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NEET FRESH 2023-24

Mark	Group		
720	PCB	**PCB EXAM - 67**	Date : 17/01/2024 Time : 3:20 Hours

Answer Key Version - P (NEET FRESH All Batches)

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PHYSICS

SECTION - A (35 Questions)

01. **(3)**

02. **(1)** $c = 4\pi \in_0 R$

$$= \frac{1}{9\times10^9}\cdot 2 = 2.2\times10^{-10}\,\text{F}$$

03. **(2)** Charge on 1 μF = CV = 1 × 10^{-6} × 10

$= 10^{-6} \times 10 = 10\ \mu$ C

charge on 3 μF = CV = $3\times10^{-6}\times20 = -60\mu\text{C}$

total charge = – 50 μC

Find charge on 1 μF & 3 μF $\rightarrow Q_1, Q_2$ respectively

then $\frac{Q_1}{Q_2} = \frac{C_1}{C_2}$ since potential of both conductor are same

$$\Rightarrow Q_1 = \frac{C_1}{C_1+C_2}(Q_1+Q_2) = \frac{1}{4}\times -50 = -12.5\,\mu\text{C}$$

$$\Rightarrow Q_2 = \frac{C_2}{C_1+C_2}(Q_1+Q_2) = \frac{3}{4}\times -50 = -37.5\,\mu\text{C}$$

04. **(4)** Let's assume V be the voltage of battery then energy stored in position 1 = $\frac{1}{2}\times 2\times V^2 \mu\text{J} = \text{V}^2\mu\text{J}$

Initial charge on 2μF × V = 2VμC

Let after connecting the common potential becomes

$$V_{comm} = \frac{Q_{total}}{C_{total}} = \frac{2V}{12} = \frac{V}{6}\text{Volt}$$

So final energy =

$$\frac{1}{2}\times2\times\left(\frac{\text{V}}{6}\right)^2 + \frac{1}{2}\times10\times\left(\frac{V}{6}\right)^2 = \frac{V^2}{6}\mu\text{J}$$

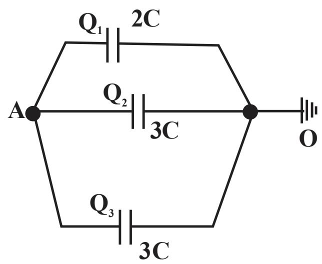
$$\text{energy dissipated} = V^2 - \frac{V^2}{6} = \frac{5V^2}{6}$$

$$\%\text{ energy dissipated} = \frac{5V^2}{6V^2}\times100 = 83.33\%$$

05. **(3)** One capacitor is short circuited.

So net capacitance : $\frac{C}{2} + C = \frac{3C}{2}$

06. **(2)**



$$Q_1 : Q_2 : Q_3 = C_1 : C_2 : C_3$$

$$Q_1 = \frac{C_1}{C_1+C_2+C_3}\cdot(Q_1+Q_2+Q_3)$$

$$\Rightarrow Q_1 = \frac{2}{8}\times16\,\mu\text{C} = 4\mu\text{C}$$

07. **(1)** $C_1 = \frac{\in_0 A}{d}$

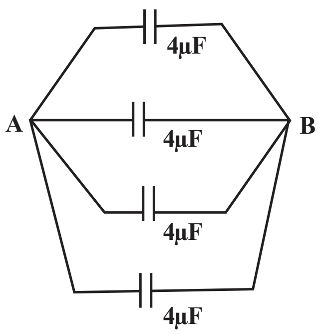
$$C_f = \frac{\in_0 A}{d - \frac{d}{2} + \frac{d}{2\infty}} = \frac{2\in_0 A}{d}$$

$$\frac{C_f}{C_i} = \frac{2}{1}$$

08. **(1)**

09. **(2)**

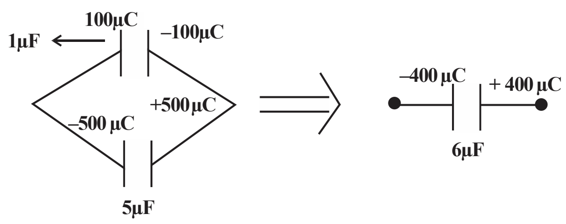
10. **(4)**



Eq. Capacitance (A & B)

= 16 μF

11. **(2)**



$$V=\frac{Q}{C}=\frac{400\mu C}{6\mu C}=\frac{200}{3}\text{V}$$

12. **(2)** $V=\frac{1}{2}\times1\times100^2+\frac{1}{2}\times5\times100^2$

$$=\frac{1}{2}\times6\times10^4\mu\text{ J}$$

$$=3\times10^4\times10^{-6}\text{J}=3\times10^{-2}\text{ J}$$

13. **(4)** $Q_{net}=400\mu\text{C}$

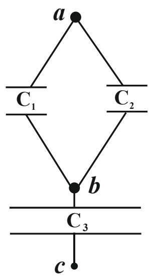
$$C_{net}=6\mu\text{F}$$

$$\text{V}=\frac{Q^2}{2C}=\frac{400\times400}{2\times6}=\frac{4}{3}\times10^4\mu\text{ J}$$

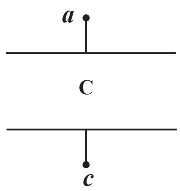
$$=1.33\times10^{-2}\text{J}$$

14. **(4)** $C=\frac{4\pi\epsilon_0 ab}{b-a}$

15. **(2)**



C_1 & C_2 are in parallel and combination of (C_1 & C_2) is in series with C_3



$$C_{a-b}=C_1+C_2=K_1\frac{\epsilon_0 A/2}{d/2}+K_2\frac{\epsilon_0 A/2}{d/2}$$

$$=(K_1+K_2)\frac{\epsilon_0 A}{d}$$

$$C_3=K_3\frac{\epsilon_0 A}{d/2}=2K_3\frac{\epsilon_0 A}{d}\ \&\ \text{C}=\frac{K\epsilon_0 A}{d}$$

$$\frac{1}{C_{a-c}}=\frac{1}{C_{a-b}}+\frac{1}{C_{b-c}}$$

$$\Rightarrow\frac{1}{C}=\frac{d}{\epsilon_A A(K_{K_1+K_2})}+\frac{d}{2K_3\epsilon_0 A}$$

$$\Rightarrow\frac{d}{\epsilon_0 A\cdot K}=\frac{d}{\epsilon_0 A\cdot(K_1+K_2)}+\frac{d}{\epsilon_0 A\cdot 2K_3}$$

$$\Rightarrow\frac{1}{K}=\frac{1}{K_1+K_2}+\frac{1}{2K_3}$$

16. **(4)**

17. **(3)** $R_0+R_0\times\frac{40}{100}=R_0\left[1+\propto(T-0)\right]$

$$1+0.4=1+3.92\times10^{-3}\times T$$

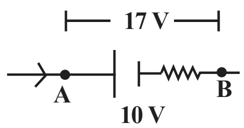
$$\Rightarrow 0.4=3.92\times10^{-3}\times\text{T}$$

$$\frac{0.4}{3.92\times10^{-3}}=\text{T}$$

100 °C = T

18. **(3)** Because bulb Q is short circuited so no current will pass through Q.

19. **(4)**

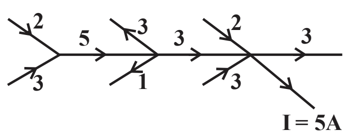


$$\text{V}_\text{A}-\text{V}_\text{B}=10+2.r$$

$$\Rightarrow 17=10+2r$$

$$\Rightarrow 7=2r\ \Rightarrow r=3.5\Omega$$

20. **(2)**



21. **(4)** 5, 12 & 17 are short circuited no current will pass through these bulbs.

22. **(1)** $R_{eq}=20\ \Omega$

$$i=\frac{60}{20}=3A$$

Voltage through 10 Ω = 3 × 10 = 30 V

23. **(4)** $i = \frac{60}{20} = 3A$

24. **(4)** R_{eq} of circuit $= \frac{R \times 1}{R+1} + 1$

$$= \frac{R+R+1}{R+1} = \frac{2R+1}{R+1}$$

Current through battery $= 15 \times \frac{R+1}{2R+1}$

Power through battery = Power dissipated through circuit = VI

$$\Rightarrow 150 = \frac{15}{2R+1} \cdot (R+1)15$$

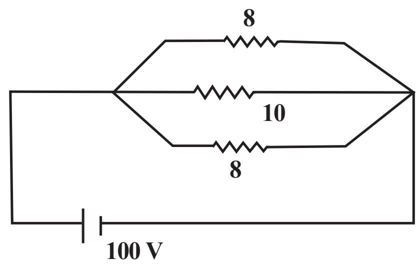
$$\Rightarrow 150 = \frac{15 \times 15}{(2R+1)}(R+1)$$

20R + 10 = 15 R + 15

5R = 5

R = 1

25. **(2)**



Current through middle row $= \frac{100}{10} = 10A$

So current through bulb no 9 = 10 A also

Power dissipated = i^2 R

$= 10^2 . 2 = 200$ W

26. **(1)**

27. **(2)** In an electrolyte there are positive and negative ions which drifts inside the electrolyte chemical when an electric field is applied onto it by some external potential difference.

28. **(1)** The current is steady that means the total amount of charge flowing through all the cross sections of the wire are same.

29. **(2)** When cells are arranged in parallel the current is divided in all the cell branches so current capacity of the equivalent cell increases.

30. **(3)** In parallel combination voltage across all resistors is equal and current is divided in inverse ratio of the resistance.

31. **(4)** $C_{air} = \frac{C_{medium}}{K} = \frac{C}{2}$

32. **(4)**

33. **(4)** $Q = (kC)V$

$$= \left(\frac{5}{3} \times 90\mu F\right)(20V)$$

= 3000 pC

= $3nC$

induced charges on dielectric

$$Q_{ind} = Q\left(1 - \frac{1}{K}\right) = 3nC\left(1 - \frac{3}{5}\right) = 1.2\,nC$$

34. **(4)** Let R be resistance of each bulb. When the bulbs are connected in series, $R_S = 3R$

$$\therefore P_S = \frac{V^2}{R_S} = \frac{V^2}{3R} \quad ...(i)$$

When the bulbs are connected in parallel,

$$\frac{1}{R_P} = \frac{1}{R} + \frac{1}{R} + \frac{1}{R} \text{ or } R_P = \frac{R}{3}$$

$$\therefore P_P = \frac{V^2}{R_P} = \frac{V^2}{(R/3)} = \frac{3V^2}{R} \quad ...(ii)$$

Divide (ii) by (i), we get, $\frac{P_P}{P_S} = \frac{3V^2}{R} \times \frac{3R}{V^2} = 9$

$$P_P = 9P_S = 9 \times 20W = 180W$$

35. **(1)**

$$i_g = i\frac{S}{G+S} \Rightarrow 10 \times 10^{-3} = \frac{S}{100+S} \times 100 \times 10^{-3}$$

$$90\text{ S} = 1000 \Rightarrow S = \frac{1000}{90} = 11.11\Omega.$$

Section - B (Attempt Any 10 Questions)

36. **(4)**

37. **(3)** The potential difference is divided in inverse ratio of capacitance in series combination so we use

$$V_{3\mu F} = \frac{6\times120}{3+6} = 80\text{ V}$$

38. **(2)**

In steady state, the capacitor branch acts like an open circuit. So the potential difference across C is the same which is there across resistance r_2, given as

$$V_{r2} = \frac{Vr_2}{(r_1+r_2)}$$

39. **(2)** The equivalent capacitance of the system shown in figure is given as

$$C_{eq} = 2C = 2\frac{\in_0 A}{d}$$

$$\Rightarrow C_{eq} = \frac{2\times8.85\times10^{-12}\times50\times10^{-4}}{3\times10^{-3}}$$

$$\Rightarrow C_{eq} = 2.95\times10^{-11}\text{F}$$

The energy stored between plates is given as

$$\text{U} = \frac{1}{2}C_{eq}V^2$$

$$\Rightarrow U = \frac{1}{2}\times2.95\times10^{-11}\times12^2 J$$

$$\Rightarrow U = 2.1\times10^{-9} J$$

40. **(4)** For the series combination of the top branch we have

$$\frac{V_{1\mu F}}{V_{1.5\mu F}} = \frac{1.5}{1}$$

$$\Rightarrow V_{1\mu F} = \left(\frac{1.5}{1.5+1}\right)(30) = 18V$$

For the series combination of the lower branch we have

$$\frac{V_{2.5\mu F}}{V_{0.5\mu F}} = \frac{0.5}{2.5} = \frac{1}{5}$$

$$\Rightarrow V_{2.5\mu F} = \left(\frac{1}{1+6}\right)(30) = 5V$$

$$\Rightarrow |V_{ab}| = V_{1\mu F} - V_{2.5\mu F} = 13V$$

41. **(1)** 20 Ω is removed since wheat stone bridge

$$\text{res.} = \frac{18\times9}{18+9} = 6\Omega$$

$$\text{R}_{eq}\text{ of circuit} = \frac{6\times6}{6+6} + 1$$

$$= 4\Omega$$

42. **(4)** at S.S, capacitor offers infinite resistance

So current through 1 Ω = $\frac{20}{4} = 5\text{A}$

P.D. through capacitor = 5 × 1 = 5V

Charge Q = CV = 1 μF × 5V = 5 μC

43. **(4)** Circuit current flows in clockwise and it is given as

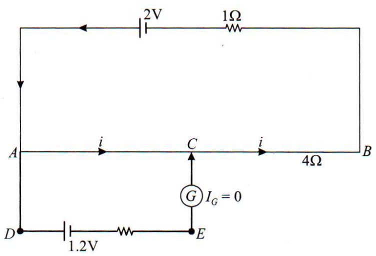
$$i = \frac{10-5}{2.5+2.5+40} = \frac{1}{9}\text{A}$$

Writing equation of potential drops from B to A gives

$$V_B - 15i - 25i = V_A$$

$$\Rightarrow V_A - V_B - 40i = -\frac{40}{9}V$$

44. **(4)** In the figure shown below at null deflection we have $V_{AC} = V_{DE}$



$$\Rightarrow \quad i(R_{AC}) = E = 1.2$$

$$\Rightarrow \quad \left(\frac{2}{4+1}\right)\left(\frac{4}{100}\times l\right) = 1.2$$

$$\Rightarrow \quad l = 75\text{cm}$$

45. **(3)** $R = \rho \cdot \frac{l}{A}$ So R $\propto$ l

$$R_{final} = R_0 \times 1.25$$

$$P_{initial} = \frac{V^2}{R_0}$$

$$P_{final} = \frac{V^2}{R_0 \times 1.25}$$

Since voltage of supply wil be smae.

$$\text{decrement} = \frac{P_{final} - P_{initial}}{P_{initial}} \times 100$$

$$\frac{\frac{V^2}{R_0 \times 1.25} - \frac{V^2}{R_0}}{\frac{V^2}{R_0}} \times 100$$

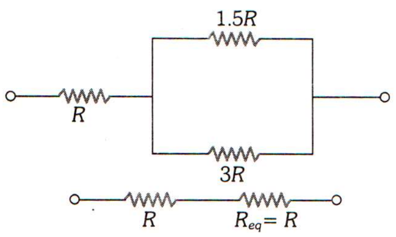
$$\Rightarrow \left(\frac{100}{125} - 1\right) \times 100 = \frac{-25}{125} \times 100 = -20\%$$

46. **(2)** No current flows through the capacitor branch in steady state. Total current supplied by the battery

$$i = \frac{6}{2.8 + 1.2} = \frac{3}{2}$$

Current through 2 Ω resistor $= \frac{3}{2} \times \frac{3}{5} = 0.9$ A

47. **(4)** $V_B = V_C = V_A$



48. **(1)** For ohmic resistance V $\propto i \Rightarrow V = Ri$ (here R is constant)

49. **(1)** Slope of V-i curve at any point equals to resistance at that point. From the curve slope for T_1 > slope for T_2 $\Rightarrow R_{T_1} > R_{T_2}$. Also at higher temperature resistance will be higher so $T_1 > T_2$.

50. **(2)** According to Kirchoff's second law for a complete traversal of a closed loop the algebraic sum of changes in potential is zero, *i.e.*, $\sum \Delta V = 0$.

For n closed loops there will be $(n-1)$ equations.

CHEMISTRY

SECTION - A (35 Questions)

51. **(3)**

Both are correct

52. **(1)**

H_2 is anode and Cu is cathode

53. **(3)**

Remains same

54. **(3)**

O_2 at anode and Cu at cathode

55. **(1)**

Anode is negative electrode

56. **(1)**

E^o is an intensive property.

57. **(3)**

Oxygen

58. **(3)**

Both (1) and (2)

59. **(3)**

R.A. itself gets oxidised easily, i.e., Mg.

60. **(2)**

0.1M HCl

61. **(2)**

$$R = \rho \frac{l}{A}$$

$$\frac{1}{\rho} = \frac{1}{R} \times \frac{l}{A}$$

$$\kappa = \frac{G^*}{R}$$

62. **(1)**

$E_{cell} = 0$

63. **(4)**

Compounds of active metals (Zn, Na, Mg) are reducible by H_2 whereas those of noble metals (Cu, Ag, Au) are not reducible.

64. **(4)**

Mn

65. **(4)**

Λ^{o}_{NaCl}

66. **(2)**

Kohlrausch's law states that at infinite dilution, each ion makes definite contribution to equivalent conductance of an electrolyte whatever be the nature of the other ion of the electrolyte.

67. **(3)**

R.P. of C > A > B.

68. **(3)**

E_{cell} is an intensive property while ΔG of cell reaction is an extensive property

69. **(4)**

EMF of a cell = Reduction potential of cathode

– Reduction potential of anode

= Reduction potential of cathode

+ Oxidation potential of anode

= Oxidation potential of anode

– Oxidation potential of cathod.

70. **(1)**

Strong electrolytes are completely ionised at all concentrations. On increasing dilution the no. of ions remains the same but the ionic mobility increases and the equivalent conduction increases.

71. **(3)**

$$E_{cell} = 0 - \frac{0.06}{2}\log\frac{C_1}{C_2} > 0 \text{ when } C_1 < C_2$$

72. **(3)**

$$E_{cell} = E^{o}_{cell} - \frac{0.059}{2}\log\left\{\frac{[Sn^{2+}]}{[Ag^{+}]^2}\right\}$$

73. **(4)**

Statement-1 is false, statement-2 is true

74. **(3)**

Statement-1 is true, statement-2 is false

75. **(1)**

$PbSO_4$ anode is reduced to Pb

76. **(3)**

$$1 = \eta \times 3 \quad \Rightarrow \eta = \frac{1}{3}$$

77. **(1)**

$$\Delta_r G = -2.303RT \log K$$

78. **(3)**

Gold has higher reduction potential than iron

79. **(1)**

At anode : $Sn \longrightarrow Sn^{2+} + 2e^{-}$ is more spontaneous

80. **(4)**

Pure copper as cathode and impure sample as anode

81. **(4)**

Dilute H_2SO_4 using Cu electrode

82. **(2)**

(a-u), (b-v), (c-w), (d-x)

83. **(1)**

Cr

84. **(1)**

–A

85. **(4)**

There is no reaction

SECTION - B (Attempt Any 10 Questions)

86. **(1)**

$Br^- < Fe^{2+} < Al$

87. **(2)**

Species having higher reduction potential will have greater oxidising power.

88. **(4)**

$$(n_{Ag}) \times 1 = (n_{Cu}) \times 2 = (n_{Au}) \times 3$$

89. **(4)**

$$\frac{[x_1 + x_2 - 2x_3]}{2}$$

90. **(3)**

$$\Delta G^\circ = -nFE^\circ = -2.303 RT \log_{10} K$$

$$\Rightarrow E^\circ = \frac{0.0591}{2} \log_{10}(2 \times 10^{19}) = +0.57\ V$$

91. **(4)**

For a galvanic cell, $\Delta G < 0$ or $E_{cell} > 0$ and $Q < K,\ \Delta G^\circ < 0$.

92. **(4)**

According to Faraday's second law,

$$\frac{W_{Ag}}{E_{Ag}} = \frac{W_{O_2}}{E_{O_2}} \text{ or } \frac{W_{Ag}}{108} = \frac{\frac{5600}{22400} \times 32}{8}$$

$$\text{or } \frac{W_{Ag}}{108} = \frac{8}{8} \Rightarrow W_{Ag} = 108\ g$$

93. **(2)**

Statement-1 is true, statement-2 is true, statement-2 is not a correct explanation for statement-1

94. **(3)**

$$E_{R.P.} = -\frac{0.06}{2} \log\left\{\frac{P_{H_2}}{[H^+]^2}\right\} < 0 \text{ when } P_{H_2} > [H^+]^2$$

95. **(2)**

Decreases by 59 mV

96. **(3)**

(a-q), (b-r), (c-q, s), (d-p, r)

97. **(2)**

$$HA(aq) \rightleftharpoons H^+(aq) + A^-(aq)$$

At eqm. $c(1-\alpha) \qquad c\alpha \qquad c\alpha$

$$K_a = \frac{c\alpha^2}{1-\alpha}; \text{where } \alpha = \frac{\Lambda_m}{\Lambda_m^\infty}$$

$$\therefore\ K_a = \frac{x\left(\frac{\Lambda_m}{\Lambda_m^\infty}\right)^2}{\left(1 - \frac{\Lambda_m}{\Lambda_m^\infty}\right)}$$

$$= \frac{c\Lambda_m^2}{\Lambda_m^\infty(\Lambda_m^\infty - \Lambda_m)}$$

98. **(3)**

$$\frac{2}{\frac{197}{3}} = \frac{i \times 20 \times 60}{96500} \Rightarrow i = 2.449\ A$$

99. **(2)**

A, D

100. **(4)**

$$E_{cell} = E^\circ_{cell} - \frac{0.059}{n} \log Q$$

$$= 1.67 - \frac{0.059}{4} \log 10^7$$

$$= 1.67 - \frac{0.059}{4} \times 7$$

$$= 1.67 - 0.103$$

$$= 1.567\ V$$