Heat Energy Questions

Name: _____ Date: _____

$$\Delta E_H = Q = mc\Delta T$$

1. Describe what is meant by the term Thermal Inertia. Also, describe how the specific heat capacity of a material is considered a quantitative measure of the thermal inertia of a material.

2. Using Gold and Water as the two reference materials, show the difference (via calculations or formulas) in the amount of energy required to heat equal masses of the two materials. Comment on your results with reference to your answer from question 1. (*e.g.* compare the energy required to heat gold and water each with a mass of 1.5 kg from 12°C to 40°C.)

3. Determine how much energy it takes to heat a 0.234 kg mass of water from 15°C to 76°C.

4. Vegetable oil has a specific heat capacity of 2.0×10^3 J/kg°C. If the same amount of energy as was required to heat the water in question 3 were given to the same mass of vegetable oil with an initial temperature of 15°C. Calculate the final temperature of the oil. Explain why your answer makes sense.

5. Ethyl alcohol has a specific heat capacity of 2.46×10^2. The same amount of energy required to heat the water in question 3 was given to the alcohol and caused the temperature to raise from 25°C to 47°C. What mass of alcohol was heated? Explain why your answer makes sense.

6. The sun is shining onto a 3.4m^2 concrete surface which as a mass of 500 kg. The sun's incident radiation at this location averages 1000 W/m^2. It takes 10 minutes to heat the concrete from 25°C to 27°C. Calculate the specific heat capacity of the concrete.

7. **LAB INVESTIGATION:** using a hotplate, thermometer, beaker (filled with a specific mass of water), and a stop watch determine the efficiency of the hotplate. Write a purpose/question, materials list, procedure, calculations/analysis, and a conclusion. [Must be a formal report and type-written]

Hints:

1. You can get the power rating of the hotplate by reading it off the hotplate.
2. $\%efficiency = \frac{output\ energy}{input\ energy} \times 100\%$ - where the input energy is the energy output by the hotplate in a given amount of time and the output energy is the actual energy that was required to heat the water.
3. Use the stop watch to time the heating so you can then determine the amount of input energy from the hotplate.