Aakash + BYJU'S

Corporate Office : Aakash Tower, 8, Pusa Road, New Delhi-110005, Phone : 011-47623456

MM : 720

Term Exam for NEET – 2023
Test - 2

Time 3 Hrs. 20 Min.

Answer Key

1.	(3)	41.	(4)	81.	(4)	121.	(1)	161.	(1)
2.	(3)	42.	(4)	82.	(3)	122.	(3)	162.	(3)
3.	(2)	43.	(4)	83.	(2)	123.	(3)	163.	(4)
4.	(1)	44.	(1)	84.	(4)	124.	(4)	164.	(4)
5.	(3)	45.	(2)	85.	(3)	125.	(3)	165.	(1)
6.	(4)	46.	(4)	86.	(2)	126.	(3)	166.	(1)
7.	(3)	47.	(1)	87.	(2)	127.	(3)	167.	(4)
8.	(3)	48.	(3)	88.	(2)	128.	(1)	168.	(3)
9.	(2)	49.	(2)	89.	(4)	129.	(4)	169.	(2)
10.	(1)	50.	(1)	90.	(4)	130.	(4)	170.	(4)
11.	(1)	51.	(2)	91.	(3)	131.	(1)	171.	(1)
12.	(4)	52.	(3)	92.	(1)	132.	(4)	172.	(2)
13.	(3)	53.	(4)	93.	(3)	133.	(3)	173.	(1)
14.	(3)	54.	(1)	94.	(2)	134.	(2)	174.	(3)
15.	(2)	55.	(2)	95.	(2)	135.	(4)	175.	(1)
16.	(3)	56.	(3)	96.	(3)	136.	(2)	176.	(3)
17.	(2)	57.	(2)	97.	(4)	137.	(1)	177.	(2)
18.	(3)	58.	(2)	98.	(3)	138.	(3)	178.	(2)
19.	(3)	59.	(4)	99.	(3)	139.	(3)	179.	(3)
20.	(3)	60.	(4)	100.	(3)	140.	(1)	180.	(1)
21.	(1)	61.	(3)	101.	(1)	141.	(1)	181.	(3)
22.	(4)	62.	(3)	102.	(2)	142.	(4)	182.	(3)
23.	**(Del)**	63.	(2)	103.	(4)	143.	(1)	183.	(2)
24.	(4)	64.	(2)	104.	(3)	144.	(1)	184.	(3)
25.	(1)	65.	(3)	105.	(1)	145.	(4)	185.	(4)
26.	(1)	66.	(4)	106.	(2)	146.	(2)	186.	(2)
27.	(3)	67.	(2)	107.	(3)	147.	(2)	187.	(4)
28.	(2)	68.	(2)	108.	(4)	148.	(1)	188.	(2)
29.	(1)	69.	(2)	109.	(3)	149.	(2)	189.	(3)
30.	(4)	70.	(1)	110.	(2)	150.	(4)	190.	(2)
31.	(3)	71.	(3)	111.	(2)	151.	(3)	191.	(3)
32.	(3)	72.	(2)	112.	(4)	152.	(1)	192.	(1)
33.	(3)	73.	(4)	113.	(3)	153.	(4)	193.	(4)
34.	(1)	74.	(3)	114.	(3)	154.	(2)	194.	(4)
35.	(1)	75.	(1)	115.	(3)	155.	(1)	195.	(3)
36.	(2)	76.	(1)	116.	(4)	156.	(3)	196.	(2)
37.	(3)	77.	(4)	117.	(4)	157.	(4)	197.	(3)
38.	(2)	78.	(2)	118.	(3)	158.	(2)	198.	(4)
39.	(4)	79.	(3)	119.	(1)	159.	(4)	199.	(1)
40.	(2)	80.	(3)	120.	(2)	160.	(2)	200.	(4)

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Hints and Solutions

PHYSICS

SECTION-A

1. Answer (3)

$$R = \frac{mv}{qB}$$

$$R = \frac{20 \times 10^{-3} \times 8}{2 \times 4}$$
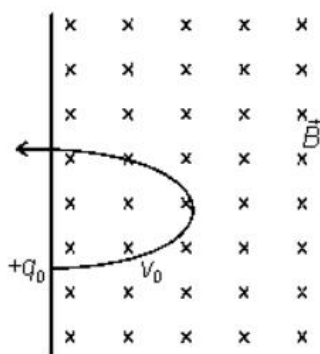
$R = 20 \times 10^{-3}$ m

$R = 2$ cm

2. Answer (3)
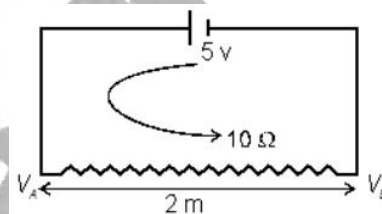
For completing full circle inside the magnetic field time period charge $T = \frac{2\pi m}{qB}$

Here charge will complete half circle

$$t = \frac{T}{2} = \frac{\pi m}{qB}$$

3. Answer (2)

$$I = \frac{5}{10} = \frac{1}{2} \text{ A}$$

$$V_A - V_B = \frac{1}{2} \times 10 = 5 \text{ V}$$

$$\frac{dV}{dx} = \frac{5}{2} = 2.5 \text{ V/m}$$

4. Answer (1)

Magnetic field is not produced by charge at rest.

5. Answer (3)
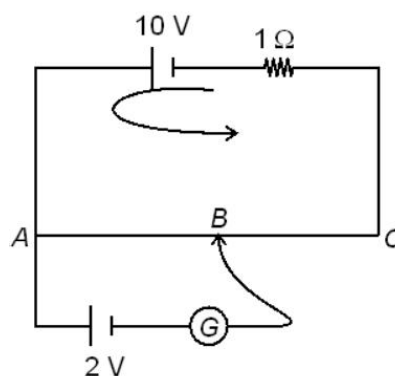
$$I = \frac{10}{5} = 2 \text{ A}$$

$K = \dfrac{4 \times 2}{1} = 8$ V/m
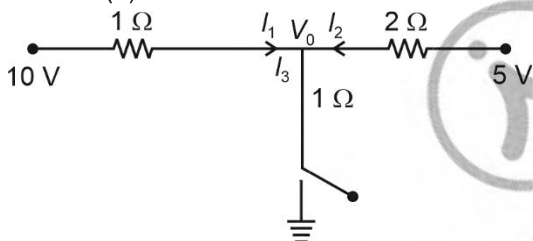
$AB = \dfrac{2}{8}$ m

Or, $AB = 25$ cm

6. **Answer (4)**
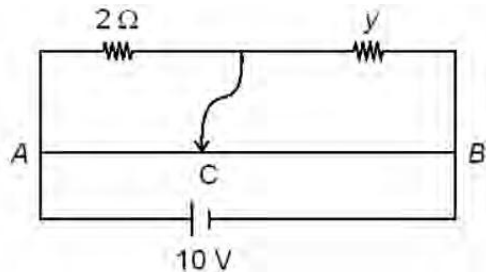
$\dfrac{2}{40} = \dfrac{y}{60}$

$y = \dfrac{6 \times 2}{4} = 3\,\Omega$

7. **Answer (3)**

$\dfrac{10 - V_0}{1} + \dfrac{5 - V_0}{2} = \dfrac{V_0 - 0}{1}$
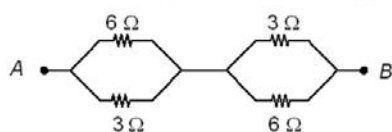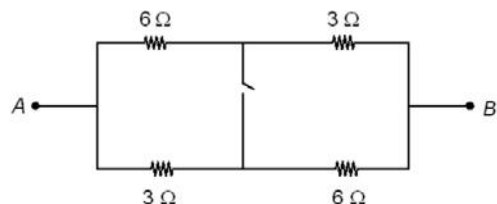
$20 - 2V_0 + 5 - V_0 = 2V_0$

$5V_0 = 25$

$V_0 = 5$ V

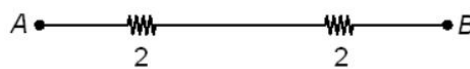$I_3 = \dfrac{10 - 5}{1} + \dfrac{5 - 5}{2}$

$I_3 = 5$ A

8. **Answer (3)**

$\dfrac{1}{R_{eff}} = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \ldots + \dfrac{1}{R_n}$

$\dfrac{1}{R} = \dfrac{1}{6} + \dfrac{1}{3}$

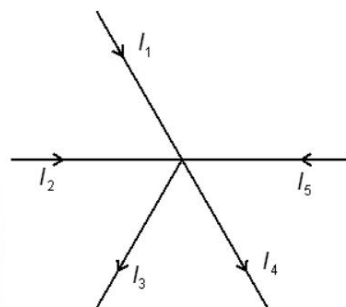$R_{eff} = \dfrac{6 \times 3}{9}$

$R_{eff} = 2\Omega$

$R_{AB} = 2 + 2 = 4\ \Omega$

9. **Answer (2)**

At any junction net incoming current will be equal net outgoing current.

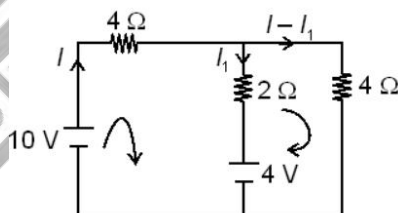$I_1 + I_2 + I_5 = I_3 + I_4$

$Q_1 + Q_2 + Q_5 = Q_3 + Q_4$

$\dfrac{dQ_1}{dt} + \dfrac{dQ_2}{dt} + \dfrac{dQ_5}{dt} = \dfrac{dQ_3}{dt} + \dfrac{dQ_4}{dt}$

Conservation of charge

10. **Answer (1)**

$+10 - 4I - 2I_1 - 4 = 0$

$4I + 2I_1 = 6$

$2I + I_1 = 3$ ......(1)

$+4 + 2I_1 - 4(I - I_1) = 0$

$4 = -2I_1 + 4(I - I_1)$

$4I - 4I_1 - 2I_1 = 4$

$4I - 6I_1 = 4$

$2I - 3I_1 = 2$ ....(2)

On solving (1) and (2)

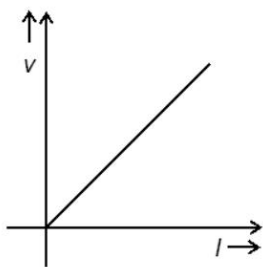$I = \dfrac{11}{8}, \quad I_1 = \dfrac{1}{4}$

$P_{consumption} = VI$

$= 4 \times \dfrac{1}{4} = 1$ W

11. Answer (1)

Ohm's law $V \propto I$

$$V = IR$$

12. Answer (4)

Resistivity of any conductor is a material property. It will not depend on geometrical dimension of conductor.

13. Answer (3)

$$v_d = \frac{I}{neA}$$

$$vd = \frac{I}{neA}$$

$$n = \frac{2 \times 10^{25}}{A}$$

$$v_d = \frac{I}{\frac{2 \times 10^{25}}{A} \times A \times 1.6 \times 10^{-19}}$$

$$v_d = \frac{4}{2 \times 1.6} \times 10^{-6}$$

$$v_d = \frac{20}{16} \times 10^{-6} \text{ m/s}$$

$$v_d = 1.25 \times 10^{-4} \text{ cm/s}$$

14. Answer (3)

$$I_{avg} = \frac{q_{total}}{t}$$

$i = 3t^2 + 2t + 1$

$$\frac{dq}{dt} = 3t^2 + 2t + 1$$

$$\int dq = \int_0^2 (3t^2 + 2t + 1)dt$$

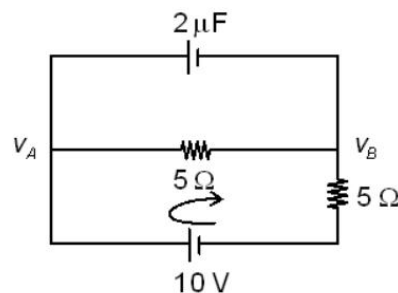$$q_{total} = [t^3 + t^2 + t]_0^2$$

$$q_{total} = 14 \text{ C}$$

$$I_{avg} = \frac{14}{2} = 7 \text{ A}$$

15. Answer (2)

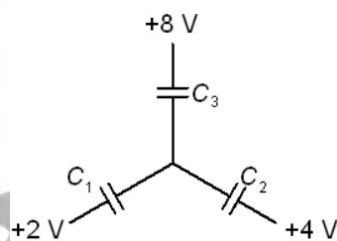In steady state condition no current will flow through capacitor

$$I = \frac{10}{10}$$

$I = 1 \text{ A}$

$$V_A - V_B = \frac{q}{c}$$

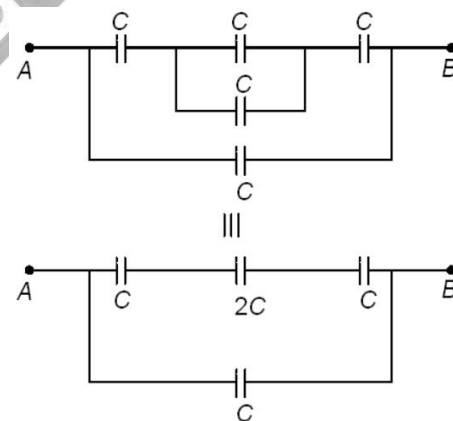$$I \times 5 = \frac{q}{2} \Rightarrow q = 10 \ \mu\text{C}$$

16. Answer (3)

$(8 - v_0)30 + (4 - v_0)20 + (2 - v_0)10 = 0$
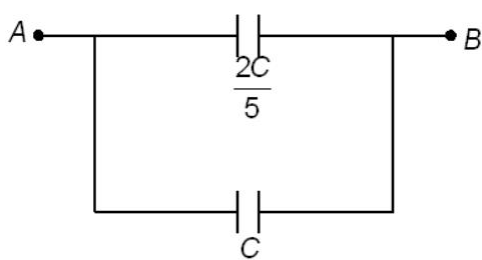
$$\Rightarrow v_0 = \frac{17}{3}$$

17. Answer (2)

$$\frac{1}{C_{eff}} = \frac{1}{2C} + \frac{1}{C} + \frac{1}{C}$$

$$\frac{1}{C_{eff}} = \frac{5}{2C}$$
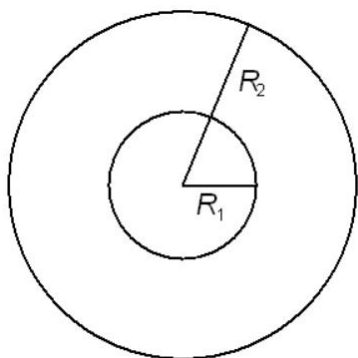
$$C_{eff} = \frac{2C}{5}$$

$$C_{AB} = \frac{2C}{5} + C$$

$$C_{AB} = \frac{7C}{5}$$

18. **Answer (3)**

Energy stored in capacitor $U = \frac{1}{2}CV^2$

19. **Answer (3)**

$$C = \frac{4\pi\varepsilon_0 R_1 R_2}{R_2 - R_1}$$

$$C = \frac{4\pi\varepsilon_0 R_1 R_2}{R_2 - R_1}$$

$R_2 = 2R$, $R_1 = R$

$C = 8\pi\varepsilon_0 R$

20. **Answer (3)**

$$C = \frac{A\varepsilon_0}{\dfrac{t}{k} + d - t}$$

$$C = \frac{A\varepsilon_0}{\dfrac{d}{2k} + d - \dfrac{d}{2}}$$

$$C = \frac{2A\varepsilon_0}{\dfrac{d}{k} + d}$$

21. **Answer (1)**

$$E = \frac{q}{A\varepsilon_0 k}$$

$$E = \frac{E_0}{k}$$

22. **Answer (4)**

$$k = \frac{E_{ext}}{E_{ext} - E_{ind}}$$

For conductor

$E_{ext} = E_{ind}$

$k = \infty$

For any insulator

$k > 1$

23. **Answer (Del)**

$$\vec{p} \propto \vec{E}$$

$$\vec{p} \propto \chi_E \vec{E}$$

$$\chi_E = \frac{\vec{p}}{\vec{E}}$$

$\vec{p}$ = dipole moment per unit volume

24. **Answer (4)**

$W_{eq} = \Delta U$

$= -PE \cos 180° - (-PE \cos 0°)$

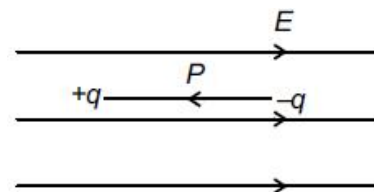$= -5 \times 10\,(-1) + 5 \times 10 \times 1$

$= +100$ J

25. **Answer (1)**

Use $V = \dfrac{q_1 q_2}{4\pi\varepsilon_0 R}$

$$V = \frac{-5 \times 10 \times 9 \times 10^9}{20 \times 10^{-2}} \times 10^{-12}$$

$V = -2.25$ J

26. **Answer (1)**

$F_{net} = 0$, $\tau_{net} = PE \sin\theta° = 0$

$U = -PE \cos\theta$
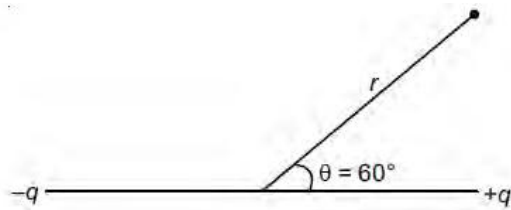
$U = +PE$
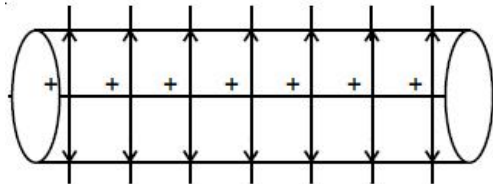
$\cos\theta = -1$

$\theta = 180°$

27. Answer (3)

Electrical potential due to short electric dipole at any general position $v = \dfrac{p\cos\theta}{4\pi\varepsilon_0 r^2}$

$\dfrac{v_A}{v_B} = \dfrac{\dfrac{p\cos 60°}{4\pi\varepsilon_0 r^2}}{\dfrac{p\cos 0°}{4\pi\varepsilon_0 r^2}}$
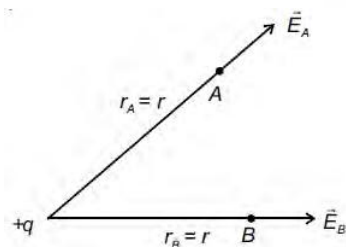
$\dfrac{v_A}{v_B} = \dfrac{1}{2}$

28. Answer (2)

Equipotential surface are cylindrical

29. Answer (1)

$V = \dfrac{q}{4\pi\varepsilon_0 r}$, $V_{net} = V_1 + V_2 + V_3$

30. Answer (4)

$\vec{E}_A = \dfrac{q}{4\pi\varepsilon_0 |r|^2}\hat{r}_A$

$\vec{E}_B = \dfrac{q}{4\pi\varepsilon_0 |r|^2}\hat{r}_B$

$|\vec{E}_A| = |\vec{E}_B|$

31. Answer (3)

Force between them remains same

32. Answer (3)

$n = \dfrac{q}{e}$

$n = \dfrac{8}{1.6 \times 10^{-19}}$

$n = 5 \times 10^{19}$

33. Answer (3)

$F_m = q_0(\vec{v} \times \vec{B})$

$F_m \perp^r \vec{v}$ and $\vec{F}_m \perp^r \vec{B}$

$P = \vec{F}_m \cdot \vec{v}$

$P = 0$

$\dfrac{dk}{dt} = 0$

k = constant

34. Answer (1)
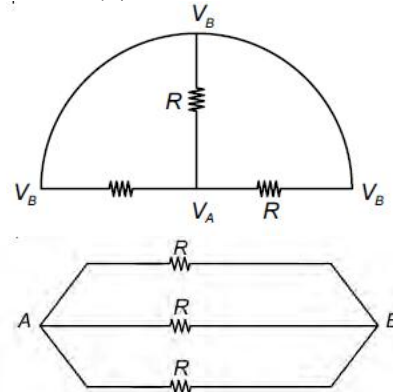
$\dfrac{1}{R_{AB}} = \dfrac{1}{R} + \dfrac{1}{R} + \dfrac{1}{R}$

$\dfrac{1}{R_{AB}} = \dfrac{3}{R}$

$R_{AB} = \dfrac{R}{3}$

35. Answer (1)
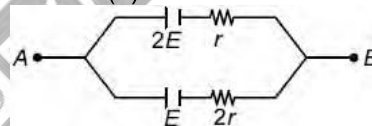
$+ 2E - E - I \times 3r = 0$

$I = \dfrac{E}{3r}$

$V_A - V_B = E + 2r \times \dfrac{E}{3r}$

$V_A - V_B = \dfrac{5E}{3}$

SECTION-B

36. Answer (2)

$\vec{F} = q(\vec{v} \times \vec{B})$

Velocity of charge with respect to observer is $\vec{v}_{C/O} = (2\hat{i})$ m/s

$\vec{F} = 10^{-5}[2\hat{i} \times (-2\hat{k})]$

$= -10^{-5} \times 4(-\hat{j})$

$= 4 \times 10^{-5}\,\hat{j}\,\text{N}$

37. Answer (3)

Magnetic force does no work on a moving charged particle, therefore its speed and kinetic energy remains constant.

38. Answer (2)

From KVL, $\Sigma V = 0$

39. Answer (4)

5 Ω resistor is shorted, hence no current will flow through it.

40. Answer (2)

$$r = R\left(\frac{l_1}{l_2} - 1\right)$$

$$= \left(\frac{70}{60} - 1\right)$$

$$= 1\ \Omega$$

41. Answer (4)

$$R = \rho\left(\frac{L}{A}\right)$$

$\Rightarrow$ Unit of $\rho = \Omega\,\dfrac{m^2}{m}$

$$= \Omega\, m$$

42. Answer (4)

$$P = \frac{V^2}{R}$$

$$R = \frac{V^2}{P}$$

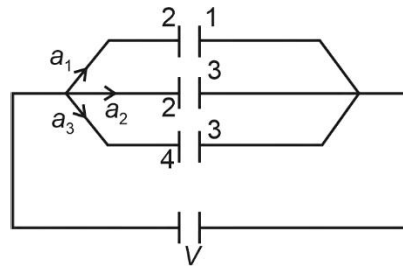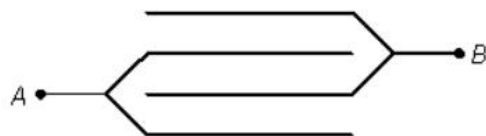$$R = \frac{(100)^2}{60}$$

$$R = \frac{1000}{6}$$

$$P_1 = \frac{V^2}{R}$$

$$= \frac{(50)^2}{\dfrac{1000}{6}}$$

$$P_1 = \frac{2500 \times 6}{1000} = 15\ \text{watt}$$

43. Answer (4)

44. Answer (1)

$$\vec{F}_m = q(\vec{v} \times \vec{B})$$

$$F_m = -3\begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 2 & -1 & 2 \\ 1 & 3 & 1 \end{vmatrix}$$

$$\vec{F}_m = -[3(-7)\hat{i} - \hat{j}(2-2) + \hat{k}(6+1)]$$

$$\vec{F}_m = +21\hat{i} - 21\hat{k}$$

$$|\vec{F}_m| = 21\sqrt{2}\ \text{N}$$

45. Answer (2)

$$\vec{F}_m = q\vec{E} + q(\vec{v} \times \vec{B})$$

At $t = 0$ only electric force will act but at any time $t = t_0$ charge will accelerate and gain some velocity therefore, both electric and magnetic force will act.

46. Answer (4)

$I = 2$

$P_d = 8 \times 2 = 16\ \text{W}$

$P_c = -2 \times 2 = -4\ \text{W}$

$P_{\text{dissipated}} = I^2 R$

$\quad\quad\quad\quad = 2^2 \times 1 = 4\ \text{W}$

For Q.43 (right column top):

$q_{\text{total}} = V\, C_{\text{eff}}$

$\quad\quad\quad = 3\, V\, C$

$$= \frac{3VA\varepsilon_0}{d}$$

$$q_1 = \frac{q_{\text{total}}}{3}$$

$$= \frac{A\varepsilon_0 V}{d}$$

Charge on plate-2 will be $+\dfrac{A\varepsilon_0 V}{d}$ and on plate-1 will be $-\dfrac{A\varepsilon_0 V}{d}$

47. Answer (1)

From balanced Wheatstone bridge

$$R_{eq} = \frac{3R \times 6R}{(3R + 6R)} = 2R$$

48. Answer (3)

$$f = \frac{qB}{2\pi m}$$

Frequency is independent of velocity and both charges are identical therefore, frequency will be same.

49. Answer (2)

Pitch $(P) = \frac{2\pi m}{qB} \times v\cos\theta$

$$\frac{P_1}{P_2} = \frac{\cos\theta_1}{\cos\theta_2}$$

$$= \frac{\cos 30°}{\cos 60°}$$

$$= \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \sqrt{3} : 1$$

50. Answer (1)

$$\vec{F}_{net} = q\vec{E} + q(\vec{v} \times \vec{B})$$

$$\vec{F}_{net} = 0$$

$$\vec{E} + (\vec{v} \times \vec{B}) = 0$$
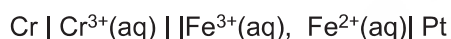
$$\vec{E} = -(\vec{v} \times \vec{B})$$

CHEMISTRY

SECTION-A

51. Answer (2)

$\Delta H = E_f - E_b$

$= (80 - 120)$kJ/mole $= -40$ kJ/mole

52. Answer (3)

The cell presentation is

$Cr \mid Cr^{3+}(aq) \mid\mid Fe^{3+}(aq), Fe^{2+}(aq)\mid Pt$

$E^0_{cell} = E^0_R - E^0_L$

$= 0.77 + 0.74 = 1.51$ V

53. Answer (4)

$\pi = iCRT$

$= 0.1 \times 0.082 \times 300$ (i = 1 for glucose)

$= 2.46$ atm

54. Answer (1)

AgBr shows both, Frenkel as well as Schottky defects.

55. Answer (2)

Order of a reaction can be zero and even a fraction.

56. Answer (3)

Metal sols are negatively charged sol. Higher the value of positive charge on metal cation faster will the coagulation of negatively charged sol.

57. Answer (2)

In ferrimagnetic substance, the magnetic moments of the domains in the substance are aligned in parallel and antiparallel directions in unequal numbers.

58. Answer (2)

$$\Lambda_m = \frac{k \times 1000}{0.4} = \frac{15 \times 10^{-2} \times 1000}{0.4} = 375 \text{ S cm}^2 \text{ mol}^{-1}$$

59. Answer (4)

$E^0_{Mg/Mg^{2+}} = +2.36$ V

Since, oxidation potential of Mg/Mg^{2+} is positive the hydrogen liberation from acidic solution will be easier.

60. Answer (4)

Freundlich adsorption isotherm is written as

$$\frac{x}{m} = k.P^{\frac{1}{n}}(n > 1).......(i)$$

Where x is mass of the gas adsorbed on mass m of the adsorbent at pressure P. k and n are constants which depend on nature of the adsorbent and the gas at a particular temperature.

Taking log of (i)

$$\log\frac{x}{m} = \log k + \frac{1}{n}\log P$$

61. Answer (3)

Physisorption results into multimolecular layers on adsorbent surface under high pressure.

62. Answer (3)

$7.5 \times 10^{-3} = 2.5 \times 10^{-3} \times C$

$$C = \frac{7.5 \times 10^{-3}}{2.5 \times 10^{-3}} = 3$$

63. Answer (2)

For the rate equation,

Rate = $k[A]^{1/2}[B]^1$

The overall order $= 1 + \dfrac{1}{2} = 1.5$

64. Answer (2)

	HA	$\rightleftharpoons$	H^+	+	A^-
Initial mole	0.3		0		0
Final mole	$(0.3 - 0.09) = 0.21$		0.09		0.09

Total number of moles at equilibrium = 0.21 + 0.09 + 0.09 = 0.39

$\Delta T_f = iK_f m$

$\Delta T_f = \dfrac{0.39}{0.3} \times 1.86 \times 0.3 = 0.725 \simeq 0.73$

$T_f = 0 - 0.73$

$= -0.73°C$

65. Answer (3)

$\Delta G° = -nFE°$

If E° is positive then $\Delta G°$ value will be negative

Again, $E^0_{cell} = \dfrac{2.303RT}{nF} \log K_{eq}$

E° is positive

so, $K_{eq} > 1$

66. Answer (4)

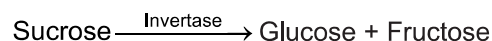$A \rightarrow P$, for 2nd order reaction

$-\dfrac{d[A]}{dt} = k[A]^2$

$\dfrac{mol\,L^{-1}}{s} = k\,(mol\,L^-)^2$

$k = \dfrac{mol\,L^{-1}}{s\,mol^2\,L^{-2}} = mol^{-1}Ls^{-1}$

67. Answer (2)

Cheese is an example of gel.

68. Answer (2)

Sucrose $\xrightarrow{\text{Invertase}}$ Glucose + Fructose

69. Answer (2)

In the Ostwald's process for the manufacture of nitric acid the catalyst used is platinised asbestos.
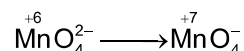
70. Answer (1)

$t_{1/2} \propto [R]_0$

for zero order reaction

71. Answer (3)

At any concentration C, if α is the degree of dissociation then it can be approximated to the ratio of molar conductivity Λ_m at concentration C to limiting molar conductivity Λ^0_m.

72. Answer (2)

$\overset{+6}{Mn}O_4^{2-} \longrightarrow \overset{+7}{Mn}O_4^-$

n factor = 1

Quantity of electricity required = 0.2 × 96500

$= 19300\ C$

73. Answer (4)

Cell constant = Conductivity × resistance

$= 1.41 \times 10^{-3} \times 90$

$= 0.13\ cm^{-1}$

74. Answer (3)

Number of equivalents of $Cu^{2+} = \dfrac{\frac{127}{63.5}}{2}$

$= \dfrac{127 \times 2}{63.5} = 4$

Number of Faradays required = 4

75. Answer (1)

Moles of methyl alcohol $= \dfrac{320}{32} = 10$

Moles of ethyl alcohol $= \dfrac{230}{46} = 5$

Moles of water $= \dfrac{180}{18} = 10$

Mole fraction of ethyl alcohol

$= \dfrac{5}{10 + 5 + 10} = \dfrac{5}{25} = 0.2$

76. Answer (1)

In H^+, there is proton transfer through hydrogen bond network of water molecules. Hence, its conductivity is highest.

77. **Answer (4)**

Mass of water = 132 − 32 = 100 g

$$\text{molality} = \frac{\dfrac{32}{32}\ \text{mole}}{\dfrac{100}{1000}\ \text{kg}} = \frac{32}{32} \times \frac{1000}{100} = 10\ m$$

78. **Answer (2)**

$$\text{Molarity} = \frac{\dfrac{160}{40}}{\dfrac{500}{1000}} = \frac{160}{40} \times \frac{1000}{500} = 8\ M$$

79. **Answer (3)**

$$Kt = 2.303 \log \frac{a}{a-x}$$

$$t = \frac{2.303}{K} \log \frac{10}{1}$$

$$t = \frac{2.303}{2 \times 10^{-2}} = 115.15\ s$$

80. **Answer (3)**

A catalyst catalyzes the spontaneous reactions but does not catalyse non-spontaneous reactions.

81. **Answer (4)**

$$\text{Number of half lives} = \frac{24}{8} = 3$$

$$\text{Fraction remained unreacted} = \left(\frac{1}{2}\right)^3 = \frac{1}{8}$$

82. **Answer (3)**

Iron, silver, graphite are conductors while silicon is a semiconductor.

83. **Answer (2)**

For simple cube, a = 2r

Volume of unit cell = $a^3 = (2r)^3 = 8r^3$

Volume occupied by atom $= \frac{4}{3}\pi r^3$

Packing efficiency

$$= \frac{\text{Volume of one atom}}{\text{Volume of cubic unit cell}} \times 100$$

$$= \frac{\dfrac{4}{3}\pi r^3}{8r^3} \times 100 = \frac{\pi}{6} \times 100 = 52.4\%$$

84. **Answer (4)**

Triclinic $a \neq b \neq c$ $\alpha \neq \beta \neq \gamma \neq 90°$

85. **Answer (3)**

Number of close packed spheres in fcc unit cell = 4

Number of tetrahedral voids = 8
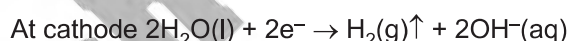
SECTION-B

86. **Answer (2)**

Inverse of resistance is called conductance.

87. **Answer (2)**

A reducing agent is a substance which will reduce other substance and itself oxidised. Oxidation potential of Na being maximum will act as the best reducing agent.

88. **Answer (2)**

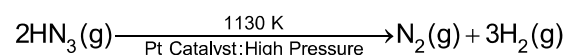H_2O is more readily reduced at cathode than Na^+.

At cathode $2H_2O(l) + 2e^- \rightarrow H_2(g)\uparrow + 2OH^-(aq)$

89. **Answer (4)**

Number of half life $= \frac{64}{16} = 4$

Amount of sample left $= \left(\frac{1}{2}\right)^4 = \frac{1}{16}\ g$

90. **Answer (4)**

The decomposition of gaseous NH_3 on a hot platinum surface is a zero order reaction at high pressure.

$$2HN_3(g) \xrightarrow[\text{Pt Catalyst; High Pressure}]{1130\ K} N_2(g) + 3H_2(g)$$

91. **Answer (3)**

Peptization is defined as the process of converting a precipitate into colloidal sol by shaking it with dispersion medium in presence of small amount of electrolyte.
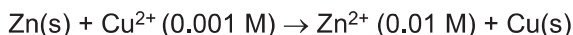
92. **Answer (1)**

For soaps, the critical micelle concentration is 10^{-4} to 10^{-3} mol L^{-1}.

93. **Answer (3)**

In Haber's process of manufacture of ammonia, the promoter used is molybdenum.

94. Answer (2)

Cell reaction

$Zn(s) + Cu^{2+}$ (0.001 M) $\rightarrow Zn^{2+}$ (0.01 M) + Cu(s)

$$E_{cell} = E^\circ_{cell} - \frac{0.059}{2} \log\frac{[Zn^{2+}]}{[Cu^{2+}]}$$

$$E_{cell} = E^\circ_{cell} - \frac{0.059}{2} \log\frac{0.01}{0.001}$$

$$E_{cell} = E^\circ_{cell} - \frac{0.059}{2} \log 10$$

$$= \left(E^\circ_R - E^\circ_L\right) - 0.03$$

$$= (0.34 + 0.76) - 0.03$$

$$= 1.07 \text{ V}$$

95. Answer (2)

In lead storage battery, the electrolyte used is 38% solution of H_2SO_4.

96. Answer (3)

Rate = $k[H^+] [H_2O] [C_{12}H_{22}O_{11}]$

Since, concentration of H^+ and H_2O is not changing

$\therefore$ rate = $k'[C_{12}H_{22}O_{11}]$

97. Answer (4)

$E^\circ_{cell} = 0.34 - (-0.25) = 0.59$ volt

$$E^\circ_{cell} = \frac{0.059}{2} \log K_C$$

$$\frac{0.59 \times 2}{0.059} = \log K_C$$

$K_C = 10^{20}$

98. Answer (3)

$$\Lambda^\circ_m(CH_3COOH) = \Lambda^\circ_m(CH_3COONa) + \Lambda^\circ_m(HCl) - \Lambda^\circ_m(NaCl)$$

$$\Lambda^\circ_m(CH_3COOH) = (z + y - x)S \text{ cm}^2\text{mol}^{-1}$$

99. Answer (3)

Arrhenius equation

$$k = Ae^{\frac{-E_a}{RT}}$$

$$\ln k = \ln A - \frac{E_a}{RT}$$

$$\text{slope} = -\frac{E_a}{R}$$

100. Answer (3)

Haemoglobin is a positively charged sol.

BOTANY

SECTION-A

101. Answer (1)

Adenine and guanine are purines, heterocyclic, 9 member double ring structure with N at position 1, 3, 7 and 9.

102. Answer (2)

In *E.coli* genetic material is double stranded circular DNA.

103. Answer (4)

DNA is acidic in nature.

104. Answer (3)

The given pedigree chart show autosomal recessive trait because it is expressing in offspring when both the allele come together.

105. Answer (1)

Myotonic dystrophy is an autosomal dominant trait.

106. Answer (2)

Chargaff's rule is applicable to dsDNA where amount of purines is equal to pyrimidines.

107. Answer (3)

The law of independent assortment is not an universal law and it is not true for gene that are linked.

In incomplete dominance, F_1 progeny do not resemble any of the two parent.

108. Answer (4)

DNA is found in cytoplasm in super coiled stage.

109. Answer (3)

Reverse transcription or terminism was reported by Temin and Baltimore.

110. Answer (2)

In a double stranded circular DNA with 500 base pairs will have 1000 phosphodiester bond which links two nucleotides to form dinucleotide.

111. Answer (2)

Bacteriophage lambda has 48502 base pairs.

112. Answer (4)

   Two nucleotides are linked through $3'-5'$ phosphodiester linkage to form a dinucleotide.

113. Answer (3)

   Aa   ×   aa
   (Woman)   (Man)

   Aa , Aa, aa, aa $= \dfrac{1}{2}$

   Probability of male child, 50% of progeny will be taster.

   Probability of taster male child $= \dfrac{1}{2} \times \dfrac{1}{2} = \dfrac{1}{4}$

114. Answer (3)

   Mating with relatives is called consanguineous mating can be represented as ⊝—▭

115. Answer (3)

   Here women is carrier of colourblindness as her father is colourblind and mother is normal. Man is colourblind as her mother was colourblind.

   Woman   ×   Man
   $X^C X$ $X^C Y$

   $X^C X^C$ $X^C X$ $X^C Y$ XY

   Female progeny   Male progeny
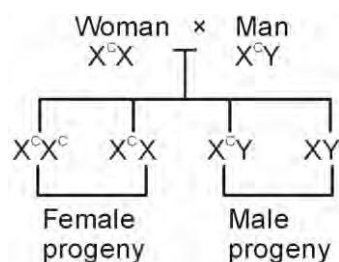
   50% male progeny will be affected only

116. Answer (4)

   The backbone of polypeptide chain is formed by sugar and phosphate.

117. Answer (4)

   Mendelian disorder are mainly determined by alteration or mutation in the single gene.

118. Answer (3)

   The female honey bee are diploid having 32 chromosomes and males are haploid.

119. Answer (1)

   Sperms can have (A + X) or (A + Y) in human males.

120. Answer (2)

   Females are heterogametic in birds and males are heterogametic in grasshopper.

121. Answer (1)

   The maximum number of recombinant type can be obtained is 50%.

122. Answer (3)

   Phenylketonuria is an example of pleiotropy where a single gene can exhibit multiple phenotype expression.

123. Answer (3)

   In Punnett square of dihybrid cross, there are four genotypes which are heterozygous for both seed colour and seed shape. The Probability of such plants is

   $= \dfrac{4}{16} = \dfrac{1}{4}$

124. Answer (4)

   Parent 1   Parent 2
   $I^A I^B$ × $I^O I^O$
   $I^A I^O, I^A I^O, I^B I^O, I^B I^O$

   Blood groups can be either A or B, blood group O is not possible.

125. Answer (3)

   The seed with genotype Bb shows intermediate sized starch grains.

126. Answer (3)

   Rr × rr
   ↓
   Rr, Rr, rr, rr

   50% are white flowered plants

127. Answer (3)

   Law of segregation based on fact that the alleles do not show any blending and both characters are recovered as such in F_2 generation.
   And therefore, gametes receive only one of the two factors.

128. Answer (1)

   To determine the genotype of the test organism, it should get crossed with homozygous recessive plant or white flowered pea plant.

129. Answer (4)

   Types of gametes = 2^n, where n = number of heterozygous locus/loci.
   $\therefore$ $2^3 = 8$

130. Answer (4)

   Recessive traits express only in homozygous condition e.g. terminal flower position.

131. Answer (1)

   Male plant = 4n
   Female plant = 4n
             ♀   ♂
   Gamete formation   2n   2n
   PEN is triploid structure (3n) = 6n
   Zygote is diploid structure (2n) = 4n

132. Answer (4)

   Middle layer is 1-3 layer thick and it degenerates at maturity.

133. **Answer (3)**

Gametic fusion is absent in asexual reproduction.

134. **Answer (2)**

Yeast reproduce via budding

135. **Answer (4)**

Algae are non embryophytes.

SECTION-B

136. **Answer (2)**

In Mendelian dihybrid cross out of 16 progenies, ten are similar to parental type.

137. **Answer (1)**

Sutton and Boveri gave Chromosomal Theory of Inheritance.

138. **Answer (3)**

Out of 16 progenies in dihybrid cross, 2 progenies have rrYy genotype.

∴ Probability of rrYy is $\dfrac{2}{16} = \dfrac{1}{8}$

139. **Answer (3)**

Males are haploid with 16 chromosomes.

140. **Answer (1)**

Birds show ZW-ZZ type of sex determination Male *Drosophila* is heterogametic.

141. **Answer (1)**

$X^C X \quad \times \quad XY$
(Woman) ↓ (Man)

$X^C X, X^C Y, XX, XY$] Progeny

No females progenies are affected

142. **Answer (4)**

Thalassemia is autosomal recessive disorder.

143. **Answer (1)**

Mendel law worked on *Pisum sativum* for seven years i.e. 1856-1863 and proposed law of inheritance.

144. **Answer (1)**

Length of DNA = total no. of bp × distance between two bp.

145. **Answer (4)**

Chargaff's rule is applicable only for dsDNA.

146. **Answer (2)**

Egg apparatus consist of two synergids and one egg cell.

147. **Answer (2)**

The progenitor of next generation inside the mature seed is embryo.

148. **Answer (1)**

Plants have evolved a special mechanism to produce seeds without fertilisation called apomixis.

149. **Answer (2)**

Anatropous ovule is most common ovule and found in 82% of angiosperm families.
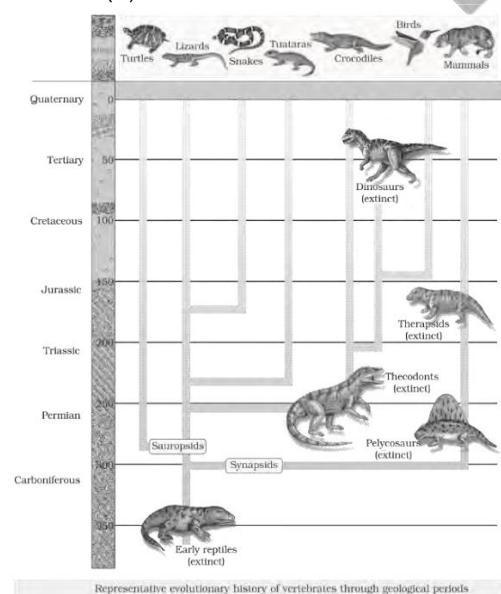
150. **Answer (4)**

Hydrophilous flower have long sticky unwettable stigma. Pollen are light and unwettable generally surrounded by membranous coverings and protect it from wetting.

ZOOLOGY

SECTION-A

151. **Answer (3)**

Birds are the closest living relatives of crocodiles.

152. **Answer (1)**

Representative evolutionary history of vertebrates through geological periods

153. **Answer (4)**

Plants were widespread on land when animals invaded land.

154. **Answer (2)**

Mutations are random and directionless while Darwinian variations are small and directional.

155. **Answer (1)**

The wide range of Australian marsupials supports the phenomenon of adaptive radiation.

156. **Answer (3)**

LNG-20 is a hormone-releasing IUD.

157. **Answer (4)**

Spermicidal creams, jellies and foams are usually used along with barrier contraceptives like vaults, cervical caps and diaphragms to increase their contraceptive efficiency.

158. Answer (2)

Statutory raising of marriageable age of the females to 18 years and that of males to 21 years is one of the measures taken to tackle problem of rapid population growth in India.

159. Answer (4)

A rapid decline in death rate, maternal mortality rate (MMR) and infant mortality rate (IMR) as well as increase in number of people in reproducible age are probable reasons for population explosion.

160. Answer (2)

Central Drug Research Institute (CDRI) is located in Lucknow, India.

161. Answer (1)

'Family planning' programmes were initiated in 1951 in India and were periodically assessed over the past decades.

162. Answer (3)

The male sex accessory ducts include rete testis, vasa efferentia, epididymis and vas deferens.

163. Answer (4)

Under unfavourable conditions, the *Amoeba* withdraws its pseudopodia and secretes a three-layered hard covering or cyst around itself. This phenomenon is termed as encystation.

164. Answer (4)

Louis Pasteur   –   Theory of biogenesis

Oparin and   –   Theory of chemical
Haldane   evolution

165. Answer (1)

Homologous structures have the same origin but different functions and share common ancestry.

Analogous structures are a result of convergent evolution.

166. Answer (1)

Hardy-Weinberg's equilibrium is given by $p^2 + 2pq + q^2 = 1$, where, q^2 = frequency of homozygous recessive individuals;

$2pq$ = frequency of heterozygous individuals.

167. Answer (4)

Darwin's finches are an example of adaptive radiation.

168. Answer (3)

Branching descent and natural selection are the two key concepts of Darwinian theory of evolution.

169. Answer (2)

Homology, divergent evolution and adaptive radiation suggest common ancestry.

170. Answer (4)

Factors like genetic drift, gene flow or gene migration, mutation are important factors affecting Hardy-Weinberg equilibrium. If any of these phenomena take place, there is a change in the frequency of alleles. However, presence of random mating maintains genetic equilibrium.

171. Answer (1)

In present era the dominant land plants are angiosperms which include monocots and dicots.

172. Answer (2)

The approximate life span of parrot is 140 years.

173. Answer (1)

Ramapithecus was a more man-like primate, while *Dryopithecus* was more ape-like.

Australopithecus is the connecting link between apes and man.

174. Answer (3)

Mutations: Large differences arising suddenly in a population.

Natural selection: The process of selection of advantageous variations by nature.

175. Answer (1)

Brachiosaurus was a long-necked, plant-eating dinosaur.

176. Answer (3)

Fish-like reptiles (*Ichthyosaurs*) evolved probably 200 mya.

177. Answer (2)

According to the 2011 census report, the population growth rate was less than 2 percent.

178. Answer (2)

In amniocentesis some of the amniotic fluid of the developing foetus is taken to analyse the foetal cells and dissolved substances.

Gravindex test is used to confirm pregnancy.

179. Answer (3)

Contraceptives are not regular requirements for the maintenance of reproductive health.

180. Answer (1)

GIFT stands for gamete intra fallopian transfer in which there is transfer of donor's ovum into the fallopian tube of another female who cannot produce ova but can provide suitable environment for fertilisation.

181. Answer (3)

The chromosome number is 12 in meiocyte of housefly and 8 in case of fruit fly.

182. Answer (3)

LH induces ovulation which usually occurs on the 14th day in the menstrual cycle of 28 days.

183. Answer (2)

Primary oocyte and primary spermatocyte show the I^{st} meiotic division. I^{st} polar body and secondary oocyte are formed as a result of meiosis I of primary oocyte. Second polar body degenerates.

184. Answer (3)

Colostrum contains several antibodies which are absolutely essential to develop resistance in the new-born babies.

185. Answer (4)

Foreskin is a part of the male reproductive system.

SECTION-B

186. Answer (2)

Nirodh is a popular brand of condom for the male.

187. Answer (4)

Use of condoms has increased in recent years due to its additional benefit of protecting the user from contracting STIs.

188. Answer (2)

Whales, bats, cheetahs and humans share similarities in the pattern of bones of forelimbs.

189. Answer (3)

From the original seed-eating features, many other forms with altered beaks arose, enabling them to become vegetarian and insectivorous finches.

190. Answer (2)

The mode of action of implants is similar to that of pills but their effective periods are much longer.

191. Answer (3)

An ideal contraceptive should be user friendly, easily available, effective and reversible with no or least side-effects.

192. Answer (1)

193. Answer (4)

Evolution is not a directed process in the sense of determinism.

194. Answer (4)

Sweet potato (root modification) and potato (stem modification) is an example of analogous structures.

195. Answer (3)

S.L. Miller created electric discharge in a closed flask containing CH_4, H_2, NH_3 and water vapour at 800°C.

196. Answer (2)

In ZIFT, there is transfer of early embryos with upto 8 blastomeres.

197. Answer (3)

Chance of failure rate is high in case of natural methods of contraception.

198. Answer (4)

Hepatitis-B and HIV infection cannot be transmitted by sharing of clothes and food with an infected person.

199. Answer (1)

Attachment of blastocyst into the endometrium of uterus is called implantation.

200. Answer (4)

hCG, hPL and relaxin are produced in women only during pregnancy.

❑ ❑ ❑