24/09/2025

Code-A

Aakash
Medical | IIT-JEE | Foundations

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Udyog Vihar, Gurugram, Haryana - 122015, ***Ph.***+91-1244168300

MM : 720

Fortnightly Test for NEET-2026_RM(P1)_FT-06A

Time : 180 Min.

PHYSICS

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CHEMISTRY

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ZOOLOGY

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Hints and Solutions

PHYSICS

(1) **Answer :** (2)
Solution:
$\frac{d^2x}{dt^2} = -4x$
Comparing with $\frac{d^2x}{dt^2} = -\omega^2 x$
$\omega^2 = 4$
$\therefore \omega = 2$
$2\pi f = 2$
$f = \frac{1}{\pi}$ Hz

(2) **Answer :** (3)
Solution:
Time period of spring-mass system is independent of acceleration of lift. It only depends on mass m and spring constant (k).

(3) **Answer :** (2)
Hint:
Maximum speed $v = A\omega$ and time period $T = \frac{2\pi}{\omega}$
Solution:
$T = \frac{2\pi}{2\pi}$
= 1 second
$v = 5 \times 2\pi = 10\pi$
$= 10 \times 3.14$ m s^{-1}
$= 31.4$ m s^{-1}

(4) **Answer :** (3)
Solution:
Total mechanical energy remains constant throughout so frequency of oscillations is zero.

(5) **Answer :** (3)
Hint:
Equation of travelling wave moving along negative x-axis is given by $y = A\sin(\omega t + kx)$
Solution:
$k = \frac{2\pi}{\lambda} \therefore k = \frac{2\pi}{0.5} = 4\pi$
$y = 0.25\sin(\omega t + 4x)$

(6) **Answer :** (2)
Hint:
In string fixed at both ends,
3rd overtone = 4(fundamental frequency)
Solution:
Third overtone is 4th harmonic
$4f = 600$
$f = 150$ Hz

(7) **Answer :** (3)
Solution:
Standing wave is given by $y = 2A\sin kx\cos\omega t$

(8) **Answer :** (2)
Solution:
In a transverse wave, energy and not the matter is transferred from one point to the other.

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

$E = \frac{\lambda}{2\pi\varepsilon_0 r} = \frac{2\times10^{-6}\times10^2}{4} \times 18 \times 10^9$

= 9 × 10^5 N/C

(10) Answer : (2)
Hint:

Flux, $\phi = \vec{E} \cdot \vec{A}$
Solution:

$\phi = \left(a\hat{i} + b\hat{j}\right) \cdot \left(\pi R^2 \hat{j}\right) = \pi b R^2$

(11) Answer : (1)
Hint:

Torque on dipole in uniform electric field is given be $\vec{\tau} = \vec{P} \times \vec{E} = PE\sin\theta$
Solution:

Here, $\frac{P_x}{E_x} = \frac{P_y}{E_y} = \frac{P_z}{E_z}$

$\therefore$ $\vec{P}$ is antiparallel to $\vec{E}$
$\Rightarrow$ sinθ = 0
$\therefore$ τ = 0

(12) Answer : (3)
Solution:
For positive charge electric field lines move away from the charge and for negative charge it will be directed towards the charge

(13) Answer : (4)
Solution:
Electric field due to individual charges are equal in magnitude and at angle 120° with each other. So, net field at centroid is zero.

(14) Answer : (4)
Solution:

Electric field due to short dipole varies as $E \propto \frac{1}{r^3}$

For point charge $E \propto \frac{1}{r^2}$

For line charge $E \propto \frac{1}{r}$

For large sheet $E \propto r^0$

(15) Answer : (3)
Hint:

$P \cdot E = \frac{1}{2}m\omega^2 y^2,\ K \cdot E = \frac{1}{2}m\omega^2(A^2 - y^2)$

$\frac{1}{2}m\omega^2 y^2 = \frac{1}{2}m\omega^2(A^2 - y^2)$
Solution:

$\frac{1}{2}m\omega^2 y^2 = \frac{1}{2}m\omega^2(A^2 - y^2)$

$y = \frac{A}{\sqrt{2}} = 0.707A = 70\%$ of A

(16) Answer : (2)
Hint:

$F = -kx$ and $T = 2\pi\sqrt{\frac{m}{k}}$

Solution:

$\because\ k = \frac{|F|}{|x|} = \frac{8}{10}\ \frac{\text{N}}{\text{cm}} = 80\ \frac{\text{N}}{\text{m}}$

$T = 2\pi\sqrt{\frac{m}{k}} = 2\pi\sqrt{\frac{0.8}{80}} = \frac{\pi}{5}$s

(17) Answer : (1)
Hint:

$T = 2\pi\sqrt{\frac{\mu}{K_{\text{eff}}}}$

Solution:

$\frac{1}{\mu}=\frac{1}{m}+\frac{1}{m}$

$\mu=\frac{m}{2}$

$K_{\text{eff}}=\frac{K}{2}$

$T=2\pi\sqrt{\frac{m}{2\times\frac{K}{2}}}$

$T=2\pi\sqrt{\frac{m}{K}}$

(18) Answer : (4)

Solution:

Time taken from 0 to *A* is $\frac{T}{4}$(where *T* is time period)

Time taken from 0 to $\frac{A}{2}$ is calculated as

$\frac{A}{2}=A\sin\omega t$

$\sin\omega t=\frac{1}{2}$

$\Rightarrow \omega t=\frac{\pi}{6}$

$\therefore\ t=\frac{\pi T}{6\times 2\pi}=\frac{T}{12}$ s

$\therefore$ Time taken from $\frac{A}{2}$ to A is $t=\frac{T}{4}-\frac{T}{12}=\frac{T}{6}$

Given, $\frac{T}{6}=0.1$ s

$\therefore T=0.6$ s

(19) Answer : (2)

Solution:

The given trigonometric function can be expressed as $y=\sqrt{a^2+b^2}\sin(\omega t+\phi)$

Hence amplitude is $\sqrt{a^2+b^2}$

(20) Answer : (2)

Hint:

$y = A\sin\omega t$

$v=\omega\sqrt{A^2-y^2}$

Solution:

At $\frac{T}{12}$, $y=\frac{A}{2}$

$v=\omega\sqrt{A^2-\frac{A^2}{4}}=\frac{\sqrt{3}A\omega}{2}$

(21) Answer : (1)

Hint:

Maximum acceleration is achieved at the extreme position.

Solution:

$a_{\max}=\frac{k}{m}A$

$a_{\max}=\frac{1200}{4}\times 2\times 10^{-2}$ m s^{-2}

= 6 m s^{-2}

(22) Answer : (2)

Hint:

If $y = A\sin\omega t + B\cos\omega t$, then net amplitude is $\sqrt{A^2+B^2}$

Solution:

$y=\sin\omega+\cos\omega t=\sqrt{2}\left|\frac{1\sin\omega t+1.\cos\omega t}{\sqrt{2}}\right|=\sqrt{2}$

$\left[\sin\omega t\times\frac{1}{\sqrt{2}}+\cos\omega t\times\frac{1}{\sqrt{2}}\right]$

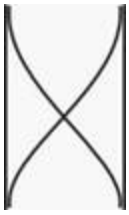
$y=\sqrt{2}\left[\sin\omega t.\cos\frac{\pi}{4}+\cos\omega t.\sin\frac{\pi}{4}\right]$

$=\sqrt{2}\sin\left(\omega t+\frac{\pi}{4}\right)$

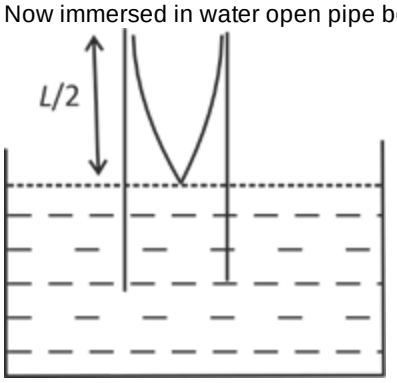
Amplitude of oscillation $=\sqrt{2}$ m

Time period $T=\frac{2\pi}{\omega}\ \Rightarrow T=2$ s

(23) Answer : (2)
Solution:
Fundamental frequency of open pipe (at both ends) $f = \frac{v}{2L}$ ...(i)



Now immersed in water open pipe behaves as closed pipe.



$f' = \frac{v}{4\left(\frac{L}{2}\right)} = \frac{v}{2L}$ ...(ii)

$f = f'$

(24) Answer : (3)
Hint:
Frequency of first overtone (or second hormonic), $f \propto \frac{1}{l}$ as tension in wire is constant.
Solution:
$\frac{f_2}{f_1} = \frac{l_1}{l_2}$
$\Rightarrow \frac{2f_1}{f_1} = \frac{l_1}{l_2}$
$\Rightarrow l_2 = \frac{l_1}{2}$
= 50% of l_1

(25) Answer : (1)
Solution:
- $v \propto \frac{1}{\sqrt{M}}$
- Mechanical waves require material medium to travel.
- $v \propto \frac{1}{\sqrt{\text{Density}}}$ with increase in water vapours, density of air decreases hence velocity of sound increases.

(26) Answer : (1)
Solution:
$|f - 246| = 5$
$f - 246 = \pm 5$
$f = 246 \pm 5$
$f = 251, 241$
After loading, frequency of the fork reduces therefore original frequency should be 251 Hz.

(27) Answer : (3)
Solution:
$\lambda = \frac{v}{f} = \frac{350}{300} = \frac{7}{6}$ m and $\Delta\delta = \frac{\pi}{3}$
Using $\frac{2\pi}{\lambda}\Delta x = \Delta\delta$
$\Delta x = \frac{\lambda}{6} = \frac{7}{36}$ m

(28) Answer : (1)
Solution:

$n_1 - n_2 = 9$

$\frac{v}{0.60} - \frac{v}{0.61} = 9$

$v = 329.4$ m/s

(29) Answer : (4)

Solution:

$\frac{I_{max}}{I_{min}} = \left(\frac{\sqrt{I_1/I_2}+1}{\sqrt{I_1/I_2}-1}\right)^2$

$= \left(\frac{\sqrt{9}+1}{\sqrt{9}-1}\right)^2$

$= \left(\frac{4}{2}\right)^2 = 4:1$

(30) Answer : (1)

Solution:

The fundamental modes of vibration of a pipe closed at one end and open at both ends (of same length) are shown in figure.

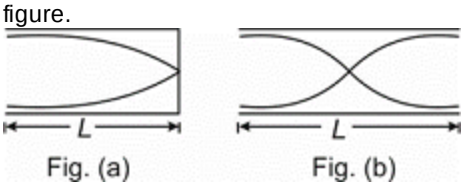


Fig. (a) Fig. (b)

The wavelength in figure (b) is half of that in figure (a). Hence the fundamental frequency in figure (b) is double that in figure (a).

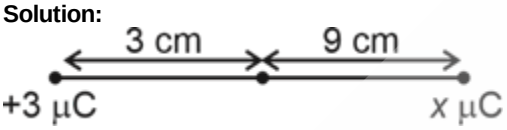
$\therefore f_{open} = 2 \times 512 = 1024$ Hz

(31) Answer : (2)

Hint:

Electric field due to a point charge $E = \frac{kq}{r^2}$

Solution:



$\frac{3k}{(3)^2} = \frac{xk}{(9)^2}$

$x = +27$ μC

(32) Answer : (4)

Solution:

$E = 10^4$ N/C ($\theta = 60°$)

$\tau = pE\sin\theta$

$\sqrt{3} \times 10^{-24} = p \times 10^4 \times \sin 60^\circ = p \times 10^4 \times \frac{\sqrt{3}}{2}$

$p = 2 \times 10^{-28}$ C-m

(33) Answer : (4)

Hint:

Electric field due to dipole on its equatorial line: $\vec{E} = \frac{-k\vec{P}}{r^3}$

Solution:

$E \propto \frac{1}{r^3}$

and $F = Eq$

$\therefore \quad \frac{F}{F\beta} = \frac{(2r)^3}{r^3} \quad \Rightarrow \quad F\beta = \frac{F}{8}$

(34) Answer : (1)

Hint:

$F = \frac{kq_1q_2}{d^2}$

Solution:

$F_i = \frac{k(40)\times(20)}{d^2} = 800\frac{k}{d^2}$

$F_f = \frac{k\left(\frac{40+20}{2}\right)^2}{d^2} = 900\frac{k}{d^2}$

Ratio = $\frac{8}{9}$

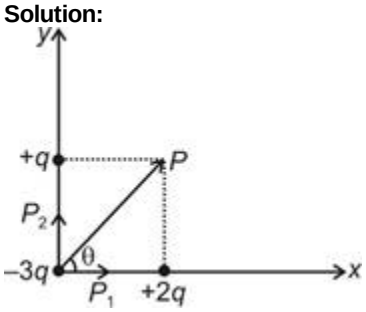
(35) Answer : (3)
Solution:

$\phi = \vec{E} \cdot \vec{S}$

$= \left(2\hat{i} - \hat{j} + \hat{k}\right) \cdot \left(\hat{i} + 2\hat{j}\right)$

= 2 – 2 = 0

(36) Answer : (3)
Hint:
Dipole moment = charge × (distance between them)
Solution:



$\vec{P}_1 = \left(2q \cdot a\right)\hat{i}$

$\vec{P}_2 = \left(q \cdot a\right)\hat{j}$

$\vec{p} = \vec{p}_1 + \vec{p}_2$

$= 2qa\hat{i} + qa\hat{j}$

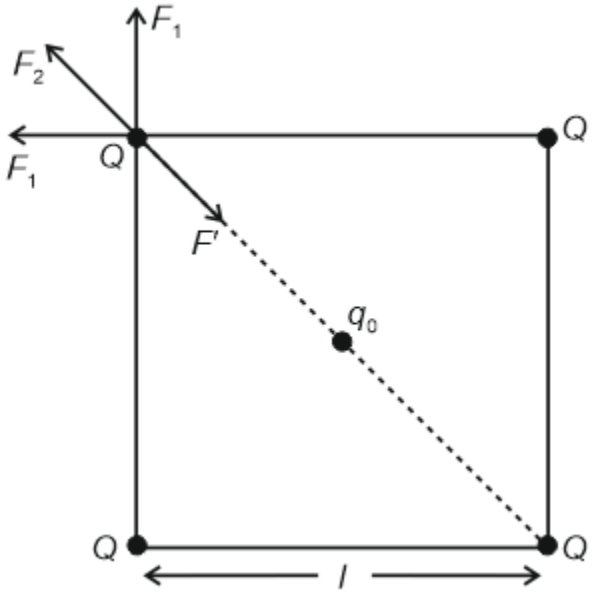
$\left|\vec{p}\right| = qa\sqrt{2^2 + 1^2} = \sqrt{5}qa$

$\tan\theta = \frac{qa}{2qa} = \frac{1}{2}$

$\theta = \tan^{-1}\left(\frac{1}{2}\right)$

(37) Answer : (4)
Solution:
If dipole moment is along the field lines then torque on dipole due to field is zero.

(38) Answer : (4)
Solution:



$F' = \sqrt{2}F_1 + F_2$

$\frac{kQq_0}{\left(\frac{l}{\sqrt{2}}\right)^2} = \frac{\sqrt{2}kQ^2}{l^2} + \frac{kQ^2}{(\sqrt{2}l)^2}$

Magnitude of $q_0 = \frac{Q}{4}\left[1+2\sqrt{2}\right]$

Also, there is attractive force between q_0 and Q.

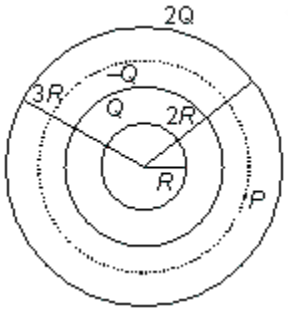
$\therefore \quad q_0 = \frac{-Q}{4}\left[1+2\sqrt{2}\right]$

(39) Answer : (1)

Hint:

$\oint \vec{E} \cdot d\vec{S} = \frac{\Sigma q_{in}}{\varepsilon_0}$

Solution:



$\oint \vec{E} \cdot \vec{ds} = \frac{Q+(-Q)}{\varepsilon_0}$

$E \oint ds = 0$

$E(4\pi r^2) = 0$

$\Rightarrow E = 0$

(40) Answer : (4)

Solution:

$U = mV = m\left[ax^2 + bx\right]$

$F = -\frac{dU}{dx} = -m[2ax + b]$

$F = -2\max - mb$

$a = -2ax + c$'

$a = -\omega^2 x \Rightarrow \omega^2 = 2a \Rightarrow \omega = \sqrt{2a}$

(41) Answer : (4)

Solution:

At any point of time, time period is given by

$T = 2\pi\sqrt{\frac{m}{k}}$

Here *m* is decreasing, so time period *T* will be decreasing

Since $\omega = \frac{2\pi}{T}$

Hence as mass leaks, ω will increase

Now, at any instant

$mg = kx_0$

So, equilibrium length $x_0 = \frac{mg}{k}$, where *m* is decreasing

So, equilibrium length will decrease.

So, amplitude also go on decreasing.

(42) Answer : (3)

Solution:

Path difference between points in same phase should be $n\lambda$, where n = 0, 1, 2,.....

(43) Answer : (1)

Hint:

$f_{beat} = |f_1 - f_2|$

Solution:

$f_{\text{beat}} = \frac{v}{2l} - \frac{v}{2(l+x)} = \frac{v}{2}\left[\frac{1}{l} - \frac{1}{l+x}\right]$

(44) Answer : (3)

Solution:

$y = 4\sin\left(4\pi t - \frac{\pi}{16}x\right)$

$\therefore \omega = 4\pi$ rad/s, $k = \frac{\pi}{16}\text{cm}^{-1}$

$v = \frac{\omega}{k} = \frac{4\pi}{\frac{\pi}{16}}$ = 64 cm/s

v = 64 cm/s in +*x* direction

(45) Answer : (1)

Solution:

$f_1 = \frac{3v}{4l}$

$60 = \frac{3v}{4l}$

$\frac{v}{l} = 80$

$\frac{7v}{4l} = \frac{7}{4} \times 80$ = 140 Hz

CHEMISTRY

(46) Answer : (3)

Solution:

$\Delta T_b = T_b - T°$

Where T_b = boiling point of solution

T_b^0 = Boiling point of pure solvent

$T_b = T_b^0 + \Delta T_b$

$\Delta T = im K_b$

$\Delta T_b \propto im$

(47) Answer : (2)

Solution:

Positive deviations are shown by such solution in which solvent-solvent and solute-solute interactions are stronger than the solute solvent interaction.

(48) Answer : (1)

Hint:

Osmotic pressure π = CRT

Solution:

$Molarity = \frac{n}{V_L} = \frac{18\times1000}{180\times250} = 0.4$

π = CRT
= 0.4 × 0.0821 × 300
= 9.85 atm

(49) **Answer :** (1)
Solution:
$\Delta T_f = iK_f m$
$3.82 = i \times 1.86 \times \frac{5 \times 1000}{142 \times 45}$
$i = \frac{3.82 \times 142 \times 45}{1.86 \times 5 \times 1000}$
= 2.63

(50) **Answer :** (2)
Solution:
Boiling point of azeotropic solutions is always constant because the mole fraction in solution as well as vapour phase are same.

(51) **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

(52) **Answer :** (2)
Hint:
$P_S = P_A^0 X_A + P_B^0 X_B$
Solution:
$P_S = 100 \times \frac{3}{5} + 150 \times \frac{2}{5} = 60 + 60 = 120\ torr$

(53) **Answer :** (4)
Solution:
$m = \frac{X_A}{X_B} \times \frac{1000}{M_B}$
$m = \frac{0.2}{0.8} \times \frac{1000}{18}$
m = 13.87

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

(55) **Answer :** (1)
Solution:
i = 1 – 0.4 + 2 × 0.4 = 1.4
$\Delta T_b = iK_b m$
= 1.4 × 0.52 × 0.2 = 0.014°C
$T_{b(solution)}$ = 100.14°C

(56) **Answer :** (1)
Hint:
The solution that shows large positive deviation from Raoult's law form minimum boiling azeotrope at a specific composition.
Solution:
Ethanol-water mixture shows positive deviation from Raoult's law due to weakening of interactions between ethanol and water.

(57) Answer : (3)
Hint:
Ideal solution obeys Raoult's law
Solution:
For Ideal solution,
Δ_{mix} H = 0
Δ_{mix} G < 0
Δ_{mix} S > 0
Δ_{mix} V = 0

(58) Answer : (1)
Solution:
$\Delta T_{b(complex)} = \Delta T_{b(glucose)}$
$iK_bm = K_b \times m$
i = 1 (So no dissociation or association)
$[CrCl_3.xNH_3] \rightarrow$ is $[Cr(NH_3)_3Cl_3]$
Hence, x = 3

(59) Answer : (1)
Solution:
The solutions that show large negative derivation from Raoult's law form maximum boiling azeotrope at a specific composition.

(60) Answer : (4)
Solution:
$\frac{P^\circ - P_s}{P^\circ} = \frac{n}{n+N} \simeq \frac{n}{N} \simeq \frac{w}{MW_{solute} \times N}$
Solution has same amount of solvent, so P_S value depends only on molecular mass of solute.
So, vapour pressure of solution $\propto$ MWsolute

(61) 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
$\overset{+7}{M}nO_4^- \rightarrow \overset{+2}{M}n^{2+}$
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.

(62) Answer : (1)
Solution:
At anode : $2Fe(s) \rightarrow 2Fe^{2+} + 4e^-$
at cathode : $O_2(g) + 4H^+(aq) + 4e^- \rightarrow 2H_2O(l)$
The overall reaction being:
$2Fe(s) + O_2(g) + 4H^+(aq) \rightarrow 2Fe^{2+}(aq) + 2H_2O(l)$

(63) Answer : (2)
Solution:
The species that has a higher reduction potential act as the strongest oxidizing agent;
The order of oxidizing power is a follows
$Ce^{4+} > MnO_4^- > Cr_2O_7^{2-} > Sn^{4+}$

(64) Answer : (2)
Hint:
$E_{cell} = E^\circ_{cell} - \frac{0.0591}{n} \log Q$

Solution:

$A(s) + 2\underset{0.1\ M}{B^+} \rightleftharpoons \underset{0.1\ M}{A^{2+}} + 2B(s)$

Q = $\frac{\left[A^{2+}\right]}{\left[B^+\right]^2} = \frac{(0.1)}{(0.1)^2} = 10$

5 = $E°_{cell} - \frac{0.0591}{2} \log\ 10$

$E°_{cell}$ = 5.03 V

(65) Answer : (3)
Solution:
For spontaneous cell
$\Delta G < 0$, $E_{cell} > 0$

(66) Answer : (4)
Solution:
Higher is the reduction potential, greater is the oxidising power,
So, order of reducing power will be : C > B > A

(67) Answer : (1)
Hint:

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

Solution:

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

(68) Answer : (3)
Solution:
Degree of dissociation (α) is given as

$\alpha = \frac{\Lambda_m}{\Lambda°_m}$

$\Lambda°_m = \Lambda°_+ + \Lambda°_-$

= 349.6 + 50.4

= 400 S cm^2 mol^{-1}

$\alpha = \frac{\Lambda_m}{\Lambda°_m} = \frac{90}{400} = 0.225$

(69) Answer : (1)
Solution:
The conductivity of an electrolytic solution depends on the concentration of the electrolyte, nature of solvent and temperature.
Conductivity decreases but molar conductivity increases with decrease in concentration.

(70) Answer : (4)
Solution:
In mercury cell;
Anode : Zn–Hg amalgam
Cathode : Paste of HgO and carbon
Electrolytes : Paste of KOH and ZnO.

(71) Answer : (2)
Solution:

$Fe^{3+}(aq) + 3e^- \rightarrow Fe(s)$ E° = x volt $\Delta G°_1 = -3Fx$

$Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq)$ E° = y volt $\Delta G°_2 = -Fy$

(i) – (ii) will give

$Fe^{2+}(aq) + 2e^- \rightarrow Fe(s)$ $\Delta G°_3$

(z is the reduction potential of above half cell reaction)

$\Delta G°_3$ = –2Fz = –3 Fx + Fy

$z = \frac{3x - y}{2}$ volts

(72) Answer : (3)
Solution:

Ion	λ°(Scm^2 mol^{-1})

OH^-	199.1
SO_4^{2-}	160.0
Br^-	78.1
Cl^-	76.3

(73) Answer : (4)
Hint:
$E^0_{cell} = \frac{0.059}{n} \log K_c$
Solution:
$\log K_c = \frac{n \times E^0_{cell}}{0.059} = \frac{2 \times 2.7}{0.059} = 91.5$
$K_C = 10^{91.5}$

(74) Answer : (2)
Solution:
$\alpha = \frac{\Lambda_m}{\Lambda_m^\circ} = \frac{25}{400} \times 100 = 6.25\%$

(75) Answer : (1)
Solution:
Anode : Pb(s) + SO_4^{2-}(aq) → $PbSO_4$ + $2e^-$
Cathode: PbO_2(s) + SO_4^{2-}(aq) + $4H^+$(aq) + $2e^-$ → $PbSO_4$ + $2H_2O$

(76) Answer : (3)
Solution:
$Ni(s) + 2\,Ag^+(0.002M) \rightarrow 2\,Ag(s) + Ni^{2+}(0.16M)$
$E_{cell} = E^\circ_{cell} - \frac{0.059}{2} \log \frac{[Ni^{2+}]}{[Ag^+]^2}$
$= 1.05 - \frac{0.059}{2} \log \frac{0.16}{(0.002)^2}$

(77) Answer : (1)
Hint:
Mass deposited by 96500 C is one equivalent.
Solution:
Q = it = 9.65 × 100 = 965 C
965 C gives 0.3 g metal
96500 C gives 0.3 × 100 g of metal
= 30 g of metal
∴ Equivalent weight of metal = 30

(78) Answer : (2)
Hint:
Conductivity of CuO is 1×10^{-7} S m^{-1}
Solution:

Material	**Conductivity (S m^{-1})**
Copper	5.9×10^3
Iron	1.0×10^3
CuO	1×10^{-7}

(79) Answer : (2)
Hint:
$\Delta G^\circ = -n E^\circ F$
Solution:
$\overset{-2.5}{C}_4 H_{10} \rightarrow \overset{+4}{C}O_2$
$n = [4 - (-2.5)] \times 4 = 26$
$\Delta G^\circ = -nE^\circ F$

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

(80) **Answer :** (3)
Solution:

a.	Dry cell	–	Moist paste of NH_4Cl and $ZnCl_2$
b.	Lead storage Battery	–	38% solution of H_2SO_4
c.	Mercury cell	–	Paste of KOH & ZnO
d.	$H_2 – O_2$ fuel cell	–	Concentrated aqueous NaOH solution

(81) **Answer :** (2)
Solution:
Li^+ has minimum standard reduction potential value.

(82) **Answer :** (1)
Solution:
In disproportionation reaction both oxidation and reduction of an element occur simultaneously. In ClO_4^-, Cl is in its highest oxidation state (+7) so, it can not increase its further oxidation state.

(83) **Answer :** (2)
Solution:

$2K\overset{+5}{Cl}O_3 \xrightarrow{\Delta} 2KCl^{-1} + 3O_2$

(84) **Answer :** (3)
Solution:
$K_2Cr_2O_7 + Fe_2(C_2O_4)_3 \rightarrow Cr^{3+} + Fe^{3+} + CO_2$
$(n \times n_f)_{\text{oxidising agent}} = (n \times n_f)_{\text{Reducing agent}}$
$(n_{\text{factor}} \times \text{mole})_{K_2Cr_2O_7} = (n_{\text{factor}} \times \text{mole})_{Fe_2(C_2O_4)_3}$ ...eq(1)
$n_f(Cr_2O_7^{2-}) = 3 \times 2 = 6$
$n_f(Fe_2(C_2O_4)_3) = 1 \times 6$
Putting eq^n(1), we get
n × 6 = 0.1 × 6
n = 0.1

(85) **Answer :** (3)
Hint:
$E^\circ_{cell} = E^\circ_{cathode} - E^\circ_{anode}$
Solution:
F_2 will make cathode and Cl_2 will make anode
$E^\circ_{cell} = 2.85 - 1.36$
= 1.49 V

(86) **Answer :** (1)
Hint:
Algebraic sum of oxidation states of all the elements will be zero for a neutral compounds.
Solution:
Given element will form a compound with formula A_2BC_2

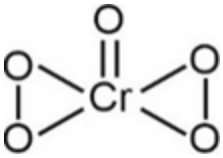
(87) **Answer :** (1)
Hint:
More reactive metals precipitate out the less reactive metal from their aqueous solution.
Solution:
Since Zn is more reactive than Ag, Zn will precipitate out Ag from $AgNO_3$(aq).

(88) **Answer :** (3)
Hint:
Calculate the increase and decrease in oxidation number and make them equal.
Solution:

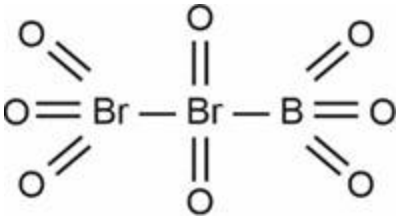
$Cr_2O_7^{2-}(aq) + 3SO_3^{2-}(aq) + 8H^+(aq) \rightarrow 2Cr^{3+}(aq) + 3SO_4^{2-}(aq) + 4H_2O(l)$

So, a = 1, b = 3; c = 8
∴ a : b : c = 1 : 3 : 8

(89) **Answer :** (3)
Solution:



(90) **Answer :** (4)
Hint:
Tribromooctaoxide is



Solution:
Oxidation state of terminal Br = +6
Oxidation state of middle Br = +4

BOTANY

(91) **Answer :** (3)
Solution:
In the members of Rhodophyceae, sexual reproduction is oogamous and accompanied by complex post fertilisation developments.

(92) **Answer :** (3)
Solution:
Bryophytes are first embryophytes. Few members of pteridophytes are heterosporous

(93) **Answer :** (4)
Hint:
The figure depicts *Equisetum*, a pteridophyte.
Solution:
In the figure,
A represents strobili which is composed of compactly arranged sporophylls.
B represents node which is a part of stem.
C represents internode.
D represents branch.
E represents rhizome which is an underground stem.
All these plant parts are of sporophytic generation and thus have diploid cells.

(94) **Answer :** (2)
Solution:
Bentham and Hooker's classification system was a natural classification system. Artificial classification system was given by Linnaeus.

(95) **Answer :** (4)
Hint:
It is a heterosporous pteridophyte *i.e*. *Salvinia*.
Solution:
Pteridophytes do not produce seeds. They need water for fertilization which is internal.

(96) **Answer :** (2)
Solution:
Microphylls are present in *Selaginella. Cycas* lacks female cones. *Ulothrix* is a filamentous alga.

(97) **Answer :** (3)
Solution:
In bryophytes, archegonium is flask shaped and produces a single egg.

(98) Answer : (4)
Solution:
Laterally attached flagella is found in Brown algae, e.g., *Ectocarpus* and *Dictyota*.

(99) Answer : (1)
Solution:
Pyrenoids are found in the members of Chlorophyceae. Pyrenoid contains protein besides starch. It does not contain oil droplets.

(100) Answer : (1)
Hint:
Only brown algae show the abundance of fucoxanthin.
Solution:
All the three forms of algae reproduce vegetatively via fragmentation. Motile gametes can be seen in the members of Chlorophyceae and Phaeophyceae but not in Rhodophyceae. Hydrocolloids can be found in the members of phaeophyceae and rhodophyceae, only.

(101) Answer : (4)
Solution:
In gymnosperms, pollen grains are carried by wind *i.e.* anemophily.

(102) Answer : (3)
Solution:
Mosses are of great ecological importance, as they colonized the rocks and form soil.

(103) Answer : (3)
Solution:
Gametophytes do not have free living existence in gymnosperms and angiosperms. *Pinus* is a gymnosperm.

(104) Answer : (3)
Solution:
Fossils play important role in phylogenetic classification system.

(105) Answer : (3)
Solution:
Lax is spirally arranged sporophylls in gymnosperms like *Cycas*.

(106) Answer : (2)
Solution:
Earliest system of classification is also known as artificial system of classification used only gross superficial morphological characters.

(107) Answer : (4)
Hint:
Gracilaria is a red alga.
Solution:
In red algae, sexual reproduction is accompanied by complex post-fertilization development.

(108) Answer : (4)
Solution:

$$\left.\begin{matrix}\text{A - Capsule}\\ \text{B - Seta}\end{matrix}\right\} \text{Diploid}$$

(109) Answer : (3)
Solution:
Salvinia being a pteridophyte shows event precursor to seed habit. Moss, like *Funaria*, shows elaborate mechanism of spore dispersal.

(110) Answer : (1)
Solution:
Algin and carrageen are hydrocolloids obtained from brown and red algae respectively.

(111) Answer : (3)
Solution:
Pteridophytes are first terrestrial plants with vascular tissues.

(112) Answer : (3)
Solution:
• Sporophyte in mosses is more elaborate than that in liverworts.

(113) Answer : (2)
Solution:
Reduced surface area decreases water loss.
Surface area becomes larger if the structure is fan shaped. Therefore it cannot be the feature to reduce water loss.

(114) Answer : (1)
Solution:
Capsule is the part of sporophytic plant body in bryophytes.
Inside capsule, the spore mother cell undergoes meiosis to produce haploid spores.

(115) Answer : (2)
Solution:
Protonema is a gametophytic stage of mosses (bryophytes) and prothallus is the gametophytic stage of pteridophytes.

(116) Answer : (3)
Hint:
Coralloid roots are present in *Cycas*.
Solution:
Cyanobacteria which are in symbiosis with coralloid roots of *Cycas*, have the ability to fix nitrogen.

(117) Answer : (4)
Solution:
Mosses come under bryophytes. Pteriodophytes lack flower.

(118) Answer : (4)
Solution:
Sphagnum is also known as peat moss.

(119) Answer : (1)
Solution:
Agar is a hydrocolloid obtained from *Gelidium*.

(120) Answer : (1)
Solution:
Bryophytes are dependent on water for sexual reproduction.

(121) Answer : (4)
Solution:
Majority of the red algae are marine and generally found in warmer areas.

(122) Answer : (2)
Solution:
In gymnosperms, microspores develop into a male gametophyte, which is highly reduced and confined to a limited number of cells. This reduced gametophyte is called a pollen grain.

(123) Answer : (2)
Solution:
Peat (obtained from *Sphagnum*) is long been used as packing material for trans-shipment of living material.

(124) Answer : (4)
Solution:
Fucus, Dictyota, Sargassum and *Ectocarpus* are brown algae and contains mannitol and laminarin as stored food material.

(125) Answer : (2)
Solution:
Ulothrix and *Spirogyra* are filamentous algae.

(126) Answer : (2)
Solution:
In certain pteridophytes the development of the zygote into young embryos take place within the female gametophytes which are retained on the parent sporophyte for variable periods. This event is said to be precursor to seed habit.

(127) Answer : (4)
Solution:
Pteridophytes are a group of seedless vascular plants.

(128) Answer : (1)
Solution:
Mycorrhizal association are found in roots of *Pinus*.

(129) Answer : (3)

Solution:
Equisetum belongs to class Sphenopsida.

(130) Answer : (3)
Solution:
Sequoia is tallest gymnosperm.

(131) Answer : (4)
Solution:
Porphyra is a red alga. While, rest are green algae.

(132) Answer : (2)
Hint:
Aristotle used simple morphological characters to classify plants.
Solution:
Aristotle classified plants into three groups.

(133) Answer : (1)
Solution:
Classification system given by Linnaeus was artificial.

(134) Answer : (2)
Solution:
Vegetative propagation in mosses is by fragmentation and budding.

(135) Answer : (3)
Hint:
Winged pollen grain are found in gymnosperms.
Solution:
In *Pinus* winged pollen grains are present. It is extended outer exine on two lateral sides to form the wing of pollen.

ZOOLOGY

(136) Answer : (4)
Solution:
FSH acts through membrane bound receptors. All other hormones given in the options are steroidal in chemical nature. They have intracellular receptors.

(137) Answer : (3)
Solution:
Cortisol stimulates gluconeogenesis, lipolysis and proteolysis; and inhibits cellular uptake and utilisation of amino acids.

(138) Answer : (2)
Solution:
More melatonin is produced by pineal gland during darkness. Its formation is interrupted when light enters the eyes and stimulates the retinal neurons. In this way the release of melatonin is governed by the diurnal dark-light cycle.

(139) Answer : (1)
Solution:

Parathyroid hormone (PTH) increases the Ca^{++} levels in the blood by stimulating the process of bone resorption (demineralisation).

(140) Answer : (1)
Hint:
Somatostatin is released by Delta cells of Pancreas
Solution:
Two main type of cells in the islets of Langerhans are called alpha-cells and beta-cells which produce glucacon and insulin respectively.

(141) Answer : (4)
Solution:
Pars intermedia secretes only one hormone called melanocyte stimulating hormone (MSH).

(142) Answer : (2)
Solution:
Neural system provides a point to point rapid coordination among organs. The neural coordination is fast but short-lived. Both neural system and endocrine system are essential for homeostasis.

(143) Answer : (4)
Solution:
Cortisol, testosterone, erythropoietin and thyroxine stimulate RBC production.

(144) Answer : (1)
Solution:
Epinephrine and norepinephrine have the similar mode of action.

(145) Answer : (4)
Solution:
Catecholamines are emergency hormones, also called hormones of fight or flight. They increase alertness, pupillary dilation, piloerection (raising of hair), sweating., *etc*.
They increase strength of heart contraction and rate of respiration.
They stimulate breakdown of glycogen resulting in increased concentration of glucose in blood. In addition, they also stimulate breakdown of lipids and proteins.

(146) Answer : (4)
Solution:
Thymus is associated with differentiation of T lymphocytes and production of antibodies.

(147) Answer : (2)
Solution:
The anterior lobe of the pituitary gland is called adenohypophysis.
GnRH is a neurogenic hormone of hypothalamus which acts on pars distalis of adenohypophysis to synthesize FSH and LH. Both FSH and LH regulate various functions of gonads in sexual reproduction, so named gonadotropins.

(148) Answer : (4)
Solution:
Androgens have anabolic effect on protein and carbohydrate metabolism.

(149) Answer : (2)
Solution:
The adrenal medulla secretes two hormones called adrenaline or epinephrine and noradrenaline or norepinephrine. These are commonly called as catecholamines. Glucocorticoids, particularly cortisol, produces anti inflammatory reactions and suppress the immune response.

(150) Answer : (2)
Solution:
Gastrin acts on the gastric glands and stimulates the secretion of hydrochloric acid and pepsinogen.
Secretin acts on the exocrine pancreas and stimulates the secretion of water and bicarbonate ions.
CCK acts on both pancreas and gall bladder and stimulates the secretion of pancreatic enzymes and bile juice, respectively.
GIP inhibits gastric secretion and motility.

(151) Answer : (3)
Solution:
Hypothalamus is the basal part of diencephalon, forebrain and it regulates a wide spectrum of body functions. It contains several groups of neurosecretory cells called nuclei which produce hormones.

(152) Answer : (1)
Solution:
'X'-Thymus gland, 'Y'-Thymosin
Thymus gland secretes thymosin. Thymosin plays a major role in differentiation of T-lymphocytes which provide cell-mediated immunity. In addition, thymosin also promotes the production of antibodies to provide humoral immunity. Thymus is degenerated in old individuals resulting in decreased production of thymosins.

(153) Answer : (2)
Solution:
Four parathyroid glands are present on the back side/dorsal side of the thyroid gland

(154) Answer : (4)
Hint:
Diabetes insipidus is characterised by production of large volume of dilute urine.
Solution:
Diabetes mellitus is characterised by presence of glucose and ketone bodies in urine. Posterior pituitary (Pars nervosa) is under direct neural regulation of hypothalamus. Goitre is simply an enlarged thyroid gland. It may be associated with hyperthyroidism or hypothyroidism.
Progesterone & prolactin regulate the growth of mammary glands & formation of milk in them.

(155) Answer : (1)

Solution:
The pituitary, pineal, thyroid, adrenal, pancreas, parathyroid, thymus and gonads (testis in males and ovary in females) are the organised endocrine glands in our body. ANF is secreted by the atrial wall of our heart. CCK is secreted by the GIT. Erythropoietin is secreted by the kidneys.

(156) Answer : (3)
Hint:
Vasopressin is released in response to fall in blood pressure.
Solution:
ADH (vasopressin) and aldosterone increase the blood pressure. ACTH, *i.e.*, adrenocorticotrophic hormone is secreted by anterior pituitary. ANF (atrial natriuretic factor) is secreted from the atrial wall of heart and decreases blood pressure.

(157) Answer : (2)
Solution:
Now, more 'X' will be secreted because 'Y' is less in concentration in the blood and thus, it will not exert any negative feedback on 'X'.

(158) Answer : (1)
Solution:
Prolactin is a proteinaceous hormone that interacts *via* membrane-bound receptors.

(159) Answer : (3)
Solution:
Pars nervosa/neurohypophysis receive & store hormones secreted from hormones like oxytocin & vasopressin from hypothalamus.

(160) Answer : (4)
Solution:
TSH (Thyroid Stimulating Hormone) released from the anterior pituitary gland stimulates the thyroid gland to make and release thyroxine. Glucagon is released by pancreas. Release of calcitonin is regulated by circulating levels of Ca^{+2} in blood.

(161) Answer : (2)
Solution:
Glucocorticoids produce anti- inflammatory reactions and suppresses the immune response.

(162) Answer : (3)
Solution:
Thymosin is secreted by thymus gland which is located in the mediastinum region between two lungs.

(163) Answer : (3)
Solution:
Aldosterone is a mineralocorticoid and not a glucocorticoid. In our body, cortisol is the main glucocorticoid.
Aldosterone mainly acts on the renal tubules and stimulates the reabsorption of Na^+ and water and excretion of K^+ and phosphate ions.

(164) Answer : (2)
Solution:
Hormones are produced by endocrine glands and released into the blood and transported to a distantly located target organs. Hormones are non-nutrient chemicals which act as intercellular messengers and are produced in trace amounts. They are secreted by organised endocrine glands and diffused tissues located in different parts of the body.

(165) Answer : (2)
Solution:
The JG cells of kidney produce a peptide hormone called erythropoietin which stimulates the formation of RBCs.

(166) Answer : (4)
Solution:
ADH interacts with target cells in the kidney and helps in regulation of homeostasis. ADH is released by the posterior pituitary gland in response to an increase in the osmotic concentration of the blood plasma. Osmoreceptors are present in hypothalamus. ADH acts on DCT and collecting duct.

(167) Answer : (4)
Solution:
Adrenal medulla is a sympathetic ganglia that releases emergency hormones. These hormones produced by post ganglionic neurons are transported through blood and are known as neurohormones. eg; epinephrine and nor-epinephrine.

(168) Answer : (4)

Solution:
Androgenic steroids are secreted from adrenal cortex only.

(169) Answer : (4)
Solution:
Insulin – Hypoglycemic hormone

(170) Answer : (2)
Hint:
TSH is thyroid stimulating hormone.
Solution:
TSH stimulates the synthesis and secretion of triiodothyronine (T_3) and thyroxine (T_4) by thyroid gland.

(171) Answer : (3)
Solution:
PTH increases the Ca^{2+} levels in the blood. PTH acts on bones and stimulates the process of bone resorption (dissolution/ demineralisation). PTH also stimulates reabsorption of Ca^{+2} by the renal tubules and increases Ca^{2+} absorption from the digested food.

(172) Answer : (3)
Solution:
Hypothalamus produces releasing or inhibiting hormones that act on adenohypophysis.

(173) Answer : (2)
Solution:
The pituitary gland is located in a bony cavity called sella tursica and is attached to the hypothalamus by a stalk.

(174) Answer : (3)
Solution:
An abnormal increase in length of long bones results from hypersecretion of GH during childhood leading to gigantism.

(175) Answer : (2)
Solution:
The posterior pituitary is not considered as a true endocrine gland because it does not synthesise any hormone. It only stores and releases hormones.

(176) Answer : (2)
Solution:
Cortisol acts through intracellular receptors. Ovarian hormone relax in and inhibin, are proteinaceous.

(177) Answer : (3)
Solution:
Testes secrete androgens.

(178) Answer : (3)
Solution:
Pineal gland is present on the roof of third ventricle. Hypothalamus is present at the base of thalamus.

(179) Answer : (2)
Solution:
Thyroid hormones are iodothyronines

(180) Answer : (1)
Solution:
A → Hypothalamic neurons
B → Portal circulation
C → Posterior pituitary
D → Anterior pituitary