



Single Replacement	Decomposition	Combination (Synthesis)	Double Displacement
$A + BC \rightarrow AC + B$	$AB \rightarrow A + B$	$A + B \rightarrow AB$	$AB + CD \rightarrow AD + CB$
<i>Type 1</i>	<i>Type 1</i>	<i>Type 1</i>	<i>Type 1 - Precipitation</i>
Reactants metal + compound	Reactants 1 binary substance	Reactants Element + Element	Reactants Ionic + Ionic
$Al + 3 CuCl_2 \rightarrow 2 AlCl_3 + 3 Cu$ Al > Cu ✓ charges	$2 H_2O \rightarrow 2 H_2 + O_2$ Forms elements - ✓ diatomics	$2 Al + 3 Cl_2 \rightarrow 2 AlCl_3$ ✓ diatomics ✓ charges on ionic product	$Pb(NO_3)_2 + 2 KCl \rightarrow PbCl_2 \downarrow + 2 KNO_3$ Swap the anions & ✓ charges One product must be insoluble
<i>Special Case 1</i>	<i>Type 2</i>	<i>Type 2</i>	<i>Type 2 - Neutralization</i>
Reactants metal + water (HOH)	Reactants 1 ternary substance	Reactants 2 compounds (covalent)	reactants Acid + Base
$Ca + 2 HOH \rightarrow Ca(OH)_2 + H_2$ Top 6 metals ✓ charges	Metal bicarbonate → metal carbonate + CO ₂ + H ₂ O	$Na_2O + CO_2 \rightarrow Na_2CO_3$ Metal first, polyatomic ion ✓ charges	$H_2SO_4 + 2 KOH \rightarrow 2 HOH + K_2SO_4$ Swap the anions & ✓ charges No check – always occur
<i>Type 2</i>	Metal carbonate → metal oxide + CO ₂	$SO_3 + H_2O \rightarrow H_2SO_4$ No metal, Hydrogen first, polyatomic ion ✓ charges	
Reactants Halogen + metal halide	Metal chlorate → metal chloride + O ₂	Solubility Rules Compounds containing the following ions are generally <i>soluble</i> in water: 1. alkali metal ions and ammonium ions, Li ⁺ , Na ⁺ , K ⁺ , NH ₄ ⁺ 2. acetate ion, C ₂ H ₃ O ₂ ⁻ 3. nitrate ion, NO ₃ ⁻ 4. halide ions (X), Cl ⁻ , Br ⁻ , I ⁻ (AgX, Hg ₂ X ₂ , PbX ₂ are insoluble exceptions) 5. sulfate ions, SO ₄ ²⁻ , (BaSO ₄ , SrSO ₄ , and PbSO ₄ are insoluble exceptions) Compounds containing the following ions are generally <i>insoluble</i> in water: 6. carbonate ions, CO ₃ ²⁻ (see rule 1 exceptions, which are soluble) 7. chromate ions, CrO ₄ ²⁻ (see rule 1 exceptions, which are soluble) 8. phosphate ions, PO ₄ ³⁻ (see rule 1 exceptions, which are soluble) 9. sulfide ions, S ²⁻ (CaS, SrS, BaS, and rule 1 exceptions are soluble) 10. hydroxide ions, OH ⁻ [Ca(OH) ₂ , Sr(OH) ₂ , Ba(OH) ₂ , and rule 1 exceptions are soluble]	
$Cl_2 + 2 NaI \rightarrow 2 NaCl + I_2$ Cl > I ✓ charges	Metal nitrate → metal nitrite + O ₂ ✓ charges Know the recipes		
Combustion Hydrocarbons (C _x H _y) burn when they combine with oxygen gas to form carbon dioxide and water. $C_xH_y + O_2 \rightarrow CO_2 + H_2O$ $C_xH_yO_z + O_2 \rightarrow CO_2 + H_2O$			
Activity Series Li > K > Ba > Sr > Ca > Na > Mg > Al > Mn > Zn > Fe > Cd > Co > Ni > Sn > Pb > H > Cu > Ag > Hg > Au			