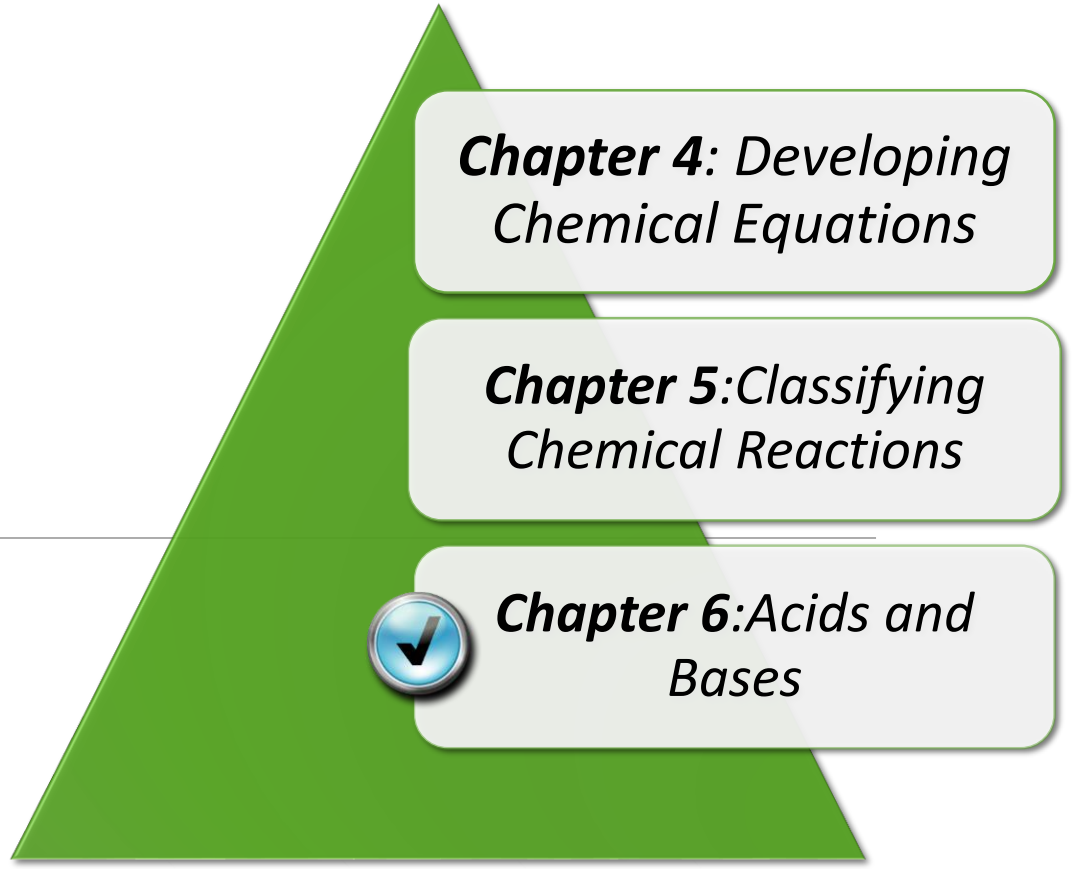
Unit 1: Chemistry (6.1)

SCN2DP



Identifying Acids and Bases

In this chapter, you will:

- ***name*** *and* ***write*** *formulas for acids and bases*
- ***explain*** *how the pH scale is used to classify aqueous solutions as acidic, basic, or neutral*
- ***discuss*** *chemical reactions that involve acids and bases*
- ***classify*** *substances as acidic, basic, or neutral*
- ***investigate*** *reactions between acids and bases*

Identifying Acids and Bases

What properties can be used to determine whether a substance is an acid or a base?

How might an acid/base indicator help with this task?

Many household items are acids and bases.

Acids

Acid :

Properties of an acid:

- Acids have a **sour taste**.
- Many acids are **corrosive** and will **react with metals**.
- Aqueous solutions of acid **conduct electricity**.

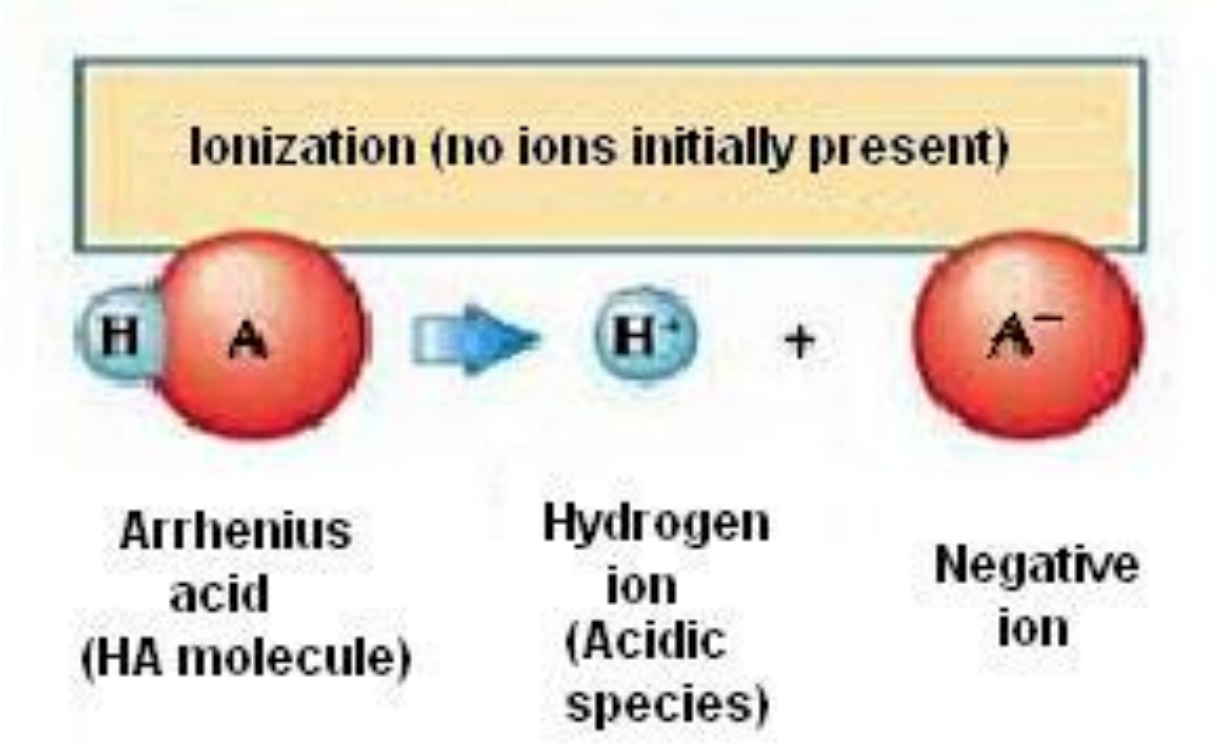
Acids

In aqueous solutions, acids are able to ionize in water and release hydrogen ions. This enables the solution to become a good conductor of electricity.

$$HCl\,(aq) \longrightarrow H^{+}\,(aq) + Cl^{-}\,(aq)$$

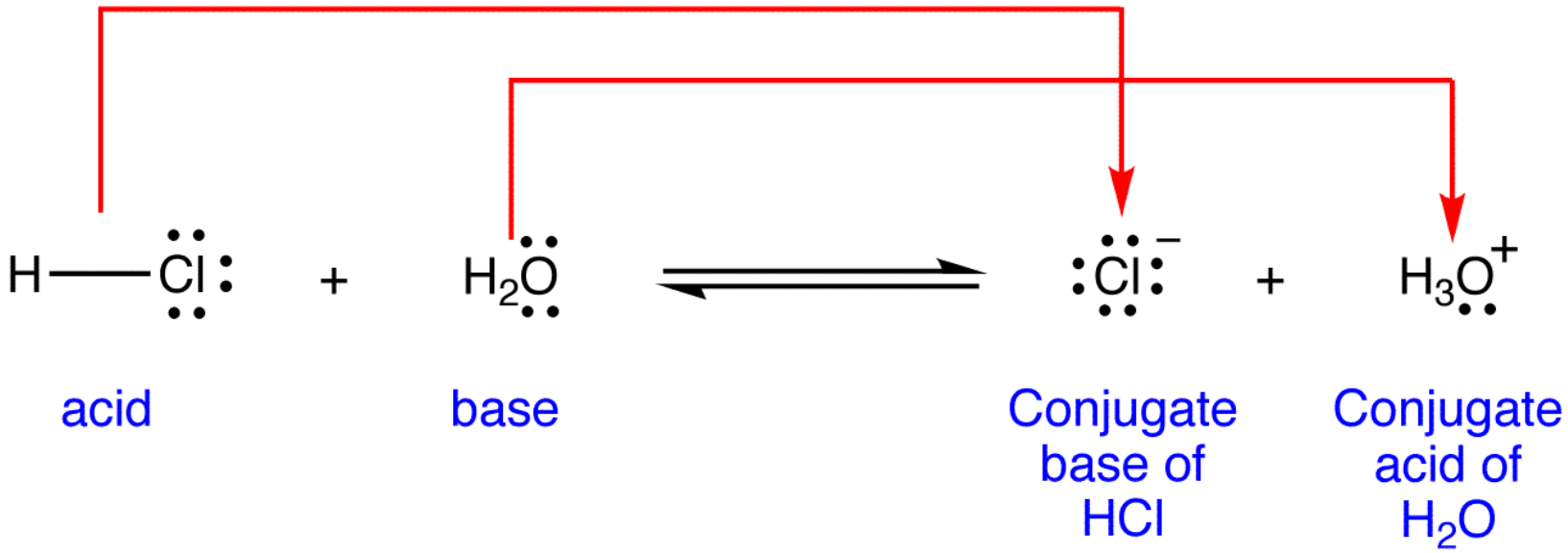
Acids

The Arrhenius definition:



Acids

Brønsted definition:



Naming Binary Acids

Binary acids

When naming **acids** you can either follow:

1) **IUPAC** (International Union of Pure and Applied Chemistry)

2) Classical naming method.

Naming Acids - IUPAC

When using the IUPAC system for naming acids you must follow the following rules:

1) Add the word ***aqueous*** to the beginning of the name

2) the word '***hydrogen***' must follow

3) Name the element that is combined with hydrogen and add '***ide***' to the suffix.

E.g: HF (aq) ***aqueous hydrogen fluoride***

Naming Acids – Classical System

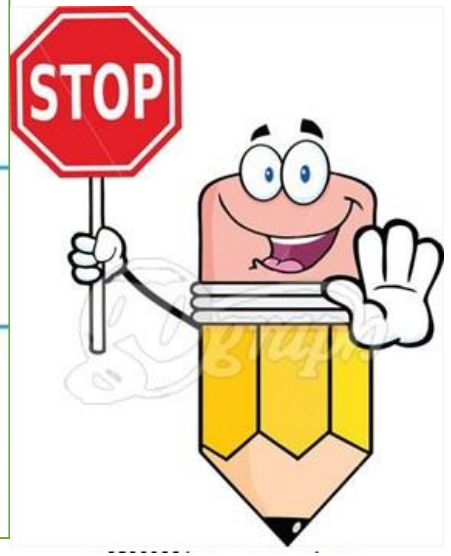
The rules for naming **binary acids** according to the classical method are:

1. Write the root of the ***non-metal name***.
2. Add the prefix ***hydro-*** to the root name.
3. Add the ending ***–ic*** to the root name.
4. Add the word '***acid***' at the end.

E.g: HF (aq) ***hydrofluoric acid***

Let's Practice!

Chemical Formula in Solution	Classical Acid Name	IUPAC Name	Uses
HF(aq)	hydrofluoric acid	aqueous hydrogen fluoride	• manufacturing aluminum and uranium • etching glass
HCl(aq)			• producing plastic • processing metals
HBr(aq)			• extracting metal ore
HI(aq)			• taking part in chemical reactions to make other compounds



Naming Oxoacids

Oxoacids:

When using the classical method to name an ***oxoacid,*** *the following steps must be followed:*

1. Write the name of the anion, without the *-ate* or *-ite* ending.
2. If the anion name ended in ***-ate*** replace it with ***-ic*** at the end of the name.
3. If the anion name ended in ***-ite***, replace it with ***-ous*** at the end of the name.
4. Add the word ***acid***.

Examples of Oxoacids

H_2SO_4 → _____

*Acid names for compounds containing **sulfur** start with **sulfur-** and those containing **phosphorus** start with **phosphor-**, rather than just starting with **sulf-** and **phosph-**.*

Chemical Formula in Solution	Classical Acid Name	IUPAC Name	Uses
$H_2SO_4(aq)$	sulfuric acid	aqueous hydrogen sulfate	• In most car batteries • component of acid precipitation
$H_2SO_3(aq)$			• disinfecting and bleaching
	nitric acid		• producing explosives and fertilizers
$H_3PO_4(aq)$			• making fertilizers, soaps, and detergents
		aqueous hydrogen chlorate	• producing explosives and matches
$H_2CO_3(aq)$			• occurs naturally in water • In carbonated drinks

LET'S PRACTICE!

Determine the chemical formula for the following acids:

1) hydrochloric acid

2) nitric acid

3) hydrofluoric acid

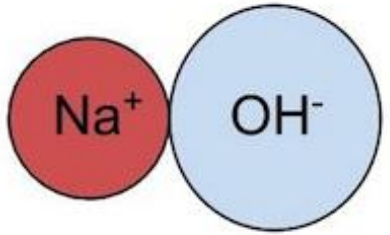
4) sulfuric acid

Homework

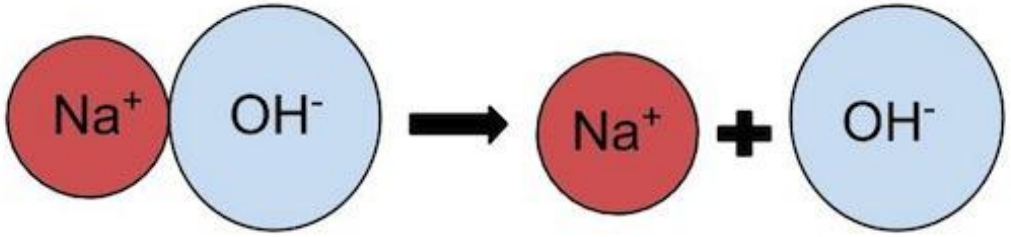
- Complete the worksheet given in class

Bases

Bases:



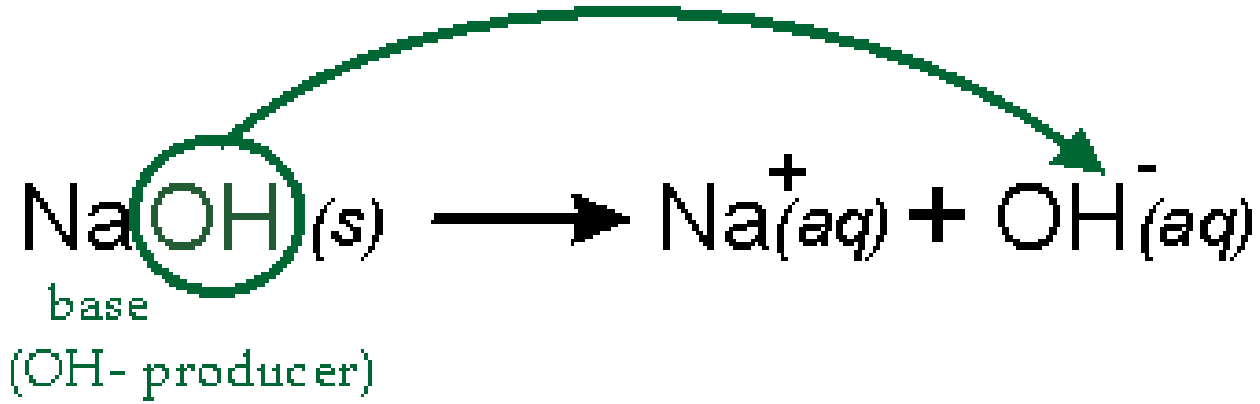
Sodium hydroxide is made of one sodium ion (Na^+) and one hydroxide ion (OH^-).



Sodium hydroxide breaks apart when dissolved in water to make sodium ions (Na^+) and hydroxide ions (OH^-).

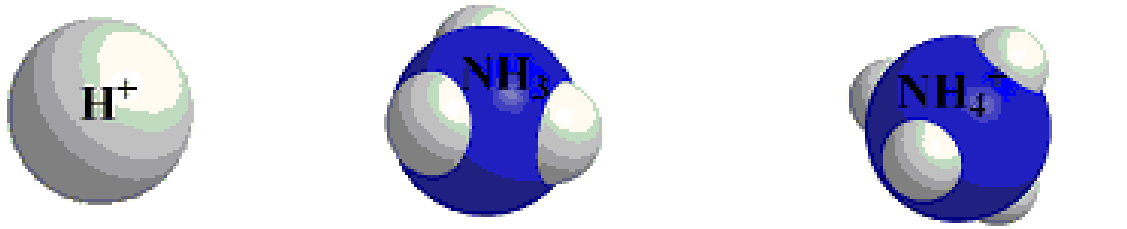
Bases

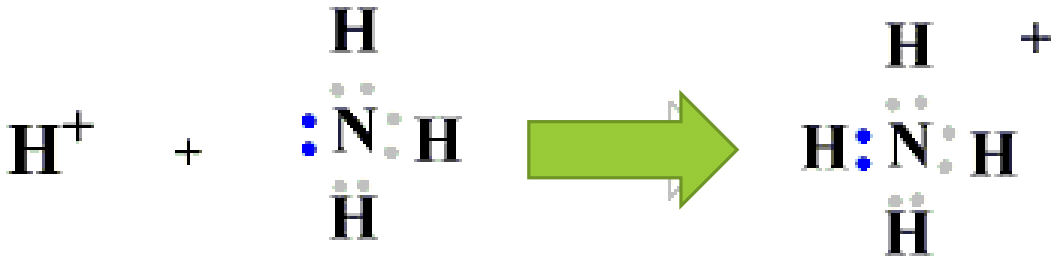
Arrhenius definition:



Bases

Brønsted base:





Naming Bases

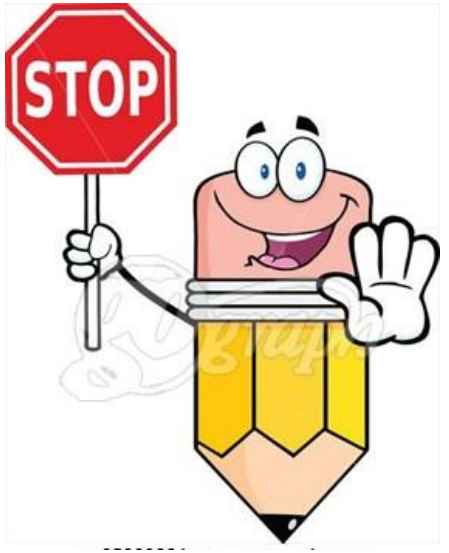
When using the IUPAC system, you treat bases as an ionic compound:

1. The first part of the name is the ***cation (metal).***

2. The second part of the name is the ***anion (non-metal).*** Change the suffix to ***–ide.*** *Most of the time the anion will be hydroxide (OH)

Let's Practice!

Chemical Formula	Chemical Name	Common Name	Uses
NaOH		lye, caustic soda	• In drain and oven cleaners • used to make paper, glass, and soap
$Mg(OH)_2$		Milk of Magnesia®	• In laxatives and antacids
$Ca(OH)_2$ (aq)		lime water	• for soil and water treatment



Writing the Chemical Formulas for Bases

1. Use the periodic table and/or table of polyatomic ions to identify the symbols for the **cation** and **anion** in the base and their charges.

2. **Add subscripts** to balance the charges.

Let's Practice!

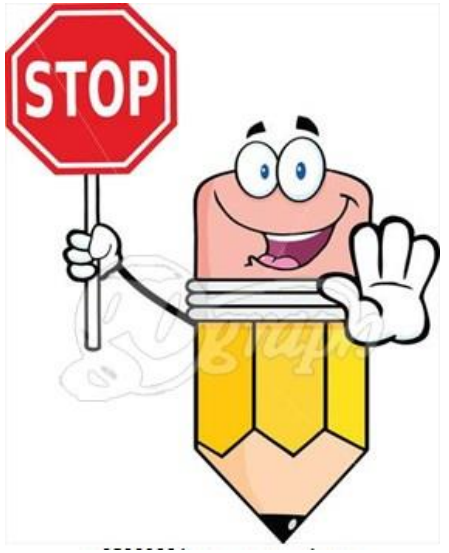
Determine the chemical formulas for the following bases:

A) calcium hydroxide

B) aluminum hydroxide

C) manganese (II) hydroxide

D) nickel (II) hydroxide



Homework

Textbook:

- Complete pg. 228 # 1, 4, 5, 6, & 7