

CH1020 Exercises (Worksheet 9)

1. A solution contains Cr^{3+} and Mg^{2+} ions. The addition of 1.00 L of 1.51 M NaF solution causes the complete precipitation of these ions as $\text{CrF}_3(\text{s})$ and $\text{MgF}_2(\text{s})$. The total mass of the precipitate is 49.6 g. Find the mass of Cr^{3+} in the original solution.

$$x = \text{mol}(\text{CrF}_3); y = \text{mol}(\text{MgF}_2)$$

$$3x + 2y = 1.51 \text{ mol F}^-$$

$$x(109.00) + y(62.30) = 49.6 \text{ g}(\text{sample})$$

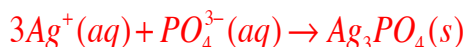
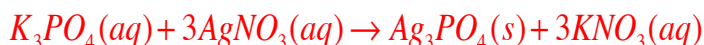
$$8.57 \text{ g Cr}^{3+}$$

2. The quantity of Cl^- in a municipal water supply is determined by titrating the sample with Ag^+ . The end point of this type of titration is marked by a change in color of a special type of indicator. (a) How many grams of chloride ion are in a sample of the water if 20.2 mL of 0.100 M Ag^+ is needed to react with all the chloride in the sample? (b) If the sample has a mass of 10.0g, what percentage of Cl^- does it contain?

a. $7.17 \times 10^{-2} \text{ g Cl}^-$

b. 0.717% Cl^-

3. A sample of 70.5 mg potassium phosphate is added to 15.0 mL of 0.050 M silver nitrate, resulting in the formation of a precipitate. (a) Write the molecular, complete ionic and net ionic equations for the reactions. (b) What is the limiting reactant in the reaction? Calculate the theoretical yield, in grams, of the precipitate that forms.



4. Three solutions are mixed together to form a single solution; in the final solution, there are 0.2 mol $\text{Pb}(\text{CH}_3\text{COO})_2$, 0.1 mol Na_2S and 0.1 mol CaCl_2 . What solid(s) will precipitate?



5. A 1.50 g sample of an unknown alkali-metal carbonate was dissolved in water, and 31.10 mL of 0.350 M CaCl_2 was required to precipitate all the carbonate ions as CaCO_3 . Give the name and formula of the unknown compound.

Potassium carbonate : K_2CO_3

6. A 3.00 g sample of an alloy (containing only Pb and Sn) was dissolved in nitric acid (HNO_3). Sulfuric acid was added to this solution, which precipitated 2.93 g of PbSO_4 . Assuming that all of the lead was precipitated, what is the percentage of Pb in the sample?

66.7%

7. A mixture contains only SrCl_2 and NH_4NO_3 . A 0.638 g of this mixture is dissolved in water, and an excess of AgNO_3 is added, producing a precipitate of AgCl . The precipitate is filtered, dried, and weighed. Its mass is 0.216 g. Calculate the mass percent of SrCl_2 in the mixture.

18.7%

8. Which of the following aqueous solutions is the most basic: (a) 0.6 M NH_3 ; (b) 0.150 M KOH ; (c) 0.100 M Ba(OH)_2 ?

Ba(OH)_2

9. Which of the following solutions is the most acidic? (a) 0.2 M LiOH ; (b) 0.2 M HI ; 1.0M methyl alcohol (CH_3OH)

HI