

## Chemical Reactions

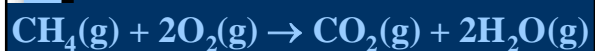
### III. Types of Chemical Reactions



I II III IV V

### A. Combustion

- the burning of any substance in  $O_2$  to produce heat



### A. Combustion

- Products:
  - contain oxygen
  - hydrocarbons form  $CO_2 + H_2O$

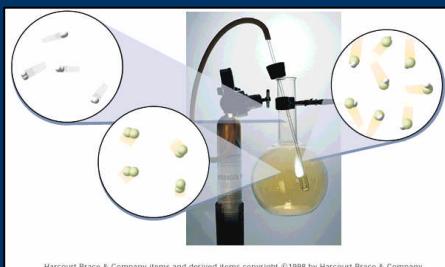


### B. Synthesis

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



### B. Synthesis



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### B. Synthesis

- Products:
  - ionic - cancel charges
  - covalent - hard to tell



### C. Decomposition

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

$$AB \rightarrow A + B$$

### C. Decomposition

$$2 \text{H}_2\text{O}(l) \rightarrow 2 \text{H}_2(g) + \text{O}_2(g)$$

### C. Decomposition

- Products:
  - binary - break into elements
  - others - hard to tell

$$2 \text{KBr}(l) \rightarrow 2 \text{K}(s) + \text{Br}_2(l)$$

### D. Single Replacement

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

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

### D. Single Replacement

$$\text{Cu}(s) + 2\text{AgNO}_3(aq) \rightarrow \text{Cu}(\text{NO}_3)_2(aq) + 2\text{Ag}(s)$$

### D. Single Replacement

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

$$\text{Fe}(s) + \text{CuSO}_4(aq) \rightarrow \text{Cu}(s) + \text{FeSO}_4(aq)$$

$$\text{Br}_2(l) + \text{NaCl}(aq) \rightarrow \text{N.R.}$$

### 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

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

$Pb^{2+}$     $NO_3^{2-}$     $K^+$     $CrO_4^{2-}$

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### E. Double Replacement

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

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

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