Acids, Bases and Salts

Acids, bases, and salts notes

- All compounds can be broken into one of two types.
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1.) Organic compounds are molecules that contain a **high percentage of carbon**.

- Organic compounds must contain carbon The carbon is always the first element written. There are two major groups of carbon compounds:

1.) Hydrocarbons – **covalent** compounds that only have carbon and hydrogen.

Ex. – propane (C_3H_8), butane (C_4H_{10}) and gasoline ($C_{15}H_{32}$ to $C_{20}H_{42}$).

2.) Alcohols – **covalent** compounds that have carbon, hydrogen, and oxygen. (always end in OH)

Ex. – methanol (CH_3OH), Ethanol (C_2H_5OH) (drinking alcohol)

2.) Inorganic compounds are molecules that often contain no carbon or a **small percentage of carbon in the forms of carbonates (NaCO_3), carbides (W_2C), or oxides (CO and CO_2)**. Other than oxides the carbon is always in the middle or at the end (NEVER IN THE FRONT)

- This second designation of compounds breaks all compounds into three categories.

1.) Acids are **ionic** compounds that release H^+ ions in solution. Always start with an H (hydrogen)

- Ex. – HCl (hydrochloric acid) = H^+ and Cl^-

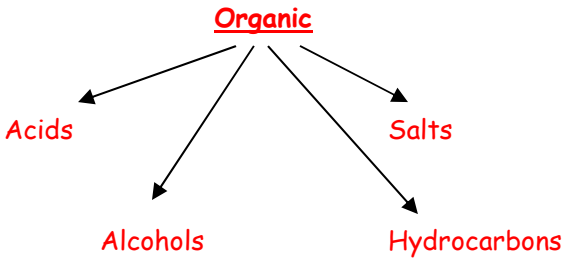
2.) Bases are **ionic** compounds that release OH^- ions in solution. Always end with an OH (hydroxide)

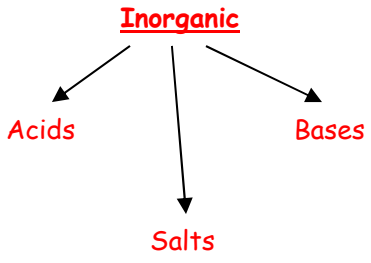
- Ex. – NaOH (sodium hydroxide) = Na^+ and OH^-

3.) Salts are **ionic** compounds that release ions that are not H^+ or OH^- ions in solution.

- Ex. – $FeSO_4$ (iron sulphate) = Fe^{2+} and SO_4^{2-}

- Salts are made from an acid and base mix, neutralizing each other and making a salt. This is called a neutralization reaction.
- When we say "in solution" that means the solid was mixed in water and the solid dissolved. This solution of a solid dissolved in water is called aqueous. We use the designation of (aq) to represent aqueous like (s) means solid and (l) means liquid.





General Properties of Acids/Bases and Salts

Acids	Bases	Salts
- conduct electricity	- conduct electricity	- conduct electricity
- cause chemical indicators to change color	- cause chemical indicators to change color	- have no effect on chemical indicators
- react with some metals to make hydrogen gas	- **do not** react with some metals to make hydrogen gas	- **do not** react with some metals to make hydrogen gas
- burn skin	- feel slippery	
- taste sour	- taste bitter	

- Chemical indicators are used to distinguish if an unknown chemical is an acid, base, or salt.

List of Common Indicators

Chemical Indicator	Color in Acid	Color in Base
Methyl orange	Red	Yellow
Methyl red	Red	Yellow
Bromothymol blue	Yellow	Blue
Litmus paper	Red	Blue
Phenolphthalein	Colorless	Pink
Indigo carmine	Blue	Yellow

- Solution acidity, basicity, or neutrality is based on how much H^+ compared to OH^- there is. If there is more H^+ than OH^- than the solution is said to be acidic. If the there is more OH^- than H^+ than it is said to be basic. If there is the same amount of H^+ and OH^- than it is neutral.
- We measure this relationship between the H^+ ions and OH^- ions using a scale called the pH scale.
- pH scale goes from 1-14 with 1 being very acidic and 14 being very basic. In the middle is 7 which is neutral.
- Each movement in a digit changes the concentration by a factor of 10!!
    - Ex. – pH of 3 goes to a pH of 2 is an increase in H^+ ions of 10 times.
- pH can be measured with a pH meter or with pH paper. The pH paper will turn a distinguishing color based on the acidity of the solution.
- Naming acids is tricky.

- The name of the acid is determined based on the name of the anion, specifically, based on the ending of the anion name. The three possibilities are listed here:

ANION NAME	ACID NAME
-ide	hydro- -ic acid
-ite	-ous acid
-ate	-ic acid

1.) If it ends in ide → write hydro, then the non-metal name with the ending of "ic acid"

Ex. 1 – HCl = Hydrochlor**ic acid**

2.) If it ends in ate → write the non-metal, and change the ending to "ic acid".

Ex. 2 – H_2CO_3 ➔ Hydrogen carbonate = Carbon**ic acid**

3.) When it ends in ite → → write the non-metal, and change the ending to "ous acid".

Ex. 3 – H_2SO_3 ➔ Hydrogen sulfite = Sulfur**ous acid**

- Here is a chart to help.

Acid Name	**Acid Formula**
Hydrochloric acid (aq)	HCl
Nitric acid (aq)	HNO_3
Sulfurous acid (aq)	H_2SO_3
Sulphuric acid (aq)	H_2SO_4
Acetic acid (aq)	CH_3COOH (organic acid so "H" at end)