Chemistry 145 – Van Bramer
Fall 2016 Problem Set – Week 6

1. When the following solutions are mixed, does a precipitate form? Write out the total, total ionic, and net ionic equations.
    a. silver nitrate and rubidium chloride
    b. lead nitrate and potassium chloride
    c. mercury (I) nitrate and hydrochloric acid
    d. calcium chloride and sodium carbonate
    e. magnesium nitrate and calcium chloride
    f. potassium sulfate and barium chloride

2. Precipitation Reactions and Solubility.
    a. Step 1: 0.8765 g of silver (I) nitrate is placed in a 250 mL volumetric flask diluted to the mark with deionized water. Determine the concentration of each ion in solution.
    b. Step 2: 1.8793 g of potassium chloride is placed in a 250 mL volumetric flask diluted to the mark with deionized water. Determine the concentration of each ion in solution.
    c. Step 3: 50.0 mL of the silver (I) nitrate solution and 50.0 mL of the potassium chloride solution are mixed together in an erlenmyer flask. Determine the mass of any precipitate formed and the concentration of each ion in solution.

3. I have a special, ideal balloon. This balloon does not exert any pressure on the gas inside it. I start by taking the balloon and inflating it to 4 L in Wilmington DE last night. The weather channel said that the temperature was 45.0 °F, and the pressure was 30.27 inches of Hg.
    a. First I take this balloon scuba diving and go down to a depth of 100 ft where the pressure is 7 atm. and the temperature is 54.2 °F. What is the volume of the balloon?
    b. Next I take the ballon out to Colorado. In Denver when I arrive at the airport the temperature is 68.4 °F and the barometric pressure is 640 mmHg. Now what size is the balloon?
    c. Next on my trip is a hike up to the top of Longs Peak (14,256 ft) where the pressure is 470 torr and the temperature is -20°C. Now what size is the balloon?
    d. Finally I take the balloon on the airplane for the trip home and let it out the window. The 747 is flying at 40,000 ft where the pressure is about 80.0 torr and the temperature is -60.0 °C. What is the volume of the balloon here?
    e. And last of all the balloon soars up into the stratosphere where the pressure has dropped to 0.8 torr and the temperature is 0°C, what size is it just before it pops?

4. *Assume a beaker of pure water has been boiling for 30 minutes. What is in the bubbles in the boiling water?
    a. Air.
    b. Oxygen gas and hydrogen gas.
    c. Oxygen.
    d. Water vapor.
    e. Heat.

5. *A glass of cold milk sometimes forms a coat of water on the outside of the glass (Often referred to as 'sweat'). How does most of the water get there?
    a. Water evaporates from the milk and condenses on the outside of the glass.
    b. The glass acts like a semi-permeable membrane and allows the water to pass, but not the milk.
    c. Water vapor condenses from the air.
    d. The coldness causes oxygen and hydrogen from the air combine on the glass forming water.

6. *What is the mass of the solution when 1 pound of salt is dissolved in 20 pounds of water?
    a. 19 Pounds.
    b. 20 Pounds.
    c. Between 20 and 21 pounds.
    d. 21 pounds.
    e. More than 21 pounds.

*From the Chemical Concept Inventory (http://www.jce.divched.org/jcedlib/qbank/collection/CQandChP/CQs/ConceptsInventory/Concepts_Inventory.html)