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Daily Practice Problems

JEE PHYSICS

Topic: Current Electricity

Q.1 An electric current is established in a hydrogen gas discharge tube when a high voltage is applied across the two electrodes in the tube. The gas is ionised. Electrons move towards the positive terminal and the positive ions towards the negative terminal. The magnitude of the current in the tube in which 3.1×10^{18} electrons and 1.1×10^{18} protons move past a cross-sectional area of the tube each second will be -

(A) 1.6 A (B) 3.2 A

(C) 0.16 A (D) 0.672 A

Q.2 A charge of 2×10^{-2} C moves at 30 revolution per second in a circle of diameter 0.80 m. The current linked with the circuit will be -

(A) 0.1 A (B) 0.2 A

(C) 0.4 A (D) 0.6 A

Q.3 The current in a copper wire is increased by increasing the potential difference between its end. Which one of the following statements regarding n, the number of charge carriers per unit volume in the wire and v the drift velocity of the charge carriers is correct -

(A) n is unaltered but v is decreased

(B) n is unaltered but v is increased

(C) n is increased but v is decreased

(D) n is increased but v is unaltered

Q.4 A wire of resistance 32 Ω is melted and drawn into a wire of half of its original length. The resistance of new wire and percentage decrease in resistance -

(A) 8Ω, 75% (B) 8Ω, 50%

(C) 16Ω, 75% (D) 16Ω, 50%

Q.5 Consider two conducting wires of same length and material, one wire is solid with radius r. The other is a hollow tube of outer radius 2r while inner r. The ratio of resistance of the two wires will be -

(A) 1 : 1 (B) 1 : 2

(C) 3 : 1 (D) 1 : 4

Q.6 A carbon and an aluminium wire connected in series. If the combination has resistance of 30 ohm at 0°C, what is the resistance of carbon and aluminium wire at 0°C so that the resistance of the combination does not change with temperature -

[$\alpha_C = -0.5 \times 10^{-3}\ (C°)^{-1}$

and $\alpha_{Al} = 4 \times 10^{-3}\ (C°)^{-1}$]

(A) $\frac{10}{3}\Omega, \frac{80}{3}\Omega$ (B) $\frac{80}{3}\Omega, \frac{10}{3}\Omega$

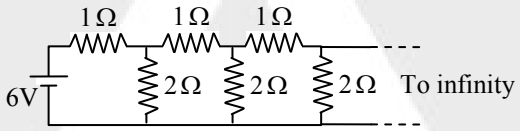
(C) 10 Ω, 80 Ω (D) 80 Ω, 10 Ω

Q.7 A resistance R_2 is connected in parallel with a resistance R_1 what resistance R_3 must be connected in series with the combination of R_1 and R_2 so that the equivalent resistance is equal to the resistance R_1 -

(A) $\frac{R_1^2}{R_1 + R_2}$ (B) $\frac{(R_1 + R_2)^2}{R_1}$

(C) $\frac{R_2^2}{R_1 + R_2}$ (D) $\frac{R_1^2}{R_2}$

Q.8 An infinite ladder network of resistance is constructed with 1Ω and 2Ω resistance. The 6V battery between A and B has negligible internal resistance. The current that passes through 2Ω resistance nearest to the battery is -



(A) 1A (B) 1.5 A

(C) 2 A (D) 2.5 A

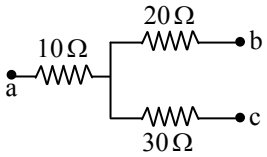
Q.9 A potential difference of 200 V is applied to a coil at a temperature of 15°C and the current is 10A. What will be the mean temperature of the coil when the current has fallen to 5A, the applied voltage being the same as before -

(Given $\alpha = \frac{1}{234}\ C^{-1}$ at 0°C)

(A) 254° (B) 256°

(C) 258° (D) 264°

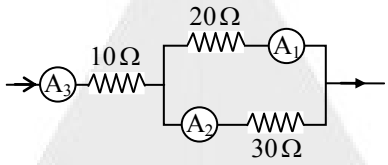
Q.10 In a given electric circuit the potentials at the points a, b and c are 30 V, 12 V and 2 V respectively. The current through resistors 10 Ω, 20 Ω and 30 Ω are -



(A) 1, 0.4, 0.6 (B) 2, 0.8, 1.2

(C) 0.6 A, 0.4 A, 1A (D) None of these

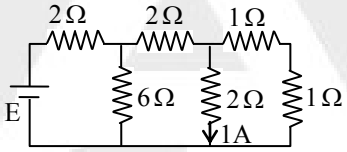
Q.11 If the reading of ammeter A_1, in figure is 2.4 A, what will the ammeter A_2 and A_3 read ? (Neglecting the resistances of ammeters) –



(A) 1.6 A, 2.3 A (B) 1.6 A, 4.0 A

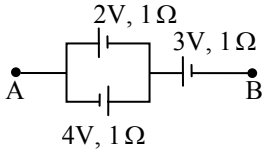
(C) 4.0 A, 1.6 A (D) 2.3 A, 1.6 A

Q.12 The emf of the battery shown in the figure is given by –



(A) 6 V (B) 12 V (C) 18 V (D) 8 V

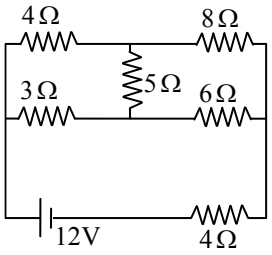
Q.13 The potential difference between points A and B is –



(A) 2 V (B) 6 V

(C) 4 V (D) 3 V

Q.14 In the given figure the ratio of current in 8Ω and 3Ω will be –



(A) $\frac{8}{3}$ (B) $\frac{3}{8}$ (C) $\frac{4}{3}$ (D) $\frac{3}{4}$

Q.15 Through an electrolyte, an electric current is due to drift of -

(A) Free electrons

(B) Free electrons and holes

(C) Positive and negative ions

(D) Protons

Q.16 A current flows in a wire of circular cross-section with the free electrons travelling with a mean drift velocity $\vec{v}$. If an equal current flows in a wire of twice the radius, new mean drift velocity is -

(A) $\vec{v}$ (B) $\vec{v}/2$

(C) $\vec{v}/4$ (D) None of these

Q.17 If a copper wire is stretched to make its radius decrease by 0.1%, then the percentage increase in resistance is approximately -

(A) 0.1% (B) 0.2% (C) 0.4% (D) 0.8%

Q.18 There is a current of 1.344 amp in a copper wire whose area of cross-section normal to the length of the wire is $1mm^2$. If the number of free electrons per cm^3 is 8.4×10^{22}, then the drift velocity would be -

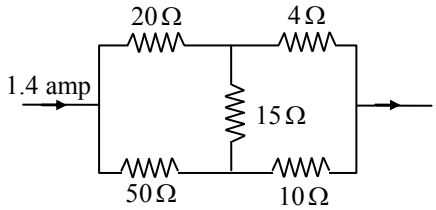
(A) 1.0 mm per sec

(B) 1.0 metre per sec

(C) 0.1 mm per sec

(D) 0.01 mm per sec

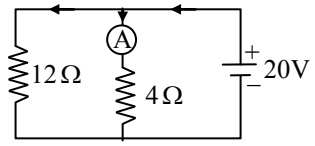
Q.19 In the following figure the current through 4 ohm resistor is -



(A) 1.4 amp (B) 0.4 amp

(C) 1.0 amp (D) 0.7 amp

Q.20 In the following figure, the reading of the ammeter A when the internal resistance of the battery is zero, is –



(A) $\frac{20}{3}$ amp (B) $\frac{20}{12}$ amp

(C) $\frac{20}{4}$ amp (D) $\left(\frac{20}{3}+\frac{20}{12}\right)$ amp

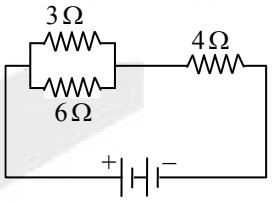
Q.21 The number of dry cells, each of e.m.f. 1.5 volt and internal resistance 0.5 Ω that must be joined in series with a resistance of 20 ohm so as to send a current of 0.6 ampere through the circuit is -

(A) 2 (B) 8 (C) 10 (D) 12

Q.22 Two batteries of different e.m.f. and internal resistance are connected in series with each other and with an external load resistor. The current is 3.0 amp. When the polarity of one battery is reversed, the current becomes 1.0 amp. The ratio of the e.m.f. of the two batteries is -

(A) 2.5 (B) 2.0 (C) 1.5 (D) 1.0

Q.23 In the following figure, current through 3Ω resistor is 0.8 amp; then the potential drop through 4Ω resistor is -



(A) 9.6 V (B) 2.6 V (C) 4.8 V (D) 1.2 V

Q.24 A cell supplies a current I_1 through a resistor of resistance R_1 and a current I_2 through a resistor of resistance R_2, then internal resistance of the cell is –

(A) $R_1 - R_2$

(B) $R_1 + R_2$

(C) $\frac{I_1R_2 + I_2R_1}{I_1 + I_1}$

(D) $\frac{I_2R_2 - I_1R_1}{I_1 - I_2}$

Q.25 The sides of a rectangular block are 2cm, 3cm and 4 cm. The ratio of maximum to minimum resistance between its parallel faces is -

(A) 4 (B) 3 (C) 2 (D) 1

Q.26 For a cell the terminal potential difference is 2.2 V when the circuit is open and reduces to 1.8 V when the cell is connected to a resistance R = 5Ω. The internal resistance of the cell (r) is-

(A) $\frac{10}{9}\Omega$ (B) $\frac{9}{10}\Omega$

(C) $\frac{11}{9}\Omega$ (D) $\frac{5}{9}\Omega$

Q.27 The current in a conductor varies with time t is $I = 2t + 3t^2$ where I is in ampere and t in seconds. Electric charge flowing through a section of conductor during t = 2 sec to t = 3 sec. is -

(A) 10 C (B) 24 C (C) 33 C (D) 44 C

Q.28 Two wires of resistance R_1 and R_2 have temperature coefficient of resistance α_1 and α_2, respectively. These are joined in series. The effective temperature coefficient of resistance is-

(A) $\frac{\alpha_1 + \alpha_2}{2}$ (B) $\sqrt{\alpha_1 \alpha_2}$

(C) $\frac{\alpha_1 R_1 + \alpha_2 R_2}{R_1 + R_2}$ (D) $\frac{\sqrt{R_1 R_2 \alpha_1 \alpha_2}}{\sqrt{R_1^2 + R_2^2}}$

Q.29 A long resistance wire is divided into 2n parts. Then n parts are connected in series and the other n parts in parallel separately. Both combinations are connected to identical supplies. Then the ratio of heat produced in series to parallel combinations will be -

(A) 1 : 1 (B) $1 : n^2$

(C) $1 : n^4$ (D) $n^2 : 1$

Q.30 Two bulbs 100 W, 250 V and 200 W, 250 V are connected in parallel across a 500 V line. Then-

(A) 100 W bulb will fused

(B) 200 W bulb will fused

(C) Both bulbs will be fused

(D) No bulb will fused

ANSWER KEY

Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Ans.	D	D	B	A	C	B	A	B	D	A
Que.	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Ans.	B	B	A	D	C	C	C	C	C	C
Que.	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Ans.	C	B	C	D	A	A	B	C	B	C