CBSE

ELECTRICITY WS 5

Class 10 - Science

Section A

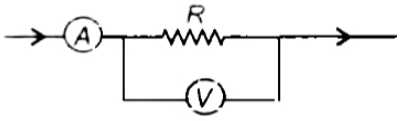
1. The resistance of a wire does **not** depend on its: **[1]**

   a) Length
   b) Material
   c) Shape
   d) Area of cross-section

2. A piece of wire of resistance 20Ω is drawn out so that its length is increased to twice its original length. **[1]**
   Resistance of the wire in the new situation:

   a) 70 Ω
   b) 50 Ω
   c) 60 Ω
   d) 80 Ω

3. In the circuit shown here, the ammeter A reads 5 A and the voltmeter V reads 20 V. The correct value of **[1]**
   resistance R is (Assume the voltmeter is not ideal.)



   a) Slightly less than 4Ω.
   b) Zero
   c) Slightly greater than 4Ω
   d) Exactly 4Ω

4. The unit of resistivity is **[1]**

   a) ohm-m
   b) mho
   c) ohm
   d) ohm/m

5. **Assertion (A):** Bending a wire does not affect electrical resistance. **[1]**
   Reason (R): Resistance of wire is proportional to the resistivity of the material.

   a) Both A and R are true and R is the correct explanation of A.
   b) Both A and R are true but R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true.

6. **Assertion (A):** The connecting wires are made of copper. **[1]**
   Reason (R): The electrical conductivity of copper is high.

   a) Both A and R are true and R is the correct explanation of A.
   b) Both A and R are true but R is not the correct explanation of A.
   c) A is true but R is false.
   d) A is false but R is true.

7. **Assertion (A):** The resistivity of the conductor increases with the increase of temperature. **[1]**
   Reason (R): The resistivity is the reciprocal of the conductivity.

   a) Both A and R are true and R is the correct
   b) Both A and R are true but R is not the

explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

8. **Assertion (A):** Wire A is thin in comparison to wire B of same material same length then resistance of wire A is greater than resistance of wire B. **[1]**

Reason (R): Resistivity of wire A is greater than resistance of wire B.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

9. **Assertion (A):** Resistivity of the material may change with temperature. **[1]**

Reason (R): Resistivity is a material property & independent of temperature.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

10. **Assertion (A):** Longer wires have greater resistance and the smaller wires have lesser resistance. **[1]**

Reason (R): Resistance is inversely proportional to the length of the wire.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

11. **Assertion (A):** When a wire is stretched to three times of its length, its resistance becomes 9 times. **[1]**

Reason (R): Resistance is directly proportional to length of wire.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

12. **Assertion (A):** When area of the conductor is halved then the resistance of the material gets doubled when length is kept constant. **[1]**

Reason (R): Because resistance is inversely proportional to the area of a cross-section of the material.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

13. **Assertion (A):** Copper is used to make electric wires. **[1]**

Reason (R): Copper has very low electrical resistance.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

14. **Assertion (A):** Heater wire must have high resistance will be the melting point. **[1]**

Reason (R): If resistance is high, the electric conductivity will be less.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

15. **Assertion (A):** The product of resistivity and conductivity of a conductor depends on the material of the conductor. **[1]**

Reason (R): Because each resistivity and conductivity depends on the material of the conductor.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

16. **Assertion (A):** When the length of a wire is doubled, then its resistance also gets doubled. **[1]**

Reason (R): The resistance of a wire is directly proportional to its length.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

17. **Assertion (A):** Alloys are used in making electric irons, toasters etc. **[1]**

Reason (R): Because the resistivity of alloys is lower than its constituent metals.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

18. **Assertion (A):** If ρ_1 and ρ_2 be the resistivity of the materials of two resistors of resistances R_1 and R_2 respectively and $R_1 > R_2$. **[1]**

Reason (R): The resistance $R = \rho\frac{l}{A} \Rightarrow \rho_1 > \rho_2$ if $R_1 > R_2$

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false.

d) A is false but R is true.

19. **Assertion (A):** Silver is not used to make electric wires. **[1]**

Reason (R): Silver is a bad conductor.

a) Both A and R are true and R is the correct explanation of A.

b) Both A and R are true but R is not the correct explanation of A.

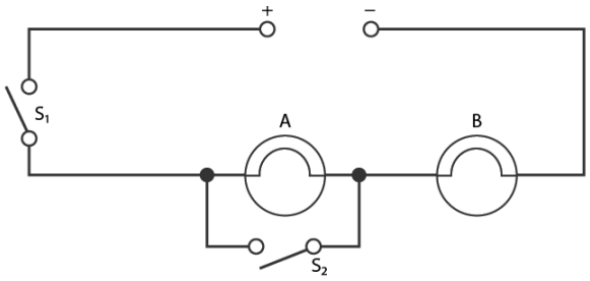
c) A is true but R is false.

d) A is false but R is true.

20. **Fill in the blanks:** **[1]**

(a) The S.I. unit of _____ is ohm metre. **[1]**

21. Using the circuit given below, state which of the following statement is correct? **[1]**



a) When S_1 and S_2 are closed, lamps A and B

b) With S_2 open and S_1 closed A and B are lit

are lit

c) With S_1 open and S_2 closed, A is lit and B is not lit

d) With S_1 closed and S_2 open, lamp A remains lit even if lamp B gets fused

22. Match the following with the correct response: **[1]**

Column A	Column B
(i) Best conductor	(a) Silicon
(ii) Standard resistor	(b) Silver
(iii) Semiconductor	(c) Ebonite
(iv) Insulator	(d) Constantan

a) (i) - (d), (ii) - (a), (iii) - (c), (iv) - (b)

b) (i) - (a), (ii) - (c), (iii) - (b), (iv) - (d)

c) (i) - (b), (ii) - (d), (iii) - (a), (iv) - (c)

d) (i) - (c), (ii) - (b), (iii) - (d), (iv) - (a)

23. Which of the following statements are correct about resistance? **[1]**

A. The resistance of a conductor is directly proportional to the length.

B. The resistance of a conductor is directly proportional to the area of cross-section.

C. The Resistance of a conductor depends on the nature of the material.

D. The Resistance of a conductor is inversely proportional to the length.

a) A, B and D

b) A and B

c) A and C

d) A and D

24. A student says that the resistance of two wires of the same length and same area of cross-section is the same. This statement is correct if**:** **[1]**

a) Both wires are made of same material and are at same temperature.

b) Both wires are made of different materials and are at the same temperature.

c) Both wires are made of same material and are at different temperature.

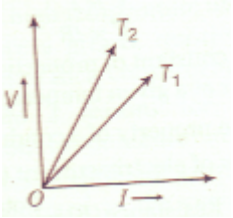
d) Both wires are of different materials.

25. The resistance of a wire of length 150 cm and of uniform area of cross-section 0.015 cm^2, is found to be 3.0 Ω. Calculate the specific resistance of the wire. **[1]**

26. Which substance is used for making resistance coil of electric heater and why? **[1]**

27. The voltage-current (V-I) graph of a metallic circuit at two different temperatures T_1 and T_2 is shown in figure. **[1]**

Which of the two temperatures is higher and why?



28. Write an expression for current **I**, if a charge **Q** flows through the cross-section of conductor in time **t**. **[1]**

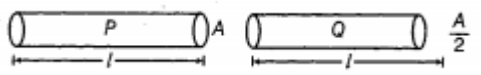
29. The resistance of a resistor is kept constant and the potential difference across its two ends is decreased to half of its former value. State the change that will occur in the current flowing through it. **[1]**

30. The following table gives the value of electrical resistivity of some materials: **[1]**

Material	Copper	Silver	Constant
Electrical resistivity (in Ω-m)	1.62×10^{-8}	1.6×10^{-8}	49×10^{-8}

Which one is the best conductor of electricity out of them?

31. What is SI unit of resistivity ? **[1]**
32. How does the resistance of a wire vary with its area of cross-section? Explain. **[1]**
33. Which material is best conductor? **[1]**
34. Define conductors and insulators? **[1]**
35. What happens to resistance of a conductor when its area of cross-section is increased? **[1]**
36. Define the term "electrical resistivity" of a material. **[1]**
37. A wire of resistivity ρ is pulled to double its length. What will be its new resistivity? **[1]**
38. Out of the two wires P and Q shown below which one has greater resistance? Justify it. **[1]**



39. What is the formula of **[1]**
    a. Resistance (R) of an electric appliance,
    b. Safe current (I) in terms of power rating (P) and voltage rating (V).
40. Why are coils of electric toasters and electric irons made of an alloy rather than a pure metal? **[1]**
41. What is a super conductor? Give two examples. **[1]**

Section B

42. Match the following: **[2]**

(a) best conductor	(i) silicon
(b) standard resistor	(ii) silver
(c) semiconductor	(iii) ebonite
(d) insulator	(iv) constantan

43. Why does resistance of a metallic conductor increase with increase in temperature? **[2]**
44. Why should a connection wire be thick? **[2]**
45. Write the formula for current **I** flowing through a conductor if **n** electrons flow through the cross-section of a conductor in time **t**. **[2]**
46. Two metallic wires A and B are connected in series. Wire A has length l and radius r, while wire B has length 2l and radius 2r. Find the ratio of total resistance of series combination and the resistance of wire A, if both the wires are of the same material? **[2]**
47. Which of the cables, one rated 5 A and the other 10 A will be of thicker wire? Give a reason for your answer. **[2]**
48. On what factors does the resistance of a conductor depend? **[2]**
49. i. Distinguish between the terms electrical resistance and resistivity of conductor. **[2]**
    ii. A copper wire of resistivity $1.63 \times 10^{-8}\pi - m$ has cross-section area of 10.3×10^{-4} cm^2. Calculate the length of the wire required to make a 20 Ω coil.
50. Two wires P and Q are made of copper. The wire P is long and thin, while the wire Q is short and thick. Which will have more specific resistance? Give a reason for your answer. **[2]**
51. A given length of a wire is doubled on itself. By what factor does the resistance of the wire change? **[2]**
52. A 4Ω resistance wire is doubled on it. Calculate the new resistance of the wire. **[2]**

53. Write two points of difference between resistance and resistivity (or specific resistance). **[2]**

54. Will current flow more easily through a thick wire or a thin wire of the same material, when connected to the same source? Why? **[2]**

55. What is electrical resistivity? In a series electrical circuit comprising of a resistor made up of a metallic wire, the ammeter reads 5 A. The reading of the ammeter decreases to half when the length of the wire is doubled. Why? **[2]**

56. On what factors does the resistance of a conductor depend? **[2]**

57. A wire has a resistance of 5 Ω. Calculate the resistance of a wire of same material, whose length is three times and area of cross-section is four times the first wire. **[2]**

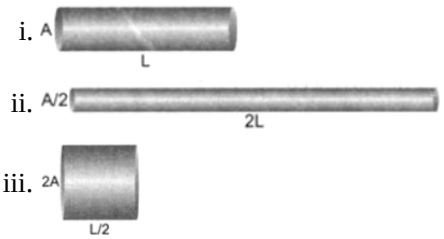
58. A wire of given material having length l and area of cross-section A has a resistance of 4Ω. What would be the resistance of another wire of the same material having length l/2 and area of cross-section 2A? **[2]**

59. A copper wire has diameter 0.5 mm and resistivity $1.6 \times 10^{-8}\ \Omega$ m. What will be the length of this wire to make its resistance 10 Ω? How much does the resistance change if the diameter is doubled? **[2]**

60. a. List the factors on which the resistance of a conductor in the shape of a wire depends. **[2]**
    b. Why are metals good conductors of electricity whereas glass is a bad conductor of electricity? Give reason.
    c. Why are alloys commonly used in electrical heating devices? Give reason.

61. (a) Define electric resistance of a conductor? **[2]**
    (b) A wire of length L and resistance R is stretched so that its length is double and the area of cross section is halved. How will its
    (i) resistance change?
    (ii) resistivity change?

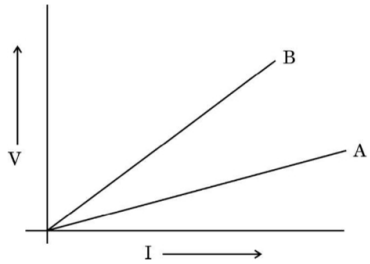
62. Figure (a), (b) and (c) show three cylindrical copper conductors along with their face areas and length. Which of the conductors will have highest resistance and why? **[2]**



Section C

63. The length of different metallic wires, but of the same area of cross-section and made of the same material are given below: **[3]**
    Wire - Length
    A - 1 m
    B - 1.5 m
    C - 2.0 m
    (i) Out of these three wires, which wire has higher resistance?
    (ii) Which wire has higher electrical resistivity? Justify your answer.

64. V - I graph for two conducting wires A and B are as shown. If both wires are of the same length and same diameter, which of the two is made of a material of high resistivity? Give reasons to justify your answer. **[3]**



65. i. Write the relationship between electrical resistance and electrical resistivity for a metallic conductor of cylindrical shape. Hence derive the SI unit of electrical resistivity. **[3]**

ii. Find the resistivity of the material of a metallic conductor of length 2 m and area of cross-section 1.4×10^{-6} m^2. The resistance of the conductor is 0.04 ohm.

66. i. In the following figure, three cylindrical conductors A, B and C are shown along with their lengths and areas of cross-section. If these three conductors are made of the same material and R_A, R_B and R_C be their respective resistances, then find (a) $\frac{R_A}{R_B}$, and (b) $\frac{R_A}{R_C}$. **[3]**

ii. If the conductor A is made of copper and the conductor C is made of constantan (alloy of copper and nickel), then which one of the two will have more electrical resistance and why?

67. a. Calculate the resistance of a metal wire of length 2 m and area of cross-section 1.55×10^{-6} m^2. (Resistivity of the metal is 2.8×10^{-8} Ωm) **[3]**

b. Why are alloys preferred over pure metals to make the heating elements of electrical heating devices?

Section D

68. **Read the following and answer any four questions:** **[4]**

Resistance is the property of a conductor to resist the flow of charges through it. The current which flows through a resistor is inversely proportional to its resistance, If the resistance is double the current get halves. A component of identical size that offers a higher resistance is a poor conductor. An insulator of the same size offers even higher resistance. The resistance of the material depends on various factors. The resistivity of an alloy is generally higher than that of its constituent metal.

i. The resistance of a wire of length 300m and cross-section area 1.0 mm^2 made of material of resistivity 1.0×10^{-7} Ω m is:

1. 2 Ω
2. 3 Ω
3. 20 Ω
4. 30 Ω

ii. The resistivity of metal depends on:

a. length
b. nature of material
c. area of cross-section
d. all of these

iii. What happens to the resistance as the conductor is made thicker?

a. Resistance decreases

b. Resistance increases

c. Resistance remains the same

d. None of these

iv. Metals and alloys' resistivity is in the range _____.

a. 10^{-10} Ωm to 10^{-5} Ωm

b. 10^{-8} Ωm to 10^{-6} Ωm

c. 10^{-10} Ωm to 10^{-6} Ωm

d. 10^{-9} Ωm to 10^{-5} Ωm

v. Why alloy is commonly used in electrical heating devices like toaster etc?

a. Alloy oxidise easily

b. Alloy does not oxidise readily at high temperature

c. Alloys is a good material

d. Alloys are easily available

69. **Read the Case study followed by 3 questions Part (i) and (ii) are compulsory. However, an internal choice has been provided in part (iii):** **[4]**

The heating effect of current is obtained by transformation of electrical energy into heat energy. Just as mechanical energy used to overcome friction is covered into heat, in the same way, electrical energy is converted into heat energy when an electric current flows through a resistance wire. The heat produced in a conductor, when a current flows through it is found to depend directly on (a)strength of current (b) resistance of the conductor (c) time for which the current flows.

The mathematical expression is given by $H = I^2Rt$.

The electrical fuse, electrical heater, electric iron, electric geyser etc. all are based on the heating effect of current.

i. What are the properties of heating element?

ii. What are the properties of electric fuse?

iii. When the current is doubled in a heating device and time is halved, what will be the heat energy produced?

OR

A fuse wire melts at 5 A. It is desired that the fuse wire of same material melt at 10 A. Find the new radius of the wire?

Section E

70. i. Find the ratio of resistances of two copper rods X and Y of lengths 30 cm and 10 cm respectively and having radii 2 cm and 1 cm respectively. **[5]**

ii. A current of 500 mA flows in a series circuit containing an electric lamp and a conductor of 10Ω when connected to 6 V battery. Find the resistance of the electric lamp.

71. What is specific resistance or resistivity ? Upon what factors does it depend ? **[5]**

72. a. Write the relation between resistance and electrical resistivity of the material of a conductor in the shape of a cylinder of length **I** and area of cross-section **A**. Hence derive the S.I. unit of electrical resistivity. **[5]**

b. The resistance of a metal wire of length 5 m is 100 Ω. If the area of cross-section of the wire is 3×10^{-7} m^2, calculate the resistivity of the metal.

73. Two wires A and B are of equal length, different cross sectional areas and made of the same metal. **[5]**

(a) (i) Name the property which is same for both the wires,

(ii) Name the property which is different for both the wires.

(b) If the resistance of wire A is four times the resistance of wire B, calculate

(i) The ratio of the cross sectional areas of the wires and

(ii) The ratio of the radii of the wire.

74. What is the electrical resistivity of a material? What is its unit? Describe an experiment to study the factors on which the resistance of conducting wire depends. **[5]**

75. i. What is meant by resistance of a conductor? Define its SI unit. **[5]**

ii. List two factors on which the resistance of a rectangular conductor depends.

iii. How will the resistance of a wire be affected if its

I. length is doubled, and

II. radius is also doubled?

Give justification for your answer.