Kinetic factors

Definition

A kinetic factor is a parameter susceptible of changing the rate of a chemical reaction, in increasing or decreasing it.

Influence of the temperature

The temperature of a system is a macroscopic manifestation of the average kinetic energy of the particles that make it up.
When the system is heated, energy is added to it. The average kinetic energy of the particles increases. In the event of a collision between particles, it is therefore “more violent.” The proportion of effective collisions increases, and the transformation is faster.
When the system is cooled, energy is removed from it. The average kinetic energy of the particles decreases. When particles collide, the collision is therefore “less violent.” The proportion of effective collisions decreases, and the transformation is slower.

Influence of the concentration of a reactant

When the concentration of a reactant in solution is increased, the number of particles per unit volume increases. This means that there is a greater probability of a collision between reactants within the system. The proportion of effective collisions remains unchanged, but statistically, if the number of collisions increases, the number of effective collisions also increases. The transformation is therefore faster.
When the concentration of a reactant in solution is decreased, the number of particles per unit volume is reduced. This means that there is a lower probability of a collision between reactants within the system. The proportion of effective collisions remains unchanged, but statistically, if the number of collisions decreases, the number of effective collisions also decreases. The transformation is therefore slower.

Influence of the surface area of a solid

When the surface area of a solid reactant is increased, there is a greater probability of a collision between the solid and other reactants. The proportion of effective collisions remains unchanged, but statistically, if the number of collisions increases, the number of effective collisions also increases. The transformation is therefore faster.
When the surface area of a solid reactant is decreased, there is a lower probability of a collision between the solid and other reactants. The proportion of effective collisions remains unchanged, but statistically, if the number of collisions decreases, the number of effective collisions also decreases. The transformation is therefore faster.

Influence of the pressure of a gas

When the pressure of a reactant in gaseous state is increased, the number of particles per unit volume increases. This means that there is a greater probability of a collision between reactants within the system. The proportion of effective collisions remains unchanged, but statistically, if the number of collisions increases, the number of effective collisions also increases. The transformation is therefore faster.

When the pressure of a reactant in gaseous state is decreased, the number of particles per unit volume is reduced. This means that there is a lower probability of a collision between reactants within the system. The proportion of effective collisions remains unchanged, but statistically, if the number of collisions decreases, the number of effective collisions also decreases. The transformation is therefore slower.

Note: The pressure has only a limited effect for solids and liquids, as these states are incompressible.