

Name: _____ Period: _____ Date: _____

Ms. Randall Regents Chemistry

Unit 5 Moles and Chemical Reactions Review

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 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 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 C_2H_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 CO_2 produced to moles of C_2H_6 consumed?

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

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

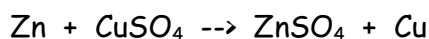
If you have 8 moles of nitrogen, how many moles of NH_3 will you produce?

- 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?



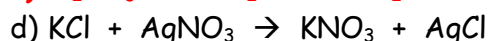
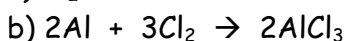
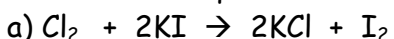
a) **single replacement**

b) double replacement

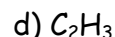
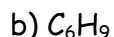
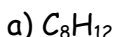
c) decomposition

d) synthesis

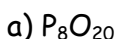
19) Which chemical equation best represent a decomposition reaction?



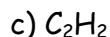
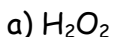
20) What is the molecular formula of a compound that has a molecular mass of 54 and an empirical formula of C_2H_3 ?



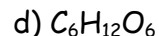
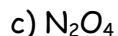
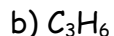
21) What is the empirical formula of the compound whose molecular formula is P_4O_{10} ?



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 ZnSO_4 . **161 g/mol**

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

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

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

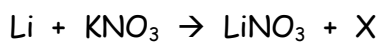
25) Use your answer from 23 to calculate the percent by mass of zinc in ZnSO_4 .

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

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



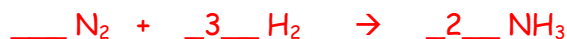
27) Li and KNO₃ according to the following equation:



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 H₂ are required to produce 6.5 moles of NH₃? 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 NH₃ are produced if 50.0 grams of N₂ are consumed? Show all work and make sure your answer has the correct number of significant figures and proper units.

Grams → moles → moles → grams

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

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

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

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