

Useful $\times 100\%$
ans.

key

Science
Energy Efficiency Test

$$E = V i t$$

1. A 240 V oven element draws 30 A of current.

a) Calculate the energy the element uses if it is cooking a turkey for 4 hours.

$$= (240)(30)(4)(60)(60) \\ = 10\,368\,000 \text{ J}$$

b) If the oven converted 47 065 000 J of that energy into heat, what is the energy efficiency of the oven?

$$\frac{47\,065\,000}{10\,368\,000} = 45.4\%$$

2. A 120 volt light bulb has a current of 0.833 A running through it for 60 seconds.

a) How much electrical energy does it use in this time?

$$E = V i t = (120)(0.833)(60) \\ = 5997.6 \text{ J}$$

b) If the light bulb is 8% efficient at converting electrical energy to light energy, how many joules of energy were actually used to light the room?

$$\frac{8}{100} = \frac{x}{5997.6} \quad x = 479.8 \text{ J}$$

c) How many joules of energy were lost as heat?

$$5517.8 \text{ J}$$

3. An electric saw draws 25 A of current while operating on 120 volts.

a) What is the power of the saw?

$$P = V i = (120)(25) = 3000 \text{ W}$$

b) If the saw is operated for 3 minutes, calculate the energy used.

$$E = (3000)(3)(60) \\ = 540\,000 \text{ J}$$

c) If the saw is 65% efficient, how much energy is used to turn the blade?

$$\frac{65}{100} = \frac{x}{540\,000} \\ x = 351\,000 \text{ J}$$

4. An outdoor floodlight has a power rating of 250 watts.
 a) Calculate the current through the bulb if the voltage is 120 volts.

$$P = VI$$

$$I = \frac{P}{V} = \frac{250}{120} = 2.08 \text{ A}$$

- b) Calculate the total energy used by the bulb if it is left on for 12 hours overnight.

$$E = Pt = (250)(12)(60)(60) = 10800 \text{ kJ}$$

- c) If the bulb converted 478 kJ of energy into light, what is the energy efficiency of the light bulb?

$$\frac{478}{10800} \times 100 = 4.47\%$$

5. A 25 W compact fluorescent light bulb is operating at a voltage of 120 V.
 a) Calculate the resistance of the bulb?

$$R = \frac{V}{I} = \frac{120}{0.21} = 571 \Omega$$

$$I = \frac{P}{V} = \frac{25}{120} = 0.21 \text{ A}$$

- b) How much electrical energy (in joules) is used if the bulb operates for 8 hours?

$$E = Pt = (25)(8)(60)(60) = 720000 \text{ J}$$

- c) If the bulb is 35% efficient, how much energy lights the room?

$$\frac{35}{100} = \frac{x}{720000}$$

$$x = 252000 \text{ J}$$

6. A projector has a 300 W bulb in it.

- a) How much energy does it use when it runs for a 56 minute Science period?

$$E = Pt = (300)(56)(60) = 1008000 \text{ J}$$

- b) If the bulb is 14% efficient, how much energy is lost as heat?

$$\frac{14}{100} = \frac{x}{1008000 \text{ J}}$$

$$x = 141120 \text{ J}$$

lost: $1008000 - 141120 =$

$$866880 \text{ J lost}$$