

- Aluminum and hydrochloric acid react to form aluminum chloride and hydrogen gas. $2Al + 6HCl \rightarrow 3H_2 + 2AlCl_3$
- Calcium hydroxide and phosphoric acid react to form calcium phosphate and water. $3Ca(OH)_2 + 2H_3PO_4 \rightarrow Ca_3(PO_4)_2 + 6H_2O$
- Copper and sulfuric acid react to form copper (II) sulfate and water and sulfur dioxide.
- Hydrogen gas and nitrogen monoxide react to form water and nitrogen gas.

Writing equations

Write equations for the following reactions:

- The reaction of ammonia with iodine to form nitrogen triiodide (NI₃) and hydrogen gas. $3NH_3 + 3I_2 \rightarrow 2NI_3 + 3H_2$
- The combustion of propane (C₃H₈). $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$
- The reaction of nitric acid with potassium hydroxide. $HNO_3 + KOH \rightarrow KNO_3 + H_2O$
- The reaction of copper (II) oxide with hydrogen to form copper metal and water. $CuO + H_2 \rightarrow Cu + H_2O$
- The reaction of iron metal with oxygen to form iron (III) oxide. $4Fe + 3O_2 \rightarrow 2Fe_2O_3$
- The reaction of AlBr₃ with Mg(OH)₂. $2AlBr_3 + 3Mg(OH)_2 \rightarrow 2Al(OH)_3 + 3MgBr_2$
- The decomposition of hydrogen peroxide to form water and oxygen. $2H_2O_2 \rightarrow 2H_2O + O_2$
- The reaction of ammonia with sulfuric acid. $2NH_3 + H_2SO_4 \rightarrow (NH_4)_2SO_4$

Predict products and classify type of reaction

- $NaOH + CaBr_2 \rightarrow NaBr + Ca(OH)_2$ double replacement
- $Pb(NO_3)_2 + HCl \rightarrow HNO_3 + PbCl_2$ double replacement
- $AgNO_3 + CuSO_4 \rightarrow Ag_2SO_4 + Cu(NO_3)_2$ double replacement
- $AgF + NiCl_2 \rightarrow AgCl + NiF_2$ double replacement
- $Ca(OH)_2 + HF \rightarrow H_2O + CaF_2$ double replacement
- $Pb(NO_3)_2 + K_2CrO_4 \rightarrow KNO_3 + PbCrO_4$ double replacement
- $NaC_2H_3O_2 + H_2SO_4 \rightarrow Na_2SO_4 + CH_3COOH$ double replacement
- $Cu(OH)_2 + H_3PO_4 \rightarrow H_2O + Cu_3(PO_4)_2$ double replacement
- $AgNO_3 + Na_2CO_3 \rightarrow Ag_2CO_3 + NaNO_3$ double replacement
- $Zn + H_2CO_3 \rightarrow ZnCO_3 + H_2$ single replacement

Types of reactions

Balance the following equations and indicate the type of reaction taking place:

- $3 NaBr + 1 H_3PO_4 \rightarrow 1 Na_3PO_4 + 3 HBr$ double displacement
- $3 Ca(OH)_2 + 1 Al_2(SO_4)_3 \rightarrow 3 CaSO_4 + 2 Al(OH)_3$ double displacement
- $3 Mg + 1 Fe_2O_3 \rightarrow 2 Fe + 3 MgO$ single replacement
- $1 C_2H_4 + 3 O_2 \rightarrow 2 CO_2 + 2 H_2O$ combustion
- $2 PbSO_4 \rightarrow 2 PbSO_3 + 1 O_2$ decomposition
- $2 NH_3 + 3 I_2 \rightarrow 1 N_2I_6 + 3 H_2$ double displacement
- $1 H_2O + 1 SO_3 \rightarrow 1 H_2SO_4$ synthesis

Chapter 11

The mole

Molar mass

Changing moles to particles

Changing particles to moles

Changing grams to moles

Changing moles to grams

Changing particles to grams

Changing grams to particles

Percent composition

Practice problems

Molar mass

Find the molar masses of the following compounds:

- NaBr 102.9 g/mol
- PbSO₄ 303.3 g/mol
- Ca(OH)₂ 74.1 g/mol
- Na₃PO₄ 164.0 g/mol
- (NH₄)₂CO₃ 96.0 g/mol
- C₆H₁₂O₆ 180.0 g/mol
- Fe₃(PO₄)₂ 357.4 g/mol
- (NH₄)₂S 68.1 g/mol
- Zn(C₂H₃O₂)₂ 183.4 g/mol
- AgF 126.9 g/mol

Mole calculations

Answer the following questions:

- How many moles are in 25 grams of water? 1.39 moles
- How many grams are in 4.5 moles of Li₂O? 134.1 grams
- How many molecules are in 23 moles of oxygen? 1.38×10^{25} molecules