KEY

Joule's Law

1.) Your oven has a power rating of $5000\ W$.

a. How many kilowatts is this?

$5000\ W \times \frac{1\ KW}{1000\ W} = 5\ KW$

b. If the oven is used for two hours to bake cookies, how many kilowatt·hours ($kW \cdot h$) are used?

$5 \times 2 = 10\ Kw \cdot h$

c. If your town charges $\$0.15\ per\ kW \cdot h$, what is the cost to use the oven to bake the cookies?

$10\ Kw\cdot h \times \frac{\$0.15}{1\ Kw\cdot h} = \$1.50$

2.) You use a $1200.\ W$ hair dryer for ten minutes each day.

a. How many minutes do you use the hair dryer in a month? (Assume 30 days in the month.)

$10 \times 30 = 300\ min \Rightarrow 300\ min \times \frac{1\ h}{60\ min} = 5\ hours.$

b. How many hours do you use the hair dryer in a month?

c. What is the power of the hair dryer in *kilowatts*?

$1200\ W \times \frac{1\ Kw}{1000\ W} = 1.2KW$

d. How many *kilowatt · hours* of electricity does the hair dryer use in a month?

$1.2 \times 5 = 6\ Kw \cdot h$

e. If your town charges $\$0.15\ per\ kW \cdot h$, what is the cost to use the hair dryer for a month? F.) Given The power of the heater is $1500.\ W$. The heater was used for three hours.

$6 \times 0.15 = \$0.90$

F.) $1500\ W \times \frac{1\ KW}{1000\ W} = 1.5\ KW$

$1.5 \times 3 = 4.5\ Kw\cdot h$ $\quad 4.5 \times 30 = 135\ Kw\cdot h \times \$0.15 = \$20.25$

3. Calculate the power rating of a home appliance (in *kilowatts*) that uses $8.0\ A$ of current when plugged into a $110\ V$ outlet. $P = VI$ / $P = (8.0)(110)$ / $P = 880\ W$

$$880\ W \times \frac{1\ KW}{1000\ W} = 0.88\ KW$$

4. Calculate the power of a motor that draws a current of $2.0\ A$ when connected to a $12\ V$ battery.

$P = VI$ / $P = 12 \times 2.0$ / $P = 24\ W$

5. Your alarm clock is connected to a $110\ V$ circuit and draws $0.50\ A$ of current.

a. Calculate the power of the alarm clock in *Watts*.

$P = VI$ / $P = (110)(0.50)$ / $P = 55\ W$

b. Convert the power to *kilowatts*.

$$55\ W \times \frac{1\ KW}{1000\ W} = 0.055\ KW$$

c. Calculate the number of *kilowatt · hours* of electricity used by the alarm clock if it is left on for one year.

$$0.055\ KW \cdot h \times 24\ h \times 365.25\ day = 482\ KW \cdot h$$

d. Calculate the cost of using the alarm clock for one year if your town charges $\$0.15\ per\ kW \cdot h$.

$$482\ KW \cdot h \times \frac{\$0.15}{1\ KW \cdot h} = \$72.30$$