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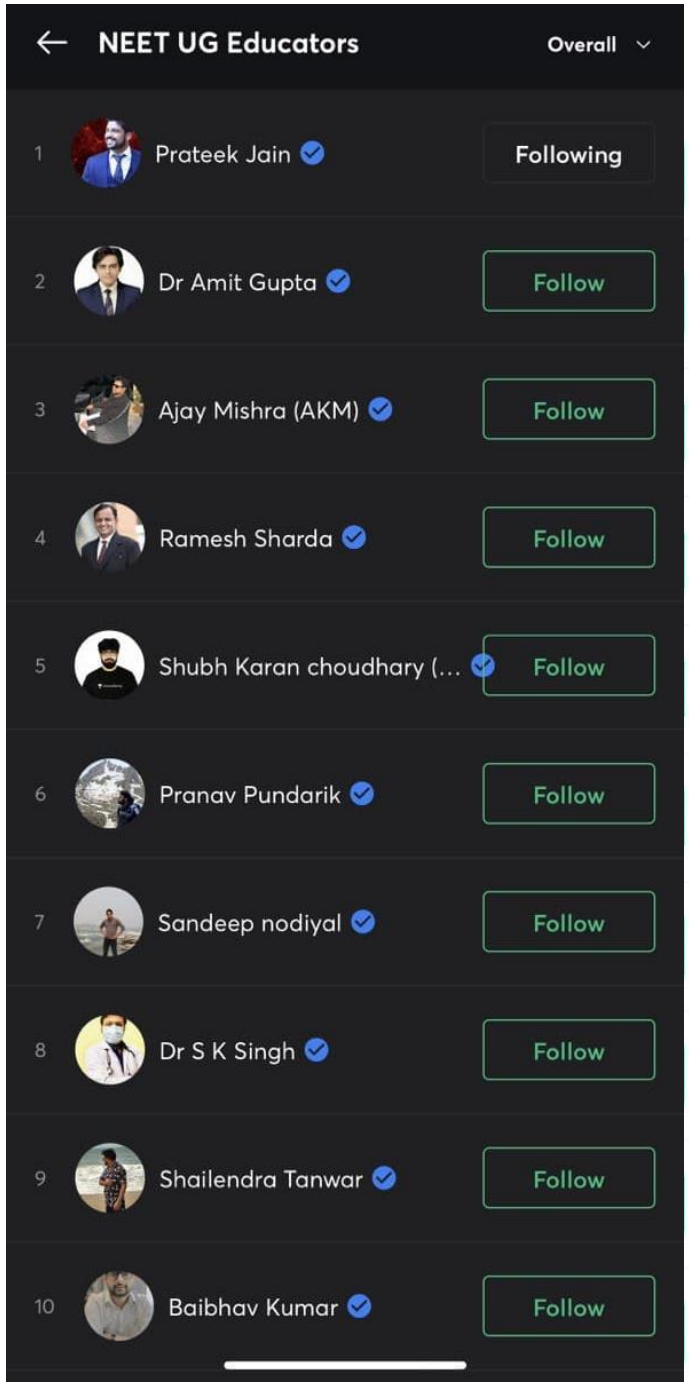

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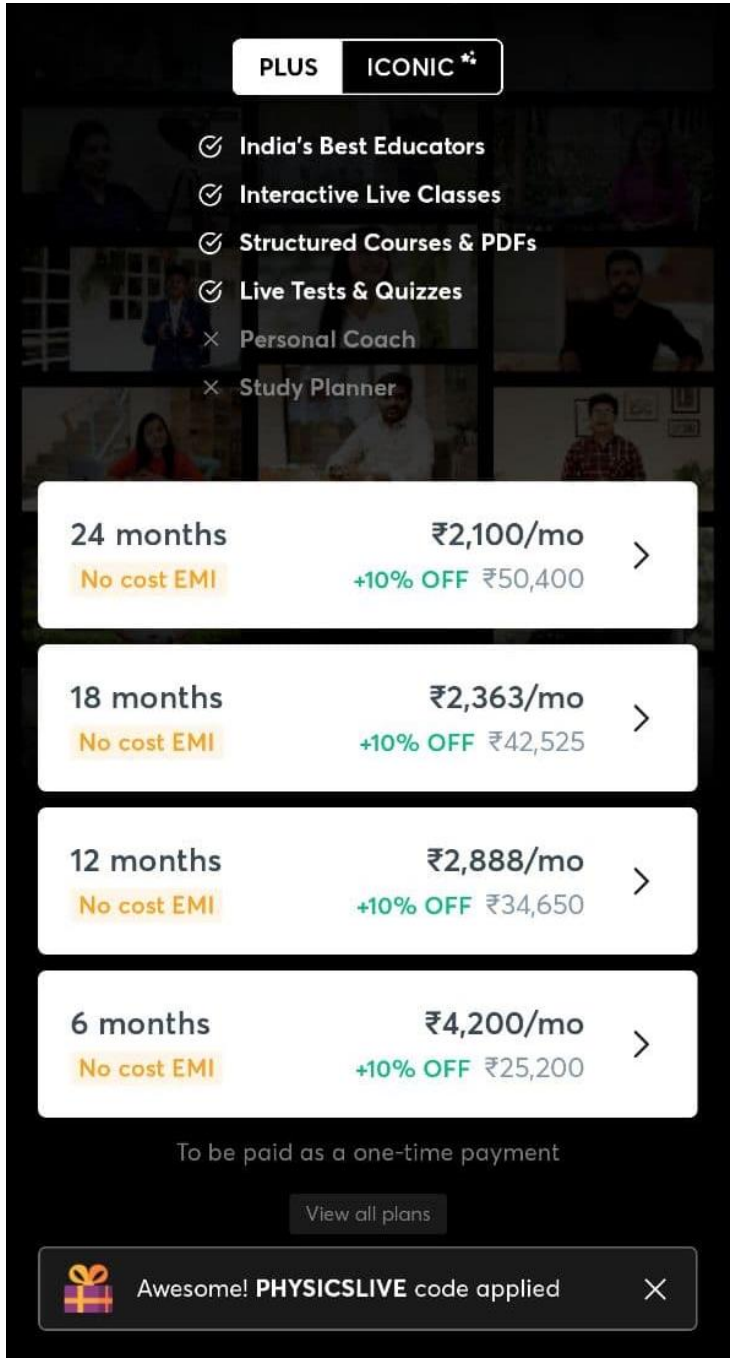

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Solution
NEET & AIIMS PYQs

Current Electricity (1/3): Current density, Mean free path, Drift Velocity, Resistance, Kirchoff's Current Law

By Physicsaholics Team

PYQs on Following Subtopic:

Current, Current density, Mean free path, Drift Velocity etc.

Q) A charged particle having drift velocity of 7.5×10^{-4} m s^{-1} in an electric field of 3×10^{-10} Vm^{-1}, has a mobility in m^2 V^{-1} s^{-1} of:

NEET 2020

(1) 2.5×10^{-6}

(2) 2.25×10^{-15}

(3) 2.25×10^{15}

(4) 2.5×10^{6}

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Ans. 4

Which of the following relations is called as current density ?

(a) $\frac{I^2}{A}$ (b) $\frac{A}{I}$

(c) $\frac{I^3}{A^2}$ (d) $\frac{I}{A}$.

AIIMS (1995)

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Ans. d

Across a metallic conductor of non-uniform cross-section, a constant potential difference is applied. The quantity which remain constant along the conductor is

[CBSE AIPMT 2015]

(a) current density
(b) current
(c) drift velocity
(d) electric field

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Ans. b

The mean free path of electrons in a metal is 4×10^{-8} m. The electric field which can give on an average 2 eV energy to an electron in the metal will be in unit of Vm^{-1}

[CBSE AIPMT 2009]

(a) 8×10^{7}

(b) 5×10^{-11}

(c) 8×10^{-11}

(d) 5×10^{7}

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Ans. d

The velocity of charge carriers of current (about 1 A) in a metal under normal conditions is of the order of

[CBSE AIPMT 1991]

(a) a fraction of mm/s
(b) velocity of light
(c) several thousand m/s
(d) a few hundred m/s

v_d

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Ans. a

Assertion : An electrical bulb starts glowing instantly as it is switched on.

Reason : Drift speed of electrons in a metallic wire is very large. *(2017)*

AIIMS

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PHYSICSAHOLICS

Ans. c

Assertion : A current flows in a conductor only when there is an electric field within the conductor.

Reason : The drift velocity of electron in presence of electric field decreases.

(2018)

AIIMS

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Ans. c

A steady current flows in a metallic conductor of non-uniform cross-section. Which of these quantities is constant along the conductor?

(a) Electric field (b) Drift velocity

(c) Current (d) Current density

(2000, 2016)

AIIMS

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Ans. c

Assertion : The conductivity of an electrolyte is very low as compared to a metal at room temperature.

Reason : The number density of free ions in electrolyte is much smaller as compared to number density of free electrons in metals. Further, ions drift much more slowly, being heavier.

(2015)

AIIMS

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PHYSICSAHOLICS

Ans. a

PYQs on Following Subtopic:

Resistance & Conductance

. The resistance of a wire is R ohm. If it is melted and stretched to n times its original length, its new resistance will be *[NEET 2017]*

(a) nR (b) $\frac{R}{n}$ (c) n^2R (d) $\frac{R}{n^2}$

PRATEEK JAIN PHYSICSAHOLICS

Ans. c

A wire of resistance 4Ω is stretched to twice its original length. The resistance of stretched wire would be

[NEET 2013]

(a) 2 Ω
(b) 4 Ω
(c) 8 Ω
(d) 16 Ω

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

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Ans. d

A wire of a certain material is stretched slowly by 10 percent. Its new resistance and specific resistance become respectively

[CBSE AIPMT 2008]

(a) 1.2 times, 1.1 times
(b) 1.21 times, same
(c) Both remain the same
(d) 1.1 times, 1.1 times

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

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Ans. b

. The electric resistance of a certain wire of iron is R. If its length and radius are both doubled, then *[CBSE AIPMT 2004]*

(a) the resistance will be doubled and the specific resistance will be halved

(b) the resistance will be halved and the specific resistance will remain unchanged

(c) the resistance will be halved and the specific resistance will be doubled

(d) the resistance and the specific resistance will both remain unchanged

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Ans. b

. There are three copper wires of length and cross-sectional area (L, A), $(2L, A/2)$ $(L/2, 2A)$. In which case is the resistance minimum ? *[CBSE AIPMT 1997]*

(a) It is the same in all three cases

(b) Wire of cross-sectional area $2A$

(c) Wire of cross-sectional area A

(d) Wire of cross-sectional area $\frac{1}{2}A$

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

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Ans. b

The masses of the three wires of copper are in the ratio of 1 : 3 : 5 and their lengths are in the ratio of 5 : 3 : 1. The ratio of their electrical resistance is *[CBSE AIPMT 1988]*

(a) 1 : 3 : 5
(b) 5 : 3 : 1
(c) 1 : 25 : 125
(d) 125 : 15 : 1

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Ans. d

When a wire of resistance R is stretched and its radius becomes $r/2$, then its resistance will be

(a) $16R$ (b) $2R$

(c) $4R$ (d) R. *(1997, 2001)*

AIIMS

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Ans. a

A wire of length L is drawn such that its diameter is reduced to half of its original diameter. If the initial resistance of the wire was 10 Ω, its new resistance would be

(a) 40 Ω (b) 80 Ω

(c) 120 Ω (d) 160 Ω.

AIIMS (2003)

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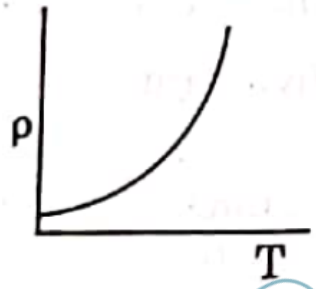
Ans. d

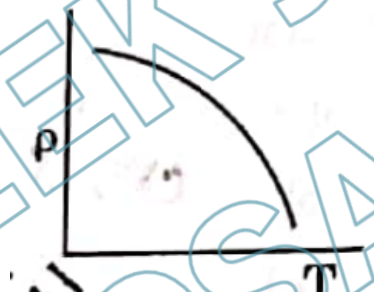
PYQs on Following Subtopic:

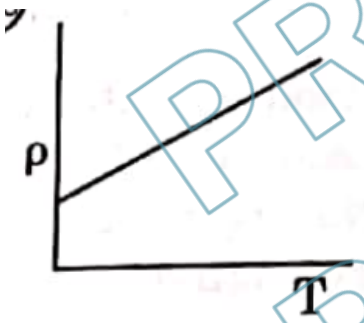
Effects of temperature on resistance

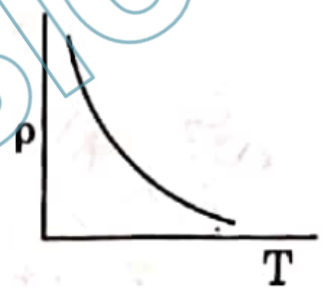
Q) Which of the following graph represents the variation of resistivity (ρ) with temperature (T) for copper?

NEET 2020

(1) 

(2) 

(3) 

(4) 

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Ans. 1

If the resistance of a conductor is 5 Ω at 50°C and 7 Ω at 100°C, then the mean temperature coefficient of resistance (of the material) is [CBSE AIPMT 1996]

(a) 0.01/°C (b) 0.04/°C (c) 0.06/°C (d) 0.08/°C

$R = R_0(1$

(wrong)

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dDT is not small

Ans. a

PYQs on Following Subtopic:

Ohmic conductors

. The resistance of a discharge tube is

[CBSE AIPMT 1999]

(a) zero
(b) ohmic
(c) non-ohmic
(d) infinity

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Ans. c

Assertion : Ohm's law is applicable for all conducting elements.

Reason : Ohm's law is a fundamental law.

(2007)

AIIMS

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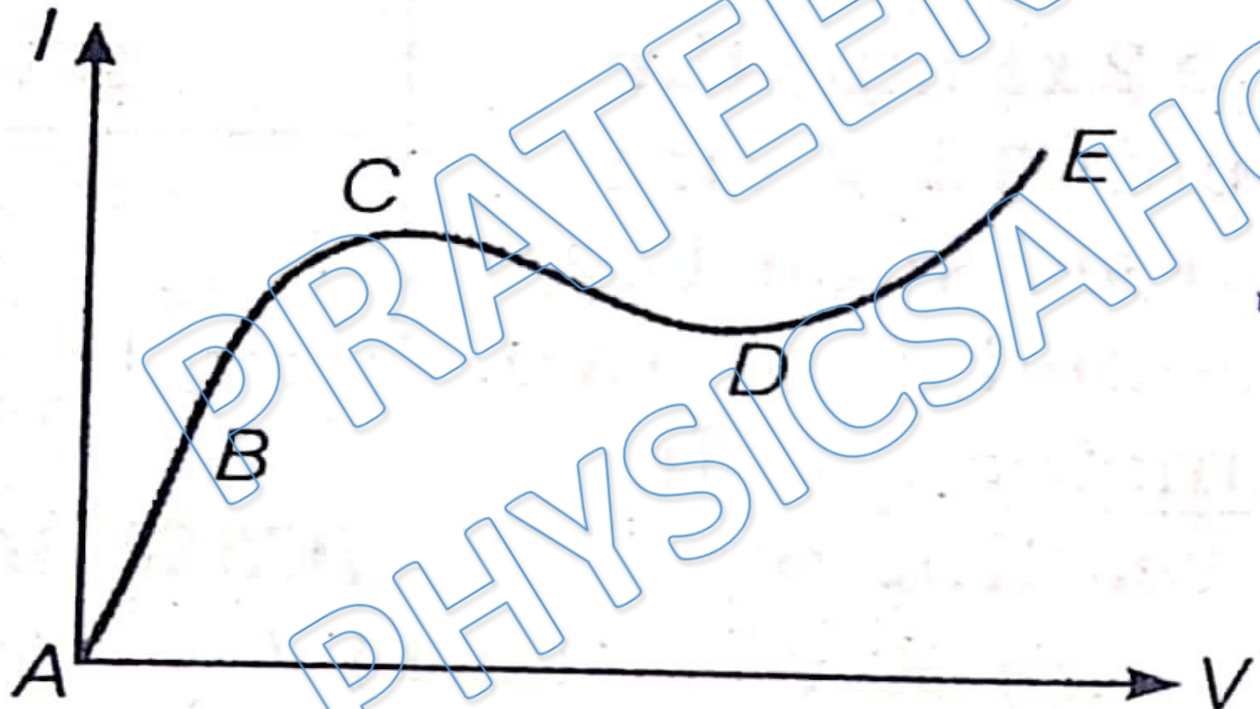
Ans. d

From the graph between current I and voltage V shown in figure, identify the portion corresponding to negative resistance.

[CBSE AIPMT 1997]



$V = IR$

(a) *DE* (b) *CD* (c) *BC* (d) *AB*

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Ans. b

PYQs on Following Subtopic:

Kirchoff's Current Law

. Kirchhoff's first law, i.e. $\Sigma i = 0$ at a junction, deals with the conservation of

[CBSE AIPMT 1997]

(a) angular momentum (b) linear momentum
(c) energy (d) charge

PRATEEK JAIN PHYSICSAHOLICS

Ans. d

. Kirchhoff 's first law of electricity follows Vogue

[CBSE AIPMT 1992]

(a) only law of conservation of energy
(b) only law of conservation of charge
(c) law of conservation of both energy and charge
(d) sometimes law of conservation of energy and some other times law of conservation of charge

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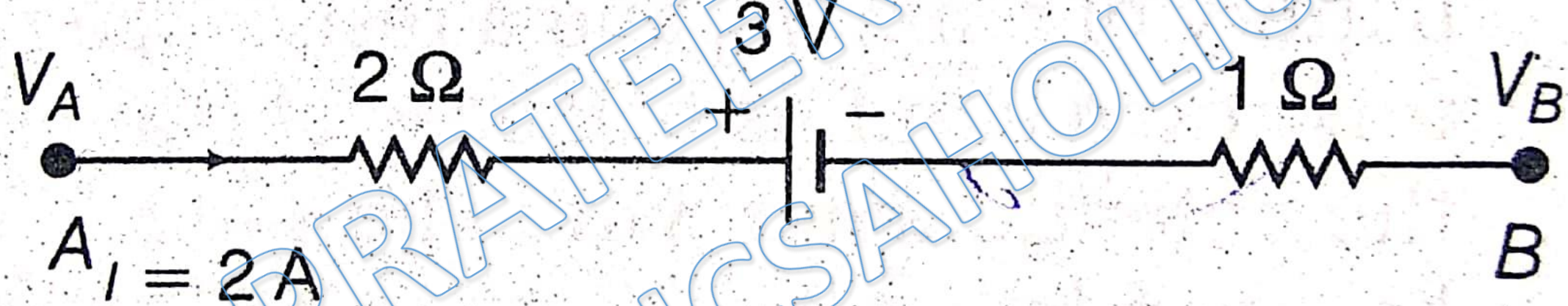
Ans. b

The potential difference $(V_A - V_B)$ between the points A and B in the given figure is

[NEET 2016]

(a) $-3\,V$ (b) $+3\,V$ (c) $+6\,V$ (d) $+9\,V$



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Ans. d

. The internal resistance of a 2.1 V cell which gives a current of 0.2 A through a resistance of 10 Ω is

[NEET 2013]

(a) 0.2 Ω
(b) 0.5 Ω
(c) 0.8 Ω
(d) 1.0 Ω

KVL

PRATEEK JAIN
PHYSICSAHOLICS

Ans. b

. A current of 2 A flows through a 2 Ω resistor when connected across a battery. The same battery supplies a current of 0.5 A when connected across a 9 Ω resistor. The internal resistance of the battery is

[CBSE AIPMT 2011]

(a) 1/3 Ω
(b) 1/4 Ω
(c) 1 Ω
(d) 0.5 Ω

KVL

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Ans. a

A student measures the terminal potential difference (V) of a cell (of emf ε and internal resistance r) as a function of the current (I) flowing through it. The slope and intercept of the graph between V and I, respectively, equal to *[CBSE AIPMT 2009]*

(a) ε and $-r$
(b) $-r$ and ε
(c) r and $-\varepsilon$
(d) $-\varepsilon$ and r

PRATEEK JAIN PHYSICS ANOTICS

Ans. b

For a cell, the terminal potential difference is 2.2 V when circuit is open and reduces to 1.8 V when cell is connected to a resistance $R = 5\ \Omega$, the internal resistance (r) of cell is *[CBSE AIPMT 2002]*

(a) $\frac{10}{9}\ \Omega$ (b) $\frac{9}{10}\ \Omega$ (c) $\frac{11}{9}\ \Omega$ (d) $\frac{5}{9}\ \Omega$

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Ans. a

. A cell has an emf 1.5 V. When connected across an external resistance of 2 Ω, the terminal potential difference falls to 1.0 V. The internal resistance of the cell is

[CBSE AIPMT 2000]

(a) 2 Ω
(b) 1.5 Ω
(c) 1.0 Ω
(d) 0.5 Ω

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Ans. c

The internal resistance of a cell of e.m.f. 2 volt is 0.1 Ω. It is connected to a resistance of 3.9 Ω. The voltage across the cell will be (in volt)

(a) 1.95 V (b) 0.5 V

(c) 2 V (d) 1.9 V. *(1995)*

AIIMS

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Ans. a

A battery of emf 10 V and internal resistance 3 Ω is connected to a resistor. If the current in the circuit is 0.5 A, what is the resistance of the resistor?

(a) 13 Ω (b) 15 Ω

(c) 17 Ω (d) 19 Ω

AIIMS (1997)

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Ans. c

A 6 V battery is connected to the terminals of a 3m long wire of uniform thickness and resistance of 100 Ω. The difference of potential between two points on the wire separated by a distance of 50 cm will be

[CBSE AIPMT 2004]

(a) 2 V (b) 3 V (c) 1 V (d) 1.5 V

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Ans. c

Assertion : In a simple battery circuit, the point of the lowest potential is positive terminal of the battery.

Reason : The current flows towards the point of the higher potential, as it does in such a circuit from the negative to the positive terminal. AIIMS *(1996, 2002)*

PRATEEK JAIN PHYSICSAHOLICS

Ans. d

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