

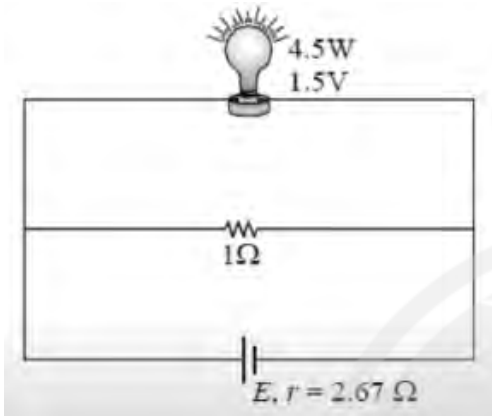
Ultimate KCET Crash Course 2026

PHYSICS

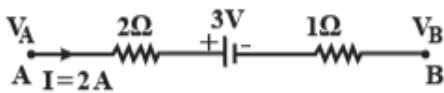
DPP: 1

Current Electricity

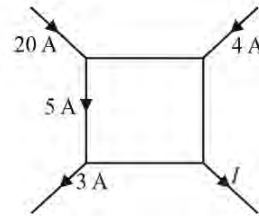
- Q1** A torch bulb rated as 4.5 W , 1.5 V is connected as shown in fig. the e.m.f. of the cell, needed to make the bulb glow at full intensity is :



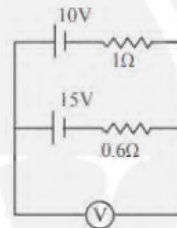
- (A) 4.5 V
 (B) 1.5 V
 (C) 2.67 V
 (D) 13.5 V
- Q2** Two wires A and B of the same material, having radii in the ratio $1 : 2$ carry currents in the ratio $4 : 1$. The ratio of drift speed of electrons in A and B is:
- (A) $16 : 1$ (B) $1 : 16$
 (C) $1 : 4$ (D) $4 : 1$
- Q3** The potential difference ($V_A - V_B$) between the points A and B in the given figure is.



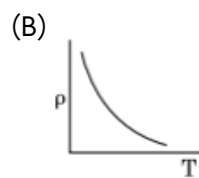
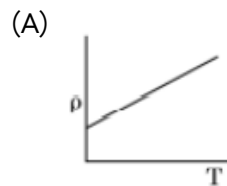
- (A) $+9\text{ V}$
 (B) -3 V
 (C) $+3\text{ V}$
 (D) $+6\text{ V}$
- Q4** For the circuit shown, the value of current I is:



- (A) 19 A (B) 21 A
 (C) 4 A (D) 8 A
- Q5** A 10 V battery with internal resistance 1Ω and a 15 V battery with internal resistance 0.6Ω are connected in parallel to a voltmeter (see figure). The reading in the voltmeter will be close to:

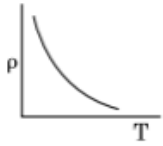


- (A) 12.5 V (B) 24.5 V
 (C) 13.1 V (D) 11.9 V
- Q6** Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper?

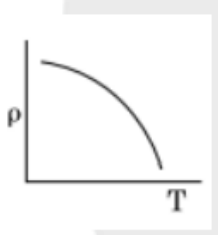


(C)

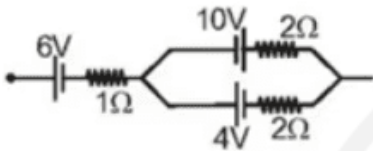




(D)

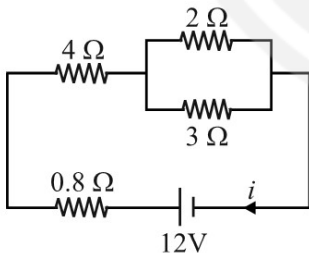


Q7 The emf and internal resistance of single battery which is the equivalent to the combination of three batteries as shown in figure are



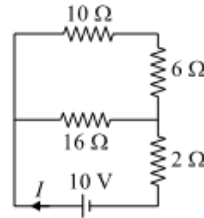
- (A) 2 V, 3Ω
- (B) 3 V, 2Ω
- (C) 20 V, 2Ω
- (D) 2 V, 20Ω

Q8 A battery of 12 V and an internal resistance of 0.8 Ω, is connected to 3 resistors as shown in the figure. The current i in the circuit is:



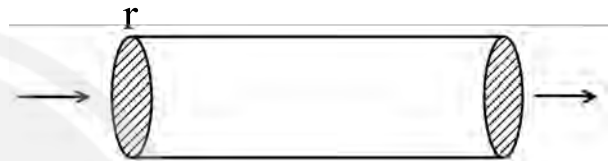
- (A) 2.3 A
- (B) 4.0 A
- (C) 2.0 A
- (D) 1.33 A

Q9 Find out the value of current (I) in the circuit shown below.



- (A) 1 A
- (B) 0.5 A
- (C) 2 A
- (D) 5 A

Q10 A cylindrical conductor of length ' l ' and radius ' r ' is made of a material with resistivity ' ρ '. If current enters from one circular face and exits from the opposite circular face, as indicated by the arrows in the figure, what is the electrical resistance of the conductor?

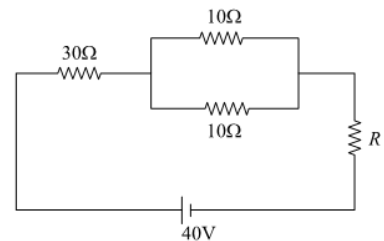


- (A) $\rho \frac{l}{\pi r^2}$
- (B) $\rho \frac{\pi r^2}{l}$
- (C) $\rho \frac{l}{2\pi r}$
- (D) $\rho \frac{2\pi r}{l}$

Q11 A charged particle moves through a region having an electric field of $4 \times 10^{-10} \text{ V m}^{-1}$. If the mobility of the particle is $3 \times 10^6 \text{ m}^2 \text{ V}^{-1} \text{ s}^{-1}$, determine the drift velocity of the particle

- (A) $1.6 \times 10^{-3} \text{ m s}^{-1}$
- (B) $8.4 \times 10^{-4} \text{ m s}^{-1}$
- (C) $1.2 \times 10^{-3} \text{ m s}^{-1}$
- (D) $7.5 \times 10^{-5} \text{ m s}^{-1}$

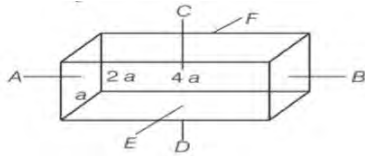
Q12 A D.C. circuit is shown in figure. The value of resistance R for which ideal battery provide 40 W power is:



- (A) 5 Ω
- (B) 10 Ω
- (C) 15 Ω
- (D) 20 Ω

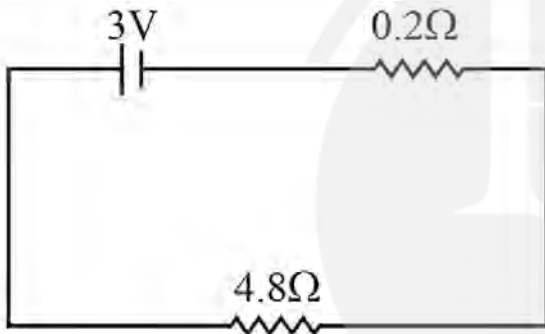


Q13 A conductor with rectangular cross-section has dimensions $(a \times 2a \times 4a)$ as shown in figure. Resistance across AB is R_1 , across CD is R_2 and across EF is R_3 . Then,



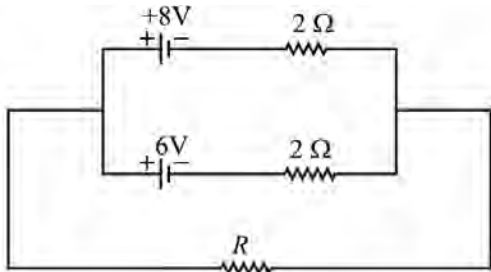
- (A) $R_1 = R_2 = R_3$
- (B) $R_1 > R_2 > R_3$
- (C) $R_2 > R_3 > R_1$
- (D) $R_1 > R_3 > R_2$

Q14 A cell of emf 3 V and internal resistance 0.2Ω is connected in series with an external resistor of 4.8Ω . The circuit is closed and a steady current flows. What is the terminal voltage across the cell?



- (A) 1.95 V
- (B) 2.10 V
- (C) 2.80 V
- (D) 1.60 V

Q15 Consider two cells connected in parallel as shown in figure, Value of $\frac{E_{eq}}{r_{eq}}$ for the two cells is: (Symbols have their usual meaning)



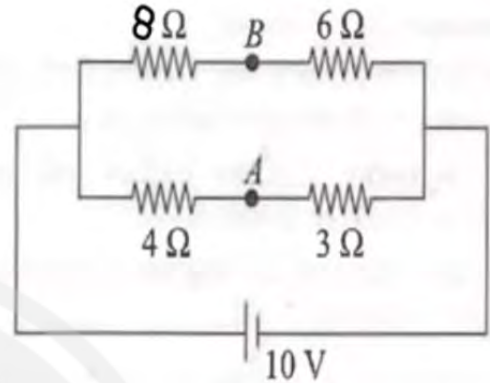
- (A) 7 A
- (B) 1 A
- (C) 2 A
- (D) 8 A

Q16

Two wires A and B of the same material, having radii in the ratio $1 : 2$ and carry currents in the ratio $4 : 1$. The ratio of drift speed of electrons in A and B is:

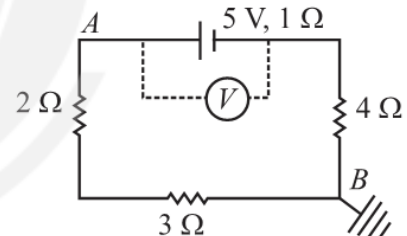
- (A) 16 : 1
- (B) 1 : 16
- (C) 1 : 4
- (D) 4 : 1

Q17 The potential difference between points A and B is



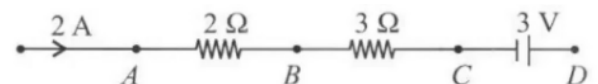
- (A) $\frac{20}{7}$ V
- (B) $\frac{40}{7}$ V
- (C) $\frac{10}{7}$ V
- (D) 0

Q18 In given circuit, the potential at point A is:



- (A) 5 volt
- (B) 0 volt
- (C) 2.5 volt
- (D) 4 volt

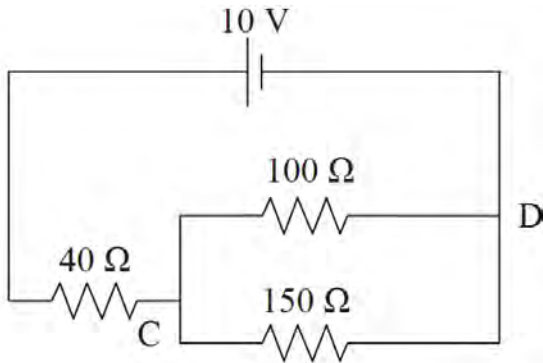
Q19 In the given circuit, the potential at point B is zero, the potential at points A and D will be



- (A) $V_A = 4$ V; $V_D = 9$ V
- (B) $V_A = 3$ V; $V_D = 4$ V
- (C) $V_A = 9$ V; $V_D = 3$ V
- (D) $V_A = 4$ V; $V_D = -3$ V

Q20 In the network shown below, potential difference across CD is

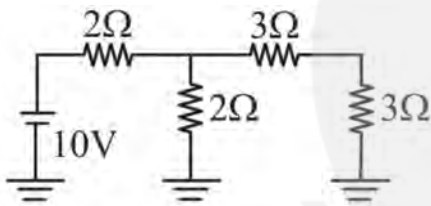




- (A) 4 V
- (B) 6 V
- (C) 10 V
- (D) 5 V

- Q21** A wire of length l and area of cross-section A is melted and half the volume is discarded. If the remaining metal is remoulded into a wire of length l , the new resistance of the wire would be:
- (A) twice of original resistance
 - (B) half of original resistance
 - (C) one-fourth of original resistance
 - (D) thrice of original resistance

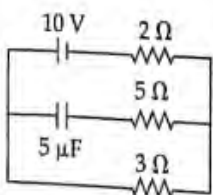
Q22 Current in $3\ \Omega$ resistance is



- (A) 1 A
- (B) $\frac{1}{7}$ A
- (C) $\frac{5}{7}$ A
- (D) $\frac{15}{7}$ A

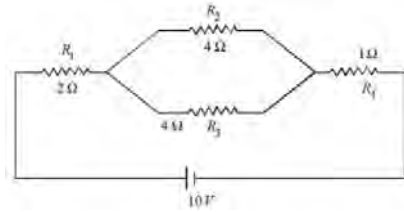
- Q23** If charged particle has drift velocity of 6×10^{-3} ms^{-1} in an electric field 3×10^{-9} Vm^{-1} , then its mobility in $\text{m}^2 \text{V}^{-1} \text{s}^{-1}$ is:
- (A) 2×10^{-6}
 - (B) 2×10^6
 - (C) 2.5×10^6
 - (D) 2.5×10^{-6}

Q24 The steady state current in the circuit shown below is :



- (A) 0.67 A
- (B) 1.5 A
- (C) 2 A
- (D) 1 A

Q25 In the given circuit, the current in resistance R_3 is :



- (A) 1.5 A
- (B) 1 A
- (C) 2.5 A
- (D) 2 A

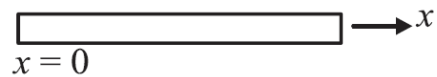
Q26 The temperature coefficient of resistance of a conductor is:

- (A) Positive always
- (B) Negative always
- (C) Zero
- (D) Infinite

Q27 A conducting wire of cross-sectional area 1 cm^2 has 3×10^{23} charge carriers per m^3 . If wire carries a current of 24 mA, then drift velocity of charge carriers is;

- (A) 5×10^{-2} m/s
- (B) 0.5 m/s
- (C) 5×10^{-3} m/s
- (D) 5×10^{-6} m/s

Q28 If along a uniform rod of length L carrying current I , the voltage V changes with position x along the length of the rod such that $dV/dx = -k$, where k is a positive number, then the resistance of the rod is



- (A) $\frac{kL}{2I}$
- (B) $\frac{kL}{I}$
- (C) $\frac{3kL}{2I}$
- (D) $\frac{2kL}{I}$

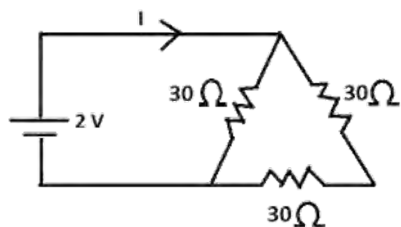
Q29 Drift speed of electrons, when 1.5 A of current flows in a copper wire of cross-section 5 mm^2 is v . If the electron $9 \times 10^{28}/\text{m}^3$, the value of v in



mm/s is close to (Take charge of electron to be
 $= 1.6 \times 10^{-19} \text{ C}$)

- (A) 0.02 (B) 0.2
(C) 2 (D) 3

Q30 The current i in the circuit is kys



- (A) 1/45 A (B) 1/15 A
(C) 1/10 A (D) 1/5 A



Answer Key

Q1 (D)
Q2 (A)
Q3 (A)
Q4 (B)
Q5 (C)
Q6 (C)
Q7 (B)
Q8 (C)
Q9 (A)
Q10 (A)
Q11 (C)
Q12 (A)
Q13 (B)
Q14 (B)
Q15 (A)

Q16 (A)
Q17 (D)
Q18 (C)
Q19 (D)
Q20 (B)
Q21 (A)
Q22 (C)
Q23 (B)
Q24 (C)
Q25 (B)
Q26 (A)
Q27 (C)
Q28 (B)
Q29 (A)
Q30 (C)



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Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Video Solution:



Q2 Text Solution:

(1)

$$4i = neA V_D$$

$$i = ne(4A) V'_D$$

$$4 = \frac{V_D}{4V'_D}$$

$$\frac{V_D}{V'_D} = 16 : 1$$

Video Solution:



Q3 Text Solution:

Using Kirchoff's law,

$$V_A - 2 \times I - 3 - 1 \times I - V_B = 0$$

Here, $I = 2A$

$$V_A - 2 \times 2 - 3 - 1 \times 2 - V_B = 0$$

$$V_A - V_B = 9V$$

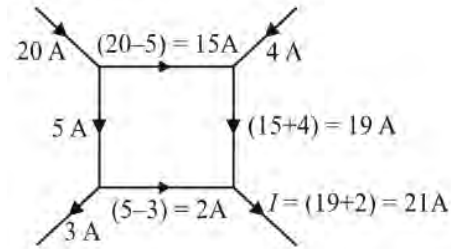
Hence, the correct option is A, i.e. +9V

Video Solution:



Q4 Text Solution:

(2)



Video Solution:



Q5 Text Solution:

Let i be the current flowing through the circuit.

Applying Kirchoff's voltage law in the circuit,

$$15 - 10 - 1 \times i - 0.6 \times i = 0$$

$$\Rightarrow 5 = 1.06i$$

$$\Rightarrow i = \frac{5}{1.06} = 3.125 A$$

The voltmeter reading is given by the potential difference across the lower circuit with 15 V battery.

Applying Kirchoff's voltage law in the lower circuit,

$$V = 15 - 0.6i$$

$$\Rightarrow V = 15 - 0.6 \times 3.125 = 13.1 V$$

Video Solution:



Q6 Text Solution:

Relation between resistivity and temperature is given by

$$\rho = \rho_0 e^{-\alpha T}$$

Video Solution:



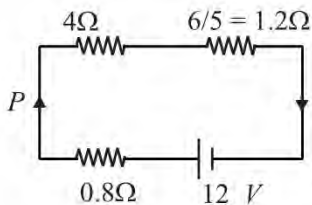
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Q7 Video Solution:



Q8 Text Solution:



$$i = \frac{12}{4 + 0.8 + 1.2} = \frac{12}{6} = 2A$$

Video Solution:



Q9 Text Solution:

(1)

$$R_{eq} = 10\Omega$$

$$I = \frac{V}{R_{eq}} = 1A$$

Video Solution:



Q10 Video Solution:



Q11 Text Solution:

1. Drift velocity formula:

$$v_d = \mu E$$

2. Substitute values:

$$v_d = (3 \times 10^6) (4 \times 10^{-10})$$

3. Calculate:

$$v_d = 12 \times 10^{-4} = 1.2 \times 10^{-3} \text{ m/s}$$

Video Solution:



Q12 Text Solution:

(1)

$$P = \frac{V^2}{R_{eq}}$$

$$40 = \frac{1600}{R_{eq}} \Rightarrow R_{eq} = 40\Omega$$

$$R_{eq} = R + 35$$

$$R = 5\Omega$$

Video Solution:



Q13 Video Solution:



**Q14 Text Solution:**

Total resistance: $R_{\text{tot}} = 0.2 + 4.8 = 5\Omega$.

Current: $I = \frac{3}{5} = 0.6A$.

Terminal voltage: $V = E - Ir = 3 - (0.6)(0.2) = 2.88V$.

Approx 2.8V.

Answer: (c) 2.80 V

Video Solution:**Q15 Text Solution:**

$$\frac{E_{\text{eq}}}{r_{\text{eq}}} = \frac{E_1}{r_1} + \frac{E_2}{r_2} = \frac{8}{2} + \frac{6}{2} = 7 \text{ A}$$

Video Solution:**Q16 Text Solution:**

(1)

Current flowing through the conductor,

$I = n e v_d A$. Hence

$$\frac{4}{1} = \frac{nev_{d1}\pi(1)^2}{nev_{d2}\pi(2)^2} \text{ or } \frac{v_{d1}}{v_{d2}} = \frac{4 \times 4}{1} = \frac{16}{1}.$$

Video Solution:**Q17 Video Solution:****Q18 Text Solution:**

$$I = \frac{5}{10} = \frac{1}{2} \quad V_A - 5 \times \frac{1}{2} - V_B = 0$$

$$V_A = \frac{5}{2} = 2.5 \text{ volt}$$

Video Solution:**Q19 Text Solution:**

From the given circuit

$$V_A - V_B = 2 \times 2 = 4V$$

According to question $V_B = 0$

Point D is connected to positive terminal of battery of emf $3V$.

$$\text{As, } V_B - V_C = 2 \times 3 = 6V$$

$$\therefore V_D - V_C = V_D - (-6) = 3V$$

$$\Rightarrow V_D = 3 - 6 = -3V$$

Video Solution:**Q20 Text Solution:**

Short Explanation:

1. Parallel Equivalent: The 100Ω and 150Ω resistors are in parallel, giving

$$R_{\text{parallel}} = \frac{100 \times 150}{100 + 150} = 60\Omega$$

2. Currents: Let the potential at C be V_C . At D it is 10 V (the battery's + terminal). Then:

$$\text{Current through parallel branch} = \frac{10 - V_C}{60}, \quad \text{Current through } 40\Omega = \frac{V_C - 0}{40}$$

3. KCL at node C : Both currents are equal (same path):

$$\frac{10 - V_C}{60} = \frac{V_C}{40}$$

Solve for $V_C = 4$ V.

4. Potential Difference:

$$V_D - V_C = 10 - 4 = 6$$
 V

Video Solution:



Q21 Text Solution:

$$\text{Original resistance: } R_0 = \rho \frac{l}{A}.$$

Half the volume is kept:

$$V_{\text{new}} = \frac{lA}{2}.$$

Remoulded into a wire of *the same length* l :

$$A_{\text{new}} = \frac{V_{\text{new}}}{l} = \frac{A}{2}.$$

New resistance:

$$R_{\text{new}} = \rho \frac{l}{A_{\text{new}}} = \rho \frac{l}{A/2} = 2R_0.$$

Thus the resistance doubles.

Video Solution:



Q22 Video Solution:



Q23 Text Solution:

(2)

$$\mu = \frac{V_d}{E} = \frac{6 \times 10^{-3}}{3 \times 10^{-9}}$$

$$\mu = 2 \times 10^6$$

Video Solution:



Q24 Video Solution:



Q25 Video Solution:



Q26 Text Solution:

With increase of temperature the resistance of the conductor increases always. Hence



conductors have positive thermal coefficient of resistance.

Video Solution:



Q27 Text Solution:

(3)

$$i = neAV_d$$

$$\Rightarrow V_d = \frac{i}{neA}$$

$$\Rightarrow \frac{24 \times 10^{-3}}{3 \times 10^{23} \times 1.6 \times 10^{-19} \times 10^{-4}}$$

$$\Rightarrow 5 \times 10^{-3} \text{ M/s}$$

Video Solution:



Q28 Text Solution:

$$dV = -IdR = -I\rho \frac{dx}{A}$$

$$\frac{dV}{dx} = -I \frac{\rho}{A} = -k$$

$$\Rightarrow R = k/l$$

II Method:

$$V_2 - V_1 = \int \left(\frac{dV}{dl} \right) dl = kL = IR$$

Video Solution:



Q29 Video Solution:



Q30 Text Solution:

$$\frac{1}{R_{ag}} = \frac{1}{30} + \frac{1}{60} = \frac{90}{30 \times 60} \text{ or } R_{aq} = 20\Omega$$

$$V = IR$$

$$\text{or } l = \frac{2}{20} = 0.1\text{A}$$

Video Solution:

