

Section 11.2

Electrolytes



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Learning Objectives



- Define and give examples of electrolytes
- Distinguish between the physical and chemical changes that accompany dissolution of ionic and covalent electrolytes
- Relate electrolyte strength to solute-solvent attractive forces

Electrolytes



- **Electrolytes** produce ions when dissolved in water.
- **Nonelectrolytes** do not produce ions when dissolved in water.
 - Sugar, most gases
- **Strong Electrolytes** ionize completely in solution.
 - Sodium Chloride, Potassium Bromide
- **Weak Electrolytes** ionize partially in solution.

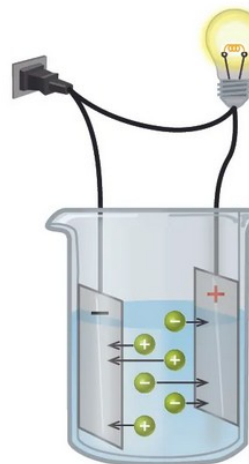
Conductivity of Solutions



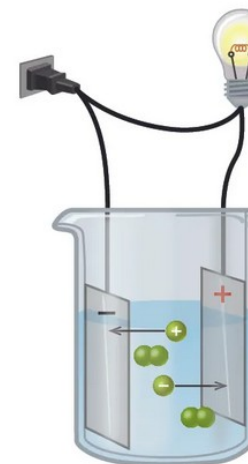
- When ions are dissolved in the water they become mobile conducting electricity.
 - Water itself is not conductive
- The degree of conductivity allows us to determine the strength of an electrolyte.



ethanol
No conductivity



KCl
High conductivity



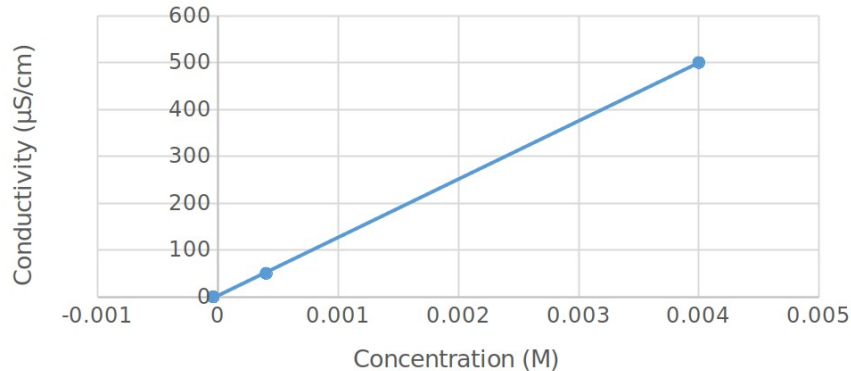
acetic acid solution
Low conductivity

Quantitative Conductivity

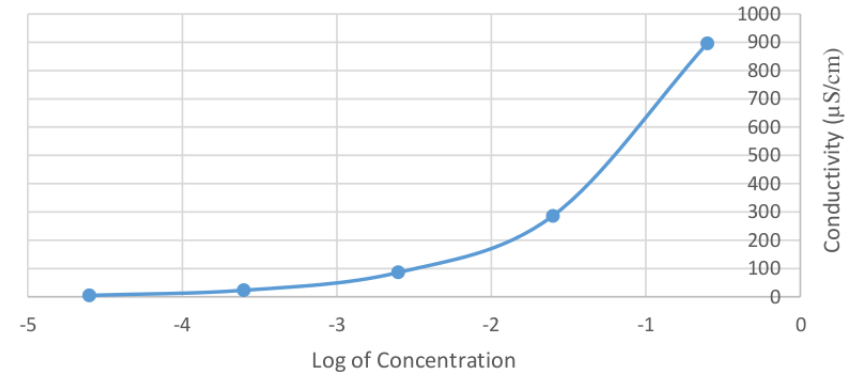


- Strong Electrolytes will have a linear relationship between concentration and conductivity
- Weak electrolytes will have nonlinear relationship.

Strong Electrolyte (Ammonium Chloride):
Conductivity vs. Concentration



Weak Electrolyte (Acetic Acid): Conductivity vs.
Log of Concentration

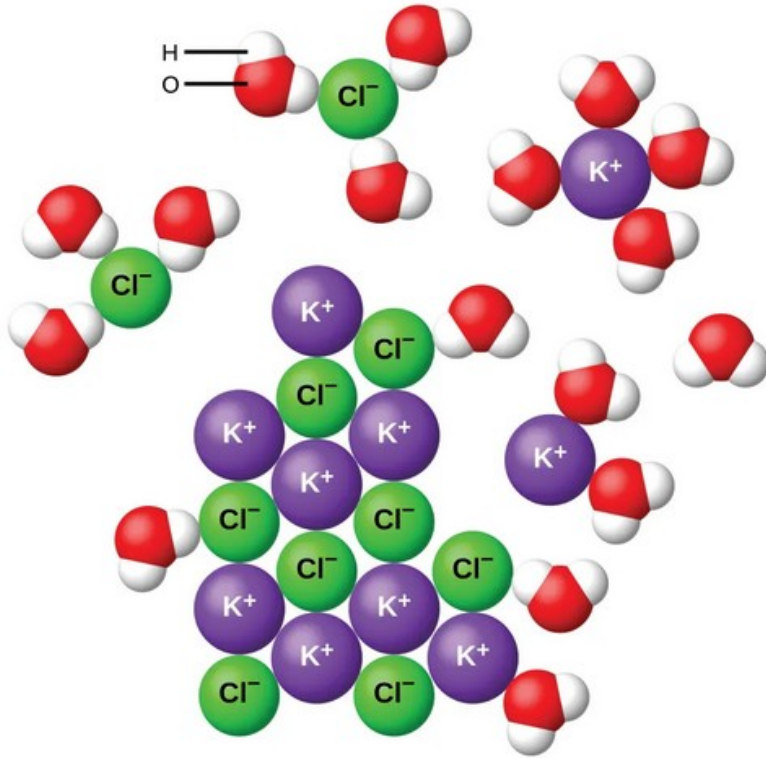


Ionic Electrolytes



- The electrostatic attraction between an ion and a molecule with a dipole is called an **ion-dipole attraction**.
- Ions in the solid separate and disperse uniformly throughout the solution, **dissociate**, because water molecules surround and solvate the ions.
- Most ionic solutes are strong electrolytes.
- Even sparingly, soluble ionic compounds are strong electrolytes, since the small amount that does dissolve will dissociate completely.

Solvating Electrolytes



- As potassium chloride (KCl) dissolves in water, the ions are hydrated. The polar water molecules are attracted by the charges on the K^+ and Cl^- ions. Water molecules in front of and behind the ions are not shown.

Covalent Electrolytes



- Pure water is a poor conductor because it does not dissociate much in itself.



- Some covalent solvents will react with water to form ions.
 - For example, acids like HCl or CH₃COOH

