

Electrical resistivity and resistance

Electrical resistivity and its inverse, electrical conductivity are fundamental properties of a material that quantifies how strongly it resists or conducts electric current. A low resistivity indicates a material that readily allows electric current to flow.

Resistance is defined as the ratio of potential difference across a conductor to the current passing through it. Resistance is the property of a conductor to resist the flow of charges through it.

Both resistance and resistivity describe how difficult it is to make electrical current flow through a material, but unlike resistance, resistivity is an intrinsic property. This means that all pure copper wires irrespective of their shape and size, have the same resistivity, but a long, thin copper wire has a much larger resistance than a thick, short copper wire. Every material has its own characteristic resistivity. For example, rubber has a far larger resistivity than copper. Resistivity of metals also varies with temperature.

The resistance of almost all alloys increases with increase in temperature but the rate of change of resistance is less than that of metals. In fact, the resistance of certain alloys such as Manganin, Eureka, and Constantan show practically no change in resistance to a considerable range of temperature.

Question 1:- What happens to the resistivity of a wire if it is stretched?

- a) It will increase
- b) It will decrease
- c) First increases then decreases
- d) Remains the same.

Question 2:- Though silver is a good conductor, why it is not an ideal choice for transmission of electricity?

- i) It is expensive
 - ii) It oxidizes and tarnishes when it comes in contact with air.
 - iii) Its resistivity decreases with increase in temperature
- a) Only (i)
 - b) Only (ii)
 - c) Both (i) and (ii)
 - d) Only (iii)

Question 3:- The area of cross section of a wire becomes half when its length is stretched to double. How the resistance of the wire is affected in the new condition?

Question 4:- The resistivity does not change if

- (a) the material is changed
- (b) the temperature is changed
- (c) the shape of the resistor is changed
- (d) both material and temperature are changed

Question 5:- Ajay made the following conclusions regarding resistance of metals/alloys. Which ones would you agree or disagree with?

	STATEMENT	AGREE	DISAGREE
1	The resistivity of a metal decreases with temperature		
2	A thick copper wire has less resistance than a thin copper wire of the same length.		
3	Alloys are often used in the manufacture of standard resistors		

CCT Weekly Science Practice

Answer Key:-

1. D
2. C
3. Volume of the wire remains the same before and after stretching.
Assuming wire to be cylindrical in shape then
volume = Area of base x height/ length
due to stretching if length is increased area will decrease.
 $R = \rho l/A$
New length = $2l$
New Area = $A/2$
Resistance increases four times.
4. C
5.
 1. Disagree
 2. Agree
 3. Agree, as there is almost no change in resistance with change in temperature.

Created by:

Mr. Deepak Bisht