

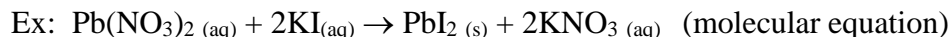
CHEMICAL REACTIONS PART 1

WRITING AND BALANCING CHEMICAL EQUATIONS (REVIEW).

All chemical equations must obey the Law of Conservation of Matter ie: they must be balanced using coefficients.

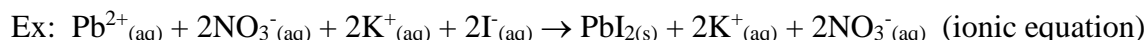
Molecular Equations:

- Show the complete formulas of each element and compound in the reaction.



Ionic Equations:

- Instead of writing formulas for the substances as molecular formulas, they are written as the ions that would be present in an aqueous solution.



- Substances written as ions are: **Soluble salts, strong acids, strong bases (see below)**

Net Ionic Equations:

- Show only the ions actually involved with the reaction.
- Once the ionic equation is written, any spectator ions (ions that appear in the same form on both sides of the equation) are deleted..



REACTION STOICHIOMETRY

Ex's:

- a) How many grams of magnesium metal are required to convert 83.6 g TiCl_4 to titanium metal?
- b) Upon being heated or exposed to severe mechanical shock, ammonium nitrate decomposes into nitrogen and oxygen gases and water vapor. If 75.5 g of ammonium nitrate decomposes, how many grams of nitrogen and how many grams of oxygen are produced?
- c) How many milliliters of liquid water should be produced by the combustion in abundant oxygen of 775 mL of octane $\text{C}_8\text{H}_{18(l)}$? Assume that all volumes are measured at 20 °C where the densities are 0.7025 g/mL for octane and 0.9982 g/mL for water.

A) Limiting reactants:

- The reactant that is completely consumed in a chemical reaction and that limits the amount of product formed.
- Calculate the expected yield using each of the given reactant amounts.
- Whichever reactant gives the least product is the limiting reactant.

Ex: a) Iron (II) sulfide reacts with hydrochloric acid to give hydrogen sulfide and iron (II) chloride. If 10.2 g HCl is added to 13.2 g FeS, how many grams of H₂S can be formed? What is the mass of the excess reactant remaining?

B) Yields of Chemical reactions:

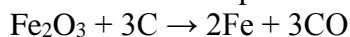
- Theoretical yield = the calculated quantity of product.
- Actual yield = the measured quantity of product.
- Percent yield = $\frac{\text{actual yield}}{\text{theoretical yield}} \times 100$

Ex: 1) In the reaction: $\text{Fe}_2\text{O}_{3(s)} + 3\text{CO}_{(g)} \rightarrow 2\text{Fe}_{(s)} + 3\text{CO}_{2(g)}$

a) If you start with 150 g of Fe₂O₃ as the limiting reagent, what is the theoretical yield of Fe?

b) If the actual yield was 87.9 g, what was the percentage yield?

2) An iron ore sample contains Fe₂O₃ and other impurities. A 752g sample of impure iron ore is heated with excess carbon producing 453 g of pure iron by the following reaction:



What is the mass percent of Fe₂O₃ in the original sample assuming that Fe₂O₃ is the only source of iron and the reaction goes to completion?