

5.5 Calculating Limiting and Excess Reagents

Define:

- Excess reagent
- Limiting reagent
- When reactants in a chemical reaction are mixed together, the quantities that react are determined by the mole ratios in a balanced equation.
- Generally, industrial and laboratory procedures are designed so that one of the reactants is used as the limiting reagent and the other reactants are in slight excess.

Calculating Excess Reagent

1. Determine the amount in moles of the limiting reagent.
 2. Apply the mole ratios in the balanced equations to calculate the minimum amount in moles of other reagents(s).
 3. Add 10% to the minimum amount in moles of excess reagents(s).
 4. Convert the excess amount in moles to mass.
- E.g. Sodium metal and chlorine gas react to produce solid sodium chloride. If 0.75 g of sodium is to be completely reacted, what is a reasonable mass of chlorine gas to use in the reaction?

Which Reactant is Limiting?

1. Write a balanced equation for the reaction.
 2. Select one of the reactants and calculate the amount in moles available.
 3. Use the mole ratios in the balanced equation to calculate the amount in moles needed of the other reactants.
 4. Calculate the available amount in moles of the other reactants. If the available amount of a reactant is more than sufficient, it is in excess. If the available amount is insufficient, it is limiting.
- E.g. When solid iron (III) oxide is heated in the presence of carbon monoxide gas, iron metal and carbon dioxide gas are produced.
 - a) Write a balanced equation for this reaction.
 - b) If 74.2 kg of iron (III) oxide and 40.3 kg of carbon monoxide are available, what is the mass of iron metal produced?

Homework

- Practice Questions: 1,2,3,4,5,6,7,8,9,12,13
- Section Questions: 1,2,3,4,5,6,7