

CASE STUDY QUESTION 30

Read the following and answer any four questions from (i) to (v)

Every electrical appliance like an electric bulb, radio or fan has a label or engraved plate on it which tells us the voltage (to be applied) and the electrical power consumed by it. The power rating of an electrical appliance tells us the rate at which electrical energy is consumed by the appliance. For example, a power rating of 100 watts on the bulb means that it will consume electrical energy at the rate of 100 joules per second. If we know the power P and voltage V of an electrical appliance, then we can very easily find out the current I drawn by it. This can be done by using the formula: $P = V \times I$.



(a) An electric bulb may have power of 15 W, 40 W, 60 W, 100 W or more



(b) The usual power of a TV set is about 120 W



(c) An electric iron has a power of 750 W or more



(d) An electric heater may have power of 1000 W or 2000 W, etc.



(e) The usual power of a washing machine is 3000 W (or 3 kW)

(i) Which of the following does not represent electrical power in a circuit ?

- (a) I^2R (b) IR^2 (c) VI (d) V^2/R

Ans: (b) IR^2

(ii) An electric bulb is rated 220 V and 100 W. What is the resistance of the bulb?

- (a) 448 Ω (b) 488 Ω (c) 484 Ω (d) 482 Ω

$$P = \frac{V^2}{R}$$

$$\text{So, } 100 = \frac{(220)^2}{R} \Rightarrow R = \frac{220 \times 220}{100} = 484 \Omega$$

Ans: (c) 484 Ω

(iii) When the bulb in (ii) is operated on 110 V, the power consumed will be :

- (a) 100 W (b) 75 W (c) 50 W (d) 25 W

$$P = \frac{V^2}{R} \Rightarrow P = \frac{(110)^2}{484}$$
$$= \frac{110 \times 110}{484} = 25 \text{ W}$$

Ans: (d) 25 W

(iv) The commercial unit of energy is :

- (a) watt (b) watt-hour (c) kilowatt-hour (d) kilo-joule

Ans: (c) kilowatt-hour

(v) What will be the current drawn by an electric bulb of 40 W when it is connected to a source of 220 V ?

- (a) 0.15 A (b) 0.18 A (c) 0.20 A (d) 0.24 A

$$P = V \times I \Rightarrow 40 = 220 \times I$$

$$\Rightarrow I = \frac{40}{220} = \frac{2}{11}$$

$$\Rightarrow I = 0.18 \text{ ampere}$$