Practice Questions Section 2.2

Collision Theory & Reaction Mechanism

1. Nitrogen monoxide reacts with hydrogen gas to produce nitrogen gas and water vapour. The mechanism is believed to be:

   Step 1: $2\ NO \rightarrow N_2O_2$

   Step 2: $N_2O_2 + H_2 \rightarrow N_2O + H_2O$

   Step 3: $N_2O + H_2 \rightarrow N_2 + H_2O$

   For this reaction find the following:

   the overall balanced equation

   any reaction intermediates

2. Give two reasons why most molecular collisions do not lead to a reaction.

3. An important function for managers is to determine the rate-determining steps in their business processes. In a certain fast-food restaurant, it takes 3 minutes to cook the food, 1.5 minutes to wrap the food, and 5 minutes to take the order and make change. How would a good manager assign the work to four employees?

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Collision Theory & Reaction Mechanism Answers

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   Step 1: $2\ NO \rightarrow N_2O_2$

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   For this reaction find the following:

   the overall balanced equation

   any reaction intermediates

   Solution

   To find the overall balanced equation, cross out substances that appear in equal numbers on both sides of the reaction and add together like items on the same side of the equation:

   Step 1: $2\ NO \rightarrow N_2O_2$

   Step 2: $N_2O_2 + H_2 \rightarrow N_2O + H_2O$

   Step 3: $N_2O + H_2 \rightarrow N_2 + H_2O$

   Net Reaction: $2\ NO + 2\ H_2 \rightarrow N_2 + 2\ H_2O$

   To identify the reaction intermediates, look for substances that first appear on the product side of the equation, but then appear in the next step as a reactant. In this example there are **two reaction intermediates - N_2O_2 and N_2O.**

2. Give two reasons why most molecular collisions do not lead to a reaction.

   Solution:

   The collision may not have: the correct orientation or

   the necessary energy.

3. An important function for managers is to determine the rate-determining steps in their business processes. In a certain fast-food restaurant, it takes 3 minutes to cook the food, 1.5 minutes to wrap the food, and 5 minutes to take the order and make change. How would a good manager assign the work to four employees?

   Solution:

   Assign two workers to take the orders since that is the rate determining step.