Electric Circuits
Physics First Honors 2012/13

Name KEY

Watt - Power Problems!

$$P = \frac{\text{energy converted(J),(kW - hr)}}{\text{time(s),(hr)}} = V \times I = \frac{V^2}{R} = I^2 R \qquad V = IR$$

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)*

$P = IV = 15(120) = 1800\,W$

   b) It takes 15 minutes to cook a meal, how much energy does it use?

$1800\,W \frac{1\,kW}{1000} \frac{0.25\,hrs}{} = 0.45\ KW\text{-}hrs$

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

$0.45(0.08) = 0.036 \qquad 3.6\,¢$

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

$P = IV \qquad 120000 = 240V \qquad V = \frac{120000}{240} = 500A$

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)*

$P = IV$

$2000 = 120V \qquad V = \frac{2000}{120} = \boxed{16.7\ A}$

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

$2\,kW \cdot 5\,hrs = 10\,kw\cdot hrs$

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 x 10^{-4} W)*

$P = IV = 5\times10^{-5}(9) = 4.5\times10^{-4}\,W$

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

$E = P\cdot time = 4.5\times10^{-4}(20\,min)\frac{60\,sec}{min}$

$E = 0.54\ J$