Ch. 8 – Chemical Reactions

III. Types of Chemical Reactions (p. 256 - 267)

I II III IV V

A. Combustion

- the burning of any substance in O_2 to produce heat

$$A + O_2 \rightarrow B$$

$$2Mg(s) + O_2(g) \rightarrow 2MgO(s)$$

$$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$$

A. Combustion

- Products:
  - Contain oxygen
  - Hydrocarbon combustion forms $CO_2 + H_2O$

$$4\ Na(s) + O_2(g) \rightarrow 2\ Na_2O(s)$$

$$C_3H_8(g) + 5\ O_2(g) \rightarrow 3\ CO_2(g) + 4\ H_2O(g)$$

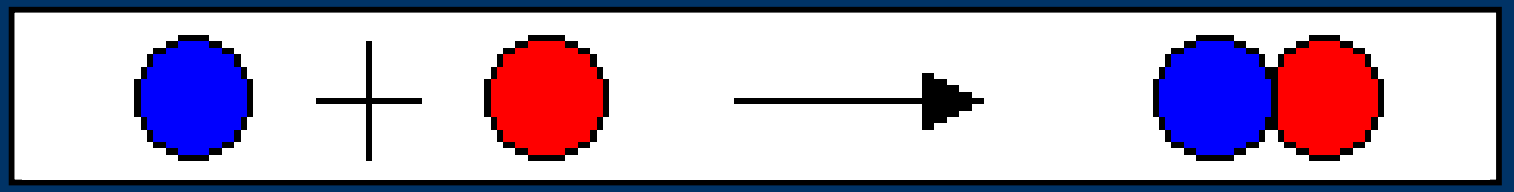
Combustion Reaction

- http://www.marymount.k12.ny.us/marynet/stwbwk05/05flashchem/lyreaction/lyreaction.html

B. Synthesis(Combinations)

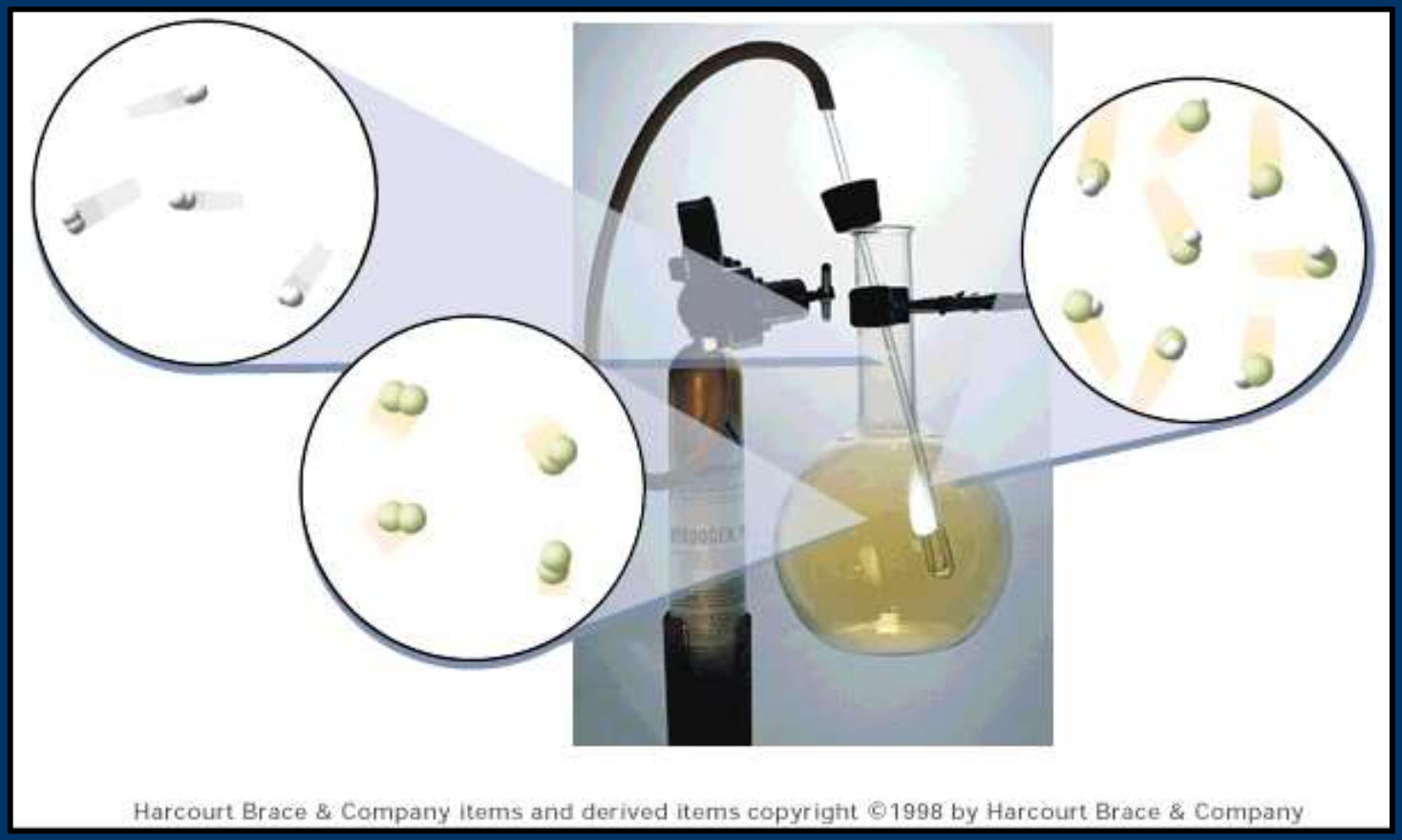
- the combination of 2 or more substances to form a compound
- only one product

$$A + B \rightarrow AB$$



B. Synthesis (Combination)

$$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$$



B. Synthesis (Combination)

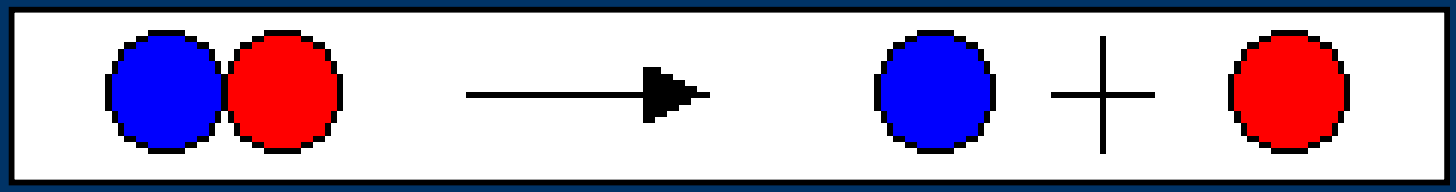
- Products:
  - ionic formula units - cancel charges (CRISS-CROSS)
  - covalent molecules - hard to tell

$$2\,Al(s) + 3\,Cl_2(g) \rightarrow 2\,AlCl_3(s)$$

C. Decomposition

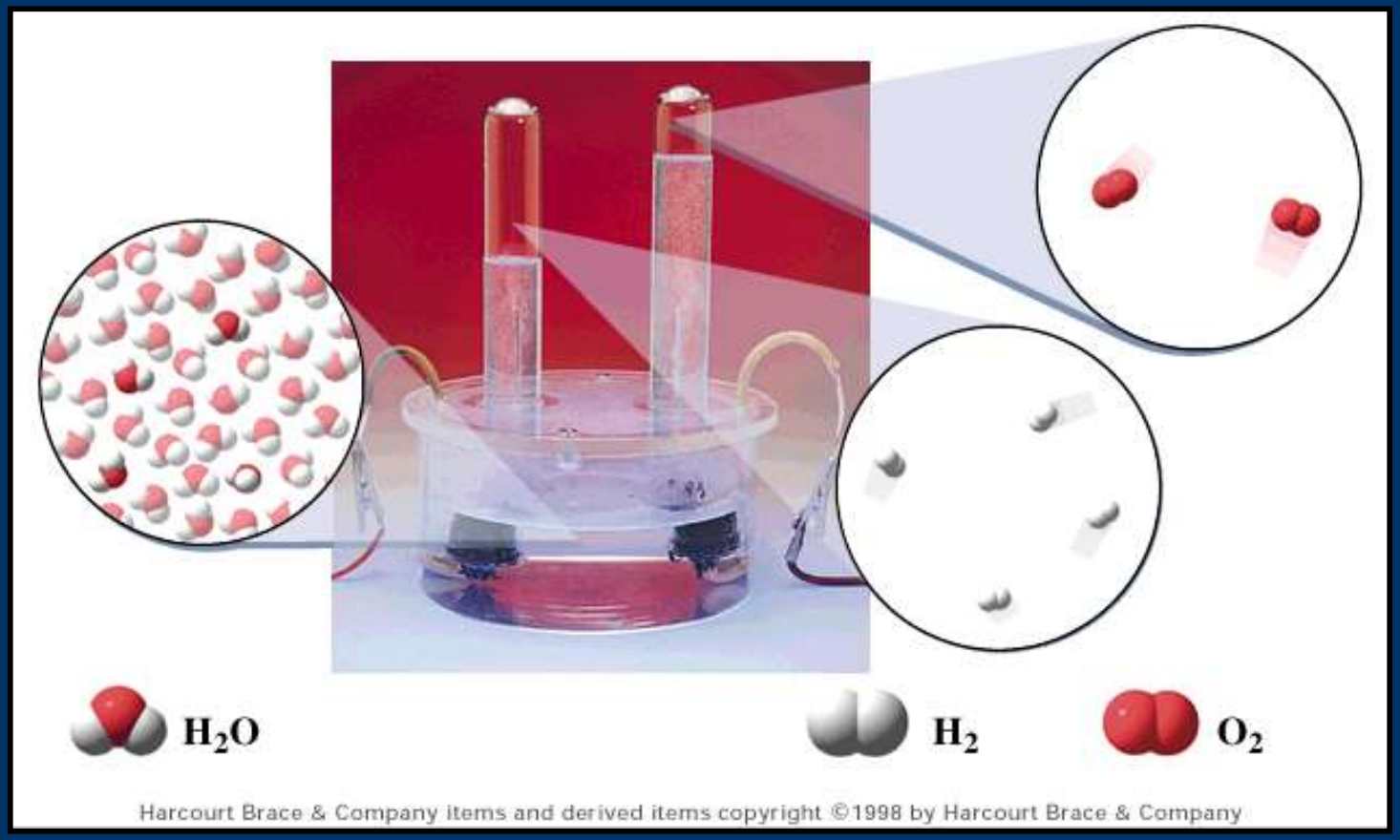
- a compound breaks down into 2 or more simpler substances
- only one **reactant**

$$AB \rightarrow A + B$$



C. Decomposition

$$2\ H_2O(l) \rightarrow 2\ H_2(g) + O_2(g)$$



C. Decomposition

- Products:
  - Binary compounds - break into elements
  - others - hard to tell

$$2\ KBr(l) \rightarrow 2\ K(s) + Br_2(l)$$

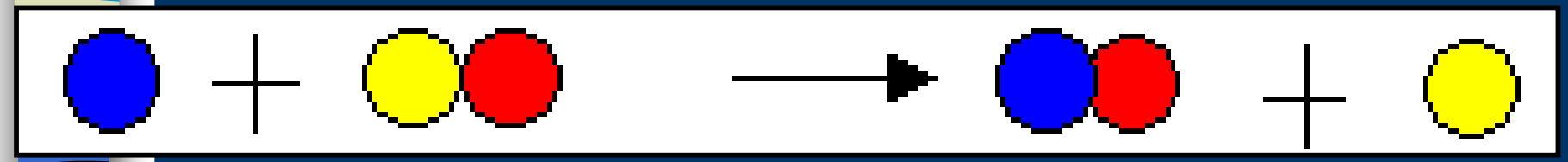
Decomposition Resulting in the Formation of a Compound and an Element

- http://www.marymount.k12.ny.us/marynet/stwbwk05/05flashchem/mnreaction/reaction.html

D. Single Replacement

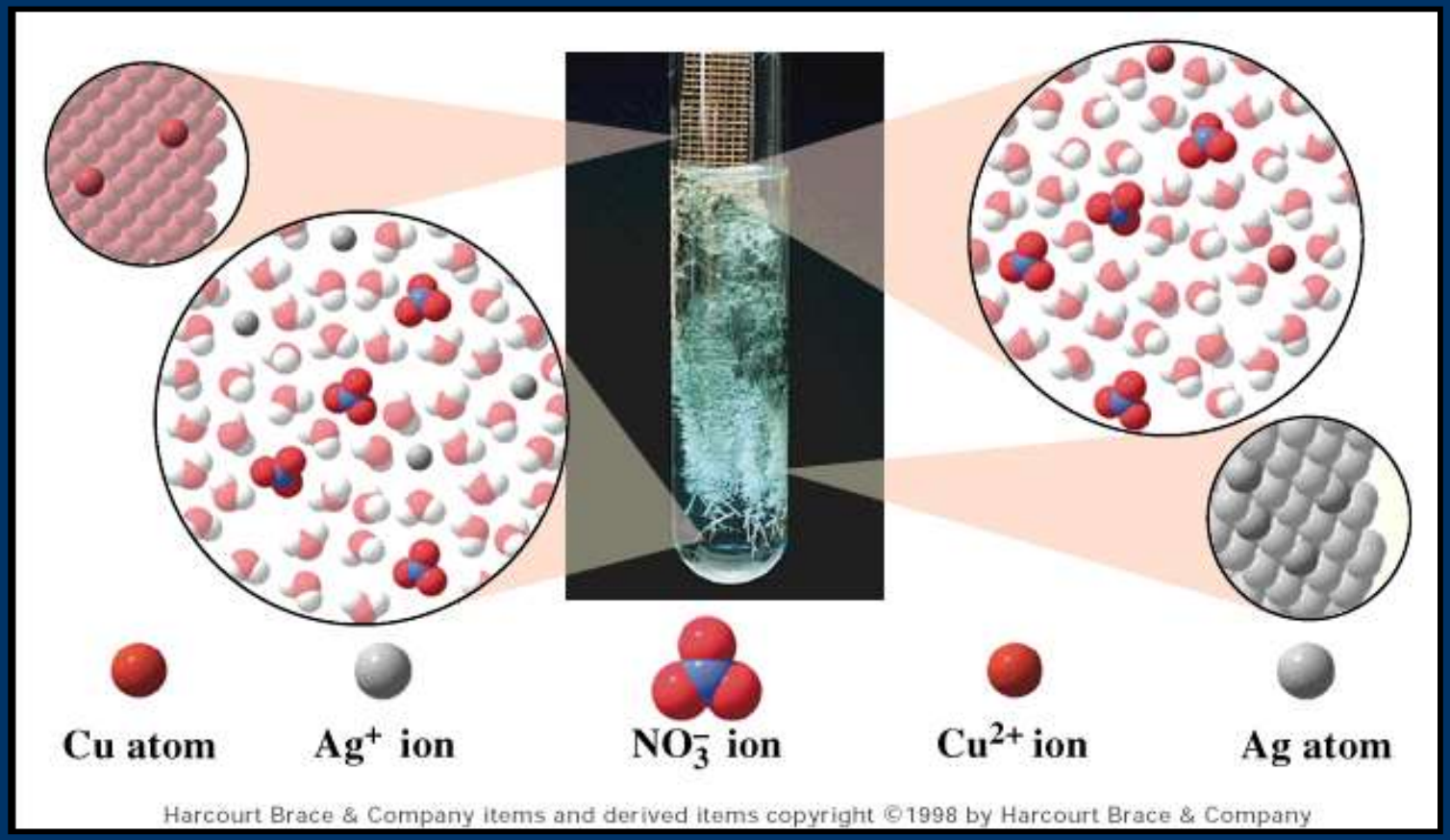
- one element replaces another in a compound
  - metal replaces metal (+)
  - nonmetal replaces nonmetal (-)

$$A + BC \rightarrow B + AC$$



D. Single Replacement

$$Cu(s) + 2AgNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2Ag(s)$$



D. Single Replacement

- Products:
  - metal → metal (+)
  - nonmetal → nonmetal (-)
  - free element must be **more active** (check ***activity series***)

$$Fe(s) + CuSO_4(aq) \rightarrow Cu(s) + FeSO_4(aq)$$

$$Br_2(l) + NaCl(aq) \rightarrow N.R.$$

$Mg(s) + 2HCl \rightarrow MgCl_2(aq) + H_2(g)$

- http://www.marymount.k12.ny.us/marynet/stwbwk05/05flashchem/avreaction/avreaction.html

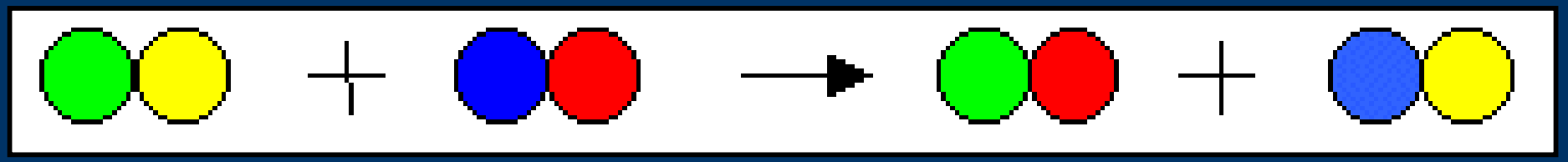
Single Replacement Involving a Metallic Element

- http://www.marymount.k12.ny.us/marynet/stwbwk05/05flashchem/gbreaction/reaction.html

E. Double Replacement

- ions in two compounds “change partners”
- cation of one compound combines with anion of the other

$$AB + CD \rightarrow AD + CB$$



E. Double Replacement

$$Pb(NO_3)_2(aq) + K_2CrO_4(aq) \rightarrow PbCrO_4(s) + 2KNO_3(aq)$$

E. Double Replacement

- Products:
  - switch negative ions
  - one product must be **insoluble** (check solubility table)

$$Pb(NO_3)_2(aq) + 2KI(aq) \rightarrow PbI_2(s) + 2KNO_3(aq)$$

$$NaNO_3(aq) + KI(aq) \rightarrow \text{N.R.}$$

Double Replacement: Evolution of a Gas

- http://www.marymount.k12.ny.us/marynet/stwbwk05/05flashchem/isreaction/reaction.html

Double Replacement Reaction Involving a Polyatomic Ion and Producing a Precipitate

- http://www.marymount.k12.ny.us/marynet/stwbwk05/05flashchem/kereaction/reaction.html