

## 3.79 Define limiting reagent and excess reagent.

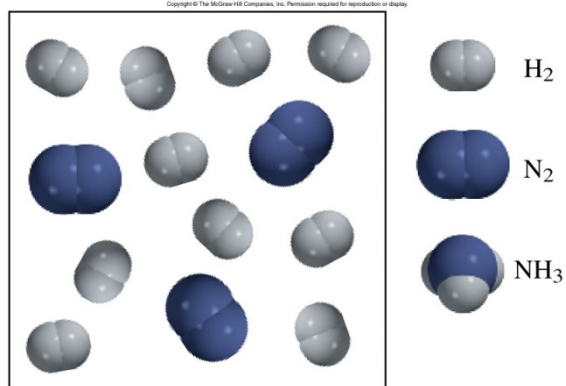
What is the significance of the limiting reagent in predicting the amount of the product obtained in a reaction?

Can there be a limiting reagent if only one reactant is present?

3.82  $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$  From diagram, one sees that there are 3 moles of  $\text{N}_2$  and 10 moles of  $\text{H}_2$ 

Fill in the “ICF” table to help answer all questions:

	$\text{N}_2$	+	$3 \text{H}_2$	$\rightarrow$	$2 \text{NH}_3$
Initial	3 mc		10 mc		0 mc
Change					
Final					

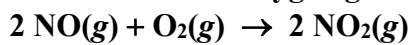


What is the limiting reagent? Explain.

Number of moles of product produced:

Number of moles of excess reagent left:

## 3.83 Nitric oxide reacts with oxygen gas to form nitrogen dioxide, a dark-brown gas:



In one experiment 0.886 mole of NO is mixed with 0.503 mole of  $\text{O}_2$ . Calculate which of the two reactants is the limiting reagent. Calculate also the number of moles of  $\text{NO}_2$  produced.

## 3.88 Why is the actual yield of a reaction almost always smaller than the theoretical yield?

- 3.84** The depletion of the ozone in the stratosphere has been a matter of great concern among scientists in recent years.  $\text{O}_3 + \text{NO} \rightarrow \text{O}_2 + \text{NO}_2$  If 0.740 g of  $\text{O}_3$  reacts with 0.679 g of NO... How many grams of  $\text{NO}_2$  produced?

How many moles of excess reagent remain?

- 3.92** Ethylene ( $\text{C}_2\text{H}_4$ ), can be prepared by heating hexane ( $\text{C}_6\text{H}_{14}$ ) at  $800^\circ\text{C}$ :  $\text{C}_6\text{H}_{14} \rightarrow \text{C}_2\text{H}_4 +$  other products. If the yield of ethylene production is 42.5 percent, what mass of hexane must be reacted to produce 481 g of ethylene?

- 3.94** Disulfur dichloride is used in the vulcanization of rubber. It is prepared by heating sulfur in an atmosphere of chlorine. What is the theoretical yield of  $\text{S}_2\text{Cl}_2$  when 4.06 g of  $\text{S}_8$  is heated with 6.24g of  $\text{Cl}_2$
- $$\text{S}_8(l) + 4\text{Cl}_2(g) \rightarrow 4\text{S}_2\text{Cl}_2(l)$$

If the actual yield of  $\text{S}_2\text{Cl}_2$  is 6.55 g, what is the percent yield?

- 3.108**  $\text{Fe}_2\text{O}_3 + 3 \text{CO} \rightarrow 2 \text{Fe} + 3 \text{CO}_2$  One obtains  $1.64 \times 10^3$  kg Fe from  $2.62 \times 10^3$  kg of an impure sample of  $\text{Fe}_2\text{O}_3$ . What is % purity of sample?  
[Hint: Determine the mass of pure  $\text{Fe}_2\text{O}_3$  that reacted to produce the amount of Fe obtained]