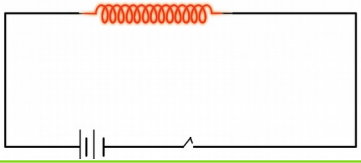
PHYSICS - X

- **Write down the energy changes in them with respect to their use.**

Device	Use	Energy change
• Electric bulb	.....	..... → .....
• Induction cooker	To get heat	Electrical energy → Heat
• Storage battery (while charging)	.....	..... → .....
• Mixie	.....	..... → .....
•	.....	..... → .....
•	.....	..... → .....

Heating effect of electric current

* **When electricity passes through any conductor, it generates heat energy.**



One volt

* *The potential difference between two points will be one volt if one joule of work is done in moving one coulomb of charge from one point to the other.*

Joule Heating or Ohmic Heating.

* *Heat is developed in a circuit on passing current through it is known as the Joule Heating or Ohmic Heating.*

* *What are the factors influencing the heat developed when a current passes through a conductor?*

1. *Intensity of electric current (I)*
2. *Resistance of the conductor (R)*
3. *The time of flow of current (t)*

JOULE'S LAW

Joule's Law

The heat generated (H) in a current carrying conductor is directly proportional to the product of the square of the current (I) in the conductor, the resistance of the conductor (R) and the time (t) of flow of current.

$H \propto I^2Rt \qquad \therefore H = I^2Rt$ joule

I is the current in ampere, R is the resistance in ohm and t is the time in second.

**Joule's Law is useful in devices that make use of heating effect of electricity.*

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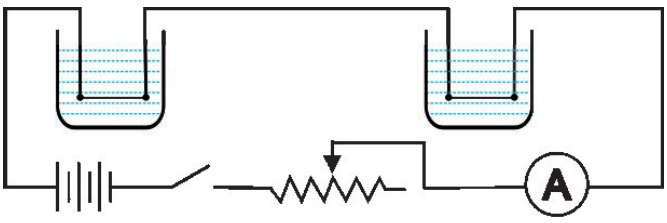

* Complete the following table on the basis of Joule's Law.

Resistance of conductor R (Ω)	Intensity of Current I (A)	Time for which current flows t (s)	Heat generated I^2Rt (J)	Change in Heat (H)
2 R	I	t	2 I^2Rt	Twice (2H)
R	2 I	t	.....	.....
R/2	I	t	.....	.....
R	I/2	t	.....	.....
R	I	2t	.....	.....
R	I	t/2	.....	.....

*** Analyse the table and find out the factor that influences heat the most.**

***$H = I^2Rt$* is used to find out the heat developed when current flows through a conductor. Let's try to write down the equation in some other forms.**

$H = I^2Rt$
$H = VIt$
$H = V^2t/R$

H – Heat energy
R - Resistance
V – Potential difference
I – Current
t - Time

Let's solve some mathematical problems which are related to Joules Law.

1. How much will be the heat developed if 0.2 A current flows through a conductor of resistance 200 Ω for 5 minute?

2. Let's find out the heat developed in 3 minute by a device of resistance 920 Ω working under 230 V.

3.Let's calculate the heat developed when 3 A current flows through an electric iron box designed to work under 230 V. Which equation will help us to solve the problem easily? Solve the problem.

**** Details of two electric heaters are given below. How much will be the heat developed if they are made to work for 5 minute each?***

Heater - A	Heater - B
Working voltage : 230 V Resistance : 1150 Ω Working time : 5 minute	Working voltage : 230 V Resistance : 460 Ω Working time : 5 minute
$H = \frac{V^2t}{R}$ $= \frac{230^2 \times 300}{1150}$ $= 13800\ J$	$H = \frac{V^2t}{R}$ $= \frac{230^2 \times 300}{460}$ $= 34500\ J$

**** Why does the heater having low resistance get heated more?***

**** In which way does the change in resistance influence the heat developed?***

**** Find out the current in the heaters A and B and compare the heat developed.***

**** How do the resistors bring about a change in the current in the circuit?***