Physics Class Notes

Electric Power

The amount of energy consumed by an electrical appliance in unit time is its power.

According to Joule's Law, the heat generated (H) in an electrical circuit in an interval of time t second or the work done is H =I^2Rt Then, how is the power calculated?

Work done H =I^2Rt
Time = t
Power, P = Work / Time
$\qquad$ = I^2Rt/ t
$\qquad$ = I^2R
By Ohm's law I= V/R, P= $(V/R)^2$ x R= V^2 /R
Or R=V/I , P= I^2 x V/I = VI

Electric Power, P = I^2R = V^2/R =VI

The unit of power is Watt (W).

Problems

1. An appliance of power 540 W is used in a branch circuit. If the voltage is 230 V, what is its amperage?

Ans: **Amperage = Wattage/ Voltage**
$\qquad$ **I= W/V**
$\qquad$ **= 540/ 230= 2.34 ≈ 2.4 A**

2. A heating appliance has a resistance of 115 Ω. If 2 A current flows through it, what is the power of the appliance?

Ans: **R = 115 Ω**
$\qquad$ **I = 2 A**
Power,P= I^2 R
$\qquad$ **= 2^2 x 115 = 460 W**

3. The power of an electrical appliance is 1600 W. The device works at 400 V. If we give 200 V instead of 400 V , what is its power?

Ans: **Power, P = 1600 V**
$\qquad$ **V = 400 V**
$\qquad$ **P= V^2/ R**
Therefore R = V^2 / P
$\qquad$ **= 400 x 400 / 1600**
$\qquad$ **= 100 Ω**
When Voltage was 200 V
Then Power, P = V^2 / R
$\qquad$ **= 200 x 200 / 100**
$\qquad$ **= 400 W**
If voltage is decreased to half, then power decreases to one forth.

Homework

1. A current of 0.4 A flows through an electric bulb working at 230 V. What is the power of the bulb?

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