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NEET FRESH 2023-24

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

Answer Key Version - Q (NEET FRESH All Batches)

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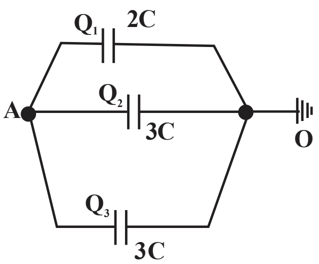
PHYSICS

SECTION - A (35 Questions)

01. **(2)**



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

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

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

02. **(1)** $C_1 = \dfrac{\epsilon_0 A}{d}$

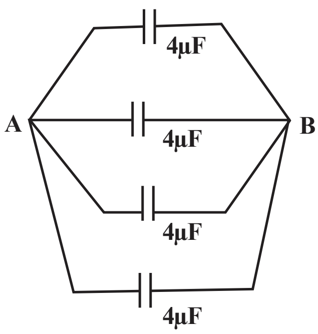
$C_f = \dfrac{\epsilon_0 A}{d - \dfrac{d}{2} + \dfrac{d}{2\infty}} = \dfrac{2\epsilon_0 A}{d}$

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

03. **(1)**

04. **(2)**

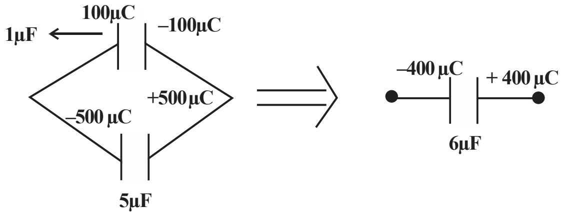
05. **(4)**



Eq. Capacitance (A & B)

$= 16\,\mu F$

06. **(2)**



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

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

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

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

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

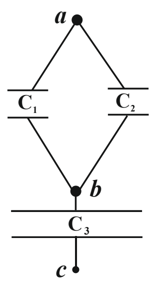
$C_{net} = 6\mu F$

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

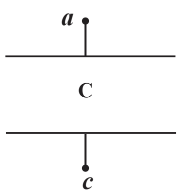
$= 1.33 \times 10^{-2} J$

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

10. **(2)**



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



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

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

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

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

$$\Rightarrow \frac{1}{C} = \frac{d}{\in_A A(K_{K_1+K_2})} + \frac{d}{2K_3 \in_0 A}$$

$$\Rightarrow \frac{d}{\in_0 A \cdot K} = \frac{d}{\in_0 A \cdot (K_1 + K_2)} + \frac{d}{\in_0 A \cdot 2K_3}$$

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

11. **(4)**

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

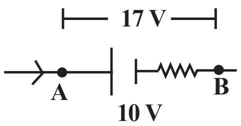
$1 + 0.4 = 1 + 3.92 \times 10^{-3} \times T$

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

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

100 °C = T

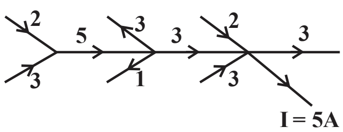
13. **(3)** Because bulb Q is short circuited so no current will pass through Q.

14. **(4)** 

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

$\Rightarrow 17 = 10 + 2r$

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

15. **(2)** 

16. **(4)** 5, 12 & 17 are short circuited no current will pass through these bulbs.

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

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

Voltage through 10 Ω = 3 × 10 = 30 V

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

19. **(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

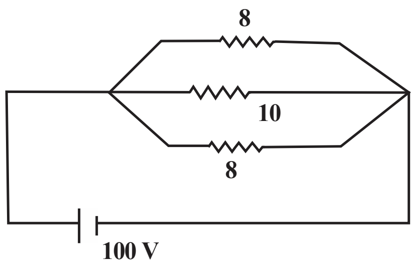
$\Rightarrow 150 = \frac{15}{2R+1} \cdot (R+1)15$

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

20R + 10 = 15 R + 15

5R = 5

R = 1

20. **(2)** 

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

So current through bulb no 9 = 10 A also

Power dissipated = i^2 R

$= 10^2 . 2 = 200$ W

21. **(1)**

22. **(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.

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

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

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

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

27. **(4)**

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

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

= 3000 pC

= $3nC$

induced charges on dielectric

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

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

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

When the bulbs are connected in parallel,

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

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

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

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

30. **(1)**

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

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

31. **(3)**

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

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

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

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

charge on 3 μF = CV = $3 \times 10^{-6} \times 20 = -60\mu C$

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

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

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

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

Initial charge on $2\mu F \times V = 2V\mu C$

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 =

$$\frac{1}{2} \times 2 \times \left(\frac{V}{6}\right)^2 + \frac{1}{2} \times 10 \times \left(\frac{V}{6}\right)^2 = \frac{V^2}{6}\mu J$$

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

% energy dissipated = $\frac{5V^2}{6V^2} \times 100 = 83.33\%$

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

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

Section - B (Attempt Any 10 Questions)

36. **(1)** 20 Ω is removed since wheat stone bridge

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

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

$$= 4\Omega$$

37. **(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

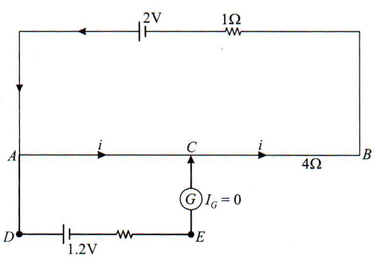
38. **(4)** Circuit current flows in clockwise and it is given as

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

Writing equation of potential drops from B to A gives

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

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



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

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

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

40. **(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.

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

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

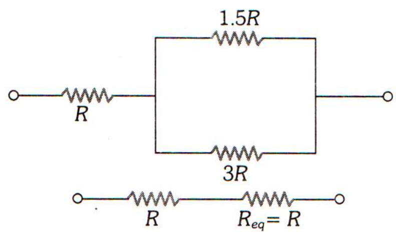
$$\Rightarrow \left(\frac{100}{125} - 1\right)\times 100 = \frac{-25}{125}\times 100 = -20\%$$

41. **(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 $= \frac{3}{2}\times\frac{3}{5} = 0.9\text{ A}$

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



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

44. **(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 $T_1 > T_2$.

45. **(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.

46. **(4)**

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

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

48. **(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

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

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

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

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

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

The energy stored between plates is given as

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

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

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

50. **(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

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

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

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

CHEMISTRY

SECTION - A (35 Questions)

51. **(1)**

E° is an intensive property.

52. **(3)**

Oxygen

53. **(3)**

Both (1) and (2)

54. **(3)**

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

55. **(2)**

0.1M HCl

56. **(2)**

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

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

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

57. **(1)**

$E_{cell}=0$

58. **(4)**

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

59. **(4)**

Mn

60. **(4)**

Λ^{o}_{NaCl}

61. **(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.

62. **(3)**

R.P. of C > A > B.

63. **(3)**

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

64. **(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.

65. **(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.

66. **(3)**

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

67. **(3)**

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

68. **(4)**

Statement-1 is false, statement-2 is true

69. **(3)**

Statement-1 is true, statement-2 is false

70. **(1)**

$PbSO_4$ anode is reduced to Pb

71. **(3)**

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

72. **(1)**

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

73. **(3)**

Gold has higher reduction potential than iron

74. **(1)**

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

75. **(4)**

Pure copper as cathode and impure sample as anode

76. **(4)**

Dilute H_2SO_4 using Cu electrode

77. **(2)**

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

78. **(1)**

Cr

79. **(1)**

–A

80. **(4)**

There is no reaction

81. **(3)**

Both are correct

82. **(1)**

H_2 is anode and Cu is cathode

83. **(3)**

Remains same

84. **(3)**

O_2 at anode and Cu at cathode

85. **(1)**

Anode is negative electrode

SECTION - B (Attempt Any 10 Questions)

86. **(4)**

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

87. **(4)**

According to Faraday's second law,

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

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

88. **(2)**

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

89. **(3)**

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

90. **(2)**

Decreases by 59 mV

91. **(3)**

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

92. **(2)**

$$\begin{array}{llll} & HA(aq) \rightleftharpoons & H^+(aq) + & A^-(aq) \\ \text{At eqm.} & c(1-\alpha) & c\alpha & c\alpha \end{array}$$

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

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

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

93. **(3)**

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

94. **(2)**

A, D

95. **(4)**

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

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

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

$$=1.67-0.103$$

$$=1.567\text{ V}$$

96. **(1)**

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

97. **(2)**

Species having higher reduction potential will have greater oxidising power.

98. **(4)**

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

99. **(4)**

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

100. **(3)**

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

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