

Key

Science & Technology 404 Energy Efficiency Worksheet

$$= \frac{\text{useful energy}}{\text{consumed energy}} \times 100\%$$

- ① A 240 V oven element draws 22 A of current.

- a) Calculate the energy the element uses if it is cooking a turkey for 3.0 hours.

$$P = VI = (240)(22) = 5280 \text{ W}$$

$$E = Pt = (5280)(3)(60)(60) = 57024000 \text{ J}$$

- b) If the oven converted 37 065 000 J of that energy into heat, what is the energy efficiency of the oven?

$$EE = \frac{37065000}{57024000} \times 100 = 65\%$$

- ② A 120 volt light bulb has a current of 0.833A running through it for 30 seconds.

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

$$E = Pt = (120)(0.833)(30) = 2998.8 \text{ J}$$

- b) If the light bulb is 5% efficient at converting electrical energy to light energy, how many joules of energy were actually used to light the room?

$$\frac{5}{100} = \frac{x}{2998.8} \quad x = 149.94 \text{ J}$$

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

$$2998.8 \text{ J} - 149.94 \text{ J} = 2848.86 \text{ J}$$

- ③ An electric saw draws 15 A of current while operating on 120 volts.

- a) What is the power of the saw? $P = Vi = (120)(15) = 1800 \text{ W}$

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

$$E = (1800)(3)(60) = 324000 \text{ J}$$

- c) If the saw is 85% efficient, how much energy is used to turn the blade?

$$\frac{85}{100} = \frac{x}{324000} \quad x = 275400 \text{ J}$$

4. An outdoor floodlight has a power rating of 150 watts.

a) Calculate the current through the bulb if the voltage is 120 volts.

$$P = VI \quad I = \frac{P}{V} = \frac{150}{120} = \underline{1.25 A}$$

b) Calculate the total energy used by the bulb if it is left on for 10 hours overnight.

$$E = Pt = (150)(10)(60)(60) = \underline{540000 J}$$

c) If the bulb converted 378 000 J of energy into light, what is the energy efficiency of the light bulb?

$$EE = \frac{378000}{540000} \times 100 = \underline{7\%}$$

5. An 18 W compact fluorescent light bulb is operating at a voltage of 120 V.

a) Calculate the resistance of the bulb? $P = VI \quad I = \frac{P}{V} = \frac{18}{120} = \underline{0.15 A}$

$$R = \frac{V}{I} = \frac{120}{0.15} = \underline{800 \Omega}$$

b) How much electrical energy (in joules) is used if the bulb operates for 5 hours?

$$E = Pt = (18)(5)(60)(60) = \underline{324000 J}$$

c) If the bulb is 17% efficient, how much energy lights the room?

$$\frac{17}{100} = \frac{X}{324000} = \underline{55080 J}$$

6. A projector has a 500 W bulb in it.

a) How much energy does it use when it runs for a 75 minute Science period?

$$E = Pt = (500)(75)(60) = \underline{2250000 J}$$

b) If the bulb is 4% efficient, how much energy is lost as heat?

$$\frac{4}{100} = \frac{X}{2250000}$$

$$X = \underline{90000 J}$$

$$E_{\text{lost}} = 2250000 - 90000 \\ = \underline{2160000 J}$$