

CLASS RESPONSE

Questions (One-word Answer)

- Which particles are responsible for flow of electric current in a conductor?
- Name the device that converts chemical energy into electrical energy.
- Name the quantity whose SI unit is a coulomb.
- What is the name assigned to a combination of cells?
- Which device is used to measure potential difference?
- Name the SI unit of electric current.
- Name the metal whose resistivity is minimum.
- Which alloy is used to prepare heating elements of electric iron/heater, etc.?
- Resistance wire of resistivity ' $\rho$ ' is stretched so as to double its length. What is its new resistivity?
- What is the value of electric charge on an electron?
- Name the scientist who studied the relationship between electric current and potential difference between the ends of a conductor.
- What happens to the resistance of a metal wire if its temperature is increased?
- How should we connect four resistors so as to have a maximum value of the equivalent resistance?
- Name the SI unit of electric power.
- In which arrangement of resistors, the potential difference across each resistor is same as the potential difference across entire combination?
- How many joules equal 1 kW h energy?
- Are the following statements true or false?
  - Direction of flow of current in a conductor is same as the direction of flow of electrons in it.
  - When an ebonite rod is rubbed with wool, positive charge is developed on the ebonite rod.
  - Electric current is defined as the rate of flow of electric charge.
  - Electric current can flow only when an electric circuit is a closed circuit.
  - Resistivity of an alloy is greater than the resistivity of the constituent metals.
  - Nichrome is used for preparing the filament of an electric bulb.
  - An ammeter is always connected in series of an electric circuit.
  - Resistance of a voltmeter should be as small as possible.
  - Potential difference across the ends of a conductor is doubled, then its electric resistance is also doubled.
  - The resistance of a thin wire is more than that of a thick wire of same length and same material.
  - The SI unit of resistivity is  $\Omega \text{ m}^{-1}$ .
  - Electric current is a vector having both magnitude as well as direction.
  - For series grouping, resistances are joined end-to-end so as to form a long chain.
  - In a parallel combination of resistors, the reciprocal of an equivalent resistance is equal to the sum of reciprocals of individual resistances.
  - According to Joule's law, the amount of heat produced through a given resistor in given time is directly proportional to the amount of current flowing through it.
  - Electric power in a circuit is defined as the rate of consumption of electrical energy in the circuit.
  - An electric bulb is filled with nitrogen gas in order to prolong the life of filament.
  - An electric iron of 750 W rating, if used for 20 hours, will consume 15 units of electrical energy.

C. Answer the Following Questions (in One Sentence only)

1. What is the cause of electrification of a glass rod when rubbed with a silk piece?
2. What are electric insulators?
3. Define one ampere of current.
4. What is an electric circuit?
5. Define electric potential at a point.
6. Why is copper used for the line wire in domestic electric circuits?
7. How are an ammeter and a voltmeter connected in an electric circuit?
8. When is resistance of a resistor said to be 1 ohm?
9. What is the function of a rheostat in an electric circuit?
10. How does current flowing through a given resistor change on changing the potential difference across its ends?
11. Name any two factors on which resistance of a metal wire depends.
12. What is the composition of nichrome?
13. Give an example where you employ series grouping of resistors.
14. If  $n$  resistors, each of resistance  $R$ , are joined in (a) series, and (b) parallel, then what is the magnitude of effective resistance of the circuit?
15. What is heating effect of electric current?
16. What is the main function of an electric fuse?
17. What do you mean by the commercial unit of electrical energy?

D. Match the Columns

| I. Physical Quantity    | Unit                 |
|-------------------------|----------------------|
| 1. Electric charge      | (a) ohm ( $\Omega$ ) |
| 2. Potential difference | (b) ampere (A)       |
| 3. Electric current     | (c) watt (W)         |
| 4. Resistance           | (d) coulomb (C)      |
| 5. Electric power       | (e) volt (V)         |

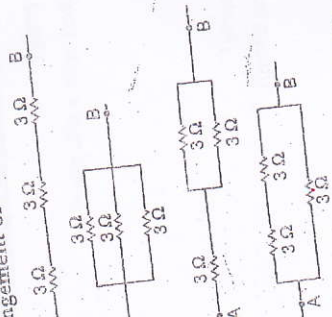
  

| II. Electric Component | Symbol                                 |
|------------------------|--|
| 1. Variable resistance | (a) $\text{---} \text{---} \text{---}$ |
| 2. Electric bulb       | (b) $\text{---} \text{---} \text{---}$ |
| 3. Plug key (open)     | (c) $\text{---} \text{---} \text{---}$ |
| 4. Plug key (closed)   | (d) $\text{---} \text{---} \text{---}$ |
| 5. Fixed resistance    | (e) $\text{---} \text{---} \text{---}$ |

| III. Column A | Column B                                  |
|---------------|---|
| 1. A volt     | (a) ampere $\times$ second                |
| 2. A coulomb  | (b) $\frac{\text{volt}}{\text{ampere}}$   |
| 3. An ohm     | (c) volt $\times$ ampere                  |
| 4. A watt     | (d) $\frac{\text{joule}}{\text{coulomb}}$ |

**Arrangement of Resistors in a Circuit**



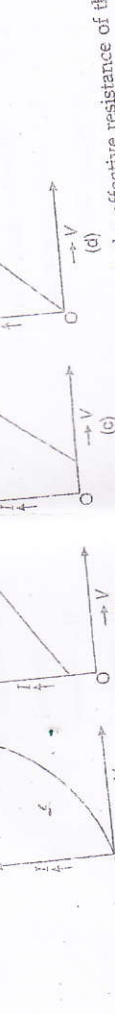
**Multiple Choice Questions (MCQs)**

1. Instrument used to measure current flowing through a wire if number of electrons passing through a cross-section of wire is  $1.6 \times 10^{19}$  is (a) voltmeter (b) galvanometer (c) ammeter (d) potentiometer
2. A wire of length  $l$  and resistance  $R$  is cut into four equal parts. These are joined in parallel. The effective resistance is (a)  $4R$  (b)  $R/4$  (c)  $R$  (d)  $R/16$
3. A wire of length  $l$  and resistance  $R$  is cut into four equal parts. These are joined in series. The effective resistance is (a)  $4R$  (b)  $R/4$  (c)  $R$  (d)  $R/16$
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6. A wire of length  $l$  and resistance  $R$  is cut into four equal parts. These are joined in parallel. The effective resistance is (a)  $4R$  (b)  $R/4$  (c)  $R$  (d)  $R/16$
7. A wire of length  $l$  and resistance  $R$  is cut into four equal parts. These are joined in series. The effective resistance is (a)  $4R$  (b)  $R/4$  (c)  $R$  (d)  $R/16$

Which of the following devices would you use to maintain potential difference between two points of a conductor? (a) A cell (b) A voltmeter (c) An ammeter (d) A potentiometer

Which of the graphs shown below correctly represents I-V relationship for a conductor in the form of a metallic wire at a given temperature?



7. If 4 resistors, each of  $4\ \Omega$  resistance, are joined in parallel arrangement. What is the effective resistance of the combination? (a)  $16\ \Omega$  (b)  $4\ \Omega$  (c)  $1\ \Omega$  (d)  $1/4\ \Omega$

8. A student obtained a V-I graph as shown in the adjoining figure in an experiment to find resistance of a given resistor. The resistance of the given resistor is (a)  $10\ \Omega$  (b)  $20\ \Omega$  (c)  $5\ \Omega$  (d)  $0.05\ \Omega$

9. In an ammeter, there are 9 more small marks between 0 A and 1 A marks. The least count of the ammeter is (a)  $9\ A$  (b)  $1/9\ A$  (c)  $1/10\ A$  (d)  $1/8\ A$

- Equivalent Resistance
- (a)  $4.5\ \Omega$  (b)  $2.0\ \Omega$  (c)  $9.0\ \Omega$  (d)  $1.0\ \Omega$

10. What is the maximum resistance which can be made using five resistors each of  $1/5\ \Omega$ ? (a)  $1/5\ \Omega$  (b)  $10\ \Omega$  (c)  $5\ \Omega$  (d)  $1\ \Omega$

11. What is the minimum resistance which can be made using five resistors each of  $1/5\ \Omega$ ? (a)  $1/5\ \Omega$  (b)  $1/25\ \Omega$  (c)  $1/10\ \Omega$  (d)  $25\ \Omega$

12. Four resistors, each of  $1\ \Omega$  resistance, are joined together as shown in the adjoining figure. The effective resistance between the points A and B will be (a)  $4\ \Omega$  (b)  $2\ \Omega$  (c)  $1\ \Omega$  (d)  $1/2\ \Omega$

13. Which material is used to prepare the filament of an electric lamp? (a) Copper (b) Constantan (c) Nichrome (d) Tungsten

14. A cylindrical conductor of length  $l$  and uniform area of cross-section A has resistance R. Another conductor of length  $2l$  and resistance R of the same material has an area of cross-section (a)  $A/2$  (b)  $3A/2$  (c)  $2A$  (d)  $3A$

15. A student carries out an experiment and plots the I-V graph of three samples of nichrome wire with resistances  $R_1$ ,  $R_2$  and  $R_3$  respectively as shown in the adjoining figure. Which of the following is true? (a)  $R_1 = R_2 = R_3$  (b)  $R_1 > R_2 > R_3$  (c)  $R_3 > R_2 > R_1$  (d)  $R_2 > R_3 > R_1$

16. What will happen to the current passing through a conductor if potential difference is doubled and the resistance is halved? (a) Remains unchanged (b) Becomes doubled (c) Becomes halved (d) Becomes four times

17. Find the resistor value in the given circuit shown in the adjoining figure. (a)  $200\ \Omega$  (b)  $1\ k\Omega$  (c)  $2\ k\Omega$  (d)  $4\ k\Omega$

18. In an electric circuit, three incandescent electric bulbs A, B and C of rating  $40\ W$ ,  $60\ W$  and  $100\ W$  respectively are connected in parallel to an electric source. Which of the following is likely to happen regarding their brightness? (a) Brightness of all the bulbs will be same. (b) Brightness of bulb A will be maximum. (c) Brightness of bulb B will be minimum. (d) Brightness of bulb C will be maximum.

19. The SI unit of electric power may be expressed as (a) volt ampere (b) kilowatt hour (c) watt second (d) joule second

20. In an electrical circuit, two resistors of  $2\ \Omega$  and  $4\ \Omega$  respectively are connected in series to a  $6\ V$  battery. The heat dissipated by the  $4\ \Omega$  resistor in  $5\ s$  will be (a)  $5\ J$  (b)  $10\ J$  (c)  $20\ J$  (d)  $30\ J$

[Exemplar Problem]

[Exemplar Problem]

[Exemplar Problem]

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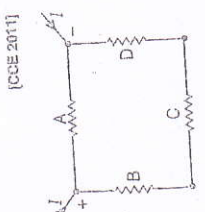
[Exemplar Problem]

[Exemplar Problem]

The experiment to verify Ohm's Law, rheostat is used to vary voltage of the cell  
 direction of the current

adjoining figure shows a network of 4 resistors which is connected to an electric source. Identify the resistors which are connected in series in this network. [CCE 2011]

- (a) B, C and D  
 (b) B, A and D  
 (c) C, D and A  
 (d) A, B and C
- electric kettle consumes 1 kW of electric power when operated at 220 V. A fuse of what rating must be used for it?  
 (a) 1 A  
 (b) 2 A  
 (c) 3 A  
 (d) 5 A



[CCE 2011]

HOME ASSIGNMENT

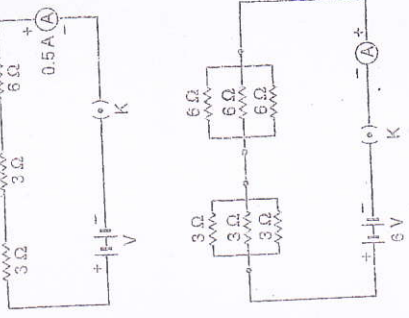
Over the Following Questions

1. Name the SI unit of electric charge. How is it related to an ampere? That is meant by saying that the potential difference between two points is 1 volt? In which principle, does an electric cell work? How do you design a battery of cells? Ohm's law a universal law? Give examples to illustrate your answer. State Ohm's law and represent it mathematically. Draw the V-I graph for a metallic wire. What does its slope indicate? What is the cause of resistance offered by a metallic conductor for flow of electric current through it? Draw an electric circuit comprising of a battery of 4 cells, an electric bulb, a resistor, an ammeter and a plug key, all connected in series. Also, show the direction of flow of current in the circuit. Three bulbs of 60 W, 40 W and 100 W respectively are connected (a) in series, and (b) in parallel to a voltage source. Which physical quantity is same through the bulbs in two arrangements? What is the cause of heat produced in a resistor when a current is flown through it? List three factors on which amount of heat produced in a resistor due to an electric current depends. Define 1 kW h. What is its value in joules?

NUMERICAL BASED QUESTIONS

Over the Following Numerical Problems

1. Calculate the current in a circuit if a charge of 600 C passes through it in 20 minutes.
2. A current of 80  $\mu$ A flows in the filament of an X-ray tube. How many electrons are crossing a cross-section of filament per second?
3. Given that charge on an electron =  $1.6 \times 10^{-19}$  C. Find the electric potential at a point if 0.002 J work is to be done to bring a 40  $\mu$ C charge from infinity to that point.
4. The heating coil of a geyser draws a current of 7.5 A when connected to a source maintaining a potential difference of 200 V between its terminals. What is the resistance of the coil?
5. Calculate the resistance of a constantan wire of length 2.0 m and radius 0.1 mm. Given that resistivity of constantan is  $49 \times 10^{-8} \Omega \cdot \text{m}$ .
6. The resistance of a given wire is 24  $\Omega$ . What will be its new resistance if (a) only the length of a conductor is increased to 3 times of its original length, and (b) only the cross-section area of the wire is doubled?
7. Find the effective resistance if three resistances  $R_1 = 1 \Omega$ ,  $R_2 = 2 \Omega$  and  $R_3 = 3 \Omega$  are connected in (a) series, and (b) parallel.
8. What possible values of resultant resistance are possible by combining two resistors  $R_1 = 4 \Omega$  and  $R_2 = 12 \Omega$ ?



9. What is the potential difference between the terminals of the battery shown in the circuit of adjoining figure, if a constant current of 0.5 A, is flowing through the circuit?
10. A wire of resistance 16  $\Omega$  is cut into 4 equal parts and these parts are then joined in parallel. Calculate the net resistance of the combination.
11. Calculate the equivalent resistance of the circuit shown in the adjoining figure. What is the reading of the ammeter?
12. Two electric bulbs are rated as (a) 100 W, 220 V, and (b) 40 W, 220 V. Calculate their resistances.
13. Two bulbs A of 20 W, 100 V and B of 40 W, 100 V are joined in parallel across a 100 V source. Calculate the total current drawn from the voltage source.
14. A shop owner uses 2 fluorescent tubes of 40 W each, a fan of 60 W rating and a TV of 160 W rating. If he uses all these gadgets for 5 hours daily, calculate the units of electrical energy consumed by him in the month of April.