Chem 1100 Chapter Four Study Guide

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Practice Problems
1. Write the ionic equation and net ionic equation for the following molecular equation.

\[ \text{H}_2\text{SO}_4 \text{ (aq)} + 2 \text{ NaOH (aq)} \rightarrow \text{Na}_2\text{SO}_4 \text{ (aq)} + 2 \text{ H}_2\text{O (l)} \]

2. Give the type of reaction for each of the following as either an acid-base, combustion, gas evolution, or precipitation reaction.
   a. \( 2 \text{ C}_4\text{H}_{10} \text{ (g)} + 13 \text{ O}_2 \text{ (g)} \rightarrow 8 \text{ CO}_2 \text{ (g)} + 10 \text{ H}_2\text{O (l)} \)
   b. \( \text{Cu(NO}_3)_2 \text{ (aq)} + 2 \text{ NaOH (aq)} \rightarrow \text{Cu(OH)}_2 \text{ (s)} + 2 \text{ NaNO}_3 \)
   c. \( \text{H}_2\text{SO}_3 \text{ (aq)} \rightarrow \text{SO}_2 \text{ (g)} + \text{H}_2\text{O (l)} \)
   d. \( \text{H}_2\text{SO}_4 \text{ (aq)} + 2 \text{ NaOH (aq)} \rightarrow \text{Na}_2\text{SO}_4 \text{ (aq)} + 2 \text{ H}_2\text{O (l)} \)

3. Salts, acids and bases are all examples of ________________, compounds that when added to water enable it to conduct electricity.

4. An excess of AgNO\textsubscript{3} was added to 100.0 mL of a MgCl\textsubscript{2} solution and 1.215 g of AgCl precipitate was formed. What is the concentration of the original MgCl\textsubscript{2} solution?

5. A 0.100 molar solution of NaOH was used to titrate 25.00 mL of a H\textsubscript{2}SO\textsubscript{4} solution of unknown concentration. If it takes 12.50 mL of NaOH to titrate the H\textsubscript{2}SO\textsubscript{4}, what is the concentration of the H\textsubscript{2}SO\textsubscript{4} solution?
6. Underline the element or compound that is oxidized in the following reactions.
   a. $2 \text{Cu} (s) + \text{O}_2 \rightarrow \text{CuO} (s)$
   b. $\text{C}_6\text{H}_6 (l) + \text{O}_2 \rightarrow \text{C}_6\text{H}_6\text{O}_2$

7. Underline the element or compound that is being reduced in the following reactions.
   a. $\text{Zn} (s) + \text{CuCl}_2 (s) \rightarrow \text{ZnCl}_2 (s) + \text{Cu} (s)$
   b. $4 \text{CuO} (s) + \text{CH}_4 \rightarrow 4 \text{Cu} (s) + \text{CO}_2 (g) + 2 \text{H}_2\text{O} (l)$

8. In an oxidation-reduction reaction the compound that causes another compound to be oxidized is known as a(n) ______________________.

9. What is the oxidation state of the carbon in the following compounds?
   a. $\text{CO}_2$
   b. $\text{CH}_4$
   c. $\text{CO}$

10. When dissolved in water, of HClO$_4$, Ca(OH)$_2$, KOH, and HI, which are acids?
    a. only HI
    b. only KOH
    c. HClO$_4$ and HI
    d. Ca(OH)$_2$ and KOH

11. What is the concentration of HCl in the final solution when 65mL of a 12 M HCl solution is diluted with pure water to a total volume of 0.15 L?
    a. 28 M
    b. $5.2 \times 10^3$ M
    c. 5.2 M
    d. $2.8 \times 10^02$ M

12. How many milliliters of 0.260 M Na$_2$S are needed to react with 25.00 mL of 0.315 M AgNO$_3$?
    $\text{Na}_2\text{S} (aq) + 2 \text{AgNO}_3 (aq) \rightarrow 2 \text{NaNO}_3 (aq) + \text{Ag}_2\text{S} (s)$
    a. 41.3 mL
    b. 60.6 mL
    c. 15.1 mL
    d. 30.3 mL

13. The reaction $\text{HNO}_3 (aq) + \text{KOH} (aq) \rightarrow \text{KNO}_3 (aq) + \text{H}_2\text{O} (l)$ is best classified as a(n)
    a. precipitation reaction
    b. oxidation-reduction reaction
    c. acid-base neutralization reaction
    d. single replacement reaction
14. HCl, NaOH, and NaCl are all classified as
   a. bases
   b. nonelectrolytes
   c. acids
   d. electrolytes

15. Which is the balanced net ionic equation for the reaction of CdCl₂ (aq) with Na₂S (aq)?
   a. Cd²⁺ (aq) + 2 Cl⁻ (aq) + 2 Na⁺ (aq) + S²⁻ (aq) → CdS (s) + 2 NaCl (aq)
   b. CdCl₂ (aq) + Na₂S (aq) → CdS (aq) + 2 NaCl (aq)
   c. Cd²⁺ (aq) + 2 Cl⁻ (aq) + 2 Na⁺ (aq) + S²⁻ (aq) → CdS (s) + Na⁺ (aq)
   d. Cd²⁺ (aq) + S²⁻ (aq) → CdS (aq)

16. Which of the following compounds is insoluble in water?
   a. Rb₂CO₃
   b. NaNO₃
   c. K₂SO₄
   d. PbSO₄

17. What is the oxidation number of the sulfur atom in H₂SO₄?
   a. +2
   b. +4
   c. -2
   d. +6

18. Which species functions as the oxidizing agent in the following redox reaction:
   Zn (s) + Cu²⁺ (aq) → Cu (s) + Zn²⁺ (aq)
   a. Cu²⁺ (aq)
   b. Zn²⁺ (aq)
   c. Cu (s)
   d. Zn (s)