

Acids and Bases

Review

- What is an ACID
- What is a BASE
- What is a NEUTRAL
- What is a SALT

Need to know...

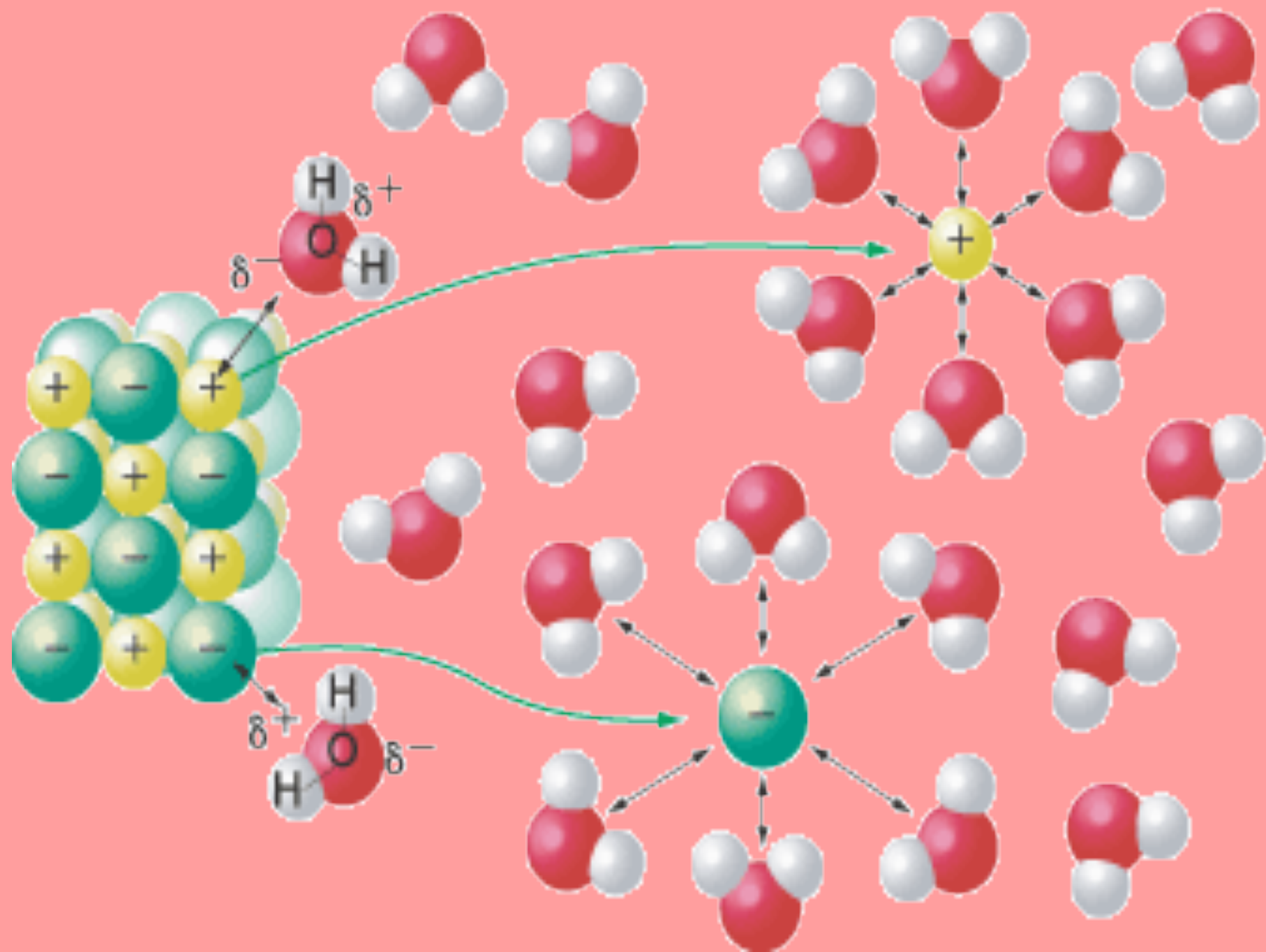
- solute – a substance in a solution whose bonds are broken by a solvent; a substance that dissolve
- solvent – the dissolver

Solutions

- water molecules break bonds between ions (in an ionic solute) causing dissociation

Dissociation

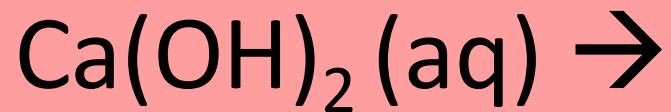
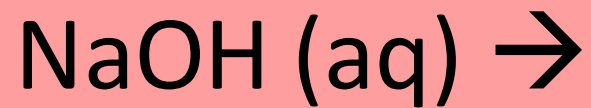
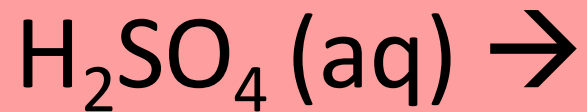
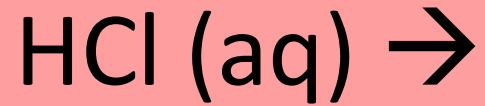
- the separation of a chemical substance into its individual ions in solution
- occurs due to electrostatic attraction between charged ions of the solute and the charges on water molecules



Arrhenius

- in 1887 Swedish chemist Svante Arrhenius published a theory
- Acids contain hydrogen ions H^+
- Bases contain hydroxide ions OH^-

Examples

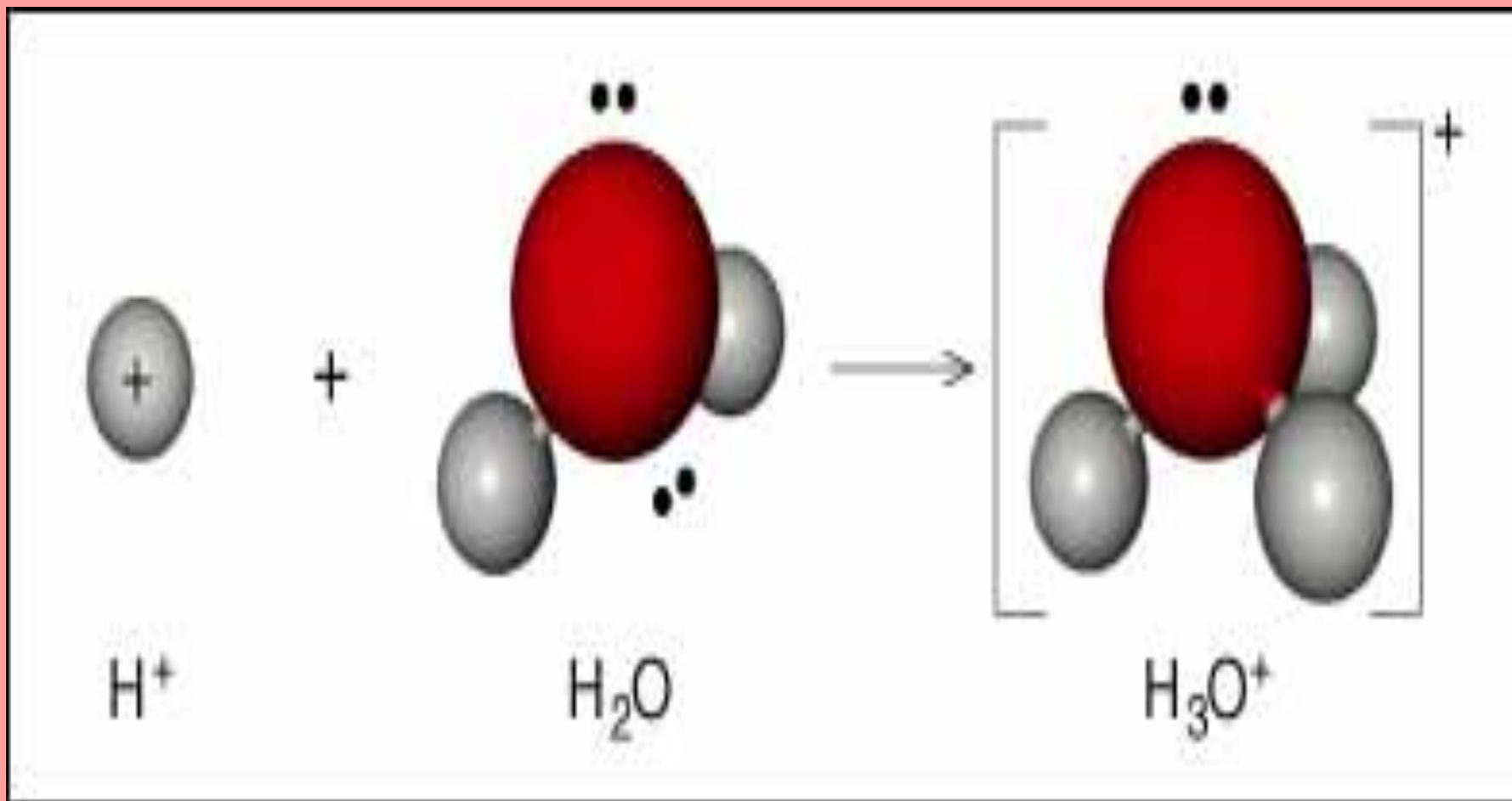


Limitations

$\text{Na}_2\text{CO}_3(\text{aq}) \rightarrow \text{acid? base?}$

$\text{AlCl}_3(\text{aq}) \rightarrow ??$

Hydronium



- Arrhenius's theory was not able to explain the basic properties of solutions like sodium carbonate Na_2CO_3 .
- Bronsted Lowry viewed it as a proton acceptor

Bronsted Lowry

- in 1923 Johannes Bronsted and Thomas Lowry both published similar theories
- described Acids and Bases in a different way

Bronsted Lowry Acids and Bases

- describes the ACTION of an acid or a base
- Acids are proton (H^+) donors
- Bases are proton acceptors

- Reactions produce conjugate acids and bases
- An acid loses a H^+ and becomes a conjugate base
- A base gains an H^+ and becomes its conjugate acid

- Bronsted Lowry theory gained acceptance within the scientific community because it described the mechanism for the formation of H_3O^+

Example 1

- Sour gas contains hydrogen sulfide (H_2S). Hydrogen sulfide can dissolve and react with water in the atmosphere. Write the chemical equation of the reaction between aqueous hydrogen sulfide and water.

Example 2

- Hydrofluoric acid (HF) used to remove oxide coatings from metals prior to electroplating, can be neutralized by a reaction with the hydroxide ion (OH^-) of aqueous sodium hydroxide. Write the chemical equation for this neutralization reaction.

Example 3

- In an experiment, aqueous sodium carbonate (Na_2CO_3) turned red litmus paper blue, indicating a basic solution. Write the chemical equation for the reaction between dissociated carbonate ions (CO_3^{2-}) and water

- using lasers scientists were able to prove that the hydrogen ion is transferred between acid and base