CHEM 101A – Chapter 4 Aqueous Solutions Problems

1. Aqueous solutions containing sodium sulfate and lead(II) nitrate are mixed.

    a. What species precipitates?

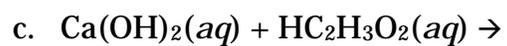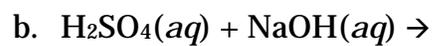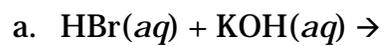   b. Calculate the mass of precipitate formed when 1.25 L of 0.0500 M Pb(NO$_3$)$_2$ and 2.00 L of 0.0250 M Na$_2$SO$_4$ are mixed.

2. Complete and balance each acid-base reaction below. Write the net ionic equation of equations **a** and **c.**

   a. $HBr(aq) + KOH(aq) \rightarrow$

   b. $H_2SO_4(aq) + NaOH(aq) \rightarrow$

   c. $Ca(OH)_2(aq) + HC_2H_3O_2(aq) \rightarrow$

3. You combine 28.0 mL of 0.250 M HNO_3 with 53.0 mL of KOH.

    a. Write the net ionic equation.

    b. Calculate the molarity of excess H^+ or OH^- ions.

    c. Calculate the volume of H_2O formed (assume H_2O density $= 1.00$ g/mL). Would the volume change substantially or negligibly?

4. A mixture contains only sodium chloride and potassium chloride. A 0.1586-g sample of the mixture was dissolved in water. It took 22.90 mL of 0.1000 M AgNO3 to completely precipitate all the chloride present. What is the composition (by mass percent) of the mixture?

5. Assign oxidation state to all atoms in the equation below. <u>Is the reaction redox?</u>

$$H_3PO_4(aq) + 3KOH(aq) \rightarrow 3H_2O(l) + K_3PO_4(aq)$$
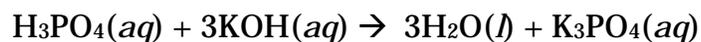
Atom	Ox State Reactant	Ox State Product
H		
P		
O (in phosphate)		
O (in hydroxide/water)		
K		

6. Determine the oxidizing agent and the number of electrons transferred in each redox reaction below.

    a. $2AgNO_3(aq) + Cu(s) \rightarrow 2Ag(s) + Cu(NO_3)_2(aq)$

    b. $14H^+(aq) + Cr_2O_7^{2-}(aq) \rightarrow 2Cr^{3+}(aq) + Cl_2(g) + 7H_2O(l)$

    c. $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$