

CHAPTER-4 PROBLEM SET

- Write balanced net ionic equations for the reactions that occur in each of the following cases. Identify the spectator ion or ions in each reaction.
 - $\text{Cr}_2(\text{SO}_4)_3(aq) + (\text{NH}_4)_2\text{CO}_3(aq) \rightarrow$
 - $\text{Ba}(\text{NO}_3)_2(aq) + \text{K}_2\text{SO}_4(aq) \rightarrow$
 - $\text{Fe}(\text{NO}_3)_2(aq) + \text{KOH}(aq) \rightarrow$
- Which of the following solutions is the most acidic? (a) 0.2 M LiOH, (b) 0.2 M HI, (c) 1.0 M methyl alcohol (CH_3OH).
- Determine the oxidation number for the indicated element in each of the following compounds: (a) Co in LiCoO_2 , (b) Al in NaAlH_4 , (c) C in CH_3OH (methanol), (d) N in GaN, (e) Cl in HClO_2 , (f) Cr in BaCrO_4 .
- Using the activity series (Table 4.5), write balanced chemical equations for the following reactions. If no reaction occurs, write NR. (a) Nickel metal is added to a solution of copper(II) nitrate, (b) a solution of zinc nitrate is added to a solution of magnesium sulfate, (c) hydrochloric acid is added to gold metal, (d) chromium metal is immersed in an aqueous solution of cobalt(II) chloride, (e) hydrogen gas is bubbled through a solution of silver nitrate.
- A person suffering from hyponatremia has a sodium ion concentration in the blood of 0.118 M and a total blood volume of 4.6 L. What mass of sodium chloride would need to be added to the blood to bring the sodium ion concentration up to 0.138 M, assuming no change in blood volume?
- Glycerol, $\text{C}_3\text{H}_8\text{O}_3$, is a substance used extensively in the manufacture of cosmetics, foodstuffs, antifreeze, and plastics. Glycerol is a water-soluble liquid with a density of 1.2656 g/mL at 15 °C. Calculate the molarity of a solution of glycerol made by dissolving 50.000 mL glycerol at 15 °C in enough water to make 250.00 mL of solution.
- A 0.5895-g sample of impure magnesium hydroxide is dissolved in 100.0 mL of 0.2050 M HCl solution. The excess acid then needs 19.85 mL of 0.1020 M NaOH for neutralization. Calculate the percentage by mass of magnesium hydroxide in the sample, assuming that it is the only substance reacting with the HCl solution.
- A 35.0-mL sample of 1.00 M KBr and a 60.0-mL sample of 0.600 M KBr are mixed. The solution is then heated to evaporate water until the total volume is 50.0 mL. How many grams of silver nitrate are required to precipitate out silver bromide in the final solution?

9. Tartaric acid, $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$, has two acidic hydrogens. The acid is often present in wines and precipitates from solution as the wine ages. A solution containing an unknown concentration of the acid is titrated with NaOH. It requires 24.65 mL of 0.2500 M NaOH solution to titrate both acidic protons in 50.00 mL of the tartaric acid solution. Write a balanced net ionic equation for the neutralization reaction, and calculate the molarity of the tartaric acid solution.
10. (a) By titration, 15.0 mL of 0.1008 M sodium hydroxide is needed to neutralize a 0.2053-g sample of a weak acid. What is the molar mass of the acid if it is monoprotic? (b) An elemental analysis of the acid indicates that it is composed of 5.89% H, 70.6% C, and 23.5% O by mass. What is its molecular formula?