

# Reaction Types

# Synthesis Reaction

- General form:
- $A + B \rightarrow AB$
- key: only one product
- ex:  $SO_3 + H_2O \rightarrow H_2SO_4$

# Decomposition Reaction

- General form:
- $AB \rightarrow A + B$
- key: only one reactant
- ex:  $C_6H_{12}O_6 \rightarrow C + H_2O$

# “special” elements

- Some elements occur in nature as combinations rather than individual atoms
- Diatomics:  $H_2$ ,  $N_2$ ,  $O_2$ ,  $F_2$ ,  $Cl_2$ ,  $Br_2$ ,  $I_2$
- Others:  $P_4$ ,  $S_8$
- Note – this is only when they are *free elements* (not in a compound)

# Examples in reactions...

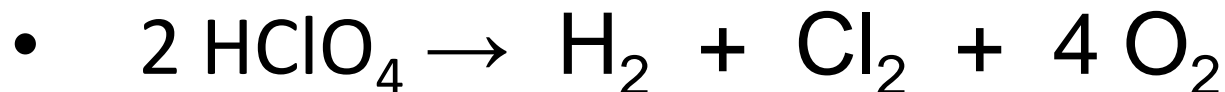
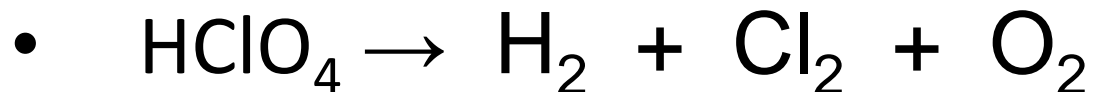
- sulfur + oxygen yields sulfur dioxide
- $S_8 + O_2 \rightarrow SO_2$  ...is this balanced?
- $S_8 + 8 O_2 \rightarrow 8 SO_2$
  
- How about... diphosphorus pentoxide decomposes into phosphorus and oxygen?
- $P_2O_5 \rightarrow P_4 + O_2$
- $2 P_2O_5 \rightarrow P_4 + 5 O_2$

# Predicting results

- Predict the result of:  $\text{HClO}_4 \rightarrow$

This is a **decomposition reaction**

1. Write every element in the compound as a “free element” on the product side
2. Watch out for the “special” elements
3. Balance the equation

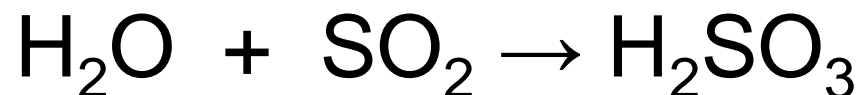


# Predicting results

- Predict the result of:  $\text{Ca} + \text{P}_4 \rightarrow$   
This is a **synthesis reaction**
- 1. There will be a single *ionic* product
- 2. Write the ion symbols & balance charges
- 3. Balance the equation
- $\text{Ca} + \text{P}_4 \rightarrow \text{Ca}^{2+} \text{P}^{3-}$
- $\text{Ca} + \text{P}_4 \rightarrow \text{Ca}_3\text{P}_2$
- $6 \text{Ca} + \text{P}_4 \rightarrow 2 \text{Ca}_3\text{P}_2$

# Predicting results: 2 more...

Nonmetal oxide + water yield an oxyacid



Write the product as a simple combination of the elements on the reactant side

Metal oxide + water yield a metal hydroxide

