# Worksheet 1

January 4, 2022

Weekly homework assignments are posted approximately one week prior to the due date. Collaborations are encouraged and students must report all collaborators in writing on each assignment. All external sources (websites, books) must be properly cited. Additional problems are listed at the end of each assignment. This week's assignment is due *Tuesday, Jan 11th at 10:00am.*

Zeroth Law of Thermodynamics

1. Suppose a system is in thermal equilibrium with a heat bath. If the temperature of the heat bath increases, describe in words and/or illustrations what happens to the temperature of the system.

2. Consider two isolated systems illustrated below. One system (left) is at $100°$C and the other (right) is at room temperature of $20°$C. The isolated systems are allowed to come into contact reaching thermal equilibrium and without losing energy to the surrounding. What is the final temperature? Describe in words and/or illustrations what happened.
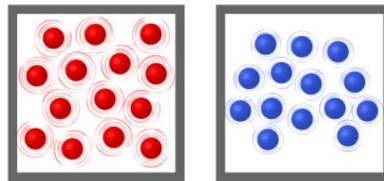

H   L
Different temperatures

Ideal Gas Law

3. **Gay-Lussac's Law**: A 250. mL aerosol can at 25.0°C and 1.10 atm was thrown into an incinerator. When the temperature in the can reached 712°C, the can exploded. What was the pressure in the can just before it exploded, assuming it reached the maximum pressure possible at that temperature in °C? Report to 3 significant figures.

4. The Victor Meyer's method (illustrated below) is used to measure molecular mass. This is accomplished by vaporizing a known mass of a volatile solid or liquid and measuring the volume of air displaced over water. Suppose 0.200g of a white crystalline solid sample is vaporized. The gas is collected over water at 1.00 atm and 25.0°C and displaces 51.8 mL of air. What is the molar mass of the sample? Report to 3 significant figures.
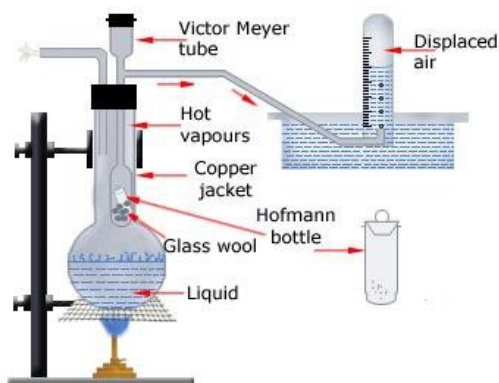
Additional Problems: Ch. 10 - odd problems 25 - 57, 83, 85, and 89.