1. (10 pts) How many joules of heat energy are needed to convert 455 g of water (liquid) to ice at 0°C?

150. KJ

2. (10 pts) Suppose you take 5.6 g of fat and put it in a bomb calorimeter. The bomb calorimeter is composed of 650.0 g of water and is initially at a temperature of at 22°C. If you ignite the fat, what should be the final temperature of the water in the bomb calorimeter. Specific heat $H_2O = 1.0 \text{ cal/g °C}$ $\text{Fat} = 9.0 \text{ kcal/ gram}$

100°C

3. (6 pts) Circle the hottest temperature (greatest kinetic energy) and put a box around the coldest temperature.

circle box

100°F 100°C 100 K

4. (8 pts) Determine if the following statements or reactions describe an exothermic or endothermic process. (Put EXO for exothermic and ENDO for endothermic)
a) The products have less energy than the reactants. **Exo**

b) \[ 2\text{Na(s)} + 2\text{H}_2\text{O(l)} \rightarrow 2\text{NaOH(aq)} + \text{H}_2 + 367.5 \text{ KJ} \] **Exo**

c) When it hails. **Exo**

d) Two chemicals are mixed and the container becomes hotter. **Exo**

5. (6 pts) List three factors that influence the rate of a reaction.

   a. **Catalyst (enzyme)**
   
   b. **Concentration of reactants**

   c. **Temperature**

6. (10 pts) Calculate the new temperature (in °C) when 8.37 g of carbon dioxide in a 475 mL container at 1.32 atm and 20.4°C has its pressure increased to 2.34 atm.

   \[ 247°C \]

7. (10 pts) A sample of NO₂ gas is placed in a 8.26 L flask at a temperature of 17.3°C and with a pressure of 48.5 mm Hg. If the sample is moved to a new flask the temperature
changes to 25.3° C while the volume increases to 18.5 liters. Calculate the pressure in atm inside the new flask.

0.0293 atm

8. (10 pts) Imagine that 250 mL of a sample of nitrogen is collected over water at 25.0° C with a total pressure of 945 mm Hg. The vapor pressure of water at this temperature is 27.0 mm Hg.
   a. Calculate the partial pressure in atm of nitrogen.

1.21 atm

   b. What is the volume in liters of nitrogen at STP conditions?

0.277 L

9. (10 pts) A sample of 25.0 g of ice at 0° C is added to 65 g of water (liquid) at 0° C. How much heat energy in kcal is needed to melt the ice, warm all the liquid water to 100° C, and change it to steam at 100° C?

60. Kcal

10. (10 pts) What is the pressure in atm of a 2.45 g sample of chlorine gas in a 1.22 L flask at 35° C?
11. (6 pts) State whether the solubility of gas in a liquid increases (I), decreases (D) or stays the same (S) upon the following changes. Assume it is a closed container.

   a) Decrease the surrounding pressure.  \( \boxed{D} \)  
   b) Add another gas.  \( \boxed{I} \)  
   c) Increase the flask pressure.  \( \boxed{I} \)  

12. (12 pts) Convert the following. Use scientific notation where appropriate.

   a. 13.3 mL to KL  \( 1.33 \times 10^{-5} \text{KL} \)  
   b. 20.0 dm to hm  \( 2.00 \times 10^{-2} \text{hm} \)  
   c. \( 4.4 \times 10^3 \) daL to hL  \( 4.40 \times 10^2 \text{hL} \)  
   d. 0.3 kg to cg  \( 3 \times 10^4 \text{cg} \)