

Rate Laws Quiz Answer Key PDF

Rate Laws Quiz Answer Key PDF

Disclaimer: The rate laws quiz answer key pdf was generated with the help of StudyBlaze AI. Please be aware that AI can make mistakes. Please consult your teacher if you're unsure about your solution or think there might have been a mistake. Or reach out directly to the StudyBlaze team at max@studyblaze.io.

Which of the following is NOT a type of rate law?

- A. Differential rate law
- B. Integrated rate law
- C. Empirical rate law
- D. Stoichiometric rate law ✓**

Explain how the method of initial rates can be used to determine the order of a reaction.

To determine the order of a reaction using the method of initial rates, one can conduct experiments by varying the concentrations of reactants and measuring the initial reaction rates. By analyzing how the rate changes with different concentrations, one can deduce the order of the reaction for each reactant.

What is the overall order of a reaction with the rate law: $\text{Rate} = k[\text{A}]^2[\text{B}]$?

- A. First order
- B. Second order
- C. Third order ✓**
- D. Fourth order

What does the rate law of a reaction express?

- A. The relationship between the rate of reaction and the temperature
- B. The relationship between the rate of reaction and the concentration of reactants ✓**
- C. The relationship between the rate of reaction and the pressure
- D. The relationship between the rate of reaction and the volume

For a second-order reaction, which of the following are true?

- A. The rate is proportional to the square of the concentration of one reactant. ✓**

- B. The rate is proportional to the product of the concentrations of two reactants. ✓**
- C. The half-life is independent of the initial concentration.
- D. A plot of $1/[A]$ vs. time is linear. ✓**

Which statements are true about the Arrhenius equation?

- A. It relates the rate constant to temperature. ✓**
- B. It includes the activation energy of the reaction. ✓**
- C. It can be used to determine the order of a reaction.
- D. It includes a frequency factor. ✓**

Which of the following methods can be used to determine the rate law of a reaction?

- A. Method of initial rates ✓**
- B. Isolation method ✓**
- C. Method of half-lives
- D. Method of integration ✓**

How can you experimentally determine whether a reaction is zero, first, or second order?

You can experimentally determine the order of a reaction by measuring the initial rates of reaction at varying concentrations of reactants and analyzing the data using the method of initial rates, integrated rate laws, or half-life analysis.

Which plot would yield a straight line for a first-order reaction?

- A. $[A]$ vs. time
- B. $\ln[A]$ vs. time ✓**
- C. $1/[A]$ vs. time
- D. Rate vs. $[A]$

What does the rate-determining step in a reaction mechanism refer to?

- A. The fastest step in the mechanism
- B. The step with the highest concentration of reactants
- C. The slowest step in the mechanism ✓**

D. The step with the lowest activation energy

Which of the following factors can affect the rate constant (k) of a reaction?

- A. Temperature ✓
- B. Concentration of reactants
- C. Presence of a catalyst ✓
- D. Pressure

Which of the following statements is true about catalysts?

- A. They increase the rate of reaction by increasing the concentration of reactants.
- B. They increase the rate of reaction by providing an alternative pathway with a lower activation energy. ✓
- C. They are consumed in the reaction.
- D. They decrease the rate of reaction.

In a zero-order reaction, how does the rate of reaction change with concentration?

- A. It increases linearly with concentration.
- B. It decreases with concentration.
- C. It remains constant regardless of concentration. ✓
- D. It increases exponentially with concentration.

Which of the following are characteristics of a first-order reaction?

- A. The rate is independent of the concentration of reactants.
- B. The half-life is constant. ✓
- C. A plot of $\ln[A]$ vs. time is linear. ✓
- D. The rate is directly proportional to the concentration of one reactant. ✓

Describe the effect of temperature on the rate constant and the rate of a chemical reaction.

As temperature increases, the rate constant (k) of a chemical reaction typically increases, leading to a higher reaction rate. This is explained by the Arrhenius equation, which shows that higher temperatures provide more energy to the reactants, allowing more molecules to overcome the activation energy barrier.

Which of the following can be determined from the integrated rate law?

- A. Concentration of reactants at a given time ✓
- B. Reaction order ✓
- C. Rate constant ✓
- D. Activation energy

Describe how the half-life of a first-order reaction can be used to determine the rate constant.

To determine the rate constant (k) of a first-order reaction, use the formula $k = 0.693/t_{1/2}$, where $t_{1/2}$ is the half-life of the reaction.

Explain the significance of the rate-determining step in a multi-step reaction mechanism.

The significance of the rate-determining step in a multi-step reaction mechanism is that it controls the overall rate of the reaction, as it is the slowest step that limits the speed at which the entire reaction proceeds.

Discuss the role of a catalyst in a chemical reaction and how it affects the reaction mechanism.

A catalyst plays a crucial role in a chemical reaction by lowering the activation energy required for the reaction to occur, thus increasing the reaction rate without being consumed in the process. It affects the reaction mechanism by providing an alternative pathway that facilitates the conversion of reactants to products.

Which of the following is the correct unit for the rate constant (k) of a first-order reaction?

- A. $\text{mol L}^{-1} \text{s}^{-1}$
- B. s^{-1} ✓
- C. $\text{L mol}^{-1} \text{s}^{-1}$
- D. $\text{mol}^2 \text{L}^{-2} \text{s}^{-1}$