Worksheet 7

Oct 5, 2022

Add't: Predicting Reactions

1) Write a balanced chemical equation for the following reactions:

a) solid lithium with liquid water

b) hydrogen gas with bromine gas

c) solid strontium with iodine gas

Limiting Reagent

2) Iron(III) oxide reacts with carbon monoxide according to the unbalanced equation:

$Fe_2O_3(s) + CO(g) \rightarrow Fe(s) + CO_2(g)$

A reaction mixture initially contains 22.55g Fe_2O_3 and 14.78 g CO. Once the reaction has occurred as completely as possible, what mass in g of the excess reactant remains? How much $CO_2(g)$ in grams is produced.

3) Zinc sulfide reacts with oxygen according to the reaction given by the unbalanced equation:

$ZnS(s) + O_2(g) \rightarrow ZnO(s) + SO_2(g)$

A reaction mixture initially contains 4.2 mol ZnS and 6.8 mol O_2. Once the reaction has occurred as completely as possible, what amount in moles of the excess reactant remains?

4) Consider the reaction:

$2\ NO(g) + 5\ H_2(g) \rightarrow 2\ NH_3(g) + 2\ H_2O(g)$

A reaction mixture initially contains 5 moles of NO and 10 moles of H_2. Without doing any calculations, determine which set of amounts best represents the mixture after the reactants have reacted as completely as possible. Explain your reasoning.

a) 1 mol NO, 0 mol H_2, 4 mol NH_3, 4 mol H_2O

b) 0 mol NO, 1 mol H_2, 5 mol NH_3, 5 mol H_2O

c) 3 mol NO, 5 mol H_2, 2 mol NH_3, 2 mol H_2O

d) 0 mol NO, 0 mol H_2, 4 mol NH_3, 4 mol H_2O

Percentage Yield

5) Incomplete combustion of the fuel in a poorly tuned engine can produce toxic carbon monoxide along with the usual carbon dioxide and water. In a test of an off-road motorcycle engine, 1.00L of octane (of mass 702 g) is burned and it was found that 1.84 kg of carbon dioxide is produced. What is the percentage yield of carbon dioxide?

6) When 24.0 g of potassium nitrate was heated with lead, lead oxide is formed along with 13.8 g of potassium nitrite was formed. Write the balanced chemical equation and calculate the percentage yield of possium nitrite.

7) When limstone, which is principally calcium carbonate is heated, carbon dioxide and quicklime (CaO) are produced. Write the balanced chemical equation. If 17.5 g of carbon dioxide is produced from the thermal decomposition of 42.73g calcium carbonate, what is the percentage yield of the reaction?

Take it together: Limiting Reagents and Yields

8) Urea (CH_4N_2O) is a common fertilizer that is synthesized by the reaction of ammonia (NH_3) with carbon dioxide given by the unbalanced equation:

$NH_3(aq) + CO_2(aq) \rightarrow CH_4N_2O(aq) + H_2O(l)$

In an industrial synthesis of urea, a chemis combines 136.4 kg of ammonia with 211.4 kg of carbon dioxide and obtains 168.4 kg of urea. Determine the limiting reactant, theoretical yield of urea, and percent yield for the reaction

9) Many computer chips are manufactured from silicon, which occurs in nature as SiO_2. When SiO_2 is heated to melting, it reacts with solid carbon to form liquid silicon and carbon monoxide gas. In an industrial preparation of silicon, 155.8 kg of SiO_2 reacts with 78.3 kg of carbon to produce 66.1 kg of silicon. Determine the limiting reactant, theoretical yield, and percent yield for the reaction.

10) When aqueous solutions of calcium nitrate and phosphoric acid are mixed, a white solid precipitates.

a) What is the molecular formula of the solid?

b) How many grams of the solid can be formed from 206 g of calcium nitrate and 150. g of phosphoric acid?