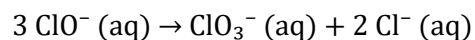


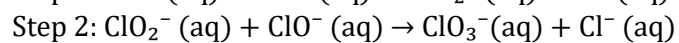
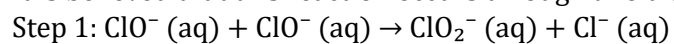
Reaction Mechanisms

Example One

The hypochlorite ion can be transformed into the chlorate ion, ClO_3^- , and chloride ions according to the overall reaction is shown below:



It is believed that this reaction occurs through two distinct steps as shown below:

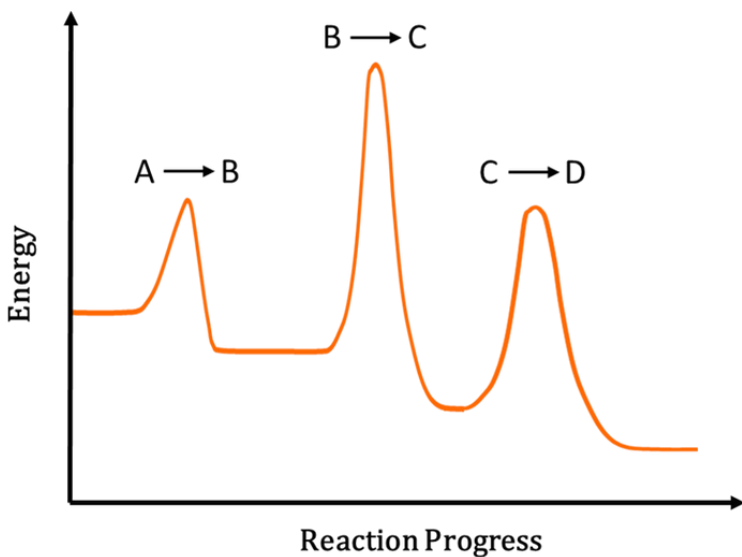


- Determine the molecularity of each step.
- Write the rate law for each step.
- Show that the elementary steps can be combined to generate the overall reaction.

Example Two

The reaction energy diagram for hypothetical reaction $A \rightarrow D$ is shown in the image below. Which step is the rate determining step?

- $A \rightarrow B$ (first step)
- $B \rightarrow C$ (second step)
- $C \rightarrow D$ (third step)



Example Three

What is the rate law based on the reaction mechanism shown below?

- Step 1: $2A + B \rightarrow C$ (slow)
- Step 2: $C + D \rightarrow E$ (fast)

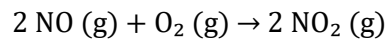
Example Four

What is the rate law based on the reaction mechanism shown below?

- Step 1: $A + B \rightarrow C$ (slow)
- Step 2: $C \rightarrow D$ (fast)

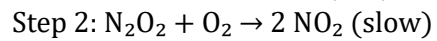
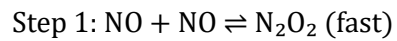
Example Five

Nitrogen monoxide and oxygen react according to the reaction below.



The experimentally derived rate law for this reaction is $\text{Rate} = k [\text{NO}]^2 [\text{O}_2]$

One mechanism which has been proposed is shown below.



Show that the proposed mechanism is consistent with both the overall reaction and the rate law.

Example Six

Step 1: $2A \rightleftharpoons B$ (fast)

Step 2: $B \rightarrow D$ (slow)

A generic reaction mechanism is shown above. What is the rate law consistent with this mechanism?

Example Seven

Step 1: $A \rightleftharpoons B$ (fast)

Step 2: $B + C \rightarrow D$ (slow)

A generic reaction mechanism is shown above. What is the rate law consistent with this mechanism?

Example Eight

Step 1: $A \rightleftharpoons B + C$ (fast)

Step 2: $B \rightarrow D$ (slow)

A generic reaction mechanism is shown above. What is the rate law consistent with this mechanism?

Example Nine

Step 1: $A \rightleftharpoons 2 B$ (fast)

Step 2: $B \rightarrow D$ (slow)

Part of a generic reaction mechanism is shown above. What is the rate law consistent with this mechanism?