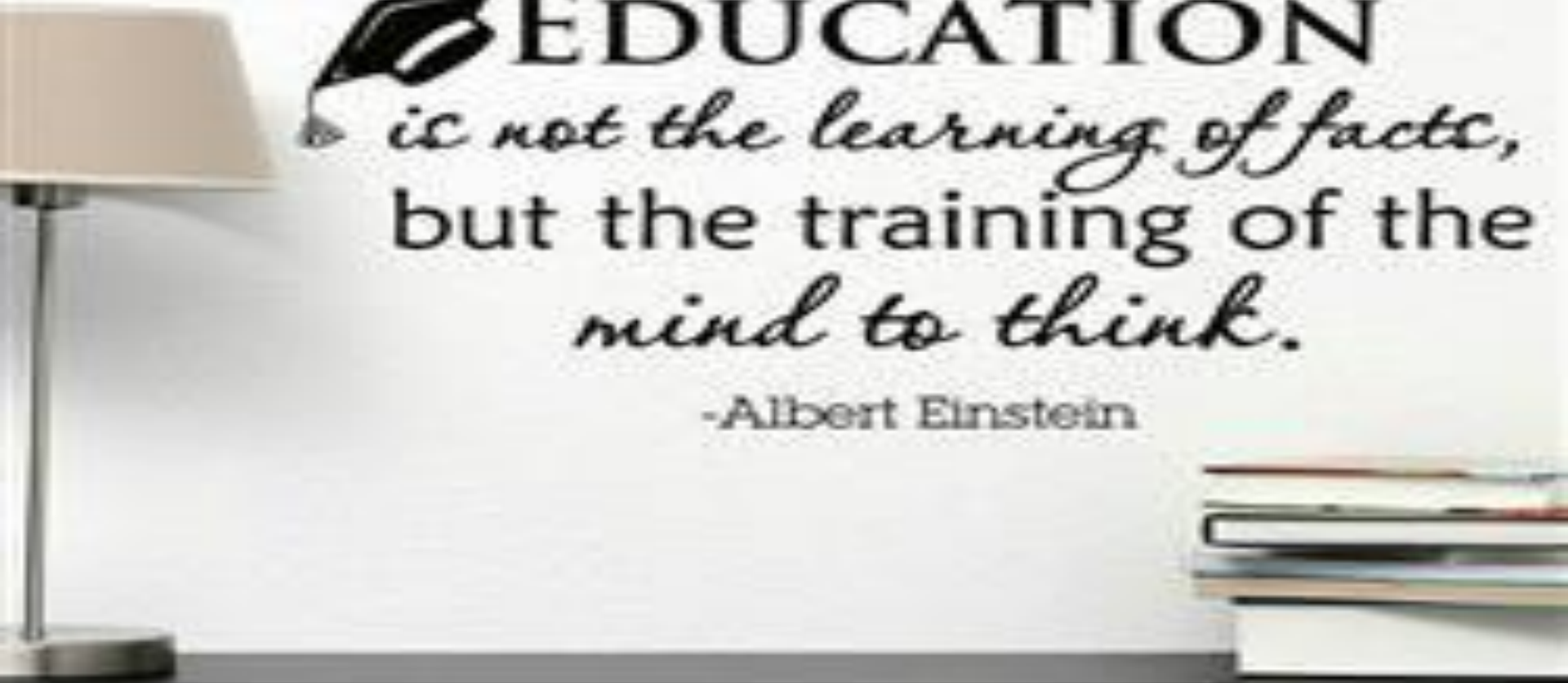




Pakistan School
Kingdom of Bahrain



 **EDUCATION**
*is not the learning of facts,
but the training of the
mind to think.*

-Albert Einstein

>> Ready for Anything

**WELCOME BACK TO
VIRTUAL CLASSES!**



#WEAREALWAYSTOGETHER



When you wish good
for others, good things
come back to you.

This is the
LAW OF NATURE.



WARM WELCOME

- ▣ A WARM WELCOME TO ALL THE STUDENTS IN ONLINE CLASSES. THIS IS D.CHARLES TEACHER SENIOR SECTION (BOYS).WE ARE GOING TO START OUR ONLINE GENERAL CLASS TODAY.
- ▣ I HOPE YOU WILL LEARN AND ENJOY.
- ▣ RULES OF THE CLASS ROOM:1)BE ON TIME FOR ALL YOUR CLASSES.2)RESPECT ALL PARTICIPANTS OF THE CLASS.3)DO NOT CREATE ANY DISTURBANCES .4) RAISE YOUR HAND IF YOU HAVE ANY QUESTION.5)GIVE RESPECT TO YOUR TEACHER.







wiseGEEK





Acid Rain

POINTS TO PONDER:



LESSON OBJECTIVE:

- ▣ BY THE END OF THIS PART OF LESSON, STUDENTS BE ABLE TO:
- ▣ DERIVE SELF-IONIZATION OF WATER.
- ▣ DEFINE pH ? WHAT IS THE IMPORTANCE OF K_w ?
- ▣ WHAT IS pH scale? Write its importance ?
- ▣ Define indicators? why they are used?
- ▣ Define salts? How they formed?
- ▣ What is meant by neutralization?

CHARACTERISTICS:

Characteristics of Acids & Bases

Acids

- Produce H_3O^{+1} (hydronium ion) in water
- Tastes sour
- May sting or burn on contact
- React with active metals to form hydrogen gas
- Turn blue litmus paper pink

Bases

- Produce OH^{-1} (hydroxide ion) in water
- Tastes Bitter
- Feels slippery
- Turns pink litmus paper blue

Properties of Acids and Bases

ACIDS	BASES
taste sour	taste bitter
do not feel slippery	feel slippery
pH < 7	pH > 7
release hydrogen (H⁺) ions in aqueous solution	release hydroxide (OH⁻) ions in aqueous solution
corrode metals	do not corrode metals
react with metals to produce a compound and hydrogen gas	do not react with metals to produce a compound and hydrogen gas
turn litmus red/pink	turn litmus blue

Acidic/Basic Characteristics

Acids

- Tend to have a tangy or sour taste
- A substance that produces hydrogen ions in solution, H^+ (aq)
- Actually produces a hydronium ion, H_3O^+ but the H^+ is used to simplify the reaction equation.

Bases

- Tend to have a bitter taste and a slippery feel
- Term alkali used for base that is soluble in water with the solution said to be alkaline.
- A substance that produces hydroxide ions in solution, OH^- (aq)

Arrhenius Definition of

- Acids - Substances that produce hydrogen ions, H^+ when dissolved in water



-
- Bases - Substances that produce hydroxide ions, OH^- when dissolved in water



Arrhenius theory of bases

- Arrhenius defined a base as:
A substance that dissociates in water to produce OH^- ions.
- For example: when NaOH is added to water:



- In general:



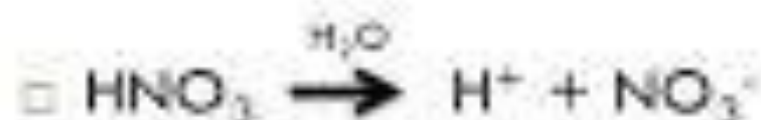
The Arrhenius Theory of Acids and Bases

- Acids are substances which produce hydrogen ions H^+ , in solution.
- Bases are substances which produce hydroxide ions OH^- in solution.
- Neutralization happens because hydrogen ions and hydroxide ions react to produce water.

Arrhenius Acids & Bases

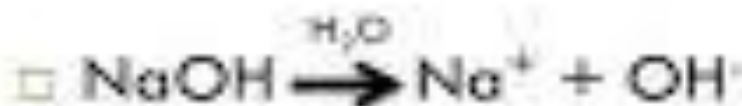
Arrhenius Acids

- Donate H^+ to the solution



Arrhenius Bases

- Donate OH^- to the solution



Common Acids

Chemical Name	Formula	Uses	Strength
Nitric Acid	HNO_3	explosive, fertilizer, dye, glue	Strong
Sulfuric Acid	H_2SO_4	explosive, fertilizer, dye, glue, batteries	Strong
Hydrochloric Acid	HCl	metal cleaning, food prep, ore refining, stomach acid	Strong
Phosphoric Acid	H_3PO_4	fertilizer, plastics & rubber, food preservation	Moderate
Acetic Acid	$\text{HC}_2\text{H}_3\text{O}_2$	plastics & rubber, food preservation, Vinegar	Weak
Hydrofluoric Acid	HF	metal cleaning, glass etching	Weak
Carbonic Acid	H_2CO_3	soda water	Weak
Boric Acid	H_3BO_3	eye wash	Weak

Name, Formula	Use	Other Information
Acetic Acid	Food Prep and Preservation	When in solution with water it is known as vinegar
Acetylsalicyclic Acid	Pain Reliever, Fever reducer	Known as aspirin
Ascorbic Acid	Antioxidant, Vitamin	Called Vitamin C
Carbonic Acid	Carbonated Drinks	Involved in cave, stalactite, and stalagmite formation and acid rain
Hydrochloric Acid	Digestion as gastric juice	Commonly called Mariatic Acid
Phosphoric Acid	Makes detergents, fertilizers, and soft drinks	Sour but pleasant taste, detergents containing phosphates polute water
Sulfuric Acid	Car batteries, fertilizers	Dehydrating agent, causes burns by removing water from cells
Nitric Acid	Makes fertilizers	Colorless, but yellow when exposed to light

Common Acids

Common Bases and Some Everyday Uses

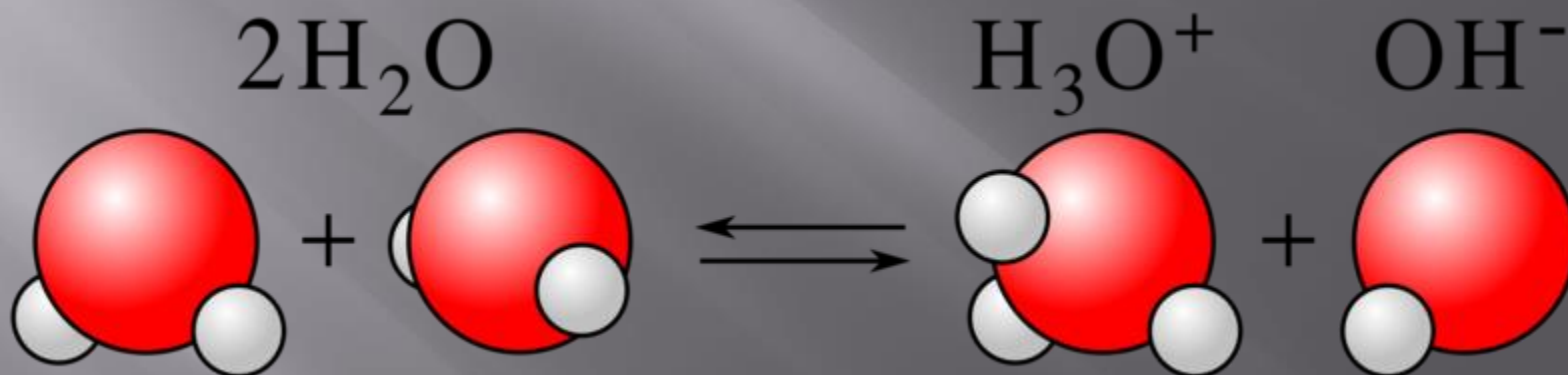
Table 13.2

Name	Formula	Uses
Sodium Hydroxide (Caustic Soda)	NaOH	Used in drain and oven cleaners and soap making.
Ammonia	NH_3	Household cleaners, fertilizers and explosives.
Calcium Hydroxide	$\text{Ca}(\text{OH})_2$	Found in cement and mortar and in garden lime to adjust soil pH.
Magnesium Hydroxide	$\text{Mg}(\text{OH})_2$	Key ingredient in some antacids.
Sodium Carbonate	Na_2CO_3	Used in manufacture of washing powder and glass.

Table 2 Examples of some common bases

Common Name	Formula	Source or use
Sodium hydroxide	NaOH	Drain cleaner
Potassium hydroxide	KOH	Soap, cosmetics
Aluminum hydroxide	$\text{Al}(\text{OH})_3$	Antacids
Ammonium hydroxide	NH_4OH	Window cleaner.

POINTS TO PONDER:



A water molecule that loses a hydrogen ion becomes a negatively charged hydroxide ion OH^- .

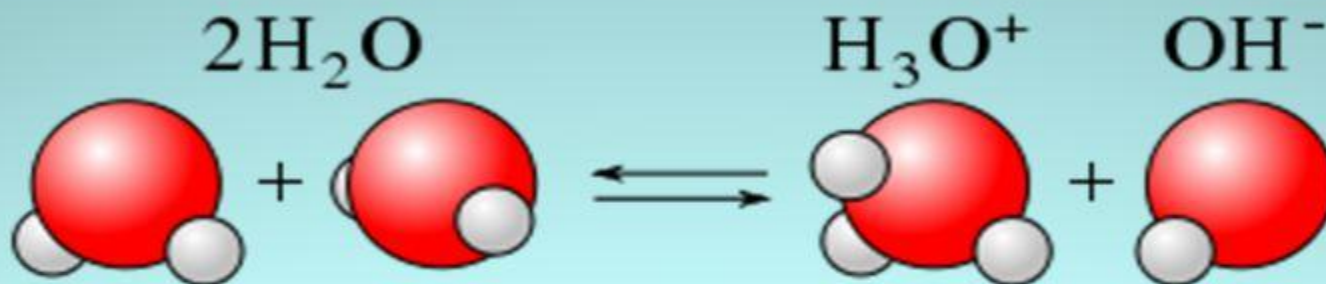
A water molecule that gains a hydrogen ion becomes a positively charged hydronium ion H_3O^+ .



Self ionization of water – the reaction in which water molecules produce ions.

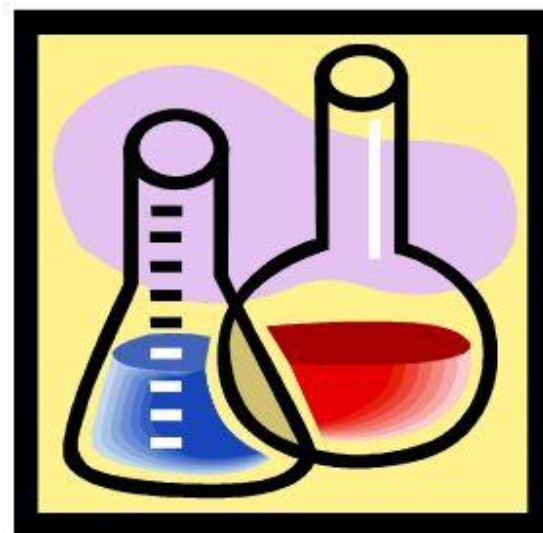
Self-ionization of water

The **self-ionization of water** (also **autoionization of water**, and **autodissociation of water**) is an **ionization** reaction in pure water or an aqueous solution.



Self-Ionization of Water

- Two water molecules produce a hydronium ion & a hydroxide ion by the transfer of a proton.
- $\text{H}_2\text{O (l)} + \text{H}_2\text{O (l)} \rightarrow \text{H}_3\text{O}^+(\text{aq}) + \text{OH}^-(\text{aq})$
- In pure water, every time you make one H_3O^+ you get one OH^-
- That is, $[\text{H}_3\text{O}^+] = [\text{OH}^-]$



SELF-IONIZATION/ K_w :

Self-Ionization Of Water

- Even the purest of water conducts electricity. This is due to the fact that **water self-ionizes**, that is, it creates a small amount of H_3O^+ and OH^- .



$$K_w = [H_3O^+][OH^-]$$

- **K_w - ion product of water**

$$K_w = 1.0 \times 10^{-14} \text{ at } 25^\circ\text{C}$$

- This equilibrium constant is very important because it applies to *all aqueous solutions* - acids, bases, salts, and non-electrolytes - not just to pure water.

POINTS TO PONDER:

K_w CONSTANT

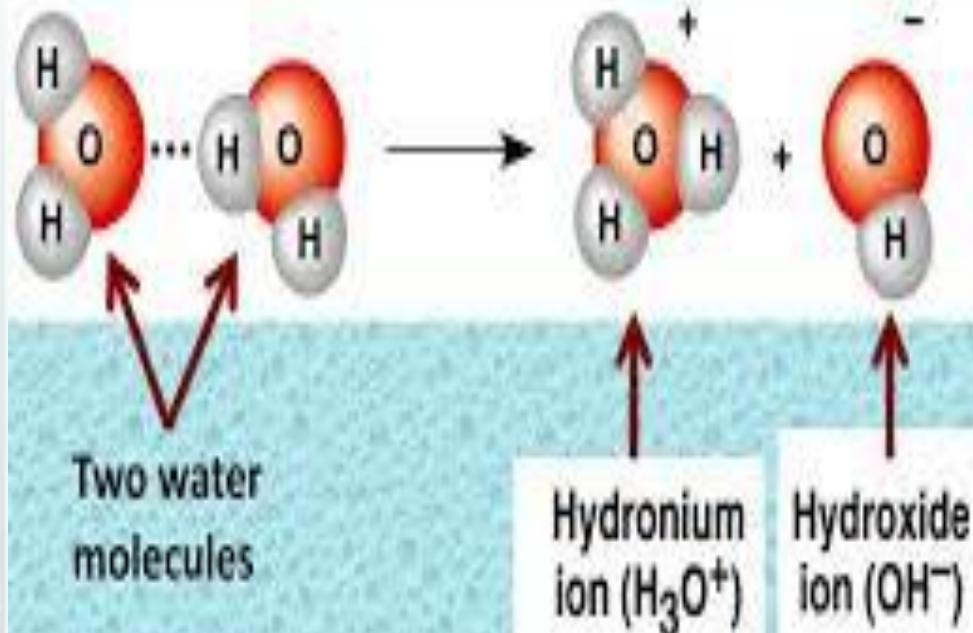
K_w

Self-ionization constant of water

$$K_w = [H_3O^+][OH^-]$$

Ionization of Water

- Water molecules have a tendency to "fall apart" or dissociate
- "Dissociate" means to separate or disconnect from



Autoionization of Water

The auto-ionization of water is described by the equation:



The equilibrium constant for this reaction is given by:

$$K = \frac{[\text{H}_3\text{O}^+][\text{OH}^-]}{[\text{H}_2\text{O}][\text{H}_2\text{O}]} = \frac{[\text{H}_3\text{O}^+][\text{OH}^-]}{[\text{H}_2\text{O}]^2}$$

$$K[\text{H}_2\text{O}]^2 = [\text{H}_3\text{O}^+][\text{OH}^-]$$

$K_w = K[\text{H}_2\text{O}]^2 = 10^{-14}$ This equilibrium lies very much to the left i.e. mostly water. For pure water $[\text{OH}^-] = [\text{H}^+] = 1 \times 10^{-7} \text{ M}$

Ionic Product of water, K_w



$$K_c = \frac{[\text{H}^+][\text{OH}^-]}{[\text{H}_2\text{O}]}$$

Since $[\text{H}_2\text{O}]$ is effectively constant and in large excess

$$K_w = [\text{H}^+][\text{OH}^-] \text{ mol}^2\text{dm}^{-6}$$

Ionic Product of water, K_w

At 298K the value of K_w is $1 \times 10^{-14} \text{ mol}^2\text{dm}^{-6}$

$$K_w = [\text{H}^+][\text{OH}^-] \text{ mol}^2\text{dm}^{-6}$$

In pure water $[\text{H}^+] = [\text{OH}^-]$

So $K_w = [\text{H}^+]^2$ Hence $[\text{H}^+] = \sqrt{K_w}$

At 298K $[\text{H}^+] = \sqrt{(1 \times 10^{-14})} = 1 \times 10^{-7}$

So at 289K the pH of pure water is 7

How is pH defined?

- The **pH of a solution is the negative logarithm of the hydrogen-ion concentration**. The pH may be represented mathematically, using the following equation:

$$\text{pH} = -\log[\text{H}^+]$$

In pure water or a neutral solution, $[\text{H}^+] = 1 \times 10^{-7}\text{M}$, and the pH is 7.

$$\begin{aligned}\text{pH} &= -\log(1 \times 10^{-7}) \\ &= -(\log 1 \times \log 10^{-7}) \\ &= -(0.0 + (-7.0)) \\ &= 7.0\end{aligned}$$

- If the $[\text{H}^+]$ of a solution is greater than $1 \times 10^{-7}\text{M}$, the pH is less than 7.0. If the $[\text{H}^+]$ of the solution is less than $1 \times 10^{-7}\text{M}$, the pH is greater than 7.0.

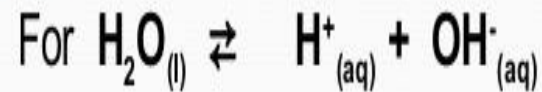
Ph definition:

The definition of pH is the negative logarithm of the hydrogen ion (H^+) activity in a given solution.

- The range of the ph scale is from 0 to 14.

$$pH = -\log aH^+$$

pH



$$\rightarrow [H^+] = [OH^-]$$

$$[H^+] \times [OH^-] = 1 \times 10^{-14} = [1 \times 10^{-7}] \times [1 \times 10^{-7}]$$

$[H^+]$ of water is at $25^\circ C$ is 1×10^{-7} mol/litre

Replacing $[H^+]$ with pH to indicate acidity of solutions

pH 7 replaces $[H^+]$ of 1×10^{-7} mol/litre

where

$$pH = -\text{Log}_{10} [H^+]$$

IMPORTANCE OF K_w :

The Importance of K_w

- It is important to recognize the meaning of K_w . In any aqueous solution at 25°C, no matter what the solution contains...

the product of $[H^+(aq)]$ and $[OH^-(aq)]$

must always equal 1.0×10^{-14}

- There are three possible situations:

1. In a NEUTRAL solution $[H_+] = [OH^-]$
2. In an ACIDIC solution $[H_+] > [OH^-]$
3. In a BASIC solution $[H_+] < [OH^-]$

In each case at 25°C,

$$[H^+(aq)] [OH^-(aq)] = 1.0 \times 10^{-14}$$

POINT TO PONDER:



POINTS TO PONDER:

Acidity

is excessive acid production in the stomach causing heartburn and acid reflux. Excess HCL acid in stomach can be due to stress and spicy foods

Home remedies for Acidity / Heartburn



Cumin seeds



Mint leaves



Ginger



Basil



Cloves



Banana



Apple cider vinegar

POINTS TO PONDER:

Which Foods Are Acidic?

Any kind of fried food not only contains fat but slows down the process of digestion. Due to this, excess amount of acid is left in the stomach or even moves to the oesophagus. This may lead to acidity or acid reflux.

For More Information:
Visit: www.epainassist.com



POINTS TO PONDER:



POINTS TO PONDER:



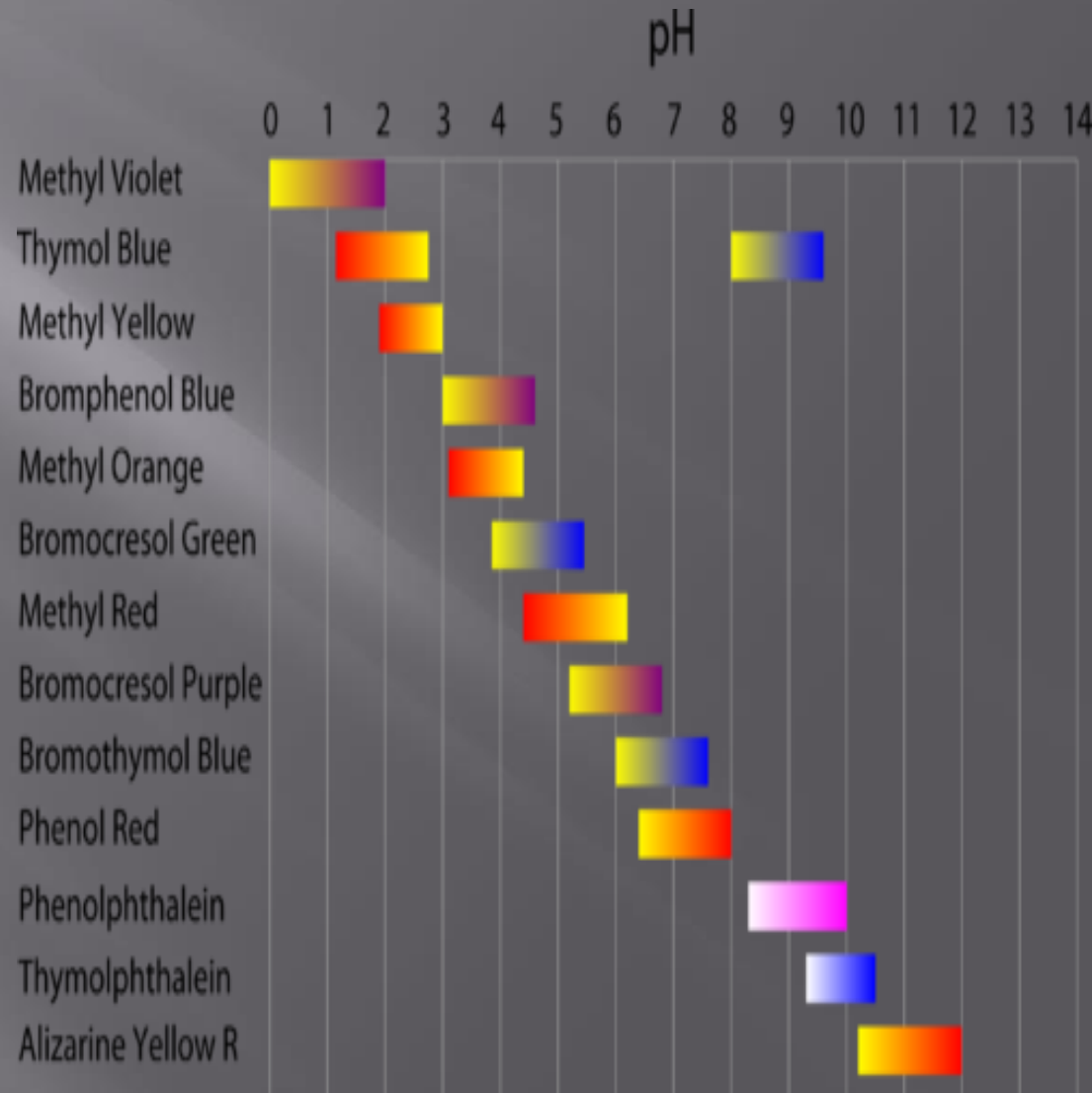
Examples of pH Conditions:

pH 2	pH 4	pH 5	pH 7	pH 7.4	pH 10	pH 12
						
gastric juices	tomato juice	human urine	pure water	human blood	hand soap	household bleach

POINTS TO PONDER:



POINTS TO PONDER:

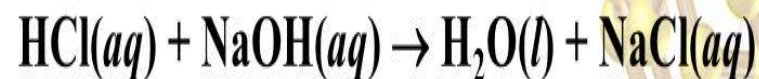


POINTS TO PONDER:

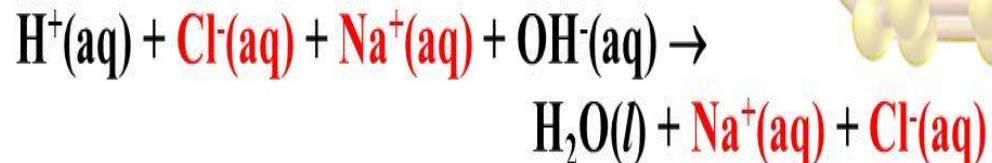


Acids, Bases, and Salts

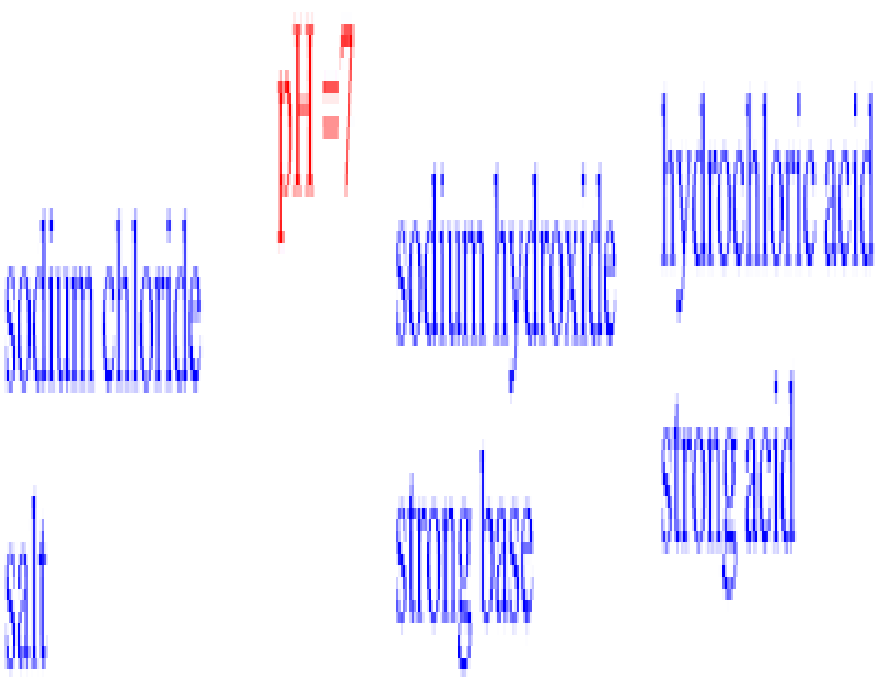
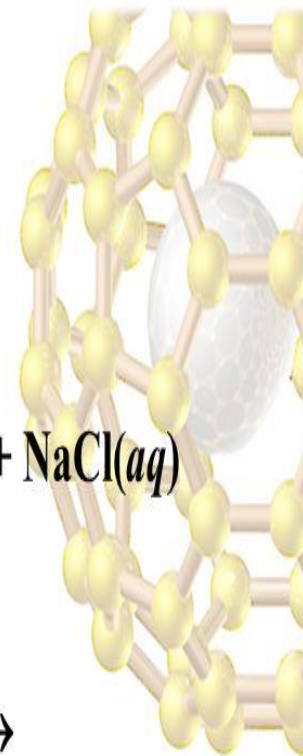
Neutralization Reaction



Total Ionic Equation



Net Ionic Equation



POINTS TO PONDER:

Chapter 10

Acids, Bases and Salts

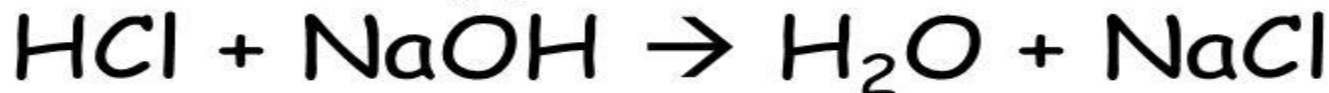
Examples of Salts

Table 1

Base (alkali)	Acid	Salt formed
Sodium hydroxide	Hydrochloric acid	Sodium chloride
Potassium hydroxide	Hydrochloric acid	Potassium chloride
Sodium hydroxide	Sulphuric acid	Sodium sulphate
Potassium hydroxide	Sulphuric acid	Potassium sulphate
Calcium hydroxide	Nitric acid	Calcium nitrate
Ammonia solution	Nitric acid	Ammonium nitrate

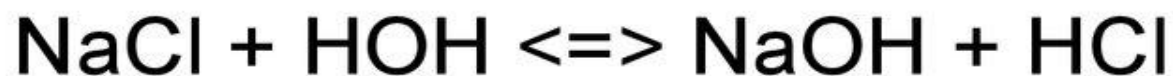
SALTS:

What type of reaction?



- A **neutralization** reaction is the reaction between an **acid** and a **base** to produce a **salt** plus **water**.
- A **salt** is any compound containing the **cation** of a base and an **anion** from an acid.
 - NaOH (base) -- Na^+ cation
 - HCl (acid) -- Cl^- anion
 - SALT -- NaCl

1) SODIUM CHLORIDE NaCl



strong
base

strong
acid



(neutral medium, pH=7)

In solution strong base and strong acid are dissociated completely. The salt solution is neutral.
No hydrolysis.

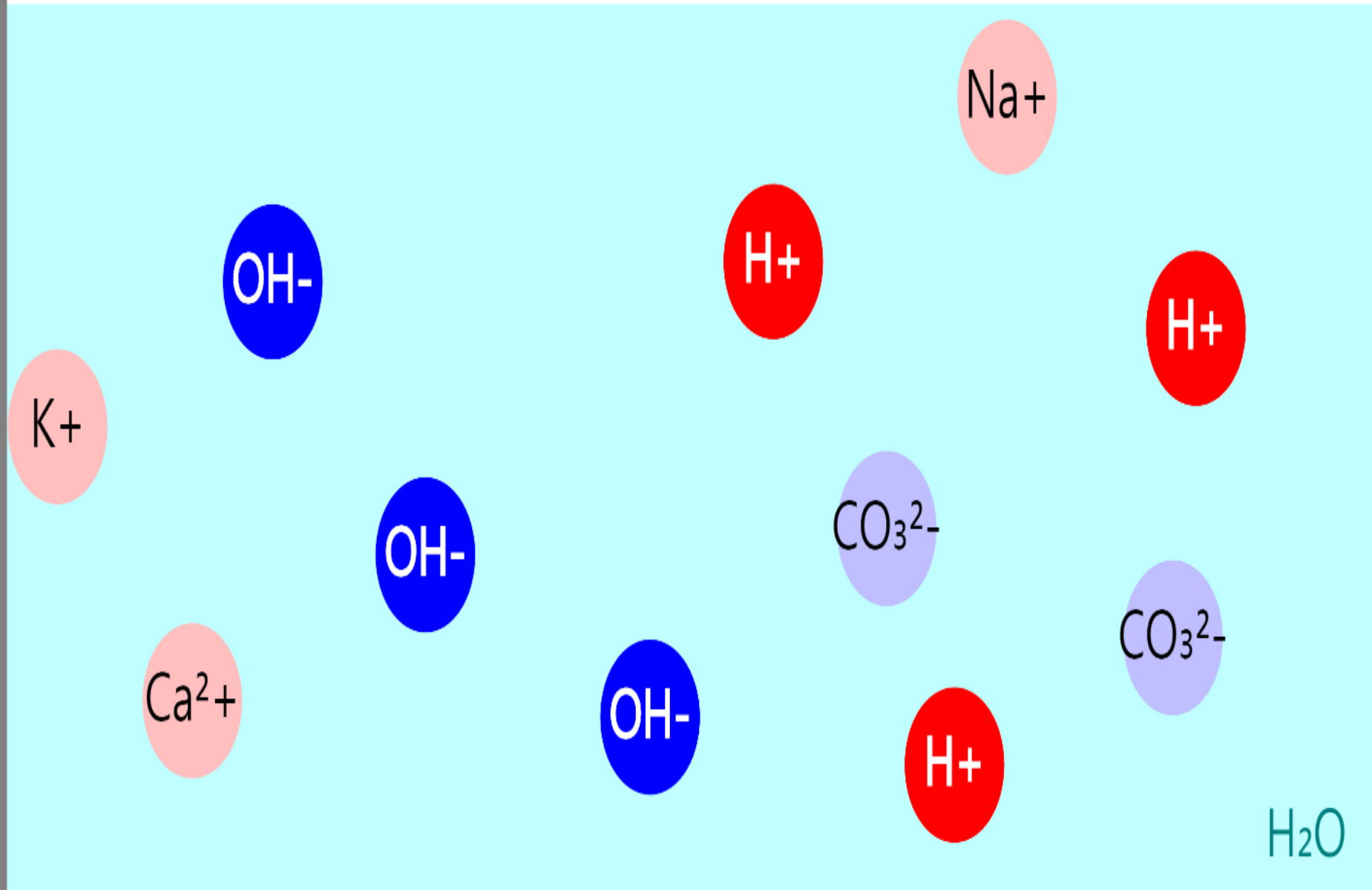
The salt produced by a neutralization reaction depends on the acid and the alkali used.

Sodium chloride is produced by the reaction between hydrochloric acid and sodium hydroxide.



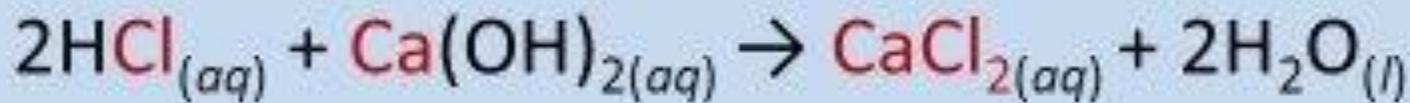
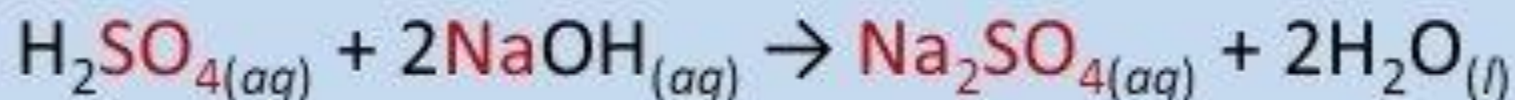
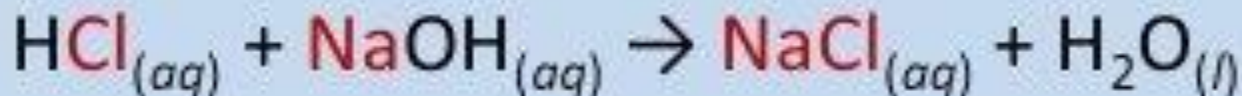
Which acid and which alkali would be needed to make the salt potassium chloride?





Neutralization

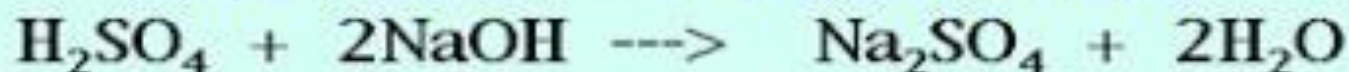
During a **neutralization reaction**, an acid and a base react to produce a salt and water. Salts are ionic compounds consisting of an **anion from an acid** and a **cation from a base**.



Neutralization

Acid-Base Neutralization

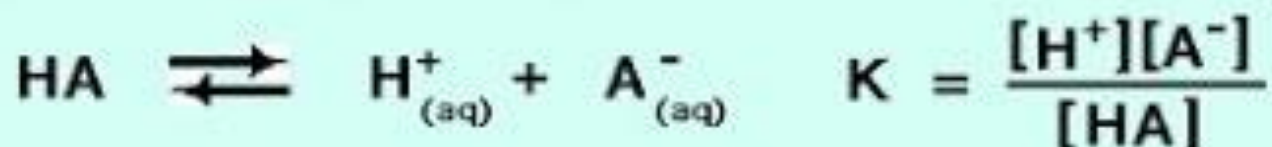
Acid + Base $\longrightarrow$ a Salt + Water



Ionic Equations show the predominant reacting species.



Strength of Acids, the Equilibrium Constant:



A large K means a strong acid. It's highly ionized.

A Salt is a compound derived from the reaction of an acid plus a base. Or from ions from opposite sides of the periodic chart.

SELF-ASSESSMENT 10.5:

- ▣ $\text{Mg}(\text{OH})_2 + \text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2\text{O}$
- ▣ $\text{KOH} + \text{HCl} \rightarrow \text{KCl} + \text{H}_2\text{O}$
- ▣ BALANCE THE FOLLOWING NEUTRALIZATION REACTIONS:
(i) $\text{H}_2\text{SO}_4 + \text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$
- ▣ (ii) $\text{H}_3\text{PO}_4 + \text{NaOH} \rightarrow \text{Na}_3\text{PO}_4 + \text{H}_2\text{O}$
- ▣ SELF ASSESSMENT 10.6:
- ▣ CLASSIFY THE FOLLOWING SALTS AS NORMAL OR ACID SALT
- ▣ $\text{NaHCO}_3, \text{NaHSO}_4, \text{Na}_2\text{SO}_4, \text{KHCO}_3, \text{K}_2\text{CO}_3$.

Today's Learning



Don't forget to put your name on!

Something I can do now that I couldn't do before the lesson is...

A question I would like to know the answer to is...

I need to improve on...





HOME-WORK:



- ▣ Homework:
- ▣ DO ANY ONE QUESTION:
- ▣ EXPLAIN SELF-IONIZATION OF WATER?
- ▣ DERIVE THE K_w OF WATER?
- ▣ WHAT IS pH ?WRITE THE IMPORTANCE OF K_w ?
- ▣ EXPLAIN pHscale?
- ▣ DEFINE SALT?HOW IT IS PREPARED?
- ▣ DEFINE NEUTRALIZATION?

CLOSURE OF THE LESSON:



90 Th Thorium 232.03806	7 N Nitrogen 14.0067	19 K Potassium 39.0983
39 Y Yttrium 88.90585	8 O Oxygen 15.9994	92 U Uranium 238.02891

THANK
YOU



good bye

good bye

SCHOOL BUS