Chemistry 20	Unit 4
Lesson 8 - Limiting and Excess Reagents	84 mins

Calculating Mass of Excess Reagents

- Most of the time you want at least 10% more of one reagent then needed to ensure that the reaction goes to completion	You decide to test the method of stoichiometry using the reaction of 2.00 g of copper(II) sulfate in solution with an excess of sodium hydroxide in solution. What would be a reasonable mass of sodium hydroxide to use? $CuSO_{4(aq)} + 2\ NaOH_{(aq)} \rightarrow Cu(OH)_{2(s)} + Na_2SO_{4(aq)}$ 2.00g m?? 159.62 g/mol 40.00 g/mol $n_{CuSO4} = 2.00\ g \times \frac{1\ mol}{159.62\ g} = 0.0125\ mol$ $n_{NaOH} = 0.0125\ mol \times \frac{2}{1} = 0.0251\ mol$ $m_{NaOH} = 0.0251\ mol \times \frac{40.00\ g}{1\ mol} = 1.00\ g$ $m_{NaOH\ (excess)} = 1.00\ g + 0.10\ g\ (10\%\ of\ 1.00\ g) = 1.10\ g$

Identifying Limiting and Excess Reagents

- Sometimes you need to calculate how much product is going to be made from 2 or more known reagents - The reagent which has MORE moles is in EXCESS and will be ignored - The reagent which has LESS moles is limiting and will be the basis for all your future calculations	If 10.0 g of copper is placed in a solution of 20.0 g of silver nitrate, which reagent will be the limiting reagent? $Cu_{(s)} + 2AgNO_{3(aq)} \rightarrow 2Ag_{(s)} + Cu(NO_3)_{2(aq)}$ 10.0g 20.0g 63.55 g/mol 169.88 g/mol $n_{Cu} = 10.0g \times \frac{1\ mol}{63.55\ g} = 0.157\ mol$ (EXCESS) $n_{AgNO3\ (from\ Cu)} = 0.157\ mol \times \frac{2}{1} = 0.315\ mol$ $n_{AgNO3\ (available)} = 20.0\ g \times \frac{1\ mol}{169.88\ g} = 0.118\ mol$ (Less than above so will be limiting) The $AgNO_3$ will be limiting so use the 0.118 mol for all future calculations

Chemistry 20 - Unit D - Limiting and Excess Reagents

Name: _____

1) A quick, inexpensive source of hydrogen gas is the reaction of zinc with hydrochloric acid (Figure 9). If 0.35 mol of zinc is placed in 0.60 mol of hydrochloric acid,

a) which reactant will be completely consumed?

b) what mass of the other reactant will remain after the reaction is complete?

2) A chemical technician is planning to react 3.50 g of lead(II) nitrate with excess potassium bromide in solution.

a) What would be a reasonable mass of potassium bromide to use in this reaction?

b) Predict the mass of precipitate expected.

3) In a chemical analysis, 3.40 g of silver nitrate in solution reacted with excess sodium chloride to produce 2.81 g of precipitate. What is the percent yield?

4) A solution containing 9.8g of barium chloride is mixed with a solution containing 5.1g of sodium sulfate.

a) Which reactant is in excess?

b) Determine the excess mass.

c) Predict the mass of precipitate.

5) A technical college instructor wishes a first-year chemistry group to perform an investigation to practise precipitation and filtration techniques and to calculate a percent yield. The class will react 50.00 mL pipetted samples of 0.200 mol/L potassium phosphate solution with an excess of 0.120 mol/L lead(II) nitrate solution.

a) Which reagent is intended to be the limiting reagent?

b) What is the minimum volume of lead(II) nitrate solution required?

c) What volume of lead(II) nitrate solution should the instructor tell the students to use?

d) Describe how the students can test for completeness of reaction of the limiting reagent.