

Chemistry 2000B Spring 2002 Assignment 4

Due: Thursday, March 21, noon

Most of the questions in this assignment will require data from the textbook. I will not tell you where to look. Think of it as a scavenger hunt. Unless otherwise stated, assume that the temperature is 25°C.

1. How much heat would it take to completely convert 28.53 g of solid mercury at its melting point to mercury vapor at 500°C? The specific heat capacity of the vapor is $20.77 \text{ J K}^{-1} \text{ mol}^{-1}$. [10 marks]
2. Explain how changing the *pH* can affect the solubility of aluminium phosphate. [5 marks]
3. Calculate the solubility of gold (III) iodide in water. Report your answer in g/L. [8 marks]
4. The solubility of calcium acetate is 374 g/L at 0°C.
 - (a) Calculate the solubility product of calcium acetate at this temperature. [6 marks]
 - (b) Explain, based on your calculation, why we would not normally have much use for the solubility product of calcium acetate. [2 marks]
5. At high concentrations, fluoride is toxic. Suppose that you are given 50 L of a solution containing fluoride ions at a concentration of 0.025 mol/L and are told to reduce the concentration to $1 \mu\text{mol/L}$, a level which is considered safe for drinking, and thus for disposal by pouring into a drain. You decide to do this by dissolving calcium nitrate into the solution since
 - (a) calcium ions are mostly harmless, and
 - (b) calcium fluoride is insoluble.

The calcium fluoride can be removed by filtration and disposed of as solid waste, which is much cheaper than trying to dispose of a large volume of liquid waste. What mass of calcium nitrate will you need to add to the 50 L of solution? [10 marks]

6. If you extracted all the oxygen from 1 L of water which is in equilibrium with the atmosphere at sea level and stored this oxygen in gaseous form in an (initially empty) 1 L container, what pressure would it exert at 25°C? [7 marks]