

## Answer on Question # 73379, Physics - Electric Circuits :

**Question:** The following readings were obtain in an experiment

P(volt) 1.5 \ 2.5 \ 3.3 \ 3.9 \ 4.3 \ 4.6

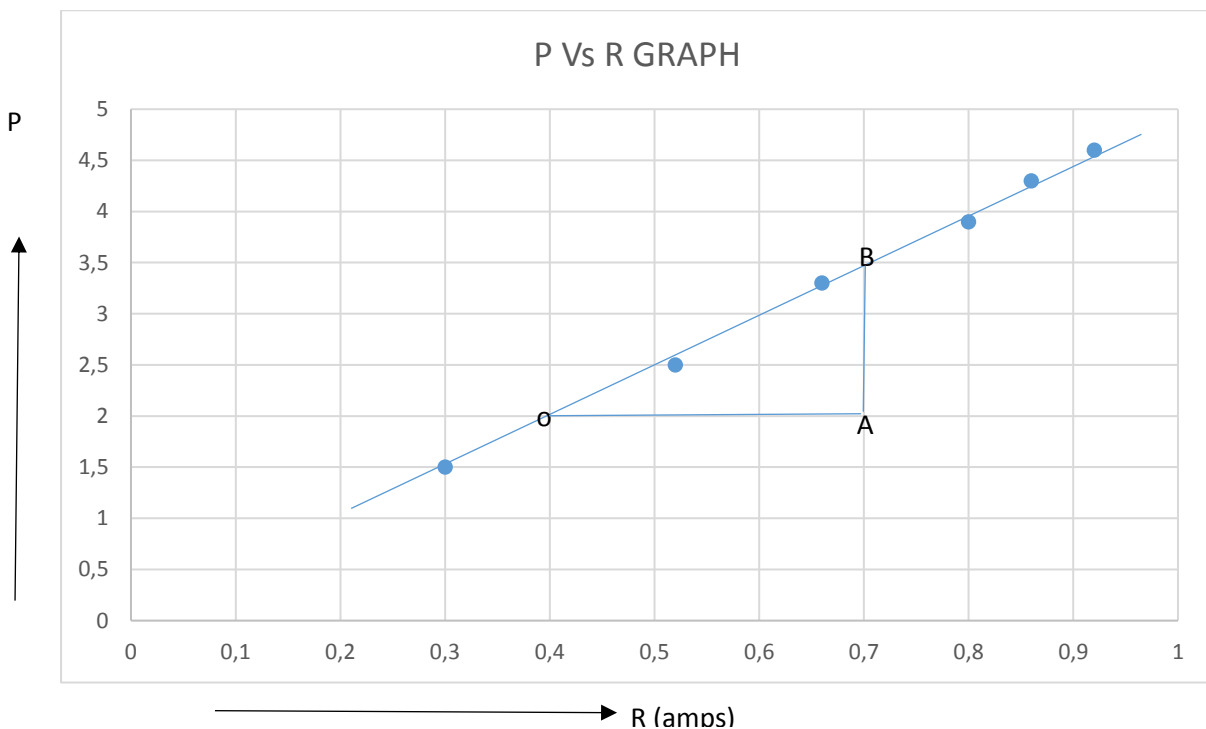
R(amp) 0.30 \ 0.52 \ 0.66 \ 0.80 \ 0.86 \ 0.92

was asked to plot a graph of P against R

a, Calculate the slope and determine the error in the slope.

b, If P and R are related by the equation  $p=a^2R$ ,determine the value of a and the standard error.

**Solution:**



a. To calculate slope we have to find first AB and OA length.

From the graph we find OA = 3 unit = 0.1 x 3 = 0.3 amps.

And AB = 3 unit = 0.5 x 3 = 1.5 volts.

$$\text{Slope} = \frac{AB}{OA} = \frac{1.5}{0.3} = 5 \text{ volts/amps.}$$

$$\text{Slope error} = \frac{N \times \text{Standard square error}}{N \sum R^2 - \sum R^2} \quad , \quad N = 6 \text{ , number of observation.}$$

So, slope error =  $\frac{6 \times 0.005}{18.132 - 3.022} = 0.04$  [Put the value standard square error from equation 1]

$$\sum R^2 = 3.022 \text{ and } N\sum R^2 = 18.132$$

- b. If P and R are related by the equation  $p = a^2R$ , then  $a^2 = 5$  (actually this is the slope of the graph). Then  $a = \sqrt{5} = 2.236068$  unit.

Now, here number of observation (N) = 6

$$\text{And } \sum (5R - P)^2 = 0.02$$

$$\text{Now standard square error} = \frac{0.02}{6-2} = \frac{0.02}{4} = 0.005 \text{ .....(1)}$$

So, standard error =  $\sqrt{0.005} = 0.0707$  (approx).

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