

Collision Theory and Rate of Reaction (6.4)

- According to collision theory, chemical reactions can occur only if enough energy is provided to break the chemical bonds in the reactants.
- So, not all collisions are successful.
- In order to react, molecules must collide with sufficient energy and correct geometry.
- The number of successful collisions per unit time is what we call the reaction rate.

→ additional notes

PS#3

→ collisions must have proper geometry + sufficient energy (OH)

① Nature of Reactant

- atomic structure of reactants
- nature of bonds
- type of reaction occurring
- activation energy (E_a) - min KE req'd for rxn.

Fraction vs. Frequency

② Concentration

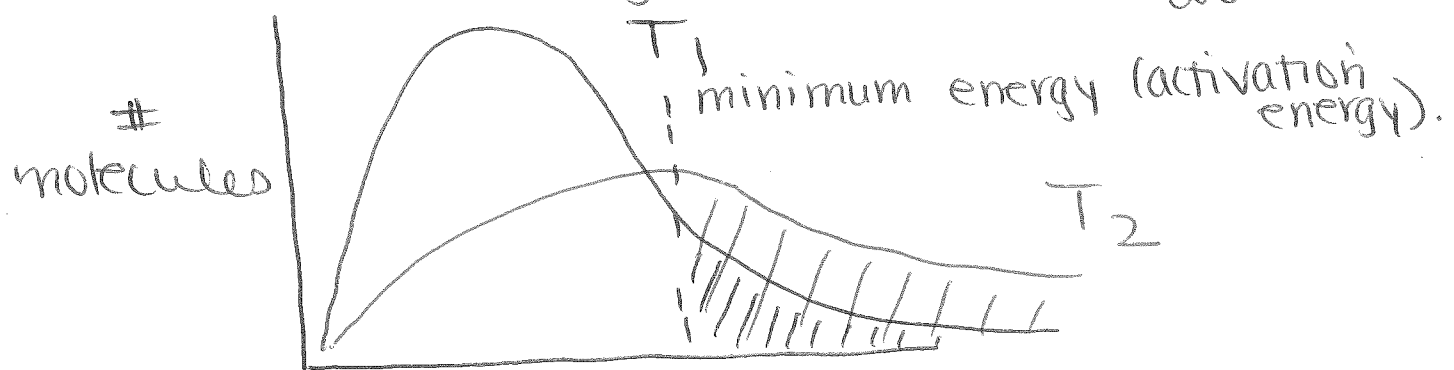
- more molecules in the same volume will increase the frequency of collisions

③ Surface Area

- increasing the number of exposed molecules available to react will increase the frequency of collisions.

④ Temperature

- when molecules are moving faster they collide more often (frequency) and with higher energy (greater fraction are successful).



⑤ Catalyst OH

Kinetic Energy

Theoretical Effect of Catalysts

- A catalyst speeds up a chemical reaction without being consumed.

a) • Theoretically, catalysts increase the rate of a chemical reaction by providing an alternative lower energy pathway from reactants to products. ** ↓ activation energy.*

✗ A catalyst allows the reaction to occur by a different mechanism, inserting different intermediate steps, but resulting in the same products overall.

✗ The new mechanism has lower activation energy and a greater fraction of the molecules possesses the minimum required energy for the reaction.

b) • Catalysts may also provide a site for the reactant molecules to collide with the proper geometry for a reaction to occur.