

What is Reaction Kinetics?

Worksheet

Reaction kinetics examines the rate of reaction (speed) and the mechanism (steps). Key factors are concentration, temperature, surface area, and catalysts. The activation energy E_a is the minimum energy barrier molecules must overcome to react.

$$\text{rate } [A]^m [B]^n$$

Questions

1. Activation energy E_a is:

- A) Energy released in reaction
- B) Minimum energy for reaction to occur
- C) Energy of products
- D) Energy lost to heat

2. Adding a catalyst will:

- A) Increase activation energy
- B) Decrease activation energy
- C) Provide more energy
- D) Slow down reaction

3. If concentration of reactant A doubles, rate typically:

- A) Stays same
- B) Doubles (first order)
- C) Quadruples
- D) Halves

4. Grinding a solid increases reaction rate because:

- A) Decreases E_a
- B) Increases concentration
- C) Increases surface area
- D) Raises temperature

5. If temperature increases by 10C, reaction rate often roughly doubles. Why?

6. Catalyst is added to a reaction. Effect on activation energy and rate?

7. Grinding a solid reactant into powder. Effect on reaction rate?

8. Define: What is reaction kinetics?

9. Define: What is activation energy E_a ?

10. Define: Does a catalyst change the final result?

Answer Key

1. B) Minimum energy for reaction to occur - E_a is the energy barrier. Molecules must have at least this energy to react.
2. B) Decrease activation energy - Catalyst lowers E_a by providing an alternative reaction pathway.
3. B) Doubles (first order) - For first-order reactions: double $[A]$ double rate. (Order depends on rate law.)
4. C) Increases surface area - Powder has more surface area more collisions with other reactants faster rate.
5. Higher temperature molecules move faster Collisions are more frequent and energetic More collisions exceed the activation energy E_a Reaction rate doubles (rule of thumb: $+10C \sim 2$ rate)
6. Catalyst provides an alternative reaction pathway Alternative pathway has lower E_a (no catalyst needed) Same E_a not reached more molecules can react Rate increases; catalyst unchanged at end
7. Increases surface area of solid More surface exposed to other reactants More collisions per unit time Reaction rate increases
8. Study of how fast reactions occur and what factors control their speed.
9. Minimum energy needed for reactant molecules to collide and form products.
10. No - same products, same amount. It just speeds up the reaction.

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