Chemistry Name: _____

Section _____ CH 10-11 STUDY GUIDE Date: _____

A. Multiple Choice.

1. Given the balanced equation representing the reaction:

$$Al_2(SO_4)_3 + 6\ NaOH \rightarrow 2\ Al(OH)_3 + 3\ Na_2SO_4$$

The mole ratio of NaOH to $Al(OH)_3$ is

(1) 1:1 (2) 1:3 (3) 3:1 (4) 3:7

2. What is the gram-formula mass of $Fe(NO_3)_3$?

(1) 146 g/mol (2) 194 g/mol (3) 214 g/mol (4) 242 g/mol

3. What is the oxidation number of manganese in $KMnO_4$?

(1) +7 (2) +2 (3) +3 (4) +4

4. Given the balanced equation representing the reaction:

$$4\ Al_{(s)} + 3\ O_{2\,(g)} \rightarrow 2\ Al_2O_{3\,(s)}$$

If 107.9 g of Al react completely with 96.0 g of O_2, what mass of Al_2O_3 will be produced?

(1) 53.95 g (2) 101.9 g (3) 107.9 g (4) 203.9 g

5. Given the balanced equation representing a reaction:

$$2\ Mg + O_2 \rightarrow 2\ MgO$$

How many moles of O_2 are required to completely react with 4.0 moles of Mg?

(1) 1.0 moles (2) 2.0 moles (3) 6.0 moles (4) 8.0 moles

6. Given the balanced equation representing the reaction between methane and oxygen:

$$CH_4 + 2\ O_2 \rightarrow CO_2 + 2\ H_2O$$

According to this equation, what is the mole ratio of oxygen to methane?

(1) $\frac{1\text{ gram } O_2}{2\text{ grams } CH_4}$ (2) $\frac{2\text{ grams } O_2}{1\text{ gram } CH_4}$ (3) $\frac{1\text{ mole } O_2}{2\text{ moles } CH_4}$ (4) $\frac{2\text{ moles } O_2}{1\text{ mole } CH_4}$

7. Given the balanced equation representing a reaction:

$$2\ KClO_3 \rightarrow 2\ KCl + 3\ O_2$$

If 4.0 moles of $KClO_3$ react completely, how many moles of O_2 should be produced?

(1) 1.0 moles (2) 2.0 moles (3) 3.0 moles (4) 6.0 moles

8. What is the total number of moles of CO_2 represented by a 340. gram sample?

(1) 7.72 moles (2) 12.0 moles (3) 16.0 moles (4) 32.0 moles

9. The coefficients in a balanced chemical equation represent

(1) the mass ratios of the substances in the reaction
(2) the mole ratios of the substances in the reaction
(3) the total number of electrons in the reaction
(4) the total number of elements in the reaction

10. Given the balanced ionic equation:

$$3\ Pb^{2+}_{(aq)} + 2\ Cr_{(s)} \rightarrow 3\ Pb_{(s)} + 2\ Cr^{3+}_{(aq)}$$

What is the number of moles of electrons gained by 3.0 moles of lead ions?

(1) 5.0 mol (2) 2.0 mol (3) 3.0 mol (4) 6.0 mol

B. Short Answer.

Base your answers to questions 11 through 13 on the information below

Baking soda, $NaHCO_3$, can be commercially produced during a series of chemical reactions called the Solvay process. In this process, $NH_{3\,(aq)}$, $NaCl_{(aq)}$, and other chemicals are used to produce $NaHCO_{3\,(s)}$ and $NH_4Cl_{(aq)}$.

To reduce production costs, $NH_{3\,(aq)}$ is recovered from the $NH_4Cl_{(aq)}$ through a different series of reactions. This series of reactions can be summarized by the overall reaction represented by the balanced equation shown below.

$$2\ NH_4Cl_{(aq)} + CaO_{(s)} \rightarrow 2\ NH_{3\,(aq)} + H_2O_{(l)} + CaCl_{2\,(aq)}$$

11. Determine the number of moles of $CaO_{(s)}$ that must be used to completely react with 4.00 moles of $NH_4Cl_{(aq)}$. [2]

2.00 moles

12. Write the chemical name for baking soda. [2]

sodium hydrogen carbonate (sodium bicarbonate is acceptable)

13. Determine the mass of NH_4Cl that represents 4.00 moles of NH_4Cl. [2]

213.97 g

14. Write the correct formula for barium chloride. [2]

$BaCl_2$

15. In the space below, balance the equation using the smallest whole-number coefficients. [2]

$$\underline{\ 2\ }\ Fe_{(s)} + \underline{\quad}\ O_{2\,(g)} + \underline{\ 2\ }\ H_2O_{(\ell)} \rightarrow \underline{\ 2\ }\ Fe_2O_{3\,(s)}$$

Base your answers to questions 16 and 17 on the information below

Sodium bicarbonate decomposes when heated according to the balanced equation below.

$$2\ NaHCO_3 \rightarrow Na_2CO_3 + CO_2 + H_2O$$

16. Determine the gram-formula mass of $NaHCO_3$. [2]

84.0069 g/mol

17. If 6.00 moles of $NaHCO_3$ decompose, how many moles of CO_2 should be produced? [2]

3.00 moles

Base your answers to questions 18 through 20 on the information below

The nuts, bolts, and hinges that attach some gates to a playground fence can be made of iron. The iron can react with oxygen in the air. The unbalanced equation representing this reaction is shown below.

$$Fe_{(s)} + O_{2\,(g)} \rightarrow Fe_2O_{3\,(s)}$$

18. In the space below, balance the equation for the reaction using the smallest whole-number coefficients. [2]

$$\underline{\quad 4 \quad} Fe_{(s)} + \underline{\quad 3 \quad} O_{2\,(g)} \rightarrow \underline{\quad 2 \quad} Fe_2O_{3\,(s)}$$

19. Determine the change in oxidation state for oxygen in this reaction. [2]

from 0 to –2 or from O^0 to O^{-2}

20. Explain, in terms of chemical activity, why copper would be a better choice than iron to make the nuts, bolts, and hinges. [2]

Copper has a lower chemical activity than iron.