

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

Ms. Randall Regents Chemistry

Unit 5 Moles and Chemical Reactions Review

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1) How many oxygen atoms are represented in the formula  $Al_2(CO_3)_3$ ?

- a) 3                      **b) 9**                      c) 10                      d) 6

2) What is the total number of atoms present in 1 mole of  $Ca_3(PO_4)_2$ ?

- a) 8                      b) 5                      c) 10                      **d) 13**

3) What is the total mass of iron in 1.0 mole of  $Fe_2O_3$ ?

- a) 72 g                      **b) 112 g**                      c) 56 g                      d) 160 g

4) What is the gram formula mass of  $Li_2SO_4$ ?

- a) 206 g                      b) 55 g                      **c) 110 g**                      d) 54 g

5) What is the percent composition by mass of sulfur in  $H_2SO_4$ ? [formula mass = 98]

- a) 98%                      b) 16%                      c) 65%                      **d) 33%**

6) A hydrate is a compound with water molecules incorporated into its crystal structure. In an experiment to find the percent by mass of water in a hydrated compound, the following data were recorded:

Mass of test tube + hydrate crystals before heating	25.3 grams
Mass of test tube	21.3 grams
Mass of test tube + anhydrate crystals after heating	22.3 grams

**4 g hydrate 3g water lost**

What is the percent by mass of water in the hydrate?

- a) 75%**                      b) 50%                      c) 8.0%                      d) 95%

7) Which of the following statements explains why mass is lost when a student heats a sample of  $BaCl_2 \cdot 2H_2O$  crystals?

- a) water is given off as a gas**                      c) chlorine is given off as a gas  
b) the crystals sublime                      d) the crystals fuse (melt)

8) When the equation  $2 H_2S + 3 O_2 \rightarrow 2 H_2O + 3 SO_2$  is completely balanced using the *smallest* whole numbers, the sum of all the coefficients is

- a) 9**                      b) 11                      c) 7                      d) 5

9) What is the percent by mass of water in the hydrate  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$  [formula mass = 286]?

- a) 26.1%      **b) 62.9%**      c) 6.89%      d) 214.5%

10) How many grams are there in 2.5 moles of  $\text{C}_2\text{H}_5\text{OH}$ ?

- a) 18      **b) 115**      c) 46      d) 0.05

11) Which quantity is equivalent to 146 grams of  $\text{NaCl}$ ?

- a) 1.0 mole      **b) 2.5 moles**      c) 2.0 moles      d) 1.5 moles

12) When the equation  $4\text{H}_2 + \text{Fe}_3\text{O}_4 \rightarrow 3\text{Fe} + 4\text{H}_2\text{O}$  is completely balanced using the smallest whole numbers, the coefficient of  $\text{Fe}$  would be

- a) 1      b) 2      **c) 3**      d) 4

13) When the equation  $3\text{NaBr} + 1\text{H}_3\text{PO}_4 \rightarrow 1\text{Na}_3\text{PO}_4 + 3\text{HBr}$  is balanced using the smallest whole numbers, the sum of the coefficients will be

- a) 6      **b) 8**      c) 5      d) 4

14) Given the equation:  $2\text{C}_2\text{H}_2 + 5\text{O}_2 \rightarrow 4\text{CO}_2 + 2\text{H}_2\text{O}$

How many moles of oxygen are required to react completely with 1.0 mole of  $\text{C}_2\text{H}_2$ ?

- a) 2.5**      b) 5.0      c) 10      d) 2.0

15) Given the reaction:  $2\text{C}_2\text{H}_6 + 7\text{O}_2 \rightarrow 4\text{CO}_2 + 6\text{H}_2\text{O}$

What is the ratio of moles of  $\text{CO}_2$  produced to moles of  $\text{C}_2\text{H}_6$  consumed?

- a) 7 to 2      **b) 2 to 1**      c) 1 to 1      d) 3 to 2

16) Given the following balanced equation:  $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$

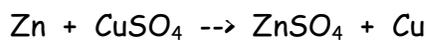
If you have 8 moles of nitrogen, how many moles of  $\text{NH}_3$  will you produce?

- a) 16**      b) 18      c) 24      d) 2

17) Given the reaction:  $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$ , what is the total number of moles of hydrogen produced when 4 moles of sodium react completely?

- a) 1      **b) 2**      c) 3      d) 4

18) What type of reaction best describes the following chemical reaction?



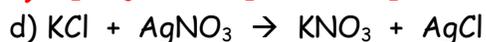
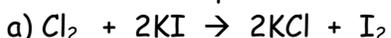
a) **single replacement**

b) double replacement

c) decomposition

d) synthesis

19) Which chemical equation best represent a decomposition reaction?



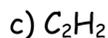
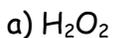
20) What is the molecular formula of a compound that has a molecular mass of 54 and an empirical formula of  $\text{C}_2\text{H}_3$ ?



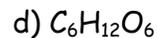
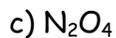
21) What is the empirical formula of the compound whose molecular formula is  $\text{P}_4\text{O}_{10}$ ?



22) Which of the following is an empirical formula?



23) Which represents *both* an empirical and molecular formula?



For questions 24 and 25, show all work and express your answer in the appropriate units.

24) Calculate the gram formula mass of  $\text{ZnSO}_4$ . **161 g/mol**

**$\text{Zn}=65 \text{ g}$**

**$\text{S}=32 \text{ g}$**

**$\text{O}=16\text{g} \times 4=64 \text{ g}$**

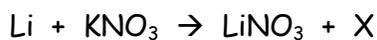
25) Use your answer from 23 to calculate the percent by mass of zinc in  $\text{ZnSO}_4$ .

**$65\text{g}/161\text{g} \times 100= 40\% \text{ Zn}$**

26) Balance the following reaction and reduce to the *lowest* whole number coefficients



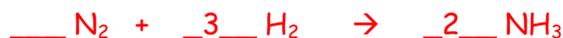
27) Li and KNO<sub>3</sub> according to the following equation:



Write the formula for the missing product X.

K

Use the chemical equation below to answer questions 28-30.



27) Balance the equation above using the lowest whole number coefficients.

29) How many moles of H<sub>2</sub> are required to produce 6.5 moles of NH<sub>3</sub>? Show all work and make sure your answer has the correct number of significant figures and proper units.

$$\begin{array}{rcl} \frac{3 \text{ mol H}_2}{x} & = & \frac{2 \text{ mol NH}_3}{6.5 \text{ mol NH}_3} \\ x & = & 9.8 \text{ mol H}_2 \end{array}$$

30) How many grams of NH<sub>3</sub> are produced if 50.0 grams of N<sub>2</sub> are consumed? Show all work and make sure your answer has the correct number of significant figures and proper units.

Grams → moles → moles → grams

$$\text{Mol} = \frac{\text{g}}{\text{gfm}} \quad \frac{50.0 \text{g N}_2}{28 \text{g/mol}} = 1.8 \text{ mol N}_2$$

$$\text{Mole ratio} = \frac{1 \text{ mol N}_2}{1.8 \text{ mol N}_2} = \frac{2 \text{ mol NH}_3}{X}$$

$$X = 3.6 \text{ mol NH}_3$$

$$\text{Mol} = \frac{\text{g}}{\text{gfm}} \quad 3.6 \text{ mol NH}_3 = \frac{x}{17 \text{g/mol}} = 61.2 \text{g NH}_3$$