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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 - R (NEET FRESH All Batches)

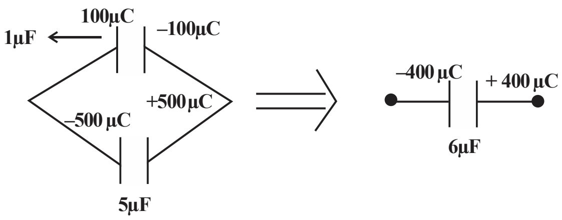
Physics					Chemistry				
Sec. A	11. 4	22. 4	33. 1	43. 2	**Sec. A**	61. 3	72. 2	83. 3	93. 4
01. 2	12. 1	23. 4	34. 2	44. 2	51. 2	62. 3	73. 1	84. 3	94. 4
02. 2	13. 4	24. 4	35. 4	45. 4	52. 1	63. 4	74. 1	85. 2	95. 3
03. 4	14. 4	25. 1	**Sec. B**	46. 1	53. 4	64. 3	75. 4	**Sec. B**	96. 4
04. 4	15. 2	26. 3	36. 2	47. 4	54. 4	65. 1	76. 3	86. 3	97. 4
05. 2	16. 1	27. 1	37. 4	48. 4	55. 4	66. 3	77. 1	87. 2	98. 2
06. 4	17. 2	28. 2	38. 1	49. 4	56. 2	67. 1	78. 3	88. 3	99. 3
07. 3	18. 1	29. 4	39. 1	50. 3	57. 3	68. 3	79. 3	89. 2	100. 2
08. 3	19. 2	30. 3	40. 2		58. 3	69. 1	80. 1	90. 4	
09. 4	20. 3	31. 2	41. 4		59. 4	70. 4	81. 1	91. 1	
10. 2	21. 4	32. 1	42. 3		60. 1	71. 4	82. 3	92. 2	

Biology									
Part-I Sec.A	110. 3	121. 3	132. 3	142. 3	**Part-II Sec.A**	160. 4	171. 2	182. 4	192. 2
	111. 4	122. 2	133. 3	143. 2		161. 1	172. 3	183. 3	193. 3
101. 4	112. 3	123. 1	134. 2	144. 3	151. 3	162. 1	173. 2	184. 2	194. 3
102. 3	113. 2	124. 4	135. 4	145. 2	152. 4	163. 3	174. 2	185. 2	195. 3
103. 2	114. 3	125. 4	**Sec.B**	146. 4	153. 2	164. 2	175. 4	**Sec. B**	196. 2
104. 1	115. 2	126. 4	136. 3	147. 4	154. 2	165. 3	176. 1	186. 4	197. 4
105. 3	116. 4	127. 4	137. 3	148. 2	155. 1	166. 3	177. 1	187. 3	198. 1
106. 3	117. 2	128. 2	138. 3	149. 4	156. 3	167. 1	178. 3	188. 3	199. 2
107. 2	118. 3	129. 1	139. 1	150. 3	157. 2	168. 1	179. 1	189. 2	200. 3
108. 1	119. 4	130. 2	140. 4		158. 4	169. 3	180. 4	190. 3	
109. 4	120. 4	131. 1	141. 2		159. 1	170. 3	181. 2	191. 3	

PHYSICS

SECTION - A (35 Questions)

01. **(2)**



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

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

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

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

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

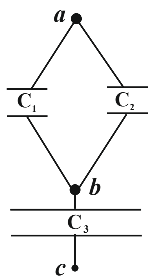
$$C_{net} = 6\mu\text{F}$$

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

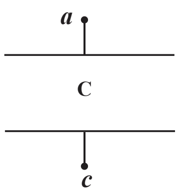
$$= 1.33\times 10^{-2}\text{J}$$

04. **(4)** $C = \frac{4\pi \in_0 ab}{b-a}$

05. **(2)**



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



$$C_{a-b} = C_1 + C_2 = K_1\frac{\in_0 A/2}{d/2} + K_2\frac{\in_0 A/2}{d/2}$$

$$= (K_1 + K_2)\frac{\in_0 A}{d}$$

$$C_3 = K_3\frac{\in_0 A}{d/2} = 2K_3\frac{\in_0 A}{d}\ \&\ \text{C} = \frac{K\in_0 A}{d}$$

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

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

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

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

06. **(4)**

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

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

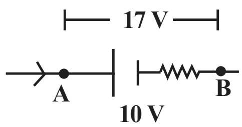
$$\Rightarrow 0.4 = 3.92\times 10^{-3}\times \text{T}$$

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

$$100\ °\text{C} = \text{T}$$

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

09. **(4)**

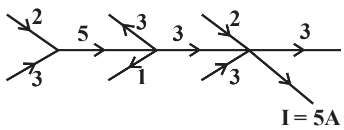


$$\text{V}_\text{A} - \text{V}_\text{B} = 10 + 2.r$$

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

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

10. **(2)**



11. **(4)** 5, 12 & 17 are short circuited no current will pass through these bulbs.

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

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

Voltage through 10 Ω = 3 × 10 = 30 V

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

14. **(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

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

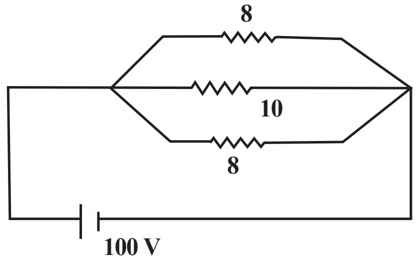
$$\Rightarrow 150 = \frac{15 \times 15}{(2R+1)}(R+1)$$

20R + 10 = 15 R + 15

5R = 5

R = 1

15. **(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

16. **(1)**

17. **(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.

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

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

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

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

22. **(4)**

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

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

= 3000 pC

$= 3nC$

induced charges on dielectric

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

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

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

25. **(1)**

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

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

26. **(3)**

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

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

28. **(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

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

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

29. **(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 =

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

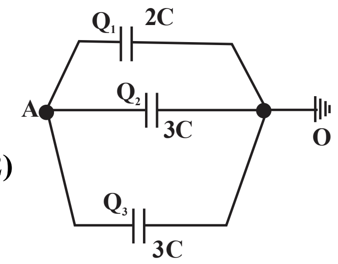
$$\text{energy dissipated} = V^2 - \frac{V^2}{6} = \frac{5V^2}{6}$$

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

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

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

31. **(2)**



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

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

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

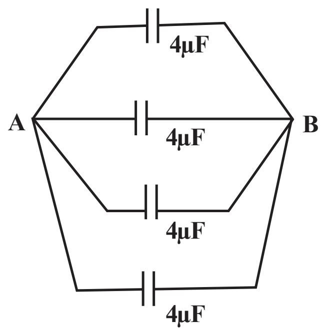
32. **(1)** $C_1 = \frac{\in_0 A}{d}$

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

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

33. **(1)** 34. **(2)**

35. **(4)**



Eq. Capacitance (A & B)

= 16 μF

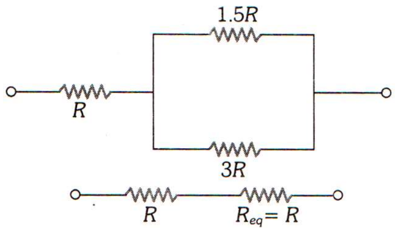
Section - B (Attempt Any 10 Questions)

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

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



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

39. **(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 $T_1 > T_2$.

40. **(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.

41. **(4)**

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

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

43. **(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

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

44. **(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

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

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

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

45. **(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

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

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

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

46. **(1)** 20 Ω is removed since wheat stone bridge

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

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

$$= 4\Omega$$

47. **(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

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

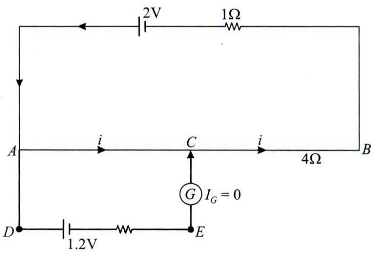
$$i = \frac{10-5}{2.5+2.5+40} = \frac{1}{9}\text{A}$$

Writing equation of potential drops from B to A gives

$V_B - 15i - 25i = V_A$

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

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



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

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

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

50. **(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.

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

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

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

CHEMISTRY

SECTION - A (35 Questions)

51. **(2)**

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

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

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

52. **(1)**

$E_{cell} = 0$

53. **(4)**

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

54. **(4)**

Mn

55. **(4)**

Λ^{o}_{NaCl}

56. **(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.

57. **(3)**

R.P. of C > A > B.

58. **(3)**

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

59. **(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.

60. **(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.

61. **(3)**

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

62. **(3)**

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

63. **(4)**

Statement-1 is false, statement-2 is true

64. **(3)**

Statement-1 is true, statement-2 is false

65. **(1)**

$PbSO_4$ anode is reduced to Pb

66. **(3)**

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

67. **(1)**

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

68. **(3)**

Gold has higher reduction potential than iron

69. **(1)**

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

70. **(4)**

Pure copper as cathode and impure sample as anode

71. **(4)**

Dilute H_2SO_4 using Cu electrode

72. **(2)**

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

73. **(1)**

Cr

74. **(1)**

–A

75. **(4)**

There is no reaction

76. **(3)**

Both are correct

77. **(1)**

H_2 is anode and Cu is cathode

78. **(3)**

Remains same

79. **(3)**

O_2 at anode and Cu at cathode

80. **(1)**

Anode is negative electrode

81. **(1)**

E^o is an intensive property.

82. **(3)**

Oxygen

83. **(3)**

Both (1) and (2)

84. **(3)**

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

85. **(2)**

0.1M HCl

SECTION - B (Attempt Any 10 Questions)

86. **(3)**

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

87. **(2)**

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

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

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

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

88. **(3)**

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

89. **(2)**

A, D

90. **(4)**

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

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

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

$$= 1.67 - 0.103$$

$$= 1.567\text{ V}$$

91. **(1)**

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

92. **(2)**

Species having higher reduction potential will have greater oxidising power.

93. **(4)**

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

94. **(4)**

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

95. **(3)**

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

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

96. **(4)**

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

97. **(4)**

According to Faraday's second law,

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

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

98. **(2)**

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

99. **(3)**

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

100. **(2)**

Decreases by 59 mV