ELECTRICITY
Electric Energy

Electric Energy:

The fact that conductors offer resistance to the flow of current, means that work must be continuously done to maintain the current. The role of resistance in electrical circuits in analogous to that of friction in mechanics. To calculate the amount of work done by a current I, flowing through a wire of resistance R, during the time t, the amount of work done is given by-

$$W = QV$$

but as $Q = I \times t$

therefore, the amount of work done, W is

$$W = V \text{ X } I \text{ X } t$$

By substituting the expression for V from Ohm's law,

$$\mathbf{V = IR}$$

we finally get $\mathbf{W = I^2 Rt}$

This shows that the electrical energy dissipated or consumes depends on the product of the square of the current I. flowing through the resistance R and the time t.

(i) Commercial unit of electrical energy (Kilowatt - hour) :

The S.I. unit of electrical energy is joule and we know that for commercial purposes we use a bigger unit of electrical energy which is called **"kilowatt - hour".** One kilowatt - hour is the amount of electrical energy consumed when an electrical appliance having a power rating of 1 kilowatt and is used for 1 hour.

(ii) Relation between kilowatt hour and Joule:

Kilowatt-hour is the energy supplied by a rate of working of 1000 watts for 1 hour.
1 kilowatt-hour = 3600000 joules
$\Rightarrow 1 \text{ kWh} = 3.3 \times 10^6 \text{ J}$