Acid-base reactions

Acid-base reaction are reactions between acids and bases. They are also called neutralizing or protolytic. Definitions of acids and bases are based on different theories. They are Arrhenius theory of acids and bases, Brönsted theory of acids and bases, electron theory of acids and bases.

Theory of acids and bases

Arrhenius theory of acids and bases

Acids are electrolytes capable of splitting off the **hydrogen cation** H^+.

Bases are electrolytes capable of cleaving the h**ydroxide anion** OH^- .

Brönsted-Lowry theory of acids and bases

Acids are electrolytes capable of **splitting off** a proton.

Bases are electrolytes capable of **accepting** a proton.

Electron theory of acids and bases

Acids are electrolytes capable of splitting off a **proton** .

Bases are electrolytes capable of removing **an electron** (electron donors).

Acid-base reactions

Autoprotolysis of water

Autoprotolysis of water is a reaction in which ions are formed from electrically neutral water molecules.

$$2H_2O \longrightarrow H_3O^+ + OH^-$$

The number of dissociated molecules compared to non-dissociated ones is very small or negligible. The concentration of hyroxide anion and oxonium cation is the same. The ionic product of water has a value of 10^{-14} $\text{mol}^2 \cdot \text{l}^{-2}$. The concentration of individual dissociated ions is therefore 10^{-7} $\text{mol} \cdot \text{l}^{-1}$.

Calculation of pH

$$\text{pH} = -\log [H_3O^+]$$

At the above concentration, neutral pH is equal to 7. Acidic pH < 7 and basic pH > 7.

Protolysis of salts

Dissolved salts in water then behave as acids or bases. The result of other ongoing reactions is the formation of either a hydroxide anion or an oxonium cation.

Buffers

More detailed information can be found on the Buffer page.

Buffers are solutions that can buffer pH changes. This ability is necessary not only for the human organism by maintaining acid-base balance (ABR), but indirectly also for maintaining overall homeostasis. But even the buffering capacity has its limitations. For example, the buffer may run out. Then there is a disturbance of the acid-base balance.

Calculation of pH

The Henderson and Hasselbalch equation describes the relationship between *buffer composition* and its *acidity* . Under simplifying assumptions :

$$\text{pH} = \text{pKa} + \log([\text{cb}]/[\text{ca}])$$

where

pH is the resulting pH of the buffer ,
pK A is the dissociation constant of the conjugate acid of the buffer,
c A and *c B* are the equilibrium concentrations of the conjugate acid and base forming the buffer.

Links

related articles

- Precipitation reaction
- Theory of acids and bases
- Henderson-Hassaelbalch equation
- Buffer
- Buffers
- Mechanism of maintenance of acid-base balance
- Disorders of acid-base balance
  - Metabolic acidosis
  - Metabolic alkalosis
  - Respiratory acidosis
  - Respiratory alkalosis
  - Combined discorders of acid-base balance
- Correction and compensation of acid-base balance disorders
- Principles of the treatment of acid-base balance disorders
- Relationships between acid-base balance and ionogram

External links

Acid-base reactions and their use in volumetric analysis (http://users.prf.jcu.cz/sima/analyticka_chemie/volumacidobas.htm)

References

- DUCHOŇ, Jiří, et al. *Medical Chemistry: Selected Chapters in General, Inorganic and Organic Chemistry for Medics and Physicians.* 1st edition. Prague: 2nd Faculty of Medicine, Charles University in Prague, 1998.
- - *Acid-base reactions and their use in volumetric analysis* [online]. ©2010. [feeling. 2010-12-12]. < http://users.prf.jcu.cz/sima/analyticka_chemie/volumacidobas.htm >.