1. Magnesium metal will react with acid to release Hydrogen gas as in the following equation:

$$Mg_{(s)} + 2\,HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_{2(g)}$$

   a. If 0.8712g Mg are reacted with ample HCl, how many grams of H_2 will be relased?
   b. At STP, how many Liters will the H_2 from part A occupy?
   c. H_2 will combust with O_2 as follows: $H_2 + O_2 \rightarrow 2\,H_2O$
      At STP, how many liters of $O_{2(g)}$ would be required to react with the H_2 from part A?

2. A sealed 4.0 L container contains both H_2 gas and N_2 gas, with pH_2 = 4.5 atm and pN_2 = 1.5 atm. The temperature is 25.0 ^oC and no other gases are present.

   a. If a spark is applied, the gases will react to form gaseous ammonia, NH_3. Will the total pressure inside the container go up, go down or remain unchanged as a result of the reaction, assuming constant temperature? Explain. (Hint: write the balanced equation)

   b. Determine the partial pressure of NH_3 gas after the reaction is complete.

   c. Based on the balanced equation for this reaction, determine how the following changes would affect the direction of the equilibrium. Reaction is endothermic.
      i. Increase pressure
      ii. Decrease pressure
      iii. Suddenly Increase temperature
      iv. Decrease $[N_2]$
      v. Increase $[H_2]$
      vi. Decrease $[NH_3$

3. Use the following equilibrium expressions to write a chemical equation for each
   a. $K = \frac{[AB_2]^2}{[A_2][B_2]^2}$
   b. $K = \frac{[A_2B_3]}{[A]^2[B]^3}$

4. A balloon is filled with helium at sea level. Describe what would happen to the balloon in each of the following scenarios (assume the balloon will never pop):
   a. The balloon floats to a higher altitude
   b. The balloon is placed in Liquid Nitrogen (-196^oC)
   c. The balloon is placed in a hyperbaric chamber which has a pressure of 2.5 atm.
   d. The balloon is heated in a microwave
   e. The balloon rides with you as you drive over a mountain range and back to sea level.

5. Fill in the missing variable:

	P_1	V_1	T_1	P_2	V_2	T_2
a	0.550 atm	1.1 L	265 K	?	3.501 L	0.0^o C
b	880. torr	1250 mL	5.04^oC	1.1 atm	?	298 K
c	200. mm Hg	3.8 * 10^{10} nL	-120^oC	100. torr	0.44 L	?

6. How many moles of gas would be in samples 5a, 5b, and 5c.