

## HEAT TRANSFER WORKSHEET

**DIRECTIONS:** using the following formulas, solve the problems below:

$$\Delta T = T_f - T_i$$

$$Q = mC\Delta T$$

1. A large pan on the stove holds a volume of  $50 \text{ cm}^3$  of water. How much heat is needed to increase the temperature of the water from  $10^\circ\text{C}$  to  $100^\circ\text{C}$ ? The mass of the water is 250 g. The specific heat of water is  $1 \text{ cal/g } ^\circ\text{C}$ . How much heat transfer is required to raise the temperature of the water from  $10^\circ\text{C}$  to  $100^\circ\text{C}$ ?
2. A 5.5kg brass ball at  $120^\circ\text{C}$  is placed in an insulated container of water at  $20^\circ\text{C}$ . When the ball and the water reach thermal equilibrium, their temperature is  $50^\circ$ . The Specific Heat for brass is  $0.091 \text{ kcal/kg } ^\circ\text{C}$ .
  - a.) What amount of heat is transferred between the ball and water?
  - b.) What is the mass of the water in the container?
3. A teakettle holds 400g of water. How much heat is needed to increase the temperature of the water from  $5^\circ\text{C}$  to  $100^\circ\text{C}$ ? What is the amount of heat transfer in calories needed to raise the temperature of the water from  $5^\circ\text{C}$  to  $100^\circ\text{C}$ . (HINT: use table 1.7, pg 71.)
4. A 200g block of gold has a temperature of  $20^\circ\text{C}$ . How much heat is needed to melt the gold so that it can be placed in a gold bar mold? (HINT: use Table 1.8, pg 75.)
5. The temperature of 500g of water is  $20^\circ\text{C}$ . How much heat is needed to vaporize all of the water? (HINT: use Table 1.8, pg 75.)
6. A 20g ice cube has a temperature of  $-10^\circ\text{C}$ . How much heat is needed to melt the ice cube and warm the resulting water to room temperature? This is a phase change problem and requires four steps: (HINT: use Tables 1.7 & 1.8)
  - a.) Calculate the heat  $Q_1$  to increase the temperature of the ice cube to the melting point, from  $-10^\circ$  to  $0^\circ\text{C}$ . For ice,  $C = 0.49 \text{ cal/g } ^\circ\text{C}$ .
  - b.) Calculate the heat  $Q_2$  needed to melt the ice.
  - c.) Calculate the heat  $Q_3$  needed to raise the temperature of the water from  $0^\circ\text{C}$  to  $20^\circ\text{C}$ .
  - d.) Determine the total (sum) of heat required.