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NEET FRESH 2023-24

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

Answer Key Version - S (NEET FRESH All Batches)

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PHYSICS

SECTION - A (35 Questions)

01. **(4)**

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

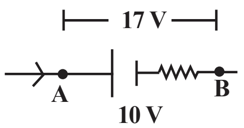
$1 + 0.4 = 1 + 3.92 \times 10^{-3} \times T$

$\Rightarrow 0.4 = 3.92 \times 10^{-3} \times T$

$\frac{0.4}{3.92 \times 10^{-3}} = T$

100 °C = T

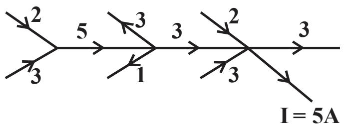
03. **(3)** Because bulb Q is short circuited so no current will pass through Q.

04. **(4)** 

$V_A - V_B = 10 + 2.r$

$\Rightarrow 17 = 10 + 2r$

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

05. **(2)** 

06. **(4)** 5, 12 & 17 are short circuited no current will pass through these bulbs.

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

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

Voltage through $10\Omega = 3 \times 10 = 30$ V

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

09. **(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

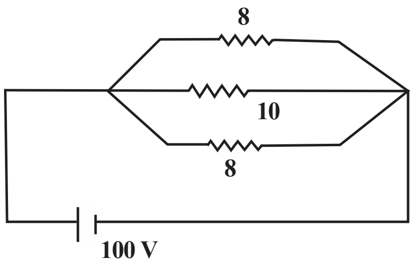
$\Rightarrow 150 = \frac{15}{2R + 1} \cdot (R + 1)15$

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

20R + 10 = 15 R + 15

5R = 5

R = 1

10. **(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

11. **(1)**

12. **(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.

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

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

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

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

17. **(4)**

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

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

$= 3000$ pC

$= 3nC$

induced charges on dielectric

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

19. **(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, $\frac{P_P}{P_S}=\frac{3V^2}{R}\times\frac{3R}{V^2}=9$

$P_P=9P_S=9\times 20W=180\text{W}$

20. **(1)**

$$i_g=i\frac{S}{G+S}\Rightarrow 10\times10^{-3}=\frac{S}{100+S}\times 100\times 10^{-3}$$

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

21. **(3)**

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

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

23. **(2)** Charge on 1 μF = CV = $1\times10^{-6}\times 10$

$= 10^{-6}\times 10 = 10\ \mu$ 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 → Q_1, Q_2 respectively

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

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

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

24. **(4)** Let's assume V be the voltage of battery then energy stored in position 1 = $\frac{1}{2}\times2\times V^2\mu\text{J} = \text{V}^2\mu\text{J}$

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 =

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

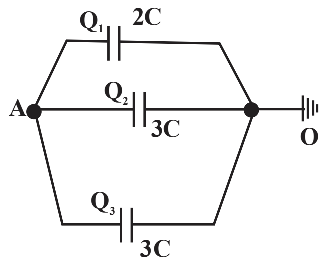
energy dissipated = $V^2-\frac{V^2}{6}=\frac{5V^2}{6}$

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

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

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

26. **(2)**



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

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

$\Rightarrow Q_1 = \frac{2}{8} \times 16\,\mu C = 4\mu C$

27. **(1)** $C_1 = \frac{\epsilon_0 A}{d}$

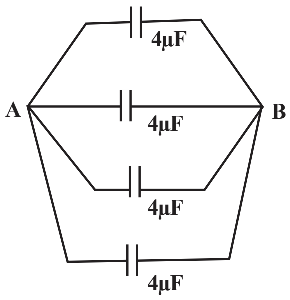
$$C_f = \frac{\epsilon_0 A}{d - \frac{d}{2} + \frac{d}{2\infty}} = \frac{2\epsilon_0 A}{d}$$

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

28. **(1)**

29. **(2)**

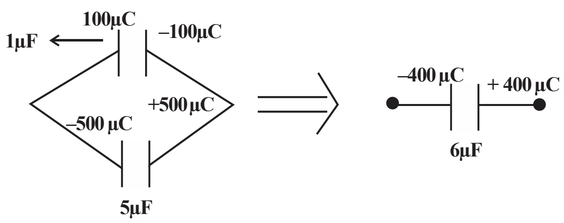
30. **(4)**



Eq. Capacitance (A & B)

$= 16\,\mu F$

31. **(2)**



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

32. **(2)** $V = \frac{1}{2} \times 1 \times 100^2 + \frac{1}{2} \times 5 \times 100^2$

$$= \frac{1}{2} \times 6 \times 10^4 \mu\ J$$

$$= 3 \times 10^4 \times 10^{-6} J = 3\ \times 10^{-2}\ J$$

33. **(4)** $Q_{net} = 400\,\mu C$

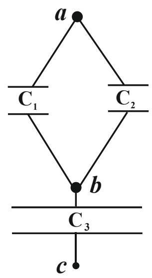
$C_{net} = 6\mu F$

$$V = \frac{Q^2}{2C} = \frac{400 \times 400}{2 \times 6} = \frac{4}{3} \times 10^4 \mu\ J$$

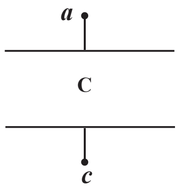
$$= 1.33 \times 10^{-2} J$$

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

35. **(2)**



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



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

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

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

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

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

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

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

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

$$V_{3\mu F} = \frac{6 \times 120}{3 + 6} = 80\ V$$

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

$$C_{eq} = 2C = 2\frac{\epsilon_0 A}{d}$$

$$\Rightarrow C_{eq} = \frac{2\times 8.85\times 10^{-12}\times 50\times 10^{-4}}{3\times 10^{-3}}$$

$$\Rightarrow C_{eq} = 2.95\times 10^{-11}\text{F}$$

The energy stored between plates is given as

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

$$\Rightarrow U = \frac{1}{2}\times 2.95\times 10^{-11}\times 12^2 J$$

$$\Rightarrow U = 2.1\times 10^{-9} J$$

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

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

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

$$= 4\Omega$$

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

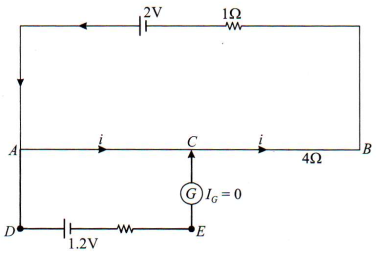
43. **(4)** Circuit current flows in clockwise and it is given as

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

Writing equation of potential drops from B to A gives

$$V_B - 15i - 25i = V_A \quad \Rightarrow V_A - V_B - 40i = -\frac{40}{9}V$$

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.

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

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

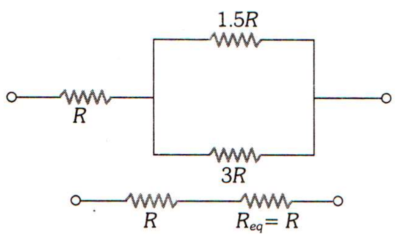
$$\Rightarrow\left(\frac{100}{125}-1\right)\times 100=\frac{-25}{125}\times 100=-20\%$$

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 $2\,\Omega$ 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. **(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.

52. **(3)**

R.P. of C > A > B.

53. **(3)**

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

54. **(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.

55. **(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.

56. **(3)**

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

57. **(3)**

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

58. **(4)**

Statement-1 is false, statement-2 is true

59. **(3)**

Statement-1 is true, statement-2 is false

60. **(1)**

$PbSO_4$ anode is reduced to Pb

61. **(3)**

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

62. **(1)**

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

63. **(3)** Gold has higher reduction potential than iron

64. **(1)**

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

65. **(4)**

Pure copper as cathode and impure sample as anode

66. **(4)**

Dilute H_2SO_4 using Cu electrode

67. **(2)**

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

68. **(1)**

Cr

69. **(1)**

$-A$

70. **(4)**

There is no reaction

71. **(3)**

Both are correct

72. **(1)**

H_2 is anode and Cu is cathode

73. **(3)**

Remains same

74. **(3)**

O_2 at anode and Cu at cathode

75. **(1)**

Anode is negative electrode

76. **(1)**

E° is an intensive property.

77. **(3)**

Oxygen

78. **(3)**

Both (1) and (2)

79. **(3)** R.A. itself gets oxidised easily, i.e., Mg.

80. **(2)**

0.1M HCl

81. **(2)**

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

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

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

82. **(1)**

$E_{cell} = 0$

83. **(4)**

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

84. **(4)**

Mn

85. **(4)**

Λ^{o}_{NaCl}

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 $Q < K$, $\Delta G^o < 0$.

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)**

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

$$\text{At eqm.} \quad c(1-\alpha) \qquad c\alpha \qquad c\alpha$$

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

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

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

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)**

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

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

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

$$= 1.67 - 0.103$$

$$= 1.567\,V$$