint:
$$\text{Molality} = \frac{\text{Mole of solute} \times 1000}{\text{Mass of solvent (in g)}}$$
Solution:
Mole of urea = 0.04
Mole of water = (1 – 0.04) = 0.96
$$\text{Molality} = \frac{0.04 \times 1000}{0.96 \times 18} = 2.3 \text{ m}$$

(67) Answer : (2)
Hint:
On adding two reaction their ΔG will be added to obtain ΔG for final reaction.
Solution:
Reverse equation (i) and add it to equation (ii).
$-\left(Cu^+ + e^- \rightarrow Cu\right),\ \Delta G_1 = -1\ F\ E_1^\circ$
$+\left(Cu^{2+} + 2e^- \rightarrow Cu\right),\ \Delta G_2 = -2\ F\ E_2^\circ$
$Cu^{2+} + e^- \rightarrow Cu^+,\ \Delta G = -1\ F\ E^\circ$
$\Delta G = \Delta G_2 - \Delta G_1$
$-1\ FE^\circ = -2\,F\,E_2^\circ + 1\ FE_1^\circ$
$E^\circ = 2\,E_2^\circ - E_1^\circ$
= 0.674 – 0.52 = 0.154 V

(68) Answer : (2)
Solution:
$\alpha = \frac{\lambda_m}{\lambda_m^o} = \frac{20}{400} = 0.05$
$K_a = \frac{C\alpha^2}{1-\alpha} \simeq C\alpha^2 = \left(0.2\right)(0.05)^2 = 5 \times 10^{-4}$

(69) Answer : (2)
Hint:

Oxidising power ∝ Reduction potential.
Solution:
Co^{3+} has highest reduction potential while Li^{+} has lowest reduction potential.

(70) **Answer :** (4)
Hint:
At anode, oxidation takes place while at cathode reduction takes place.
Solution:

$$\mathrm{NaCl}\left(\mathrm{aq}\right) \xrightarrow{\mathrm{H_2O}} \mathrm{Na^+}\left(\mathrm{aq}\right) + \mathrm{Cl^-}\left(\mathrm{aq}\right)$$

At cathode: $\mathrm{H_2O\,(l) + e^- \rightarrow \frac{1}{2}H_2\left(g\right) + OH^-\left(aq\right)}$

At anode: $\mathrm{Cl^-\left(aq\right) \rightarrow \frac{1}{2}Cl_2\left(g\right) + e^-}$

∴ H_2(g) is obtained at cathode during electrolysis of aqueous NaCl.

(71) **Answer :** (4)
Hint:

$$\chi_{(CO_2)} = \frac{P_{(CO_2)}}{K_H}$$

Solution:

$$\chi_{(CO_2)} = \frac{1.67 \times 10^5}{1.67 \times 10^8}$$

$= 10^{-3}$
Moles of H_2O = $\frac{1000}{18}$
⇒ 55.5 mol

$$\chi_{(CO_2)} = \frac{n\ mol}{n\ mol + 55.5\ mol} = 10^{-3}$$

n mol = 10^{-3} × 55.5
Weight (amount) of CO_2 = 55.5 × 10^{-3} × 44
= 2.4 g

(72) **Answer :** (3)
Hint:
Apply Nernst equation
Solution:

$$\mathrm{E^\circ_{cell} = E^\circ_C - E^\circ_A = E^\circ_{Cu^{2+}/Cu} - E^\circ_{Mg^{2+}/Mg}}$$

= (0.34) – (– 2.36)
= 2.7 V

$$\mathrm{E_{cell} = E^\circ_{cell} + \frac{0.06}{n}\log\frac{[Cu^{2+}]}{[Mg^{2+}]}}$$

$$= 2.7 + \frac{0.06}{2}\log\frac{(0.1)}{(0.01)}$$

= 2.7 + 0.03 = 2.73 V

(73) **Answer :** (2)
Hint:

$$\Delta G^\circ = -n E^\circ F$$

Solution:

$$\overset{-2.5}{C}_4H_{10} \rightarrow \overset{+4}{C}O_2$$

$$n = [4 - (-2.5)] \times 4 = 26$$

$$\Delta G^\circ = -nE^\circ F$$

$$-2.6 \times 10^6 = -26 \times E^\circ \times 96500$$ ⇒ E^0 = 1.04 V

(74) **Answer :** (2)
Solution:
Conductivity ∝ number of ions.
$K_3[Co(C_2O_4)_3]$ ⇒ 4 ions
$[Pt(H_2O)_6]Br_4$ ⇒ 5 ions
$[Co(NH_3)_5(CO_3)]Cl$ ⇒ 2 ions
$[Pt(NH_3)_2Cl(NO_2)]$ ⇒ 0 ion

(75) **Answer :** (3)
Hint:

$E_{H^{\oplus}/H_2} = E^{\circ}_{H^{\oplus}/H_2} - \frac{0.059}{2} \log \frac{P_{(H_2)}}{[H^+]^2}$

Solution:

$E^{\circ}_{H^{\oplus}/H_2} = 0, P_{H_2} = 1 \text{ bar}$

$E_{H^{\oplus}/H_2} = 0 - \frac{0.059}{2} \log \frac{1}{[H^+]^2}$

$= - \frac{0.059}{2} [\log 1 - 2 \log [H^+]]$

$= - \frac{0.059}{2} [0 - 2 \log [H^+]]$

= 0.059 log [H^+]

= – 0.059 [– log [H^+]

= – 0.059 [pH]

= – 0.059 × 4

= – 0.236 V

(76) **Answer :** (1)

Hint:

Mole fraction in vapour phase $\left(y\right) = \frac{P}{P_{total}}$

Solution:

p_{total} = p_1 + p_2

$p_{total} = p_1^0 x_1 + p_2^0 x_2$

$p_{total} = 360 \times \frac{2}{5} + 300 \times \frac{3}{5}$

= 144 + 180

= 324 mm of Hg

Mole fraction of hexane in vapour phase $\left(y\right) = \frac{144}{324}$ = 0.44

(77) **Answer :** (1)

Solution:

The overall reaction during discharge is:

$Cd(s) + 2Ni(OH)_3(s) \rightarrow CdO(s) + 2Ni(OH)_2$ (s) + H_2O (l)

(78) **Answer :** (1)

Hint:

Cell constant = $\left(\frac{l}{a}\right)$.

Solution:

Unit of cell constant is cm^{-1} or m^{-1}.

(79) **Answer :** (1)

Solution:

At anode ⇒ $2H_2O \rightarrow 4H^+ + O_2 + 4e^-$

At cathode ⇒ $H_2O + e^- \rightarrow \frac{1}{2}H_2 + OH^-$

(80) **Answer :** (2)

Solution:

Conductivity decreases with dilution as number of ions per unit volume that carry current in a solution decreases with dilution.

(81) **Answer :** (3)

Hint:

$E^o_{cell} = \frac{2.303RT}{nF} \log K_{eq.}$ and $\Delta G^\circ = -nF E^o_{cell}$.

Solution:

$E^o_{cell} is\ positive,\ so\ K_{eq} > 1\ and\ \Delta G^\circ < 0.$

(82) **Answer :** (4)

Hint:

Molar conductivity of OH^- is exceptionally high.

(83) **Answer :** (3)

Hint:

Reaction at anode

$2SO_4^{2-}(aq) \rightarrow S_2O_8^{2-}(aq) + 2e^-$

(84) **Answer :** (1)

Hint:

ClO_3^- + 6H$^+$ + 6e$^-$ → Cl$^-$ + 3H$_2$O.

Solution:

For every 1 mol

ClO_3^-, 6 mole electrons (6F charge) is required to convert into Cl$^-$.

(85) Answer : (1)

Hint:

Number of gram equivalent of Zn = Number of gram equivalent of O_2

Solution:

Number of mole of O_2 = $\frac{22400}{22400} = 1 \text{ mole}$

Number of gm equivalent of O_2 = 1 × 4 = 4

$4 = \frac{\text{Weight of Zn}}{\text{Equivalent mass of Zn}}$

$4 = \frac{w \times 2}{65.38}$

w = 130.76 g

(86) Answer : (4)

Solution:

· Leclanché cell is an example of primary battery.

· A secondary cell can be recharged so that it can be used again.

(87) Answer : (3)

Solution:

$\Lambda^\circ_{Ba(OH)_2} = \Lambda^\circ_{BaCl_2} + 2 \times \Lambda^\circ_{NaOH} - 2 \times \Lambda^\circ_{NaCl}$

= z + 2y – 2x

(88) Answer : (1)

Solution:

a. $2SO_4^{-2} \rightarrow S_2O_8^{-2} + 2e$

b. 2H$_2$O → O$_2$ + 4H$^+$ + 4e

c. $Cr_2O_7^{-2} + 14H^{\oplus} + 6e \rightarrow 2Cr^{+3} + 7H_2O$

d. $MnO_4^- + 8H^{\oplus} + 5e \rightarrow Mn^{+2} + 4H_2O$

(89) Answer : (2)

Solution:

NaCl → i = 1 + α = 1 + 0.9 = 1.9

$CaCl_2$ → i = 1 + 2α = 1 + 2 × 0.6 = 2.2

$AlCl_3$ → i = 1 + 3α = 1 + 3 × 0.5 = 2.5

$K_2[Fe(CN)_6]$ → i = 1 + 3α = 1 + 3 × 0.7 = 3.25

(90) Answer : (1)

Solution:

Gases with more solubility has less value of K_H

He → 144.97 bar^{-1}

N_2 → 76.48 bar^{-1}

CO_2 → 1.67 bar^{-1}

CH_2CHCl → 0.611 bar^{-1}

BOTANY

(91) Answer : (3)

Solution:

Viola, *Oxalis* and *Commelina* produce two types of flowers : chasmogamous flowers and cleistogamous flowers.

(92) Answer : (2)

Solution:

Endothecium helps in dehiscence of anther due to their hygroscopic nature.

(93) Answer : (3)

Solution:

Vallisneria is pollinated by water.

Zostera, a seagrass has submerged female flower.

Commelina produce two types of flowers-chasmogamous and cleistogamous. Chasmogamous flowers can be pollinated by abiotic or biotic agents.

(94) Answer : (3)
Solution:
The given figure is of a monocot seed, where:
A- Pericarp, B- Endosperm, C- Coleoptile, D- Scutellum

(95) Answer : (3)
Solution:
(1) Sporopollenin is one of the most resistant organic material known.
(2) No enzyme that degrades sporopollenin is so far known.

(96) Answer : (3)
Solution:
Apomixis is a form of asexual reproduction.
So, there is no segregation of characters.

(97) Answer : (2)
Solution:
PEN is primary endosperm nucleus. It is the result of triple fusion, among one male gamete and two polar nuclei.

(98) Answer : (4)
Solution:
Central cell forms the endosperm.
Embryo sac contains central cell. It is formed by functional megaspore. It is not the post fertilised structure.

(99) Answer : (3)
Solution:
Secondary nucleus = (2n).

(100) Answer : (1)
Hint:
The egg apparatus of a typical embryo sac has three cells.
Solution:
The egg apparatus of embryo sac has, one egg cell and two synergids. All are haploid.

(101) Answer : (3)
Solution:
Syngamy refers to fusion of egg with male gamete.

(102) Answer : (3)
Solution:
In papaya, male and female flowers are present on different plants, that is each plant is either male or female this condition prevents both autogamy and geitonogamy.

(103) Answer : (3)
Solution:
In angiosperms, a mature pollen grain has two cells, one vegetative cell and one generative cell.
In over 60 percent of angiosperms, pollen grains are shed at two celled stage.

(104) Answer : (3)
Hint:
In Angiosperms, double fertilisation involves syngamy and triple fusion.
Solution:
Double fertilisation involves five nuclei, two in syngamy and three in triple fusion.

(105) Answer : (3)
Solution:
Exine has sporopollenin that make them highly resistant.

(106) Answer : (4)
Solution:
The endosperm in angiosperm is triploid in nature.

(107) Answer : (2)
Solution:
Embryo sac is a female gametophyte.

(108) Answer : (4)
Solution:
During double fertilisation one of the male gametes moves towards the egg cell and fuses with its nucleus and other one fuses with the central cell nuclei.

(109) Answer : (4)
Solution:

Double fertilisation is a fertilisation event but pollen-pistil interaction is a pre-fertilisation event

(110) Answer : (3)
Solution:
Perispermic seeds have persistent nucellus.

(111) Answer : (2)
Solution:
After fertilisation, antipodal cells degenerate.

(112) Answer : (3)
Hint:
In majority of angiosperms, development of embryo sac is monosporic.
Solution:
In monosporic embryo sac development, only one of the four megaspores is functional and develops into 7 celled 8-nucleate embryo sac.

(113) Answer : (1)
Solution:
In parthenocarpy, fruit is formed without fertilization.
Apomictic embryos are formed without fertilization as well.
So both the phenomenon lack fusion of gametes.

(114) Answer : (1)
Solution:
Pollen grains of cereals, such as, rice and wheat lose viability within 30 minutes of their release.

(115) Answer : (4)
Solution:
Geitonogamy is transfer of pollen grains from anther to the stigma of another flower of the same plant. So it needs involvement of pollinating agents.

(116) Answer : (2)
Solution:
Generative cell divides to form two male gamates in angiosperms.

(117) Answer : (2)
Hint:
Coconut water provides nourishment to developing embryo.
Solution:
Coconut water is free nuclear endosperm (made up of thousands of nuclei) and the surrounding white kernel is the cellular endosperm.

(118) Answer : (2)
Solution:
PEN (Primary endosperm nucleus) is a triploid structure.

(119) Answer : (2)
Solution:
• Xenogamy refers to the transfer of pollen grains from anthers of one plant to stigma of a different plant which during pollination, brings genetically different types of pollen grains to stigma.
• Cleistogamy is a condition in which flower does not open.
• Geitonogamy refers to the transfer of pollen grain from anther to stigma of another flower of the same plant.
• Chasmogamy is a condition in which flowers remain open.

(120) Answer : (4)
Solution:
Maize, castor and coconut are albuminous or endospermic seeds. While, groundnut is non-endospermic or, ex-albuminous seed.

(121) Answer : (2)
Solution:
Much before the actual flower is seen on a plant, the decision that the plant is going to flower has taken place. Several hormonal and structural changes are initiated which lead to the differentiation and further development of the floral primordium.

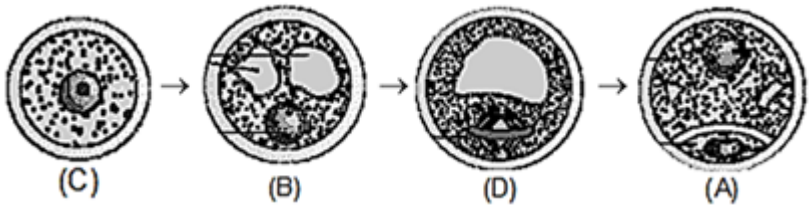
(122) Answer : (2)
Solution:
Apple, Strawberry and Cashewnut develop from other floral parts along with the ovary.

(123) Answer : (1)
Solution:
Multicarpellary, apocarpous gynoecium is seen in *Michelia*. *Papaver* has multicarpellary syncarpous gynoecium.

(124) Answer : (3)

Solution:
The proximal end of the filament is attached to thalamus or the petal of the flower. The process of formation of microspores from pollen mother cell through meiosis is called microsporogenesis.

(125) Answer : (3)
Solution:
The sequence of development of mature pollen grain is



(126) Answer : (4)
Solution:
In water lily, insect pollination occurs.

(127) Answer : (2)
Solution:
plants that adopt abiotic pollination have:
- Well exposed stamens
  Presence of a mucilaginous covering
- Large often-feathery stigma
  Presence of single ovule in each ovary

(128) Answer : (3)
Hint:
Hilum is the junction between ovule and funicle.
Solution:
Opposite to the micropylar end that represents the basal part of ovule is called chalaza.
Funicle is the stalk of ovule. Nucellus is enclosed within the integuments and forms the body of ovule.

(129) Answer : (3)
Solution:
Filiform apparatus is present at the micropylar tip.
The synergids have special cellular thickenings at the micropylar tip called filiform apparatus, which play an important role in guiding the pollen tubes into the synergids.

(130) Answer : (3)
Solution:
Self incompatibility is a phenomena, which promotes outbreeding.

(131) Answer : (4)
Solution:
Lupinus arcticus excavated from Arctic Tundra. In rice and wheat, pollen grains lose viability within 30 minutes of their release. *Michelia* have multicarpellary, apocarpous gynoecium.

(132) Answer : (2)
Solution:
Triple fusion involves the fusion of three haploid nuclei. Syngamy results in formation of a diploid cell, the zygote.

(133) Answer : (2)
Solution:
The zygote gives rise to the pro-embryo and subsequently to the other forms as in option (2).

(134) Answer : (2)
Solution:
The correct sequence of different parts of an ovule from outside to inside is integument, nucellus, embryo sac.

(135) Answer : (4)
Hint:
Orobanche is an angiosperm
Solution:
Orobanche is a parasitic species that can produce fruits with many tiny seeds.

ZOOLOGY

(136) Answer : (2)
Solution:

The meiotic division called cleavage starts as the zygote moves through the isthmus of the oviduct towards the uterus and forms 2, 4, 8, 16 daughter cells called blastomeres. Size of blastomeres decreases during cleavage.

(137) Answer : (4)
Solution:
After ovulation, secondary oocyte has two extra layers, zona pellucida and corona radiata.

(138) Answer : (1)
Solution:
At puberty, only 60,000-80,000 primary follicles are left in each ovary.

(139) Answer : (1)
Solution:
Lack of menstruation may be an indicative of pregnancy. However, it may also be caused due to some underlying causes like stress, poor health, *etc*.

(140) Answer : (3)
Solution:
The male accessory glands include paired seminal vesicles, a prostate and paired Bulbourethral glands.

(141) Answer : (2)
Solution:
Stem cells are present in inner cell mass which have potency to form all tissues as well as body organs.

(142) Answer : (3)
Solution:
Corpus luteum mainly secretes progesterone

(143) Answer : (2)
Solution:
Levels of progesterone and estrogen drop during menstrual phase to their minimum level.

(144) Answer : (3)
Solution:
In spermatogenesis, formation of sperms occurs. Insemination is the process of introducing sperm into female's reproductive system.

(145) Answer : (1)
Solution:
Scrotum helps in maintaining the low temperature of testes *i.e.* 2 - 2.5°C lower than normal internal body temperature, necessary for spermatogenesis.

(146) Answer : (2)
Solution:
Human male ejaculates 200 - 300 million sperms during a coitus, out of which for normal fertility atleast 60% must have normal shape and size and 40% of them must show vigorous motility.

(147) Answer : (1)
Solution:
The opening of the vagina is often covered partially by a membrane called hymen. A tertiary follicle is characterised by a fluid filled cavity called antrum.

(148) Answer : (4)
Solution:
GnRH is switch on hormone for menarche. Cycle of events starting from one menstruation till the next one is called the menstrual cycle. Cycle starts with menstrual phase and ends will luteal phase.

(149) Answer : (3)
Solution:
Leydig cells secrete androgens in interstitium of testis. Corpus luteum persists after ovulation under effect of LH and during pregnancy under effect of hCG.

(150) Answer : (1)
Solution:
Vasa efferentia transports sperms from testis to epididymis. The vasa efferentia leave the testis and open into epididymis located along the posterior surface of each testis.

(151) Answer : (1)
Solution:
Sex is determined only by the male gamete. Milk secretion starts towards the end of pregnancy.

(152) Answer : (1)
Solution:
Stored oxytocin is released from posterior pituitary.

(153) Answer : (1)

Solution:
hCG and hPL are produced only during pregnancy in women.

(154) Answer : (2)
Hint:
Structure whose width is almost same as length of ovary.
Solution:
In adults, each testis is oval in shape with a length of 4 to 5 cm and a width of about 2 to 3 cm.

(155) Answer : (4)
Hint:
Formed as a result of 1^{st} meiotic division.
Solution:
Acellular layer that comes out along with ovum during ovulation is zona pellucida. This layer is formed by secondary oocyte.

(156) Answer : (4)
Hint:
Male gamete
Solution:
Male germ cells present in germinal epithelium of testes undergo spermatogenesis to form spermatozoa. So, they are meiocytes (2n). Male germ cells, spermatogonia and primary spermatocytes are diploid cells whereas spermatozoa are haploid male gametes.

(157) Answer : (3)
Hint:
Structure made up of a central axial filament
Solution:
The sperm head contains an elongated haploid nucleus, the anterior portion of which is covered by a cap-like structure, acrosome. The acrosome is filled with enzymes that help in fertilisation of the ovum. The middle piece possesses numerous mitochondria, which produce energy for the movement of tail that facilitates sperm motility essential for fertilization.

(158) Answer : (4)
Solution:
Hypothalamus starts secreting the hormone GnRH in a pulsatile manner at a certain age (puberty). GnRH is responsible for changes observed during puberty. So, GnRH is the switch on hormone for puberty.

(159) Answer : (2)
Solution:
After the division of the primary oocyte, a single ovum and a first polar body is released in the ovary.
The entry of the sperm into the ovum induces the completion of the second meiotic division of the secondary oocyte in the fallopian tube and second polar is released.
Fertilisation can only occur if the ovum and sperms are transported simultaneously to the ampullary region of the fallopian tube.

(160) Answer : (4)
Solution:
Estrogen is an ovarian hormone.

(161) Answer : (2)
Solution:
In a menstrual cycle, the luteal phase is of fixed days, *i.e.* 14. Thus, the day of ovulation = 36 – 14 = 22^{nd} day

(162) Answer : (1)
Solution:
During pregnancy, the levels of estrogen, progestogens, cortisol, prolactin and thyroxine increase several folds in the maternal blood.

(163) Answer : (4)
Solution:
Decrease in LH which is responsible for maintenance of corpus luteum.
After ovulation when implantation does not occur, decrease in LH causes degeneration of corpus luteum. Progesterone levels decreases. Endometrium of uterus undergoes degeneration causing disintegration of uterine lining to start menstruation.

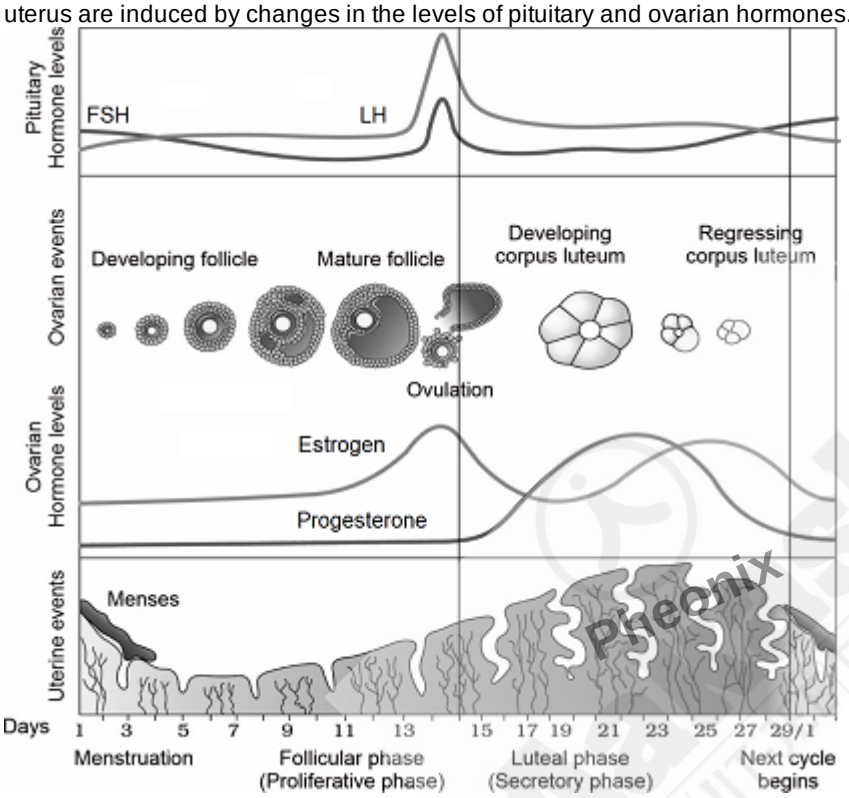
(164) Answer : (1)
Solution:
The ejaculatory duct opens into the urethra which is a common passage for urine and semen.

(165) Answer : (3)
Solution:
During fifth month (20 week), first movements of foetus are usually observed.

(166) Answer : (2)
Solution:
FSH and LH stimulates the growth of ovarian follicles.

(167) Answer : (3)
Hint:
23 chromosomes are present in a human sperm.
Solution:
Both ova and sperms in humans have 23 chromosomes each. Sperm is much smaller in size than ova but it is highly motile. Spiral arrangement of mitochondria is observed in sperms.

(168) Answer : (4)
Solution:
During follicular phase, the primary follicles in the ovary grow to become a fully mature Graafian follicle and simultaneously the endometrium of uterus regenerates through proliferation. These changes in the ovary and the uterus are induced by changes in the levels of pituitary and ovarian hormones.



(169) Answer : (4)
Solution:
Uterus is supported by ligaments attached to the pelvic wall.
The shape of the uterus is like an inverted pear.

(170) Answer : (4)
Solution:
Placenta supplies nourishment to the embryo, along with hormones and antibodies.

(171) Answer : (4)
Solution:
Secretions of seminal vesicles contain fructose which provide energy to the sperms.

(172) Answer : (1)
Solution:
Levels of estrogen and LH are maximum at follicular phase.

(173) Answer : (1)
Solution:
Depolarisation in ovum membrane checks polyspermy.

(174) Answer : (2)
Solution:
Each primary oocyte results in the formation of 1 ova and 2 polar bodies in humans.

(175) Answer : (2)
Hint:
Facilitate spermiation
Solution:

Male sex accessory ducts include rete testis, vasa efferentia, epididymis and vas deferens. After spermiogenesis, sperm heads become embedded in the Sertoli cells, and are finally released from the seminiferous tubules by the process called spermiation. Sperm formation continues in old men also.

(176) Answer : (4)
Solution:
The part of fallopian tube closest to uterus is called isthmus.

(177) Answer : (4)
Solution:
The cavity of the cervix is called cervical canal which alongwith vagina forms the birth canal.

(178) Answer : (3)
Hint:
Also secreted by placenta
Solution:
Estrogen reaches peak just before ovulation and during luteal phase.
LH and FSH reach peak during follicular phase just before ovulation.
Progesterone is secreted by corpus luteum and it reaches peak in luteal phase.

(179) Answer : (4)
Hint:
Pregnancy at a site other than uterus.
Solution:
Pregnancy at a site other than uterus is called ectopic pregnancy. Implantation of embryo within uterus near cervix is called placenta previa. Implantation of embryo in uterus occurs at blastocyst stage.

(180) Answer : (4)
Solution:
hCG stimulates the corpus luteum to secrete progesterone until placenta is formed. Decreased levels of hCG will lead to a drop in the levels of progesterone and spontaneous abortion will occur.