Name _____

Intro to Electric Power

The rate at which energy is converted from one form to another is *power*.

$Voltage = \frac{Energy}{Charge}$ Therefore: $Energy = (Voltage)(Charge)$

$Power = \frac{Energy\ Converted}{Time}$ $therefore$ $P = \frac{(Voltage)(Charge)}{time} = (Voltage)\frac{Charge}{time}$

$Since\ \frac{Charge}{time} = Current$ $\boxed{P = IV}$

$P = IV$
$= (2)(120)$

1. What power is produced when a voltage of 120 V drives a 2.0 A current through a device? 240W

$P = IV$
$60 = I \cdot 120$

2. How much current does a 60-W lamp draw when connected to 120 V? 0.5 AMPS

$P = IV$
$I = P/V = \frac{100}{120} = 0.833\ A$

3. How much current does a 100-W lamp draw when connected to 120 V? 0.833 Amps

4. If part of an electric circuit dissipates energy at the rate of 6 W when it draws a current of 3 A, what voltage is impressed across it? 2.0 V

$V = P/I = 6/3 = 2.0$ Volts

5. Using the equation $\textbf{\textit{power}} = \frac{\textbf{\textit{energy converted}}}{\textbf{\textit{time}}}$

a simple rearrangement gives

$\textbf{\textit{energy converted}} =$ POWER · TIME

6. Explain the difference between a kilowatt and a kilowatt-hour (hint look at the units).

KW = 1000W of Power KW-HR is Power x Time = ENERGY

7. One deterrent to burglary is to leave your front porch light on all the time. If your fixture contains a 60 W bulb that operates at 120 V, and your local power utility sells energy at the rate of 8 cents per kilowatt-hour, how much will it cost to leave the bulb on for the whole month? Show your work below!

$E = P \cdot t$

$E = \left|\frac{60W \cdot 1\ month}{1}\right| \left|\frac{1\ KW}{1000W}\right| \left|\frac{30\ days}{1\ month}\right| \left|\frac{24\ HRS}{1\ DAY}\right| = \frac{43200}{1000} = 43.2$ KW·hr

COST = (43.2)(0.08) = $3.46

Name _____

Watt - Power Problems!

P = I·V *Energy converted = Power x Time*

Show all work for full credit.:

1. A microwave draws 15 A when operated on 120 V.
   a) How much power does it use? *(1800 W)*

   b) It takes 15 minutes to cook a meal, how much energy does it use?
   (0.45 Kw-Hrs)

   c) At $0.080 kWh, what does it cost to cook the meal?

2. How much current is supplied by a 240 V generator delivering 120 kW of power (500 A)

3. An electric heater provides 2.0 kW of power when connected to a 120 V potential difference.
   a) What is the current through the heater? *(16.7 A)*

   b) How much energy is used, in kW-hr, if the heater is on for five hours? (Watch your units)
   (10 kW-hr)

4. A pocket calculator draws 5.0 x 10^{-5} A of current when connected to a 9.0 V battery.
   a) What power does this calculator use? *(4.5×10^{-4} W)*

   b) How much energy, in joules, does the calculator use if it is left on for 20.0 minutes?
   (0.54 J)

   ENERGY IN Joules is (Power in watts) x (time in sec)