

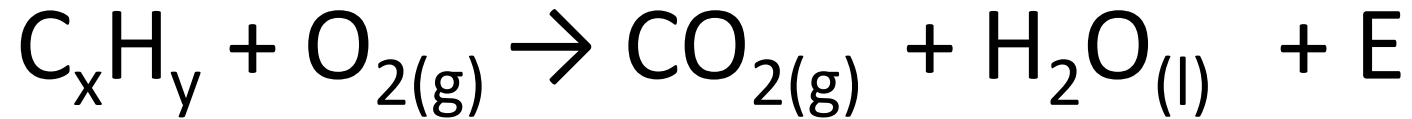
More reaction types...

**combustions** and

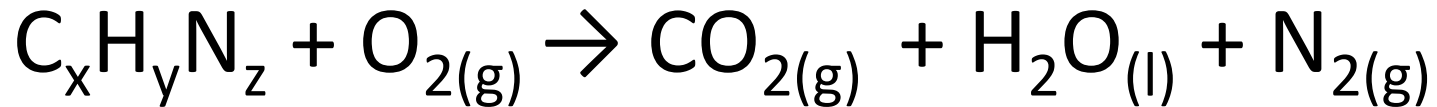
**acid/base**

**neutralizations**

# Combustion reactions

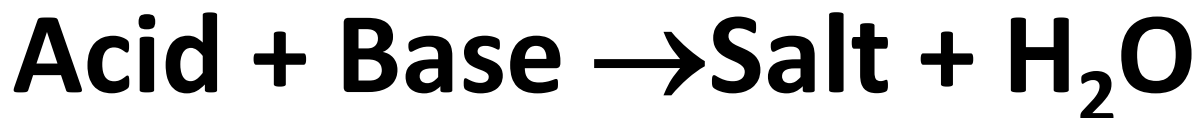


If the hydrocarbon contains nitrogen as well...

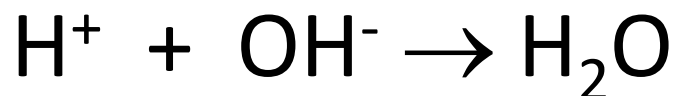


# Acid/Base Neutralization

Hydroxide base – general form



- what's actually happening?



- Salt = the anion from the acid  
+ the cation from the base

# Predicting results...

## Acid + hydroxide base...

Example:  $\text{NaOH} + \text{HCl} \rightarrow$

1. Write  $\text{H}_2\text{O}$  as a product

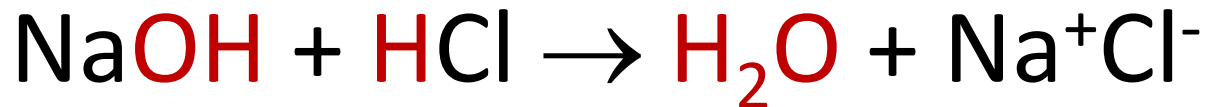


# Predicting results...

## Acid + hydroxide base...

Example:  $\text{NaOH} + \text{HCl} \rightarrow$

2. Form the salt from the remainders of the acid and base

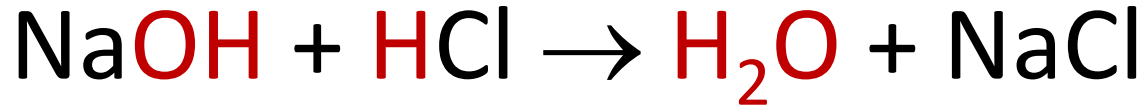


# Predicting results...

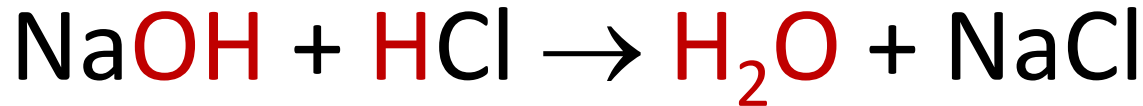
## Acid + hydroxide base...

Example:  $\text{NaOH} + \text{HCl} \rightarrow$

3. Balance the charges in the salt



4. Balance the equation



# Predicting results...

## Acid + hydroxide base...



1. Write  $\text{H}_2\text{O}$  as a product

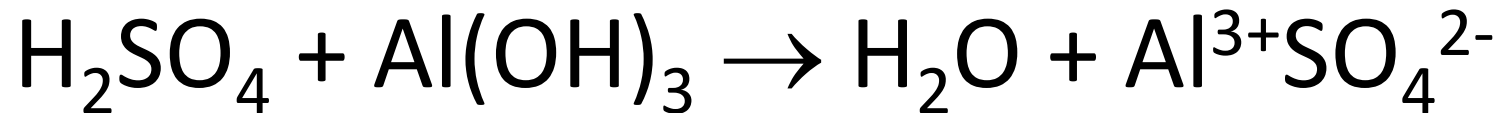


# Predicting results...

## Acid + hydroxide base...



2. Form the salt from the remainders of the acid and base



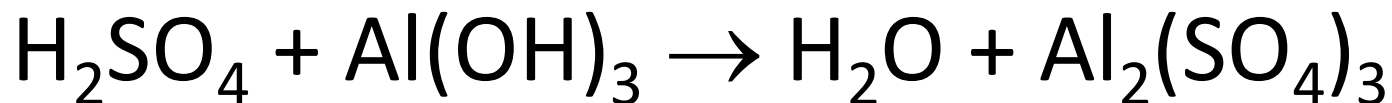


# Predicting results...

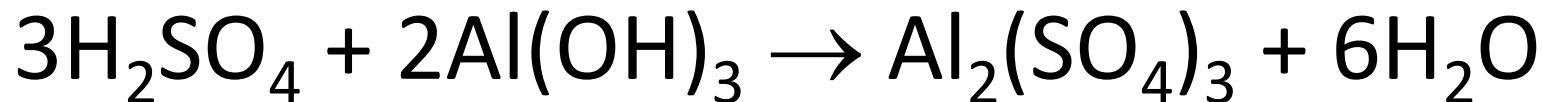
## Acid + hydroxide base...



3. Balance the charges in the salt



4. Balance the equation

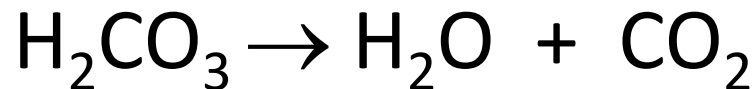
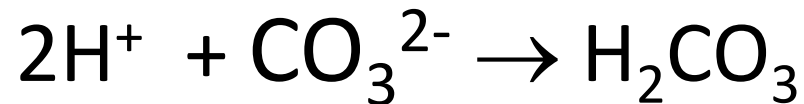


# Acid/Base Neutralization

## carbonate base – general form



- what's actually happening?



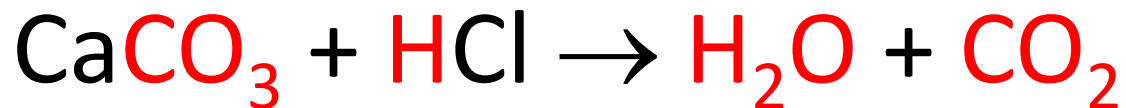
- Salt = the anion from the acid  
+ the cation from the base

# Predicting results...

## Acid + carbonate base...



1. Write  $\text{H}_2\text{O} + \text{CO}_2$  as products

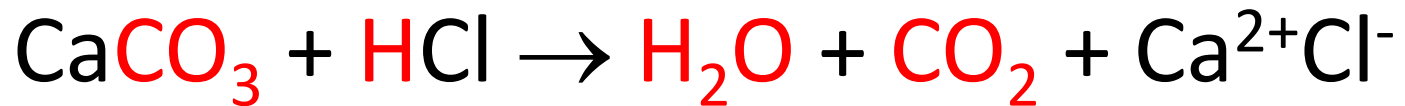


# Predicting results...

## Acid + carbonate base...



2. Form the salt from the remainders of the acid and base



# Predicting results...

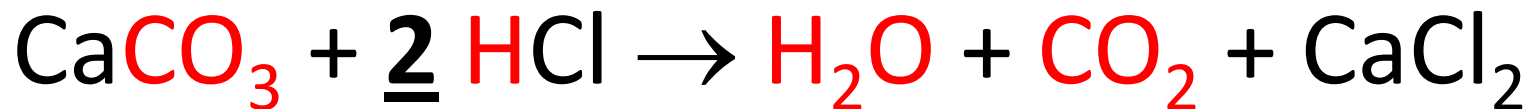
## Acid + carbonate base...



3. Balance the charges in the salt



4. Balance the equation



# Predicting results...

## Acid + carbonate base...



1. Write  $\text{H}_2\text{O} + \text{CO}_2$  as products

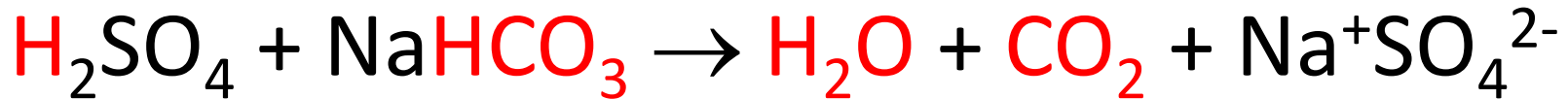


# Predicting results...

## Acid + carbonate base...



2. Form the salt from the remainders of the acid and base

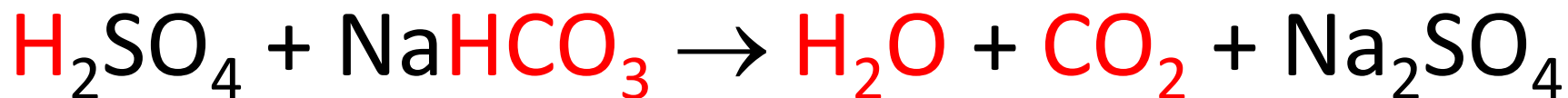


# Predicting results...

## Acid + carbonate base...



3. Balance the charges in the salt



4. Balance the equation





What reaction would be the best choice to make...

# An insoluble ionic compound?

- **Double replacement**
- But remember...
  - Both reactants must be aqueous solutions
  - You **CANNOT** use an insoluble compound as a reactant
  - The other product **MUST** be soluble

A soluble ionic compound?

- **Double Replacement**

- IF...The other product is insoluble

- **Acid/Base Neutralization**

- But remember...

- the reactants must be an acid and a base
    - The other product must be water or water and  $\text{CO}_2$

# A free element?

- **Single Replacement**

- But remember...

- the element must start as part of the compound in the reactants

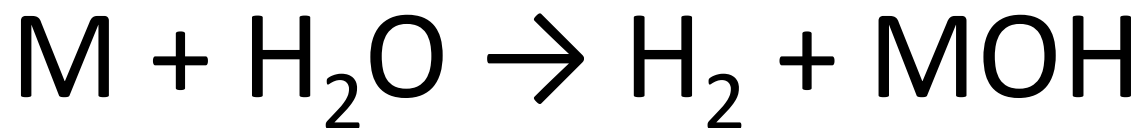
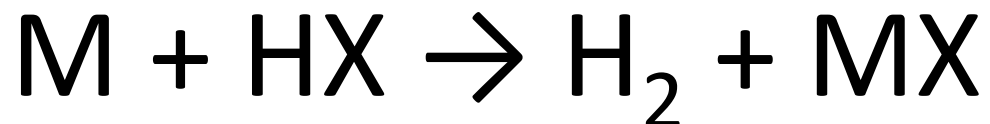
- the reactant free element must be able to replace the desired element out of the compound

- Watch out for metals that react with water

# H<sub>2</sub> gas?

- Single replacement

- IF... the free element metal reacts with water or an acid



# Water?

- **Combustion**

- IF...You have a hydrocarbon to burn

- **Acid/Base Neutralization**

- But remember...

- the reactants must be an acid and a base
    - The other product must be a salt (and maybe  $\text{CO}_2$  if the base is a carbonate)

# CO<sub>2</sub> gas?

- **Combustion**

- IF...You have a hydrocarbon to burn

- **Acid/Base Neutralization**

- But remember...

- the reactant base must be a carbonate or bicarbonate

