

Name: _____

Blk: _____ Date: _____

**Chemistry 12
REACTION KINETICS**

Lesson # 9/10 REACTION MECHANISMS WITH ENERGY DIAGRAMS

Because the PROBABILITY of more than TWO particles colliding SIMULTANEOUSLY is highly UNLIKELY, reactions involving more than TWO PARTICLES must involve a _____ reaction mechanism.

Example 1: For the chemical reaction : $4 \text{HBr} + \text{O}_2 \rightarrow 2 \text{H}_2\text{O} + 2 \text{Br}_2$
it has been experimentally determined that the reaction occurs in a THREE STEP REACTION MECHANISM

Step 1:

Step 2:

Step 3:

**TERMS TO KNOW:
REACTION MECHANISM-**

ELEMENTARY PROCESS-

RATE DETERMINING STEP-

REACTION INTERMEDIATE-

The reaction mechanism for the reaction $4 \text{HBr} + \text{O}_2 \rightarrow 2 \text{H}_2\text{O} + 2 \text{Br}_2$ is illustrated in the graph below:

The Activation Energy (E_a) for an individual step can be determined using
$$E_a (\text{individual step}) = \text{PE}(\text{activated complex}) - \text{PE} (\text{Reactants for the step})$$

Example 2:

- Use the graph to identify the RATE DETERMINING STEP in the reaction mechanism.
- Calculate the activation energies for each step in the reaction mechanism
 E_a (step 1) =
 E_a (step 2) =
 E_a (step 3) =

Example 3. A chemist suggests that the reaction $2 \text{SO} + \text{O}_2 \rightarrow 2 \text{SO}_2$ has a THREE STEP mechanism. If the first and third steps are:
 $2 \text{SO} \rightarrow \text{S}_2\text{O}_2$ (first) and $\text{S}_2\text{O}_4 \rightarrow 2 \text{SO}_2$ (third)

- What is the Second Step in the proposed reaction?
- List all of the Reaction Intermediates present in the reaction mechanism
- What is the formula of the Activated Complex for the second step?

Seatwork/Homework: Exercises 46-55 pgs 28 - 30
PLO's: C1, C2 and part of C5