## TOPIC

Electricity and Magnetism – Section XI – Question 7

## QUESTION

A wire at 20°C has a resistance of 500Ω. The average temperature coefficient of this wire is 0.002/°C. The total resistance in ohms at 60°C most nearly is

(A) 500
(B) 540
(C) 600
(D) 650

## HINT

Resistance is represented with the capital letter $R$ and it is measured in ohms (Ω).

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

where

$\rho$ is the resistivity of the material (Ω.m),
$A$ is the cross sectional area ($m^2$) and
$l$ is the length (m).

The resistivity of any conductive material is temperature dependent

$$\rho = \rho_0[1 + \alpha(T - T_0)]$$

Hence, resistance is also temperature dependent

$$R = R_0[1 + \alpha(T - T_0)]$$

where α is the temperature coefficient.

## SOLUTION

In the problem the reference temperature is

$T_o$=20°C,

Hence

$R_o$=500 (resistance at reference temperature)

The new temperature

T=60°C and α=0.002/°C.

Substitute into the equation

$R = R_o[1+\alpha(T-T_o)]$
$= 500[1+0.002(60-20)]$
$= 540\ \Omega.$

## ANSWER

(B)

## CONTRIBUTOR

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