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Name:_____
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Reaction Kinetics Assignment
Due: **Friday, January 19th 2024**

Lesson I. Read pages 1-5 in Hebden: Chemistry 12 then answer I-1 to I-4.

I-1. What is Reaction Kinetics? (/1)

I-2. What is the formula used for calculating reaction rate? Identify the parts of the formula.(/3)

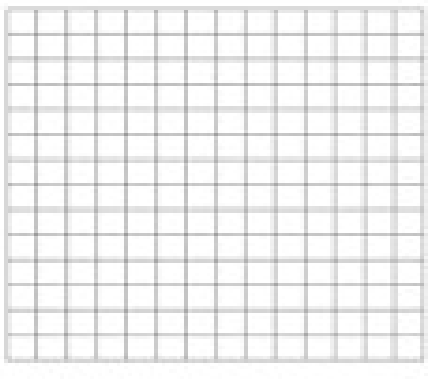
I-3. List four different properties that can be used to determine reaction rate. (/4)

I-4. The hydrolysis of chloropropane produces propanol and hydrochloric acid:

$$C_3H_7Cl + H_2O \rightarrow C_3H_7OH + HCl$$

The concentration of cholopropane at different times during the reaction: (/6)

Time (s)	$[C_3H_7Cl]$ = M
0	0.1000
50	0.0905
100	0.0820
150	0.0741
200	0.0671
300	0.0549
400	0.0439
700	0.0210
800	0.0170



a. Why is the concentration decreasing?
b. **Label** and **Plot** the data on the graph paper.
c. What is the **slope** of the line?
d. What are the units for the slope?

Lesson II. Read pages 5-10 in Hebden: Chemistry 12, copy out the notes skeleton then answer II-1 to II-6.

II-1. Identify the factors that affect reaction rate: (/2)

II-2. What is the difference between homogenous and heterogenous reactions? Provide **examples** of both. (/4)

II-3. Rank the reaction rates among phases in homogeneous reactions: (/1)

II-4. What do catalysts and inhibitors do for a chemical reaction? (/1)

II-5. The reaction of solid Chromium in the presence of aqueous sulphurous acid produces aqueous Chromium (II) sulphite and hydrogen gas. If the reaction occurs in a closed container whose volume can be changed, write out the balanced chemical reaction (including phases) and then list four ways of increasing the reaction rate. (/5)

II-6. Provide three examples of everyday situations that require the control of reaction rates: (/3)

Lesson III. Read pg 12 in Hebden: Chemistry 12, copy out the notes skeleton then answer III-1 to III-4.

III-1. Explain Collision Theory with regard to geometry and kinetic energy of molecules. (/2)

III-2. Explain the effect that increasing concentration has on reaction rates. (/2)

III-3. Explain the effect that increasing temperature has on reaction rates. (/2)

III-4. How does collision theory explain the effect that increasing surface area has on reaction rate? (/2)

Lesson IV. Read pages 13-19 in Hebden: Chemistry 12. Watch my flipped classroom lesson, copy out the notes skeleton then answer IV-1 to IV-5.

IV-1. Draw two potential energy diagrams, **be sure to label all parts!** (/ 4)

a. Exothermic reaction

b. Endothermic reaction

IV-2. Write out the formula for determining **ΔH.** (/ 1)

IV-3.

a. What is the ΔH value for an exothermic reaction? (/1)

b. What is the ΔH value for an endothermic reaction? (/1)

IV-4. An increase of what temperature will result in the doubling of a SLOW reaction rate? (/1)

IV-5. Explain, in terms of kinetic energy, why increasing the temperature will increase the reaction rate. (/2)

Lesson V. Read pages 20-25 in Hebden: Chemistry 12. Watch my flipped classroom lesson, copy out the notes skeleton and then answer V-1 to V-3.

V-1. What is activation energy? (/1)

V-2. Describe the activated complex in terms of its potential energy (PE), stability and structure.

(/ 3)

V-3. Draw and label a potential energy diagram for the following. Be sure to label and identify the **reactants,** the **activated complex**, the **products**, and the **values for the ΔH**, the **Ea (f)** and the **Ea (r)**. **(/ 12)**

a. 2 NOCl (g)→ 2 NO (g) + Cl_2 (g); ΔH = -30 KJ and Ea (f) = 20 kJ

b. H_2 (g) + Cl_2 (g) → 2 HCl (g); Ea (f) = 35 KJ and Ea (r) = 10 kJ

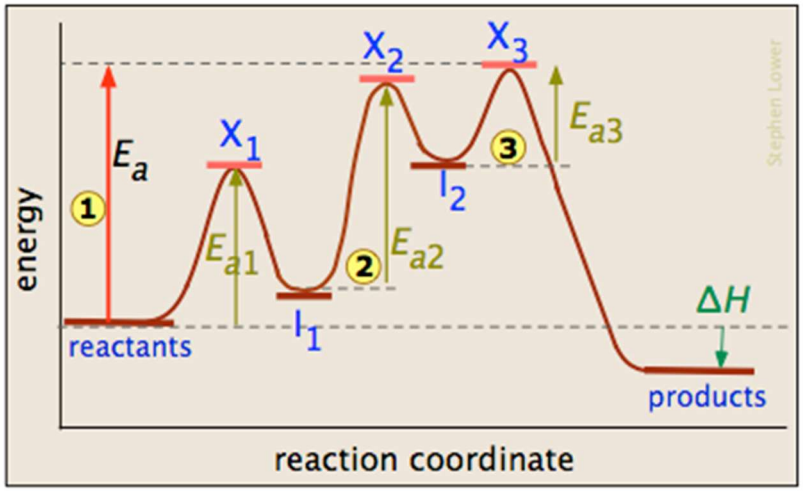
Lesson VI. Read pages 26-30 in Hebden: Chemistry 12. Watch my flipped classroom lesson, copy out the notes skeleton then answer VI-1 to VI-4

VI-1. What is the definition of a reaction mechanism? (/1)

VI-2. Describe a reaction intermediate in terms of its stability and structure. (/2)

VI-3. What is the rate-determining step? (/ 1)

VI-4. Using the following diagram to answer the questions below: (/4)

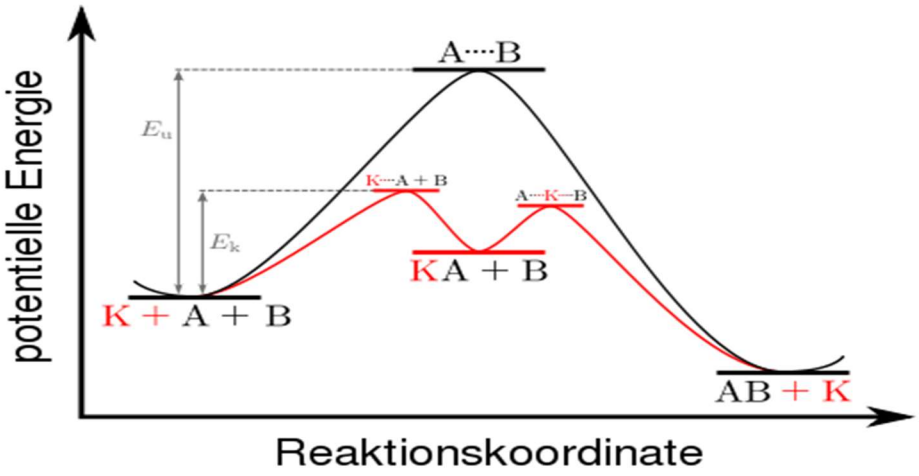


a. How many steps are in this reaction mechanism?
b. Which step is the rate determining step?
c. Is the overall reaction endothermic or exothermic
d. Would the symbol on the ΔH be positive or negative?

Lesson VII. Read pages 30-36 in Hebden: Chemistry 12. Watch my flipped classroom lesson. Answer VII-1 to VII-3

VII-1.What is the definition of a catalyst? Provide two specific catalysts and where they are used? (/3)

VII-2. Use the diagram below to answer the following:



What does the above diagram show about the catalytic reaction compared to the uncatalyzed reaction? (/2)

VII-3. Identify the overall reaction, the reaction intermediate(s) and the catalyst(s) from given the following reaction mechanism: (/3)

Step 1 : $H^+ (aq) + Pt (s) + H_2O_2 (l) \rightarrow H_3O_2^+ (aq)$

Step 2 : $Br^- (aq) + H_3O_2^+ (aq) \rightarrow HOBr (aq) + H_2O (l)$

Step 3 : $HOBr + H^+ \rightarrow H_2OBr^+ + Pt(s)$

Step 4 : $Br^- + H_2OBr^+ \rightarrow H_2O + Br_2$

Overall:

Reaction intermediate(s):

Catalyst(s)