30/07/2025

Code-A Phase-1

Aakash
Medical | IIT-JEE | Foundations

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MM : 720

Term Exam for NEET-2026_CF+OYM(P1)-TE02A (Class-XI & XII)

Time : 180 Min.

PHYSICS

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CHEMISTRY

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180. (4)

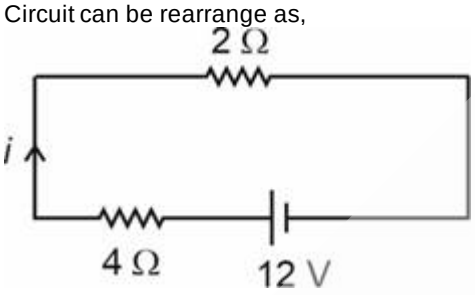
Hints and Solutions

PHYSICS

(1) **Answer :** (4)
Solution:
$I = neAv_d \Rightarrow I \propto v_d$
If v_d increase then I increases
$v_d = \frac{eE}{m}\tau$
and $\tau \propto \frac{1}{T}$
Therefore, for constant electric field $v_d \propto \frac{1}{T}$

(2) **Answer :** (2)
Solution:
$\Sigma I = 0$
$2 + 4 - 2 - 1.5 - I = 0$
$I = 2.5$ A

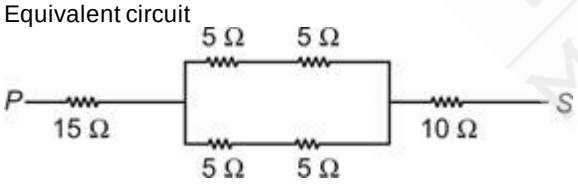
(3) **Answer :** (3)
Solution:
Circuit can be rearrange as,



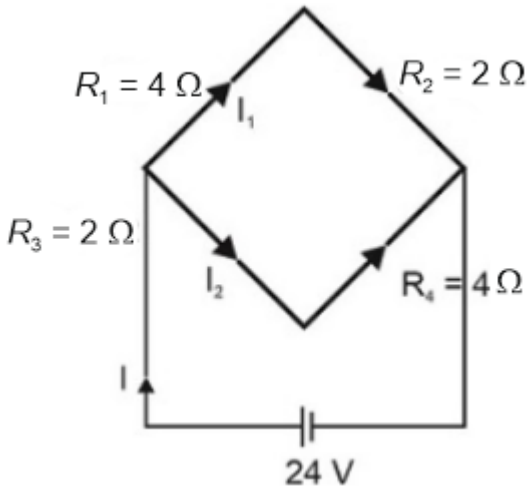
$i = \frac{12}{6} = 2A$
∴ P.D. across 3Ω = P.D. across equivalent resistance 2Ω
∴ $V_3 = i \times 2 = 4$ V

(4) **Answer :** (3)
Solution:
Heaters are connected in parallel hence voltage drop remains same.
$P = \frac{V^2}{R} \Rightarrow P \propto \frac{1}{R} \Rightarrow$ ratio of resistance = 2 : 1

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



(6) **Answer :** (3)
Solution:



$\frac{R_1}{R_2} = \frac{R_3}{R_4}$

It is a balanced Wheatstone bridge.

$R_{\text{Net}} = \frac{12 \times 6}{12 + 6} = 4\Omega$

$I = \frac{24v}{4} = 6A$

$I_1 + I_2 = 6$

$12I_1 = 6I_2$

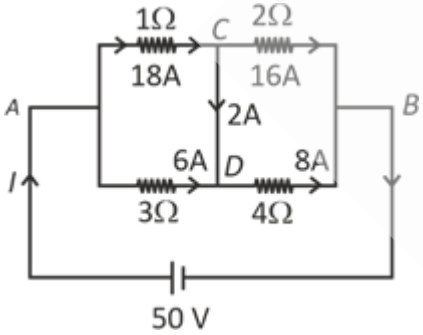
$I_1 + 2I_1 = 6$

$I_1 = 2A$

(7) **Answer :** (3)
Solution:

$V_d = \frac{eE\tau}{m}$

(8) **Answer :** (1)
Solution:



R_{AB} = (1Ω/3Ω) in series with (2Ω/4Ω)

$= \frac{3 \times 1}{3 + 1} + \frac{2 \times 4}{2 + 4}$

$= \frac{3}{4} + \frac{8}{6} = \frac{9 + 16}{12} = \frac{25}{12}\Omega$

Now total current through cell

$\mathrm{I} = \frac{50}{25/12} = 24\ \mathrm{A}$

$\mathrm{I}_{1\Omega} = \frac{3}{4} \times 24 = 18\ \mathrm{A}\ ,\quad \mathrm{I}_{3\Omega} = \frac{1}{4} \times 24 = 6\ \mathrm{A}$

$\mathrm{I}_{2\Omega} = \frac{4}{6} \times 24 = 16\ \mathrm{A}\ ,\quad \mathrm{I}_{4\Omega} = \frac{2}{6} \times 24 = 8\ \mathrm{A}$

Using junction rule at C, I_{CD} = 18 – 16 = 2A (From C to D)

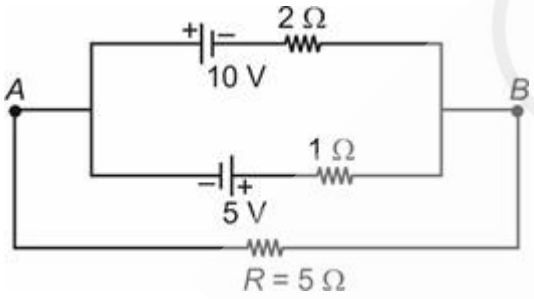
(9) **Answer :** (1)
Solution:

$J = \frac{i}{A} \Rightarrow J_A > J_B \text{ as } A_A < A_B$

(10) **Answer :** (4)
Solution:
When key is opened, $i = 0$
$V = E = 2$ V
When key is closed
$V = 1.5$ V $i = 1$ A
$V = E - ir$
$1.5 = 2 - 1 \times r$
$r = 0.5\ \Omega$

(11) **Answer :** (2)
Solution:
$R_{eq} = R + \frac{R}{2} + \frac{R}{4} + \frac{R}{8} + \cdots\infty$
$R_{eq} = R\left(1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \cdots\infty\right)$
$R = \left(\frac{1}{1-\frac{1}{2}}\right)$
$= 2R$

(12) **Answer :** (4)
Solution:
Hint: Equivalent EMF = $\frac{\left(\frac{\varepsilon_1}{r_1} + \frac{\varepsilon_2}{r_2}\right)}{\left(\frac{1}{r_1} + \frac{1}{r_2}\right)}$
and equivalent internal resistance $\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2}$.
Sol.: By redrawing circuit

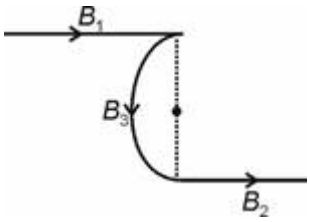


Equivalent EMF of cells $E = \frac{\frac{\varepsilon_1}{r_1} + \frac{\varepsilon_2}{r_2}}{\frac{1}{r_1} + \frac{1}{r_2}} = \frac{\frac{10}{2} + \left(\frac{-5}{1}\right)}{\left(\frac{1}{2}\right) + \left(\frac{1}{1}\right)} = 0$
$\therefore V_{AB} = 0$
No current flows through 5 Ω resistance.

(13) **Answer :** (1)
Hint:
Meter bridge is based on the principle of balanced wheatstone bridge.
Solution:
$40 \times 120 = 60 \times R$
$R = 80\ \Omega$

(14) **Answer :** (3)
Solution:
Magnetic moment is a vector quantity while torsion constant and permeability of free space is scalar.

(15) **Answer :** (1)
Hint:
Magnetic field due to semi-circular arc at its center is $\frac{\mu_0 I}{2r}$.
Magnetic field due to semi-infinite wire at distance d is $\frac{\mu_0 I}{4\pi d}$
Solution:



$B = B_1 + B_2 + B_3$

$= \frac{\mu_0 I}{4\pi r}\left(-\hat{k}\right) + \frac{\mu_0 I}{4\pi r}\hat{k} + \frac{\mu_0 I}{4r}\hat{k}$

$= \frac{\mu_0 I}{4r}\hat{k}$

(16) **Answer :** (3)
Solution:
Speed of charged particle remains same in magnetic field therefore kinetic energy remains same.

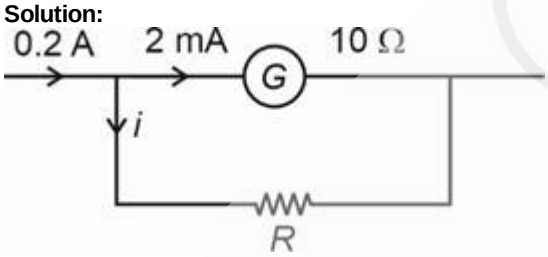
(17) **Answer :** (3)
Solution:
Magnetic field due to *AB* and *CD* portions of wire = zero

Field due to $BC = \frac{\mu_0 i}{4\pi R}\theta = \frac{\mu_0 i}{4\pi R}\left(\frac{\pi}{2}\right) = \frac{\mu_0 i}{8R}$ (into the plane)

Field due to $DE = \frac{\mu_0 i}{4\pi(OD)}\left(\sin\alpha + \sin 0^\circ\right)$ where $\tan\alpha = \frac{ED}{OD} = 1 \Rightarrow \alpha = 45^\circ$

$\therefore \quad \vec{B}_{\text{net}} = \vec{B}_1 + \vec{B}_2 = \frac{\mu_0 i}{4R}\left(\frac{1}{2} + \frac{1}{3\sqrt{2}\pi}\right)$ (into the plane)

(18) **Answer :** (2)
Hint:
Shunt resistance is connected in parallel to the galvanometer to convert it into an ammeter.
Solution:



$2 \times 10^{-3} \times 10 = (0.2 - 2 \times 10^{-3})\, R$

$2 \times 10^{-3} \times 10 = (2 \times 10^{-1} - 0.02 \times 10^{-1})\, R$

$R = \frac{2\times10^{-2}}{1.98\times10^{-1}} \approx 0.1\ \Omega$

(19) **Answer :** (2)
Solution:
$F = qvB \sin\theta$
If $v = 0$, then $F = 0$.

(20) **Answer :** (3)
Solution:

Magnetic force on a charged particle is $\vec{F} = q\left(\vec{v} \times \vec{B}\right)$

Hence it is dependent on speed of charged particle.

(21) **Answer :** (3)
Solution:

$B = \frac{\mu_0 i}{2\pi r} \Rightarrow B \propto \frac{1}{r}$

(22) **Answer :** (1)
Solution:

$d\vec{B} = \frac{\mu_0\left(I\ \vec{d}\ i\times\hat{r}\right)}{r^2} = \frac{\mu_0 I\left(\vec{d}\ i\times\vec{r}\right)}{r^3}$

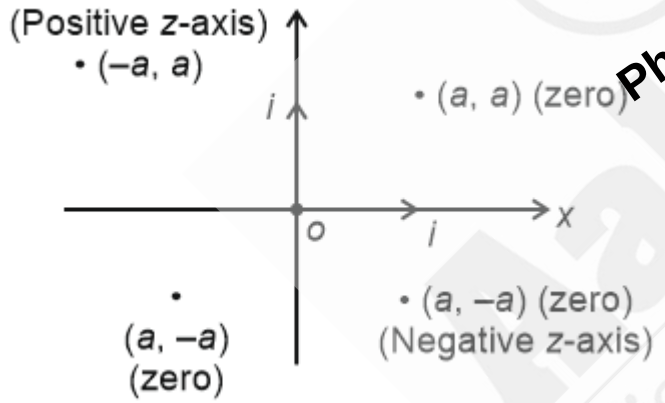
(23) **Answer :** (2)

Solution:
$\mu = niA$
$= 10 \times 2 \times 25 \times 10^{-4}$
$= 5 \times 10^{-2}$ A m^2

(24) Answer : (2)
Solution:
$\oint \vec{B} \cdot \vec{dl} = \mu_0 i_{enc}$
For loop (a), $\oint \vec{B} \cdot \vec{dl} = \mu_0 \left(4-2\right) = 2\mu_0$
For loop (b), $\oint \vec{B} \cdot \vec{dl} = \mu_0 \left(2+4\right) = 6\mu_0$
For loop (c), $\oint \vec{B} \cdot \vec{dl} = \mu_0 \left(-2+2\right) = 0$
For loop (d), $\oint \vec{B} \cdot \vec{dl} = \mu_0 \left(4+2-2\right) = 4\mu_0$
b → d → a → c

(25) Answer : (3)
Solution:
$\left|d\vec{B}\right| = \frac{\mu_0}{4\pi} \times \frac{i \times dl \times \sin\theta}{r^2}$
$= 10^{-7} \times 1 \times 10^{-3} \times 10^2 \times \frac{1}{2} \times \frac{1}{25 \times 10^{-4}}$
= 20 nT

(26) Answer : (1)
Solution:



(27) Answer : (4)
Solution:
Negative susceptibility means, its a diamagnetic substance whose susceptibility is independent of temperature change.

(28) Answer : (3)
Solution:
$M = m \times l$
⇒ $4 = m \times 0.2$
⇒ $m = \frac{40}{2} = 20$ Am

(29) Answer : (2)
Solution:
Diamagnetic substance always repelled by magnet.

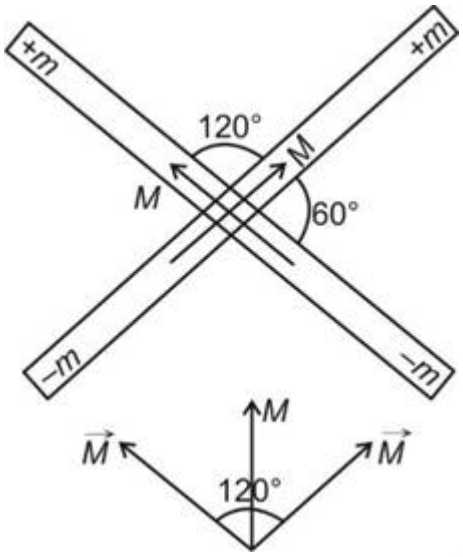
(30) Answer : (3)
Solution:
$T = 2\pi\sqrt{\frac{I}{MB}}$

$T = 2\pi\sqrt{\frac{9.8\times10^{-6}}{1280\pi^2\times10^{-5}\times0.049}}$

$T = 2\sqrt{\frac{9.8}{1280\times0.49}}$

$= 2\sqrt{\frac{20}{1280}} = \frac{1}{4}$ sec

(31) Answer : (1)
Solution:



$M_{net} = \sqrt{M^2 + M^2 + 2M^2\cos 120^\circ}$

$M_{net} = M = mL$

(32) Answer : (2)
Solution:
Bar magnet creates non-uniform magnetic field. Net force on bar magnet placed in uniform magnetic field is zero.

(33) Answer : (1)
Solution:

$U = -\vec{M}\cdot\vec{B}$

For stable equilibrium position, angle between magnetic moment and external magnetic field should be zero.

(34) Answer : (2)
Solution:

$M = lm$

$l = \frac{\pi R}{2}$

$R = \frac{2l}{\pi}$

$l_{eff} = \sqrt{2}R$

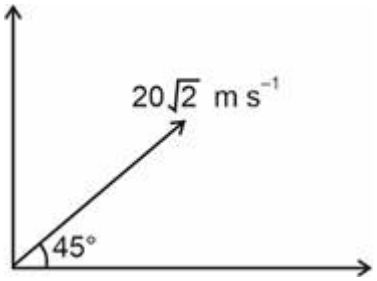
$= \frac{2\sqrt{2}l}{\pi}$

$M' = ml_{eff}$

$= \frac{2\sqrt{2}M}{\pi}$

(35) Answer : (4)
Solution:
Inside bar magnet, lines of force are from south to north.

(36) Answer : (2)
Solution:



• Maximum height $H = \frac{u^2 \sin^2\theta}{2g} = \frac{400}{20} = 20\ m$

• Time of flight $T = \frac{2u \sin\theta}{g} = \frac{40}{10} = 4\ \text{s}$

• Horizontal range

$R = \frac{u^2 \sin 2\theta}{g} = \frac{800 \times 1}{10} = 80\ \text{m}$

• Height of particle at t = 3 s is same as that at t = 1 s

$h = u_y t - \frac{1}{2} g t^2$

$h = 20(1) - \frac{1}{2}(10)(1)^2$

= 15 m

(37) Answer : (3)
Solution:
Change in momentum = Area below the F versus t graph in that interval

$= \left(\frac{1}{2} \times 2 \times 6\right) - (2 \times 3) + (4 \times 3)$

= 6 – 6 + 12 = 12 N s

(38) Answer : (2)
Solution:

Contact force = $\sqrt{N^2 + f^2} = \sqrt{(20)^2 + (20)^2}$

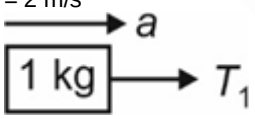
$= 20\sqrt{2}$ N

(39) Answer : (3)
Solution:

Acceleration of system (a) = $\frac{F_{net}}{m}$

$= \frac{16}{8}$

= 2 m/s^2



T_1 = 1×2

T_1 = 2 N

(40) Answer : (1)
Solution:

$v = 10 + 2t^2$

$\therefore \quad a = 4t$

(41) Answer : (1)
Solution:
Acceleration = Slope of v-t curve
For A, slope = tan 50°
For B, slope = tan 20°

Ratio = $\frac{\tan 50^\circ}{\tan 20^\circ}$

(42) Answer : (2)
Solution:

Magnitude of velocity of B w.r.t A i.e. $\left|\vec{v}_{BA}\right| = \left|\vec{v}_B - \vec{v}_A\right|$

$= \left|\left(6\hat{i} + 7\hat{j}\right) - \left(2\hat{i} + 4\hat{j}\right)\right|$

$= \left|\left(4\hat{i} + 3\hat{j}\right)\right|$

= 5 m/s

(43) Answer : (2)

Solution:

Static friction f_S opposes impending relative motion while kinetic friction f_k opposes actual relative motion between the two surfaces in contact.

(44) Answer : (3)

Solution:

$t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2 \times 20}{10}}$

t = 2 sec

$S_n = \left(\frac{10}{2}\right)(2 \times 2 - 1)$

= 5 × 3

= 15 m

(45) Answer : (4)

Solution:

Direction of acceleration changes continuously, therefore it will not be constant.

CHEMISTRY

(46) Answer : (3)

Solution:

When concentration of A is constant then rate of reaction becomes half.

$\left(\frac{0.2}{0.4}\right)^n = \frac{4\times10^{-3}}{2\times10^{-3}}$

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

$(2^{-1})^n = (2)^1$

n = –1

When concentration of B is constant then rate of reaction

$\left(\frac{0.2}{0.4}\right)^n = \left(\frac{2\times10^{-3}}{16\times10^{-3}}\right)$

$\left(\frac{1}{2}\right)^n = \left(\frac{1}{8}\right)$

$\left(\frac{1}{2}\right)^n = \left(\frac{1}{2}\right)^3$

n = 3

(47) Answer : (1)

Solution:

$r = -\frac{d[H_2O_2]}{dt} = \frac{2d[O_2]}{dt}$

$\frac{-d[H_2O_2]}{dt} = 2 \times 0.4$

= 0.8 mol L^{-1} s^{-1}

(48) Answer : (2)

Solution:

Catalyst does not affect the equilibrium composition of a reaction mixture.

(49) Answer : (3)

Solution:

Unit of rate of reaction is mol L^{-1} s^{-1} irrespective of order of reaction.

(50) Answer : (4)

Solution:

$k = \frac{2.303}{t}\log\left(\frac{A_0}{A}\right)$

$k = \frac{2.303}{80}\log\left(\frac{100}{20}\right) = \frac{2.303}{80}\log\left(5\right)$

$\frac{0.693}{t_{1/2}} = \frac{2.303}{80}\log 5 \Rightarrow t_{1/2} = \frac{0.693\times 80}{2.303\ \log 5}$

= 34.4 minutes

(51) Answer : (1)
Solution:
Slow step is rate determining step
r = K[A_3][A]

$K_C = \frac{[A_2][A]}{[A_3]}$

$\left[A\right] = \frac{K_C[A_3]}{[A_2]}$

r = K KC $\frac{[A_3]}{[A_2]}$[A_3]

r = $K^1[A_3]^2[A_2]^{-1}$

(52) Answer : (3)
Solution:
Molecularity cannot be fractional or zero and it is applicable to elementary reactions only.

(53) Answer : (2)
Solution:
$r = k[A]^x[B]^y$
$2r = k[2A]^x[B]^y$
x = 1
$Gr = k(2A)^x(2B)^y$
y = 1

(54) Answer : (1)
Solution:

	$A(g)$	$\longrightarrow$	$B(g)$	$+$	$C(g)$
$t=0$	60		0		0
$t=20$	$60-p$		p		p

60 – p + p + p = 105
p = 45

$t = \frac{2.303}{k}\log\left(\frac{p_0}{p_0-p}\right)$

$20 = \frac{2.303}{k}\log\left(\frac{60}{60-45}\right)$

$20 = 2\times\frac{2.303\log 2}{k}$

$20 = 2\times\frac{0.693}{k}$

$20 = 2 \times t_{½}$

$t_{½}$ = 10 min

(55) Answer : (4)
Solution:
For a zero order reaction $t_{1/2} = \frac{a_0}{2k}$

(56) Answer : (3)
Hint:
Arrhenius equation :
$\ln k = \ln A - \frac{E_a}{RT}$
Solution:
Compare equation, $\ln k = 2 - \frac{200}{T}$
with Arrhenius equation
lnA = 2 and $\frac{E_a}{R} = 200$
⇒ $A = e^2$ and E_a = 200 R

(57) Answer : (3)
Solution:
$\frac{r_2}{r_1} = 2^{\frac{30}{10}} = 8$
$r_2 = 8r_1$

(58) Answer : (2)
Hint:
Rate law expression
Rate = $k[A]^x [B]^y$
x + y = n = order of reaction
Solution:
Rate = $k[A]^{-1/2} [B]^{3/2}$
Rate = $k[A]^x [B]^y$
$x + y = \frac{-1}{2} + \frac{3}{2} = \frac{-1+3}{2} = 1$
Order = 1

(59) Answer : (3)
Solution:
For 1st order reaction
$t_{1/2} = \frac{\ln 2}{k}$
$t_{75\%} = \frac{\ln 4}{k}$
$t_{99.9\%} = \frac{10 \ln 2}{k}$
$t_{90\%} = \frac{\ln 10}{k}$

(60) Answer : (3)
Solution:
For zero order reaction
$t_{100\%} = 2t_{50\%}$
$= 2 \times 15 = 30$ min

(61) Answer : (2)
Solution:
Hydrolysis of cane sugar in acidic medium is a pseudo first order reaction.

(62) Answer : (4)
Solution:
$\log \frac{k_2}{k_1} = \frac{Ea}{2.303\,R} \left(\frac{1}{T_1} - \frac{1}{T_2}\right)$
$\log 2 = \frac{Ea}{2.303 \times 8.314} \left(\frac{1}{300} - \frac{1}{310}\right)$
Ea = 0.3 × 2.303 × 8.314 × 300 × 31 J
= 53.42 kJ

(63) Answer : (4)
Solution:
Scandium shows only +3 oxidation state. While Cu shows +1 and +2 oxidation states.

(64) Answer : (3)
Hint:
Interstitial compounds are formed when small atoms like H, C or N are trapped inside the crystal lattices of metals.
Solution:
They are usually non-stoichiometric, chemically inert, very hard and retain metallic conductivity.

(65) Answer : (2)
Solution:
Magnetic moment $(\mu) = \sqrt{n(n+2)}$ BM
n= Number of unpaired electrons

(66) Answer : (1)
Hint:
More is the effective nuclear charge more is the energy released on hydration.
Solution:

Ion	Δ_{hyd} H° (kJ mol^{-1})
Ti^{2+}	–1866
V^{2+}	–1895
Co^{2+}	–2079
Ni^{2+}	–2121

(67) **Answer :** (4)
Solution:
Hint: The ion in which there is no unpaired electrons is colourless in aqueous medium.
Sol.: Mn^{2+}, Ni^{2+} and Cu^{2+} ions have 5, 2 and 1 unpaired electron respectively.
∴ Their aqueous solutions are coloured.
• Zn^{2+} ion has no unpaired electron.
∴ Its aqueous solution is colourless.

(68) **Answer :** (1)
Solution:
With increase in atomic number ionic radii decreases.

(69) **Answer :** (4)
Hint:
Standard reduction potential of (Cu^{2+}/Cu) redox couple is positive.
Solution:

	Mn^{2+}/Mn	Ti^{2+}/Ti	Ni^{2+}/Ni	Cu^{2+}/Cu
E°(in volts)	–1.18	–1.63	–0.25	+0.34

(70) **Answer :** (3)
Solution:
Brass is an alloy of copper and zinc.

(71) **Answer :** (3)
Solution:
• In 3d-series, Manganese reveals maximum number of oxidation states i.e., (+2 to +7)
• Zinc atom has completely filled d-orbitals in its ground state as well as in its oxidised state, hence it is not regarded as a transition element.
• Scandium shows only one oxidation state i.e., +3.
• Cu^{+} undergoes disproportionation reaction in aqueous solution

$$2Cu^{+}(aq) \longrightarrow Cu^{2+}(aq) + Cu(s)$$

(72) **Answer :** (4)
Solution:
Neptunium (Np) → +3 to +7 oxidation states
Americium (Am) → +3 to +6 oxidation states

(73) **Answer :** (2)
Hint:
Due to lanthanide contractions, Tm^{3+} has the smallest size among the given ions.
Solution:

Ion	Radii/pm
La^{3+}	106
Eu^{3+}	95
Ho^{3+}	89
Tm^{3+}	87

(74) **Answer :** (2)
Solution:
In acidic medium, MnO_4^- converts to Mn^{2+} and has n-factor value = 5.

Number of equivalents of MnO_4^- = number of equivalents of FeC_2O_4

FeC_2O_4 converts to Fe^{3+} and CO_2.
n-factor for FeC_2O_4 = 3
Moles of $KMnO_4 \times 5 = 3 \times 1$
Moles of $KMnO_4 = \frac{3}{5}$

(75) Answer : (2)
Solution:
MnO_4^{2-} = Manganate ion
Green in colour and paramagnetic in nature
$3\,MnO_4^{2-} + 4H^+ \rightarrow 2\,MnO_4^- + MnO_2 + 2H_2O$

(76) Answer : (3)
Solution:
$2\ KMnO_4 \xrightarrow[513\ K]{\Delta} K_2MnO_4 + MnO_2 + O_2$

(77) Answer : (2)
Hint:
Along the period, effective nuclear charge of lanthanoids increases gradually so basic character decreases.

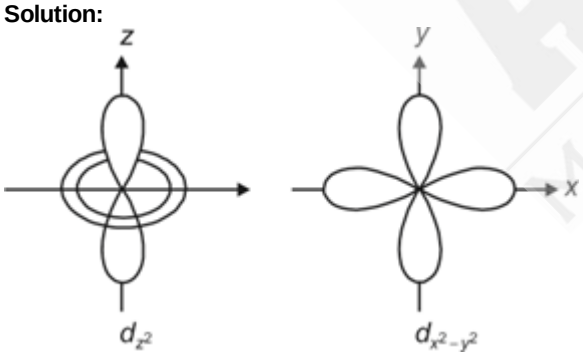
(78) Answer : (2)
Hint:
Ziegler Natta catalyst : $TiCl_4 + (C_2H_5)_3Al$.
Solution:
Ziegler Natta catalyst : $TiCl_4 + (C_2H_5)_3Al$.

(79) Answer : (4)
Solution:
$Cr_2O_7^{2-} + 3S^{2-} + 14H^+ \rightarrow 2Cr^{3+} + 3S + 7H_2O$

(80) Answer : (2)
Solution:

Species	Outer Electronic configuration
Yb^{2+}(Z = 70)	$[Xe]4f^{14}$
Lu^{3+}(Z = 71)	$[Xe]4f^{14}$

(81) Answer : (3)
Solution:



(82) Answer : (3)
Solution:
$\lambda = \frac{h}{v} = \frac{6.6\times10^{-34}\ kgm^2\ s^{-2}-s}{0.66\ kg\ \times 100m/s} = \boxed{1.0\times10^{-35}\ m}$

(83) Answer : (1)
Solution:
Because $(E_2 - E_1) > (E_3 - E_2) > (E_4 - E_3) > (E_5 - E_4) > (E_6 - E_5)$
As the difference is of one energy levels

$\therefore$ ($E_6 - E_5$) have less energy
{Alternatively value of ΔE [difference between two successive energy level decreases] as the distance from the nucleus increases.}

(84) Answer : (4)
Solution:
• For one electron system, the energy of the orbitals increases as follows:
1s < 2s = 2p < 3s = 3p = 3d
• For multielectron system, the energy of the orbitals in the same subshell decrease with increase in the atomic number (Z_{eff})

(85) Answer : (4)
Solution:
Value of m varies from '–l' to '+l' hence for l = 1, m cannot be –2.

(86) Answer : (1)
Solution:

Sol.: $\frac{1}{\lambda} = R_H\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$

$\Rightarrow \frac{1}{\lambda} = R_H\left(\frac{1}{1^2} - \frac{1}{2^2}\right)$

$\Rightarrow \frac{1}{\lambda} = R_H\left(\frac{4-1}{4}\right)$

$\Rightarrow \lambda = \frac{4}{3R_h} = \frac{4}{3\times 109677}\text{cm}$

$\Rightarrow \lambda = 1.2157\times 10^{-5}\text{cm} = 1.2157\times 10^{-7}\text{ cm}$

$\Rightarrow \lambda = 1.2157\times 10^{-9}\text{cm} \simeq 121.6\text{ cm}$

(87) Answer : (4)
Solution:

Compounds	Chemical nature
NO	Neutral
Al_2O_3	Amphoteric
Na_2O	Basic
SO_2	Acidic

(88) Answer : (3)
Solution:
Eka – Aluminium is gallium
and Eka – silicon is germanium.

(89) Answer : (1)
Hint:
Element X is chlorine
Solution:
Chlorine belongs to halogen family *i.e.* group number 17^{th} and period number 3.

(90) Answer : (3)
Solution:
Copper → Transition metal
Fluorine → Non-metal
Silicon → Metalloid
Cerium → Lanthanoid

BOTANY

(91) Answer : (4)
Solution:
In male heterogamety, male individual produces two different types of gametes whereas in female heterogamety, female produces different gametes. In Birds, female heterogamety is seen.

(92) Answer : (3)

Solution:
Test cross involves a cross between F_1 progeny showing dominant phenotype and recessive parents.

(93) **Answer :** (2)
Solution:
AB blood group shows co-dominance.

(94) **Answer :** (3)
Solution:

Number of different types of gametes = 2^n, where n = number of heterozygous loci.
Therefore, 8 different types of gametes are formed from the given genotype as n = 3 in this case.

(95) **Answer :** (1)
Solution:
The term used by Morgan to describe the physical association of genes on a chromosome is linkage.

(96) **Answer :** (2)
Solution:
In a cross between white eyed, miniature wing female with wild type male resulted in 37.2% recombinants in F_2 generation.

(97) **Answer :** (2)
Solution:
Factor occurs in pairs.

(98) **Answer :** (1)
Solution:
In birds, females have one Z and one W chromosome. Chromosomal disorders are caused due to absence or excess or abnormal arrangement of one or more chromosomes.

(99) **Answer :** (3)
Solution:
Drosophila has small number of chromosomes and produces large number of offsprings from single mating.

(100) **Answer :** (3)
Solution:
According to 'Law of segregation', factors of a character separate from each other during gamete formation.

(101) **Answer :** (3)
Solution:
α-Thalassemia is controlled by two closely linked genes HBA1 and HBA2 on chromosome 16 of each parent and it is observed due to mutation or deletion of one or more of the four genes.

(102) **Answer :** (4)
Solution:
ZZ – ZW type of sex determination is seen in birds.

(103) **Answer :** (3)
Solution:
Hint : For multiple allelism
Number of genotype $= \frac{n}{2}(n+1)$
n = Number of multiple alleles
Sol. : For four multiple alleles
No. of genotypes = 10

(104) **Answer :** (4)
Solution:
In Down's syndrome affected individual is short statured with small round head.

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

Both affected parents can never have an unaffected child. The disorder may not appear in generation but can pass from grandparent to grandson or granddaughter.

(106) **Answer :** (3)
Solution:
β-thalassemia is caused due to HBB gene on chromosome 11.

(107) Answer : (2)
Solution:
In pleiotropy, a single gene product may produce more than one effect or control several phenotypes depending on its position.

(108) Answer : (2)
Solution:
The possible combinations of genes can be studied by Punnett square.
Punnett square, developed by R. C. Punnett, is a graphical representation to calculate the probability of all possible genotypes of offsprings.

(109) Answer : (4)
Solution:
Mendel conducted his hybridization experiments on garden pea for seven years.

(110) Answer : (1)
Hint:
Recessive traits are expressed in homozygous condition only
Solution:

Terminal flower position, constricted pod	–	Recessive traits
Yellow seeds, Violet flower	–	Dominant traits

(111) Answer : (3)
Hint:
Turner's syndrome is caused due to 44 + XO type chromosome complement.
Solution:
α-thalassemia involves the genes HBA1 and HBA2 inherited in a Mendelian recessive fashion. Chromosome complement 44 + XXY results in Klinefelter's syndrome.
Physical, psychomotor and mental development are retarded in the individuals inflicted with Down's syndrome.

(112) Answer : (4)
Solution:
Chromosome complement in Turner's syndrome is 44 + XO.

(113) Answer : (1)
Solution:
Mendel experiments had a large sampling size, which gave greater credibility to the data that he collected.

(114) Answer : (3)
Solution:
Males can never be the carriers of X-linked disorders, such as colour blindness.

(115) Answer : (4)
Solution:
In human skin colour, the phenotype reflects the contribution of dominant alleles in additive manner but recessive alleles have also basic fixed value.

(116) Answer : (3)
Solution:
Experimental verification of the chromosomal theory of inheritance was done by T. H. Morgan.

(117) Answer : (3)
Solution:
The law of independent assortment is not an universal law and it is not true for the genes that are linked.
In incomplete dominance, F_1 progeny does not resemble any of the two parents.

(118) Answer : (4)
Hint:
Presence of more than two alleles for a gene is known as multiple allelism, *e.g.*, ABO blood group in humans.
Solution:
Polygenic inheritance –Human skin color
Co-dominance – AB blood group
Flower color in snapdragon – Incomplete dominance.

(119) Answer : (2)
Solution:
Hybrid produced in garden pea are fertile.

(120) Answer : (4)

Solution:

Tightly linked genes are present on same chromosome and very close to each other.

Tightly linked genes produce more parental combinations than recombinants.

(121) Answer : (3)

Solution:

Linkage of genes in *Drosophila* was discovered by Morgan.

(122) Answer : (4)

Solution:

Sickle cell anaemia is an autosomal recessive trait, controlled by one pair of allele and caused by point mutation.

(123) Answer : (2)

Hint:

Mendelian disorders can be due to recessive genes or dominant genes.

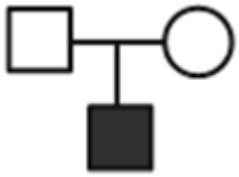
Solution:

Haemophilia, colour blindness and thalassemia are recessive gene disorders, whereas myotonic dystrophy is dominant gene disorder.

(124) Answer : (3)

Solution:

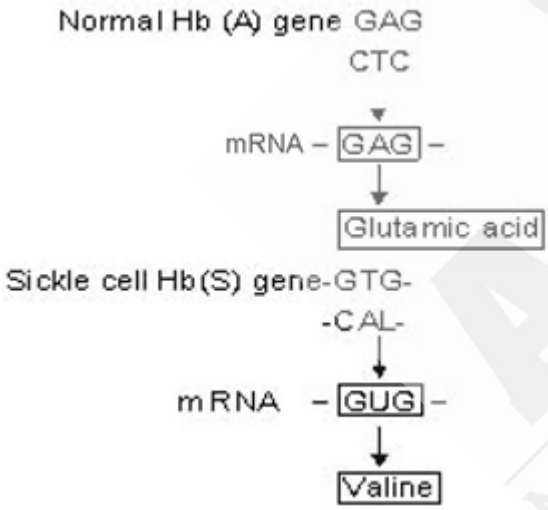
Affected individuals are represented by shaded symbols in pedigree analysis.



The above diagram represents parent with affected male child.

(125) Answer : (1)

Solution:



(126) Answer : (1)

Solution:

Due to facilitated transport of ions and other materials into the vacuole through tonoplast, concentration of these ions in vacuole is significantly higher than in the cytoplasm.

(127) Answer : (2)

Solution:

In Cyanobacteria, there are other membranous extensions into cytoplasm called chromatophores which contains pigments.

(128) Answer : (4)

Solution:

Centrioles have peripheral triplets of microtubules and are not surrounded by any membrane. Both centriole and cilium have 9 readial spokes.

(129) Answer : (3)

Solution:

Mesosomes are infoldings of plasma membrane that helps in respiration.

(130) Answer : (3)
Solution:
Bryophytes are called 'Amphibians of plant kingdom'.

(131) Answer : (2)
Solution:
Endomembrane system does not include mitochondria and chloroplast. Endomembrane system consists of single membrane bound cell organelles – Endoplasmic reticulum, Golgi bodies, lysosomes, vacuole. The functions of these organelles are coordinated.

(132) Answer : (3)
Solution:
Coralloid roots are present in *Cycas*.
Cyanobacteria which are in symbiotic association with coralloid roots are found is *Cycas*, have the ability to fix nitrogen.

(133) Answer : (2)
Solution:
Algin are obtained from brown algae.
Hydrocolloids carrageen and algin are obtained commercially from members of Rhodophyceae (red algae) and Phaeophyceae (brown algae) respectively.

(134) Answer : (2)
Solution:
Plasmodesmata - Cytoplasmic connections
Mitochondria – Site for the synthesis of ATP
Axoneme - Core of cilia and flagella
Nucleolus - Site for rRNA synthesis

(135) Answer : (3)
Solution:
Equisetum belongs to Sphenopsida, a class of pteridophytes.

(136) Answer : (2)
Solution:
The MTP (Amendment) Act, 2017, was enacted by Government of India with the intention of reducing the incidences of illegal abortions and consequent maternal mortality and morbidity.

(137) Answer : (2)
Solution:
Genital warts is completely curable if detected early and treated properly.

(138) Answer : (3)
Solution:
A fertile couple has the ability to conceive. Inability of male to copulate due to failure in erection of penis is called impotency. Permanent infertility either in male, in female or in both due to any cause is called sterility. Delivery of a dead child is known as still birth. Pregnancy in which embryo is implanted at a site other than the uterus is called ectopic pregnancy.

(139) Answer : (3)
Solution:
Tubal ligation is a permanent method of birth control.

(140) Answer : (1)
Solution:
Both statements are correct because lactational amenorrhoea occurs during time of intense breast feeding but it is effective only upto a period of 6 months. Natural methods of contraceptions have nil side effects.

(141) Answer : (3)
Solution:
Some of the infections like hepatitis-B and HIV can be transmitted by sharing of infected needles, surgical instruments, *etc*., or by transfusion of infected blood, sex with unknown or multiple partners, without condoms.

(142) Answer : (2)
Solution:

IUDs increase phagocytosis of sperms within the uterus and the Cu ions (released from copper releasing IUDs) suppress sperm motility and fertilising capacity.
The hormone releasing IUDs, in addition, make the uterus unsuitable for implantation and the cervix hostile to the sperms.
Non-medicated IUD – Lippes loop
Copper releasing IUDs – CuT, Cu7, Multiload-375
Hormone releasing IUDs – Progestasert, LNG-20

(143) Answer : (4)
Solution:
Gametogenesis remains unaffected after vasectomy.
After vasectomy, synthesis of sex hormones and spermatogenesis is not hampered because there is no effect on testes. However, semen is without sperms.

(144) Answer : (3)
Solution:
Amniocentesis is based on the analysis of amniotic fluid which contains cells of foetus.

(145) Answer : (4)
Solution:
ICDS (Integrated Child and Developmental Services) is a government programme in India which aims at providing food, pre-school education, primary healthcare, immunisation, *etc.,* to the children below 6 years of age.

(146) Answer : (3)
Solution:
Individuals in 15-24 years of age group are more vulnerable to STIs.

(147) Answer : (1)
Solution:
Diaphragm, cervical caps and vaults are barrier methods. Spermicidal creams, jellies and foams are chemical barriers. Progestasert and LNG-20 are hormone releasing IUDs. Lippes loop is a non-medicated IUD.

(148) Answer : (3)
Solution:
Intra cytoplasmic sperm injection (ICSI) is a specialised procedure to form an embryo in the laboratory in which a sperm is directly injected into the ovum. Infertility cases either due to inability of the male partner to inseminate the female or due to very low sperm counts in the ejaculate, could be corrected by artificial insemination (AI) technique. In this technique, the semen collected either from the husband or a healthy donor is artificially introduced either into the vagina or into the uterus (IUI – Intra Uterine Insemination) of the female.

(149) Answer : (1)
Solution:
An increase in the number of individuals in the reproducible age group is one of the probable reasons of population explosion.

(150) Answer : (3)
Solution:
Nearly 45 to 50 million MTPs are performed in a year all over the world which accounts for $1/5^{th}$ of the total number of conceived pregnancies in a year.

(151) Answer : (2)
Hint:
ART in which fertilisation takes place outside the body.
Solution:
In IUT, more than 8 celled embryo is transferred into the uterus.

(152) Answer : (1)
Solution:
Progestogens alone or in combination with estrogen can be used by females as injections or implants under the skin. Their mode of action is similar to that of pills and their effective periods are much longer. They have very less chances of failure. Natural methods *e.g.,* rhythm method and lactational amenorrhea have high chances of failure.

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

(154) Answer : (2)
Solution:

Multiload-375 is a Cu-releasing intra-uterine device. Progestasert is a hormone releasing IUD. Both of them are medicated IUDs.

(155) Answer : (1)
Solution:
Use of condoms has increased in recent years due to their additional benefit of protecting the users from contracting STIs and AIDS. Diaphragms, cervical caps and vaults are also barriers made of rubber that are inserted into the female reproductive tract to cover the cervix during coitus.

(156) Answer : (3)
Solution:
Oral pills containing estrogen and progesterone inhibit ovulation and implantation.

(157) Answer : (2)
Solution:
Excess of prolactin levels in blood during the period of intense lactation inhibits GnRH and hence FSH, LH levels will be low too.

(158) Answer : (2)
Solution:
Transfer of sperms into uterus is called intra uterine insemination.

(159) Answer : (3)
Solution:
GIFT (Gamete Intra Fallopian Transfer) is transfer of an ovum collected from donor into the fallopian tube of another female who cannot produce ova, but can provide suitable environment for fertilisation and further development.

(160) Answer : (4)
Solution:
An ideal contraceptive should be user-friendly, easily available, effective and reversible with no or least side-effects. It also should in no way interfere with the sexual drive, desire and/or the sexual act of the users.

(161) Answer : (4)
Solution:
Saheli is the new oral contraceptive for the females which contains a non-steroidal preparation *i.e.*, centchroman.

(162) Answer : (3)
Solution:
· Diaphragms, cervical caps and vaults are barrier methods of contraception for females which work by blocking the entry of sperms through the cervix.
· IUDs increase phagocytosis of sperms within the uterus.
· Vasectomy is a surgical method of contraception in males in which a small part of the vas deferens is removed or tied up through a small incision on the scrotum.
· Tubectomy is a surgical method of contraception in females where a small part of the fallopian tube is removed or tied up through a small incision in the abdomen or through vagina.

(163) Answer : (4)
Hint:
Thick cervical mucus retards the entry of sperms through cervix.
Solution:
Oral contraceptive pills inhibit ovulation, implantation and alter the quality of cervical mucus that retards the entry of sperms through cervix. Condoms prevent the entry of sperms in female genital tract.

(164) Answer : (2)
Solution:
IUDs are one of the most widely accepted methods of contraception in India.

(165) Answer : (2)
Hint:
Use of progestogens or estrogen-progestogen combination is employed
Solution:
Progestogens alone or in combination with estrogen can be used by females as injections or implants under the skin. Their mode of action is similar to that of steroidal pills and their effective periods are much longer.
Lippes loop is a non-medicated IUD.
Cervical caps are made of rubber and are used as barriers.

(166) Answer : (3)
Solution:
Barrier methods include condom, fem shield (female condom), diaphragm, cervical cap and vault. CuT, Multiload-375 and Lippes loop are IUDs.

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

(168) Answer : (2)
Solution:
MTP is intentional or voluntary termination of pregnancy before full term.

(169) Answer : (4)
Solution:
LNG-20 and progestasert are hormone releasing IUDs. In lactating mothers, levels of prolactin is increased which inhibits secretion of GnRH from hypothalamus that leads to prevention of ovulation. So, this method of contraception is called lactational amenorrhoea.

(170) Answer : (2)
Solution:
According to the MTP (Amendment) Act, 2017, opinion of two registered medical practitioners is required for legal abortion, if the pregnancy has lasted more than 12 weeks and fewer than 24 weeks.

(171) Answer : (3)
Solution:
Inspiration is initiated by contraction of diaphragm which increases the volume of thoracic chamber in the antero-posterior axis. The contraction of external inter-costal muscles lifts up the ribs and the sternum, causing an increase in the volume of thoracic chamber in the dorso-ventral axis.
An increase in pulmonary volume decreases the intra-pulmonary pressure which is less than the atmospheric pressure that forces the air from outside to move into the lungs.

(172) Answer : (4)
Solution:

Respiratory Gas	Atmospheric Air	Alveoli	Blood (Deoxygenated)	Blood (Oxygenated)	Tissues
O_2	159	104	40	95	40
CO_2	0.3	40	45	40	45

(173) Answer : (2)
Solution:
Oxygen dissociation curve moves to left side from normal when partial pressure of O_2 is high and pCO_2 is low with low H^+ concentration and temperature. Left shift indicates that formation of oxyhaemoglobin is favoured.

(174) Answer : (2)
Solution:
Under normal physiological conditions, every 100 mL of oxygenated blood can deliver around 5 mL of O_2 to the tissues.
Thus, 300 mL will deliver 15 mL of O_2 to the tissues.

(175) Answer : (1)
Solution:
Occupational respiratory disorders occur in individuals who work at places that involve long exposure to dust which can give rise to inflammation leading to fibrosis causing serious lung damage. Asthma is difficulty in breathing causing wheezing due to inflammation of bronchi and bronchioles. Pneumonia is a bacterial disease.

(176) Answer : (2)
Hint:

*	Leucocytes (WBCs)	–	6000-8000 mm^{-3} of blood
*	Erythrocytes (RBCs)	–	5-5.5 million mm^{-3} of blood
*	Thrombocytes (Platelets)	–	1,50,000-3,50,000 mm^{-3} of blood

(177) Answer : (3)
Solution:
Neural signals through the sympathetic nerves increase the rate of heart beat, the strength of ventricular contraction and thereby the cardiac output.

(178) Answer : (3)

Solution:

Hepatic portal system exists between liver and intestine in humans. The hepatic portal vein carries deoxygenated blood from intestine to the liver, before it is delivered to the systemic circulation.

(179) Answer : (4)

Solution:

Mitral valve or bicuspid valve is present between left atrium and left ventricle.

(180) Answer : (4)

Solution:

Atrial depolarization leads to atrial systole.