PHYSICS

BOOKS - CENGAGE PHYSICS

CURRENT ELECTRICITY

Mandatory Exercise Exercise Set I

1. When do you say a current is flowing through a conductor?

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2. How many electrons are there in one ampere of current?

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3. What causes resistance in a metal?

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4. When the terminals of a cell are connected to the ends of an iron rod, electric current flows, whereas when the terminals are connected to the ends of a wooden rod, no current flows. Explain.

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5. Does electric current flow in an open circuit?

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6. Two conductors A and B are joined by a copper wire. State the direction of flow of electrons in each of the following cases:

If A is positively charged and B is uncharged

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7. Two conductors A and B are joined by a copper wire. State the direction of flow of electrons in each of the following cases:

If A is negatively charged and Bis uncharged.

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8. Two conductors A and B are joined by a copper wire. State the direction of flow of electrons in each of the following cases:

If A is positively charged and B is negatively charged.

9. Two conductors A and B are joined by a copper wire. State the direction of flow of

electrons in each of the following cases:

If both are negatively charged.

Mandatory Exercise Exercise Set Ii

1. A charge is taken from a point A to a point B. The work done per unit charge in the process is called

    A. the potential at A

B. the potential at B

C. the potential difference between Band D

D. the potential difference between A and B

Answer:

2. Joule/coulomb is the same as

A. watt

B. volt

C. ampere

D. ohm

Answer:

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3. In a metal

A. all the electrons are free

B. all the electrons are bound to their

parent atom

C. there are no electrons

D. some electrons are free

Answer:

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4. The free electrons of a metal are free to

A. move on the surface only

B. are free to escape through surface

C. are free to fall into the nuclei

D. are free to move anywhere in the volume

of the metal

Answer:

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5. The current in a wire depends

A. only on the potential difference applied

B. only on the resistance of the wire

C. none of them

D. on both of them

Answer:

6. Consider the following incomplete statement Ohm's law relates potential difference with _____ for a given resistance: The suitable choice for the missing word is

A. power

B. energy

C. current

D. time

Answer:

7. Resistivity of a material does not depend on

A. material

B. temperature

C. length

D. all of these

Answer:

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8. When a battery of 20 V is connected across a conductor, a current of 100 A flows through it What is its resistance?

A. 5Ω

B. 2000Ω

C. 120Ω

D. 0.2Ω

Answer:

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9. What causes heating in electrical circuits?

A. Voltage

B. Current

C. Resistance

D. Surrounding

Answer:

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10. What is the unit of resistivity

A. Ohm

B. Ohm-$(\text{meter})^2$

C. Ohm-meter

D. Ohm/meter

Answer:

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11. Resistivity is very high for

A. metals

B. alloys

C. semiconductors

D. insulators

Answer:

12. Which is most important for manufacturing microchips in electronic gadgets

    A. Metals

    B. Plastics

    C. Alloys

    D. Semiconductors

Answer:

13. Which of the following is a semiconductor?

   A. Magnesium

   B. Chlorine

   C. Gallium

   D. Aluminum

Answer:

14. Which of the following material has the

highest resistivity?

    A. Copper

    B. Selenium

    C. Plastics

    D. Iron

Answer:

15. For the same wire,

A. resistance is higher in summer

B. resistance is higher in winter

C. resistance is same in summer and winter

D. none of these

Answer:

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16. A wire of resistance R is stretched to thrice its original length keeping the volume constant. Calculate its new resistance.

A. R

B. 3R

C. 9R

D. 27R

Answer:

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17. S.I. unit of conductance is

A. ampere

B. siemens

C. ohm

D. volt

Answer:

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18. Which of the following is not a desired material in electrical wires

    A. High conductivity

    B. High melting point

    C. High thermal conductivity

    D. High resistance

Answer:

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19. Identify the wrong statement

A. $I \propto V$

B. $V \propto I$

C. $I = \left(\dfrac{1}{R} \right) V$

D. $V = \left(\dfrac{1}{R} \right) I$

Answer:

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20. If both the potential difference and the resistance in a circuit are doubled then,

A. current remains same

B. current is doubled

C. current is halved

D. current is quadrupled

Answer:

1. Resistance of a conductor does not depends on

    A. area of cross-section of the conductor

    B. length of the conductor

    C. temperature

    D. resistivity of the material

Answer:

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2. The SI unit of resistance .

    A. ohm

    B. ampere

    C. volt

    D. volt/ampere

Answer:

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3. Electric current flows

    A. from lower to higher potential

    B. from higher potential to lower potential

    C. depends on the material

    D. in all directions

Answer:

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4. What are the charge carriers in

metals

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5. What are the charge carriers in

electrolytes

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Mandatory Exercise Exercise Set Iv

1. What are the charge carriers in beam of protons

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2. Which is the conventional direction of electric current?

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3. What is the direction of electric current in a metallic conductors?

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Mandatory Exercise Exercise Set V

1. Match the following.

A	B
(1) Conventional direction of current	(a) $\dfrac{RA}{L}$
(2) I	(b) emf of a cell
(3) 1 ampere	(c) direction of motion of positive charges
(4)	(d) $V = IR$
(5)	(e) $\dfrac{1}{R}$
(6) Ohm's law	(f) closed circuit

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Mandatory Exercise Exercise Set Vi

1. When a particle of charge 10 μC is brought from infinity to a point P, 2.0 mJ of work is done by the external forces. What is the potential at P?

2. Calculate the work done in taking a charge of 0.02 C from A to B, if the potential at A is 20 V, and that at B is 30 V.

3. How many charges flow through a wire in 10 min if 2.5 A of current flows through it?

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4. The amount of charge passing through a cell in 4 s is 12 C. What is the current supplied by the cell?

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5. When a 24 V battery is connected to a resistor the current in it is 0.4 A. What is the value of the resistance?

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Challenging Exercise

1. A 2 V cell is connected to a 1 ohm resistance. How many electrons come out of the negative terminal of the cell in 2 minutes?

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2. In an experiment, the current flowing through a resistor and the potential difference across it are measured. The values are given below. Show that these values confirm Ohm's law, and find the resistance of the resistor.

i (ampere)	1.0	1.5	2.0	2.5	3.0
v (Volt)	4.0	6.0	8.0	10.0	12.0

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1. On increasing the temperature of a conductor, its resistance increases because

    A. Relaxation time decreases

    B. Mass of the electrons increases

    C. Electron density decreases

    D. None of the above

Answer:

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2. The resistivity of iron is 1×10^{-7} ohm-m. The resistance of a iron wire of particular length and thickness is 1 ohm. If the length and the diameter of wire both are doubled, then the resistivity in ohm-m will be

A. 1×10^{-7}

B. 2×10^{-7}

C. 4×10^{-7}

D. 8×10^{-7}

Answer:

3. The resistance of a wire is $20 ohm$. It is so stretched that the length becomes three times, then the new resistance of the wire will be

    A. 6.67 ohms

    B. 60.0 ohms

    C. 120 ohms

D. 180.0 ohms

Answer:

4. 62.5×10^{18} electrons per second are flowing through a wire of area of cross-section $0.1m^2$, the value of current flowing wil be

A. $1A$

B. 0.1 A

C. $10A$

D. 0.11 A

Answer:

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5. Dimensions of a block are $1cm \times 1cm \times 100cm$. If specific resistance of its material is 3×10^{-7}ohm-m, then the resistance between the opposite rectangular faces is

A. 3×10^{-9} ohm

B. 3×10^{-7} ohm

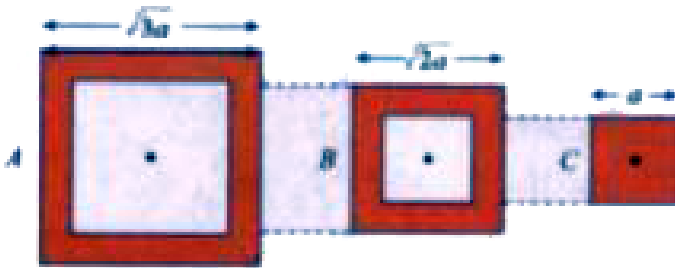C. 3×10^{-5} ohm

D. 3×10^{-3} ohm

Answer:

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6. Following figure shows cross-sections through three long conductors of the same length and material, with square cross-section

of edge lengths as shown. Conductor B will fit

snugly within conductor A, and conductor C

will fit snugly within conductor B. Relationship

between their end to end resistance is

A. $R_A = R_B = R_C$

B. $R_A > R_b > R_C$
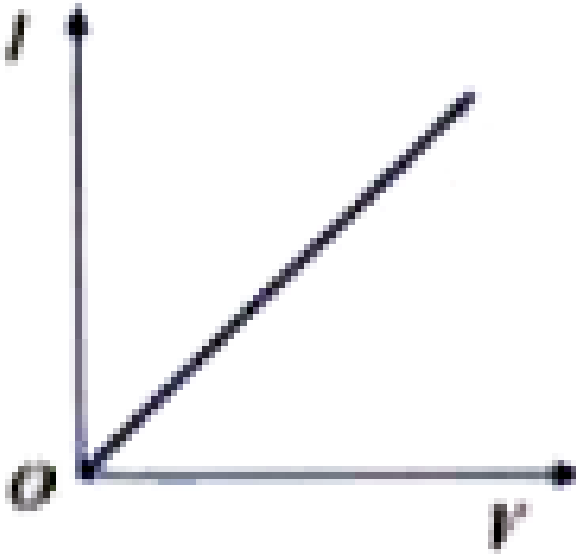
C. $R_A < R_B < R$

D. Information is not sufficient

Answer:

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7. I-V characteristic of a copper wire of length

Land area of cross-section A is shown in figure.

The slope of the curve becomes

A. More if the experiment is performed at

  higher temperature

B. More if a wire of steel of same

  dimension is used

C. More if the length of the wire is increased

D. Less if the length of the wire is increased

Answer:

8. Read the assertion and reason carefully to mark the correct option

Assertion: When the length of a conductor is doubled, its resistance will also get doubled.

Reason: Resistance is directly proportional to the length of a conductor.

A. If both assertion and reason are true and reason is the correct explanation of assertion.

B. If both assertion and reason are true but reason is not the correct explanation of assertion.

C. If assertion is true but reason is false.

D. If assertion and reason both are false.

Answer:

9. Masses of 3 wires of same metal are in the ratio $1:2:3$ and their lengths are in the ratio $3:2:1$. The electrical resistances are in ratio

A. $1:4:9$

B. $9:4:1$

C. $1:2:3$

D. $27:6:1$

Answer:

10. A rod of certain metal is $1.0m$ long and $0.6cm$ in diameter. Its resistance is $3.0 \times 10\&(-3)$ ohm. Another disc made of the same metal is $2.0cm$ in diameter and $1.0mm$ thick. What is the resistance between the round faces of the disc?

A. 1.35×10^{-8} ohm

B. 2.70×10^{-7} ohm

C. 4.05×10^{-6} ohm

D. 8.10×10^{-5} ohm

Answer:

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