Zaporizhzhya State Medical University

Analytical Chemistry Department

BIOCHEMICAL REACTION KINETICS

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Chemical kinetics studies the rate and mechanism of chemical reactions

In homogeneous reactions all the reactants exist in the same phase in which the reaction itself occurs.

$$Na_2CO_3 + HCl \leftrightarrow NaHCO_3 + NaCl$$

Heterogeneous reactions take place only in the interphase.

$$Fe + HCl \square FeCl_2 + H_2$$

Single-stage reactions are called simple (or elementary) reactions.

Multistage reactions include few simple reactions and are called complex (or non-elementary) reactions.

All biochemical reactions are non-elementary.

The dependence of the reaction rate on the concentration of reactants is described by the **law of mass action discovered by N.Beketov, C. Guldberg and P. Waage in 1967:**

«*At constant temperature the rate of chemical reaction is in direct proportion to the product of reactant concentrations in the degree of their stoichiometric coefficients*».

Mathematical expression of the law of mass action is called a

kinetic equation

or

rate law of the reaction.

Molecularity of the reaction

is determined by the number of molecules which interact and take part in an elementary act of the reaction.

Arrenius Equation

establishes a connection between the reaction rate constant, activation energy and temperature:

$$k = A \cdot e^{-\frac{E_a}{RT}}$$

- e is base of natural logarithm;
- R is universal gas constant (8.314 J / mol · K);
- T is absolute temperature, K;
- A is pre-exponential factor.

Catalysis is the change of chemical reactions rate under the influence of substances, the amount and nature of which, after completion of the reaction are the same as before the reaction.

Catalyst is a substance that influences the rate of chemical processes without changing its own chemical composition.

Enzymes are catalysts of the chemical reactions in the body.

An enzyme is a protein that catalyses a chemical reaction by lowering the activation energy.