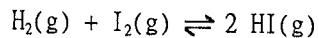1. (15%) A 145-g baseball is thrown with a speed of 25 m/s. (a) Calculate the kinetic energy of the ball in joules; (b) What is the energy in calories?

2. (15%) A 1.00-L flask is filled with 1.000 mol of H_2 and 2.000 mol of I_2 at 448 °C. The value of the equilibrium constant (K_c) is 50.5. What are the concentrations of H_2, I_2, and HI in the flask at equilibrium?

   $H_2(g) + I_2(g) \rightleftharpoons 2 HI(g)$

3. (10%) Calculate the molar solubility of CaF_2 in a solution containing 0.010 M NaF? (K_{sp} of CaF2 = 3.9×10^{-11})

4. (15%) Write balanced chemical equations for the reactions of cesium with (a) $H_2(g)$; (b) $Cl_2(g)$; (c) $H_2O(l)$.

5. (15%) Using the nitrate ion, NO_3^- as the example -- (a) draw resonance forms (b) define "resonance".

6. (15%) Predict whether the following molecules are polar or nonpolar: (a) BrCl; (b) SO_2; (c) SF_6. You need to explain your prediction.

7. (15%) (a) Draw the Lewis structure of formaldehyde, H_2CO; (b) Describe the bonding in formaldehyde in terms of set of hybrid orbitals at the carbon atom.