IB Physics
FA IB8.1 – Energy Production

Name_____

Favorite Analogy_____

Show your work, and circle your answers and use sig figs to receive full credit.

When you have finished this, go to the website and check your answers. If you got a problem wrong, cross it off on the front, and do it correctly on the back.

1. A 57.0% efficient gas water heater contains 175 liters of water at 18.0 ^{o}C. What is the temperature of the water (c = 4186 J kg^{-1} ^{o}C^{-1}) after it has burned 0.784 kg of natural gas? (The specific energy of natural gas is 55 MJ kg^{-1})

2. A 42.0% efficient power plant burns coal and generates an average power output of 2.60 MW. How many kilograms of coal will it burn in a year? (The specific energy of the coal used is 47.0 MJ kg^{-1})

3. A Styrofoam cooler has a thermal conductivity of 0.0360 W m^{-1} K^{-1} and is 4.20 cm thick. It contains 6.80 kg of ice at 0 ^{o}C and has a surface area of 2.16 m^{2}. If it is a windy 23.0 ^{o}C day outside, how many hours will it take the ice to melt? (Assume the inside and outside temperatures are uniform. L_f for ice is 3.33x10^{5} J kg^{-1})

4. You are designing a pumped storage electrical generation site. It needs to generate 950. kW of electrical power with a flow rate of 860. kg s^{-1}. What height above the generation site does the reservoir need to be if such systems are typically 65.0% efficient?

5. A solar panel measures 2.74 m by 1.35 m, and generates 547 W of power when the sunlight intensity is 800. W m^{-2}. What is the efficiency of the panels?