

FIRST STAGE II

# Volumetric Analysis

The Fifth Lecture

## Lecture Objective

- Salts
- Cations & Anions
- pH of salts solution derived from strong acids and weak base.
- Examples

## 5<sup>th</sup> Lecture

### Salts

Cations & Anions

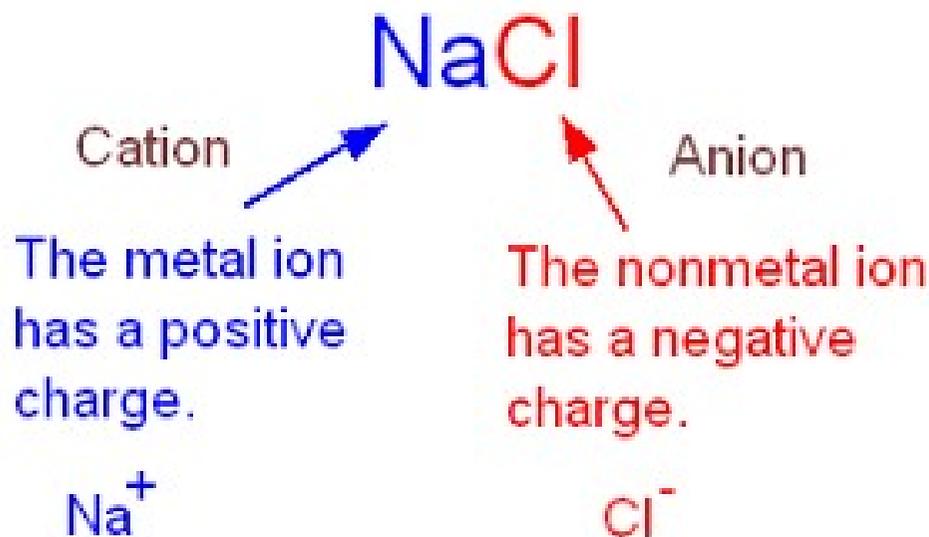
pH of salts

Examples

## Salts

A salt formed between a strong acid and a weak base is an acid salt. And salts formed between a weak acid and a strong base is a basic salt.

A salt consists of the positive ion (cation) of a base and the negative ion (anion) of an acid.



## 5<sup>th</sup> Lecture

### Salts

### Cations & Anions

### pH of salts

### Examples

## Cations & Anions

### What are cations?

Cations are positively charged ions. They are formed when a metal loses its electrons. They lose one or more than one electron. It has fewer electrons than protons. Therefore, they possess a net positive charge. Some examples of cations are Calcium ( $\text{Ca}^{2+}$ ), Potassium ( $\text{K}^+$ ), hydrogen ( $\text{H}^+$ ).

### What are anions?

Anions are negatively charged ions. They are formed when non-metal gains the electrons. They gain one or more than one electron. Therefore, they possess a net negative charge. Some examples of anions are Iodide ( $\text{I}^-$ ), chloride ( $\text{Cl}^-$ ), hydroxide ( $\text{OH}^-$ ).

## 5<sup>th</sup> Lecture

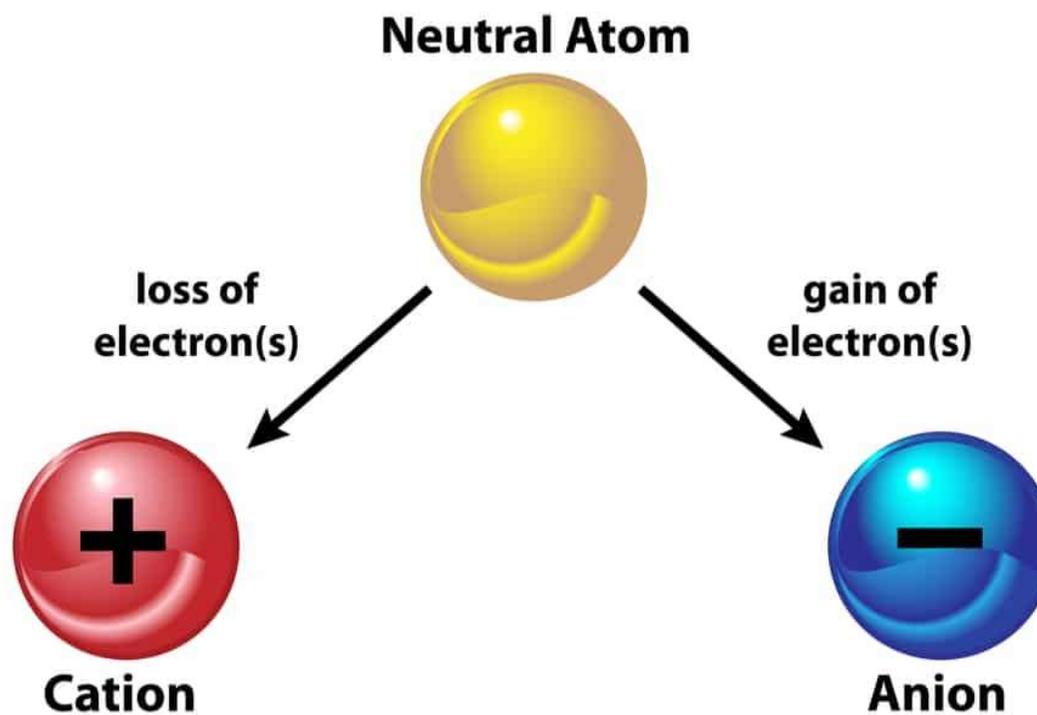
### Salts

### Cations & Anions

### pH of salts

### Examples

## Cations & Anions



# 5<sup>th</sup> Lecture

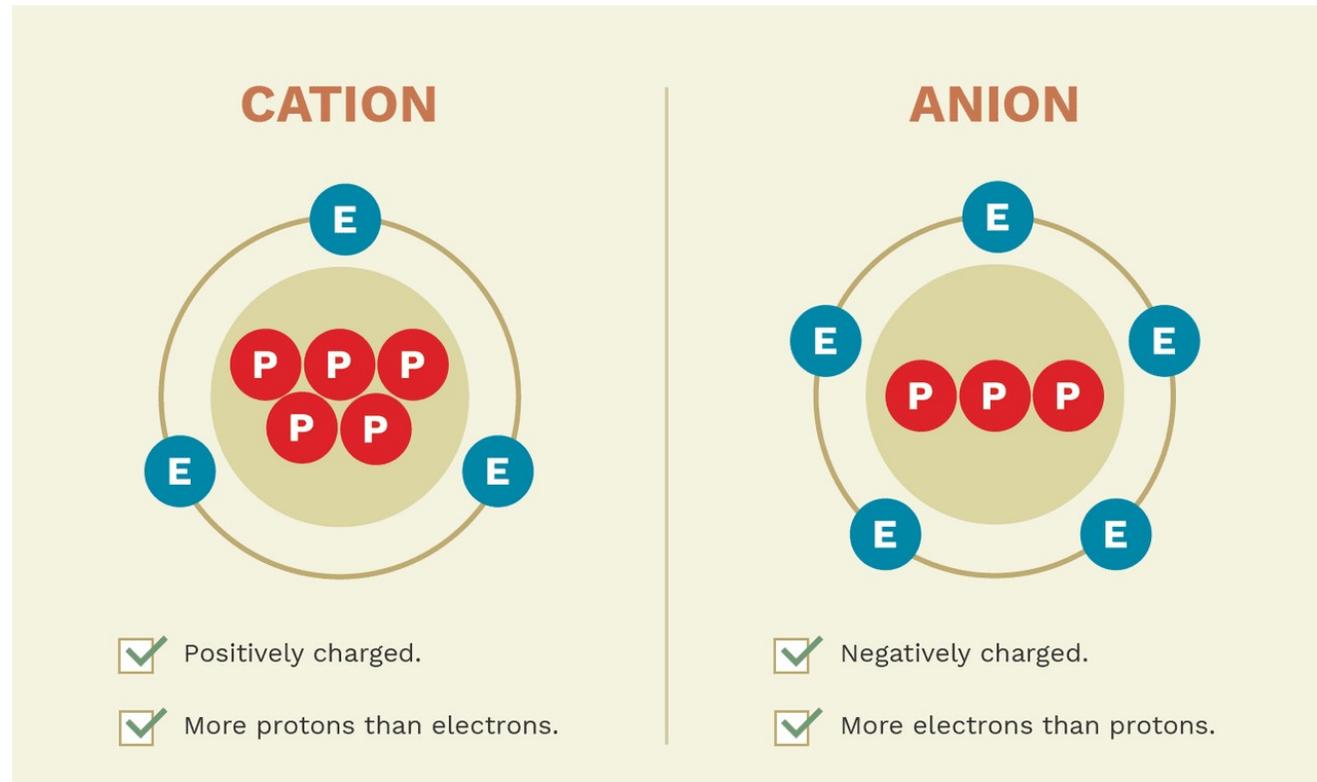
## Salts

### Cations & Anions

## pH of salts

## Examples

# Cations & Anions



## 5<sup>th</sup> Lecture

### Salts

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### pH of salts

### Examples

## Cations & Anions

### Difference Between Anions and Cations

Basis	Anions	Cations
Definition	An anion may be defined as an atom or molecule that is negatively charged.	A cation may be defined as an atom or molecule that is positively charged.
Charge Type	Negative	Positive
Type of Element	Non-Metal	Metal
Examples	Sulfide, Oxide, Fluoride, Chloride	Iron, Lead, Sodium

## 5<sup>th</sup> Lecture

### Salts

### Cations & Anions

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## pH equation of Salts derived Strong acids & weak bases

$$\text{pH} = \frac{1}{2} \text{p}K_w - \frac{1}{2} \text{p}K_b - \frac{1}{2} \log C_s$$

## 5<sup>th</sup> Lecture

### Salts

### Cations & Anions

### pH of salts

### Examples

## Examples

**Ex.** Identify each salt as acidic, basic, or neutral.

1. NaCl
2. BaF<sub>2</sub>
3. NH<sub>4</sub>Cl

## Solution

1. The ions from NaCl derive from a strong acid (HCl) and a strong base (NaOH). Therefore, neither ion will affect the acidity of the solution, so NaCl is a neutral salt.
2. Although the Ba<sup>+</sup> ion derives from a strong base (Ba(OH)<sub>2</sub>), the F<sup>-</sup> ion derives from a weak acid (HF). Therefore the solution will be basic, and BaF<sub>2</sub> is a basic salt.
3. Although the Cl<sup>-</sup> ions derive from a strong acid (HCl), the NH<sub>4</sub><sup>+</sup> ion derives from a weak base (NH<sub>3</sub>), so the solution will be acidic, and NH<sub>4</sub>Cl is an acidic salt.

## 5<sup>th</sup> Lecture

### Home Work

1. Calculate the pH and pOH of the following salt solutions?

(a) 0.02 M  $\text{NH}_4\text{NO}_3$

(b) 0.7 g of  $\text{NH}_4\text{Cl}$  dissolve to 50 ml water

$$K_b \text{NH}_3 = 1.8 \times 10^{-5}$$

2. Calculate the pH and pOH of the following salt solutions?

(a) 0.075 M  $\text{NH}_4\text{Cl}$

(b) 1 mL of 0.1M of  $\text{NH}_4\text{Cl}$  add to 100 ml water  $K_b \text{NH}_3 = 1.8 \times 10^{-5}$