Heat transfer and calorimetry: Guided Problems Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Problem A) An 11.98-gram sample of zinc metal is placed in a hot water bath and warmed to 78.4°C. It is then removed and placed into a Styrofoam cup containing 50.0 mL of room temperature water (T=27.0°C; density = 1.00 g/mL, c=4.186 J/g°C). The water warms to a temperature of 28.1°C. Determine the specific heat capacity of the zinc. \*\*Hint- use the density to determine the mass of the room temperature water\*\*

Problem B) A copper penny has a mass of 0.00302 kg and a temperature of 20.°C. It has a melting point of 1083°C and a latent heat of fusion of 2.07 x 105 J/kg. How much heat must be added to the penny to melt it and raise the liquid penny to 40.°C?

Problem C) The latent heat of sublimation (ΔHsublimation) of dry ice (solid carbon dioxide) is 570 J/g. Determine the amount of heat required to turn a 5.0-pound bag of dry ice into gaseous carbon dioxide. (Given: 1.00 kg = 2.20 lb)

Heat transfer and calorimetry Partner Practice Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. The temperature last night was 38° F. Convert this to the Celsius and to the Kelvin temperature scales. Be sure to label which temperature is which.
2. The melting point of lead is 327.3° C. Convert this measurement to Fahrenheit.

1. Oxygen changes from a gas to a liquid at -183° C. Convert this to Kelvin.

1. The specific heat of silver is 235 J/kg°C. How much heat must be added to a 0.25 kg piece of silver to raise its temperature from 25° C to 600° C?

1. How much heat energy must be added to a 0.65 kg sample of water at 30° C to turn it into steam at 125° C? (The specific heat of steam is 2100 J/kg°C and the specific heat of water is 4186 J/kg°C. The boiling point of water is 100° C. The latent heat of vaporization for water is 2.26E6 J/kg.)

1. How much heat must be added to a 0.45 kg piece of lead with an initial temperature of 20° C to change it to molten (melted) lead? The specific heat of lead is 128 J/kg°C, the latent heat of fusion for lead is 2.32E4 J/kg, and lead melts at 327° C.
2. A 1.2 kg sample of water has a temperature of 22° C. A 0.6 kg piece of copper at a temperature of 325° C is added to the sample. What is the final temperature of the water and copper? (The specific heat of copper is 385 J/kg °C and the specific heat of water is 4186 J/kg°C)
3. A 0.50 kg block of ice has a temperature of -20°C. How much heat must be added to this ice to change it to water at 70°C?
4. A copper penny has a mass of 0.003 kg and a temperature of 20°C. It has a melting point of 1083°C and a latent heat of fusion of 2.07 x 105 J/kg. How much heat must be added to the penny to melt it?
5. A 0.30 kg piece of steel (csteel = 452 J/kg\*°C) at a temperature of 350°C is added to 10 kg of water at 20°C. Assuming no heat is lost to the surroundings and no water escapes, what is the final temperature of the water and steel?
6. A 0.38 kg glass container has 1 kg of water in it. The water and the container have an initial temperature of 25°C. One kg of water at 90°C is added to the container. What is the final temperature of the 2 kg of water and the container?

 

