

Name: \_\_\_\_\_

Hour: \_\_\_\_\_ Date: \_\_\_\_\_

## Chemistry: Stoichiometry – Problem Sheet 1

Directions: Solve each of the following problems. Show your work, including proper units, to earn full credit.

1. Silver and nitric acid react according to the following balanced equation:



A. How many moles of silver are needed to react with 40 moles of nitric acid?

B. From the amount of nitric acid given in Part A, how many moles of silver nitrate will be produced?

C. From the amount of nitric acid given in Part A, how many moles of water will be produced?

D. From the amount of nitric acid given in Part A, how many moles of nitrogen monoxide will be made?

2. Given the balanced equation:  $2 \text{N}_2\text{H}_4\text{(l)} + \text{N}_2\text{O}_4\text{(l)} \rightarrow 3 \text{N}_2\text{(g)} + 4 \text{H}_2\text{O(g)}$

A. How many moles of dinitrogen tetrahydride are required to produce 57 moles of nitrogen?

B. How many moles of dinitrogen tetroxide are required to produce 57 moles of nitrogen?

C. How many moles of water are produced when 57 moles of nitrogen are made?

3. Calculate the mass of aluminum oxide produced when 3.75 moles of aluminum burn in oxygen.

Answers:

1A. 30 mol Ag

1B. 30 mol AgNO<sub>3</sub>

1C. 20 mol H<sub>2</sub>O

1D. 10 mol NO

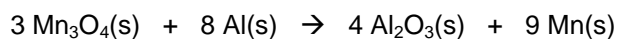
2A. 38 mol N<sub>2</sub>H<sub>4</sub>

2B. 19 mol N<sub>2</sub>O<sub>4</sub>

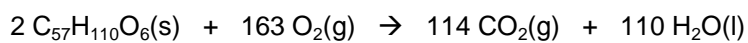
2C. 76 mol H<sub>2</sub>O

3. 191 g Al<sub>2</sub>O<sub>3</sub>

4. At a very high temperature, manganese is isolated from its ore, manganomanganic oxide, via the following balanced equation:



- A. How many manganese atoms are liberated if 54.8 moles of  $\text{Mn}_3\text{O}_4$  react with excess aluminum.
- B. How many moles of aluminum oxide are made if 3580 g of manganomanganic oxide are consumed?
- C. How many moles of manganomanganic oxide will react with  $5.33 \times 10^{25}$  atoms of aluminum?
- D. If 4.37 moles of aluminum are consumed, how many molecules of aluminum oxide are produced?
5. Camels store the fat tristearin ( $\text{C}_{57}\text{H}_{110}\text{O}_6$ ) in the hump. Besides being a source of energy, the fat is a source of water for the camel because when the fat is burned, the following reaction occurs:



- A. At STP, what volume of oxygen is required to consume 0.64 moles of tristearin?
- B. At STP, what volume of carbon dioxide is produced in Part A?
- C. If 22.4 L of oxygen is consumed at STP, how many moles of water are produced?
- D. Find the mass of tristearin required to produce 55.56 moles of water (about 1 liter of liquid water).

Answers:

4A.  $9.9 \times 10^{25}$  atoms Mn  
4B. 20.9 mol  $\text{Al}_2\text{O}_3$

4C. 33.2 mol  $\text{Mn}_3\text{O}_4$   
4D.  $1.3 \times 10^{24}$  molecules  $\text{Al}_2\text{O}_3$

5A. 1168 L  $\text{O}_2$   
5B. 817 L  $\text{CO}_2$

5C. 0.675 mol  $\text{H}_2\text{O}$   
5D. 899 g  $\text{C}_{57}\text{H}_{110}\text{O}_6$