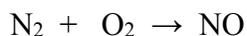


Worksheet #10 Gravimetric Stoichiometry

A. MOLE TO MOLE STOICHIOMETRY

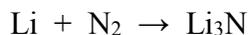
1. Nitrogen in the cylinder of a car reacts with oxygen to produce the pollutant nitrogen monoxide. How many moles of nitrogen monoxide are produced from the combustion of 1.52 mol of nitrogen?

Answer: 3.04 mol



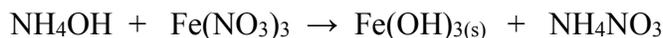
2. Lithium metal reacts with nitrogen from the air to produce a black solid. How many moles of nitrogen are required to react with 1.83 mol of lithium?

Answer: 0.31 mol



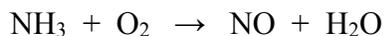
3. An orange-brown precipitate can be produced from the reaction of ammonium hydroxide with iron (III) nitrate. Determine the number of moles of ammonium hydroxide required to produce 0.13 mol of precipitate.

Answer: 0.39 mol



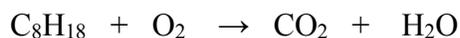
4. The first step in the production of nitric acid (for fertilizer production) is the reaction of ammonia with oxygen from the air to produce nitrogen monoxide and water. How many moles of nitrogen monoxide will be produced from the reaction of 200. mol of ammonia?

Answer: 200. mol



5. The mixture of gasoline and air in the carburetor of an engine is very important to the performance of the engine. How many moles of oxygen are required for the complete combustion of 6.14 mol of gasoline, C_8H_{18} ?

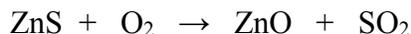
Answer: 76.75 mol



B. MOLE TO MASS STOICHIOMETRY

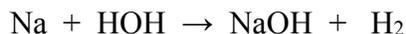
6. Zinc ore (ZnS) is converted into an oxide by roasting it before it is reduced to a pure metal. The SO₂ gas produced becomes an environmental problem if not recovered. What mass of zinc sulfide could react with 21.0 mol of oxygen to produce zinc oxide and sulfur dioxide?

Answer: 1.36 x 10³ g

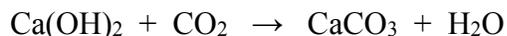


7. Sodium metal reacts rapidly with water in a single replacement reaction. What mass of sodium metal must react with water to produce 0.540 mol of hydrogen gas? (Remember for single and double replacement reactions water is written as HOH). This is how Woodland almost burned down the school.....

Answer: 24.83g

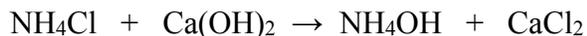


8. Slaked lime may be used for white washing or in mortar for brick laying. In both cases the solid slaked lime reacts with carbon dioxide in the air to produce calcium carbonate and water. What mass of calcium carbonate will be produced by the reaction of 0.962 mol of calcium hydroxide(slaked lime) with carbon dioxide. Answer: 96.3 g



9. One of the steps in the production of sodium carbonate (washing soda) is to first produce ammonium hydroxide from the reaction of ammonium chloride and calcium hydroxide. What mass of ammonium chloride are required for an exact reaction with 420 mol of calcium hydroxide (slaked lime)?

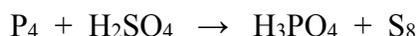
Answer: 4.49 x 10⁴ g



Worksheet 11

C. MASS TO MOLE STOICHIOMETRY

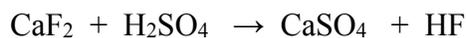
10. Phosphoric acid is produced by reacting rock phosphorus with sulfuric acid. Determine the number of moles of sulfuric acid required to react with 62.0 g of calcium phosphate.
Answer: 0.600 mol



11. In the first step in the production of sulfuric acid, sulfur is burned in air to produce sulfur dioxide. How many moles of oxygen is required to react with 160 g of sulfur?
Answer: 4.992 mol



12. Hydrofluoric acid may be produced in the lab and used to etch glass. How many moles of hydrofluoric acid may be produced by the addition of sufficient sulfuric acid to 7.81 g of solid calcium fluoride?
Answer: 0.200 mol

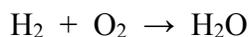


13. Ammonia for the production of fertilizers may be produced by the reaction of hydrogen with nitrogen from the air. Determine the number of moles of hydrogen gas required to react with excess nitrogen to prepare 6020 g of ammonia?
Answer: 530 mol



D. MASS TO MASS STOICHIOMETRY

- 14a) Passing a spark through a mixture of hydrogen and oxygen gas causes water to be produced. Calculate the mass of hydrogen needed to completely convert 4.00 g of oxygen into water.
Answer: 0.505 g



- 14b) What mass of water would be produced if all 4.00 g of oxygen reacted?
Answer: 4.51 g

15. The reaction between ammonia and oxygen is one step in the industrial preparation of nitric acid: $4 \text{NH}_3(\text{g}) + 5 \text{O}_2(\text{g}) \rightarrow 4 \text{NO}(\text{g}) + 6 \text{H}_2\text{O}(\text{g})$

If we use 6.80 g of ammonia in a laboratory scale experiment to demonstrate this reaction, what mass of oxygen will be required to consume all the ammonia.

Answer: 16.0 g

16. Ammonium dichromate exists as orange crystals. On strong heating, the crystals decompose to produce green chromium (III) oxide, nitrogen gas and water vapor. If 1.00 g of ammonium dichromate is heated, calculate the mass produced of each of the following:

a) chromium (III) oxide

Answer: 0.603 g

b) nitrogen gas

Answer: 0.111 g

c) water

Answer: 0.2862 g

