Name _____   Date _____
APES Topic 11 – Energy Resources   Mr. Romano

APES Energy Problems

(for this practice, you may use your calculator)

The Basics:

Energy: The basic unit of energy is a Joule (J).
Other units are kilojoule, calorie, British Thermal Unit (BTU), and therm.

1000J = 1 kJ (you should know this already …)

Power: Power is the rate at which energy is used. **Power (watts) = <u>Energy (joules)</u>**
time (sec)

1W = 1J/s   (1Watt = 1 Joule per second)

1kW = 1000 J/sec

1. A 100 Watt incandescent light bulb uses 100 J/sec of electrical energy. If it is 5% efficient, then the bulb converts 5% of the electrical energy into light and 95% is wasted by being transformed into heat (ever felt a hot light bulb?)

   a. How is the First Law of Thermodynamics referenced above?

   b. How is the Second Law of Thermodynamics referenced above?

Practice Problems:

2. How much energy, in kJ, does a 75 Watt light bulb use then it is turned on for 25 minutes?

3. The Kilowatt Hour, or kWh, is not a unit of power but of energy.
   Notice that kilowatt is a unit of power and hour is a unit of time. $E = P \times t$ (rearranged from above).
   A kilowatt hour is equal to 1 kW delivered continuously for 1 hour (3600 seconds).

   a. How many joules are equal to 1 kWh?

   b. How many kJ are equal to 1 kWh?

   c. Assume your electric bill showed you used 1355 kWh over a 30-day period.
       Find the energy used, in kJ, for the 30 day period.

   d. Find the energy used in J/day.

   e. At the NY rate of $0.194/kWh, what will your electric bill be for this month?

4. Remember: a 100-Watt incandescent light bulb is 5% efficient.

       a.) How much energy (in Joules) does it use in 12 hours of operation?

       b.) Convert total energy use to kWh.

       c.) How much energy does the bulb convert to light during 12 hours?

5. An electric clothes dryer has a power rating of 4000 W. Assume a family does 5 loads of laundry each week for
   4 weeks. Assume each dryer load takes 1 hour.

       a.) Find the energy used in J.

       b.) Find the energy used in kWh.

       c.) Find the operating cost for 4 weeks. Assume cost is $0.194/kWh