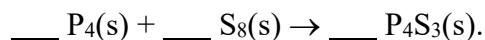


WKS 3-9 & 3-10 – Chem Honors
Limiting & Excess Reactants

NAME _____
Period _____ **Date** _____

1) What is meant by the limiting reactant? Excess reactant? Why is it necessary to identify the limiting reactant when you want to know how much product will form in a chemical reaction?

2) The unbalanced equation representing the production of tetraphosphorus trisulfide (P_4S_3), a substance used in some match heads, is



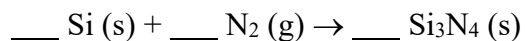
a. Balance this synthesis reaction using the lowest whole-number coefficients.

b. When 6.00 mol P_4 and 6.00 mol S_8 react, which is the limiting reactant?

c. How many moles of the excess reactant remain after the reaction is complete?

d. How many *grams* of P_4S_3 are produced?

3) Trisilicon tetranitride, a ceramic that has orthopedic applications, is formed by reacting silicon with nitrogen gas at high temperature:



a. Balance this synthesis reaction using the lowest whole-number coefficients.

b. What is the limiting reactant if 3.17 g of Si and 2.55 g of N_2 react?

c. What mass of excess reactant (in g), remains after the reaction is completed?

d. How many grams of Si_3N_4 can be produced from these reactants?

- 4) In blast furnaces, iron(III) oxide (Fe_2O_3) reacts with (is reduced by) gaseous carbon monoxide (CO) to form liquid iron and gaseous carbon dioxide:
- Write and balance the equation with the lowest whole-number coefficients.
 - If 100. g of iron(III) oxide and 56.0 g of carbon monoxide are reacted, which reactant is limiting?
 - How much excess reactant (in g) remains after the reaction is completed?
 - How many grams of iron are produced in this reaction?
- 5) One industrial process for producing nitric acid begins by combusting ammonia gas (NH_3) in oxygen gas to form nitrogen monoxide gas (NO) and liquid water.
- Write and balance the equation with the lowest whole-number coefficients.
 - Which reactant is limiting if 4.20×10^4 g of ammonia and 1.31×10^5 g of oxygen are available?
 - How many grams of the excess reactant remain after the reaction is completed?
 - How many grams of nitrogen monoxide will be produced in this reaction?

Answers: 2a) $8.3, 8; 2b)$ P; 2c) $3.75 \text{ mol S}; 2d)$ $1320 \text{ g P}_4\text{S}_3; 3a)$ $3, 2, 1; 3b)$ S; 3c) $0.44 \text{ g N}_2; 3d)$ $5.28 \text{ g Si}_3\text{N}_4; 4a)$ $1, 3, 2, 3; 4b)$ $\text{Fe}_2\text{O}_3; 4c)$ $3.4 \text{ g CO}; 4d)$ $69.9 \text{ g Fe}; 5a)$ $4, 5, 4, 6; 5b)$ $\text{NH}_3; 5c)$ $3.2 \times 10^4 \text{ g O}_2; 5d)$ $7.38 \times 10^4 \text{ g NO}$