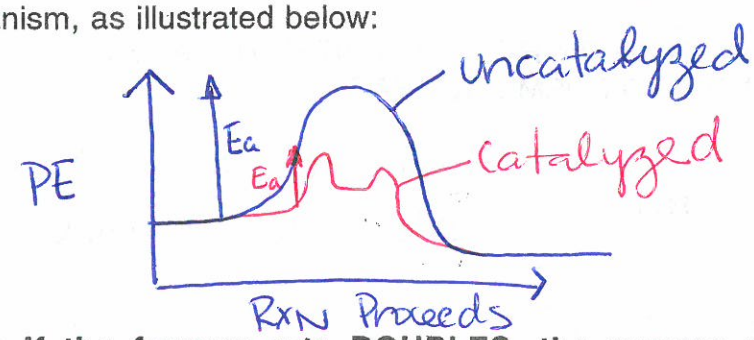
Name: Key
Blk:_____Date:_____

Chemistry 12
REACTION KINETICS
Lesson # 11-13 CATALYTIC ACTION

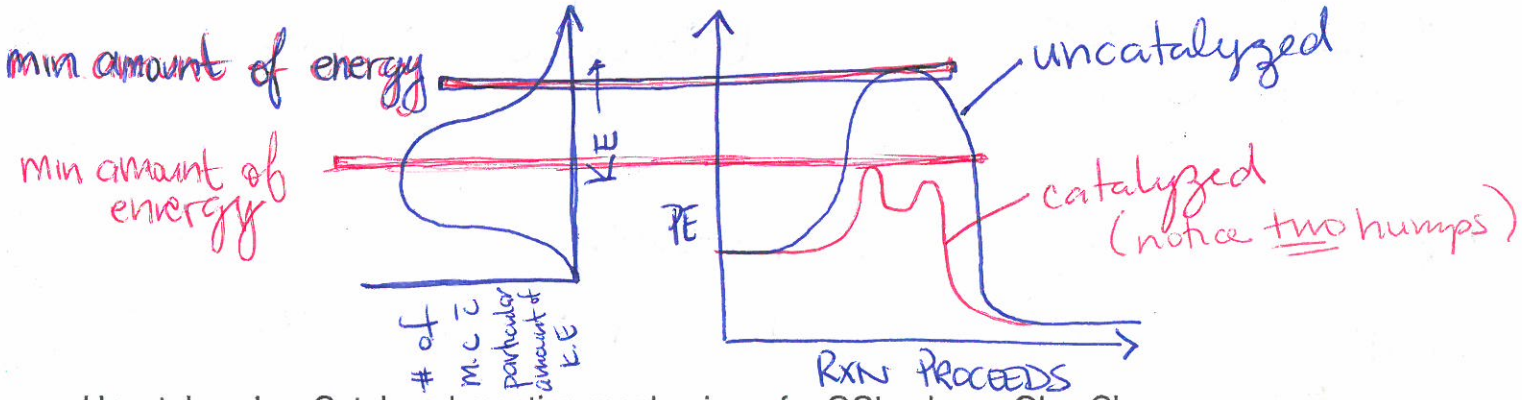
CATALYST- a substance which provides an overall rxn with an alternative mechanism having a Lower Ea !

A chemical reaction that involves a catalyst will have a TWO STEP reaction mechanism, as illustrated below:



NOTE: If the forware rate DOUBLES, the reverse reaction rate DOUBLES TOO!!!

Comparing the Potential Energy Diagram vs. Kinetic Energy Distribution Curve:



Uncatalyzed vs Catalyzed reaction mechanisms for $OCl^- + I^- \rightarrow OI^- + Cl^-$

UNCATALYZED REACTION:

$$OCl^- + I^- \rightarrow Cl^- + OI^-$$

CATALYZED REACTION:

Step 1. $ClO^- + H_2O \rightarrow ClOH + OH^-$
Step 2. $I^- + ClOH \rightarrow IOH + Cl^-$
Step 3. $IOH + OH^- \rightarrow IO^- + H_2O$
Overall: $ClO^- + I^- \rightarrow IO^- + Cl^-$

Catalyst → H_2O
Rxn Intermediates → ClOH, OH^-, IOH

NOTE:

1. A Catalyst is an ACTIVE PARTICIPANT in a chemical reation in that it is first USED then REGENERATED in a later step in the Reaction Mechanism

2. The ΔH is THE UNCHANGED for the catalyzed and uncatalyzed reactions.

3. Like a REACTION INTERMEDIATE a CATALYST appears in the elementary processes but not in the OVERALL RXN !!!! However, it is first used and then it is regenerated.

Example 1.

For the following reaction mechanisms identify the REACTION INTERMEDIATES, CATALYSTS and the OVERALL BALANCED CHEMICAL REACTION.

a.

Step 1: $2\ SO + HCl \rightarrow S_2O_2HCl$

Step 2: $S_2O_2HCl + H_2 \rightarrow S_2O + H_2O + HCl$

Step 3: $S_2O + H_2 \rightarrow S_2 + H_2O$

$2\ SO + 2\ H_2 \rightarrow S_2 + 2\ H_2O$

Rxn Int's → S_2O_2HCl, S_2O

Catalyst → HCl

b.

Step 1. $O_3 + ENERGY \rightarrow O_2 + O$

Step 2. $O_3 + NO \rightarrow NO_2 + O_2$

Step 3. $NO_2 + O \rightarrow NO + O_2$

$2\ O_3 + Energy \rightarrow 3\ O_2$

Rxn Int's → O, NO_2

Catalyst → NO

RXN INT'S → / (forward slash)

CATALYSTS → \ (backward slash)

Seatwork/Homework: Read pgs 34-36 then do Exercises 56-63

PLO's : C3, C4, C5 + C6

ALL PLO's are due NEXT CLASS!!!!