

# FRANKLIN-SIMPSON HIGH SCHOOL

Course Name: Pre – AP Chemistry    Unit Name: Chemical Kinetics

Days: 7

## Quality Core Objectives:

Unit 16 Chemical Kinetics	
I.A.1. Scientific Inquiry	a. Identify and clarify research questions and design experiments
	b. Design experiments so that variables are controlled and appropriate numbers of trials are used
	c. Collect, organize, and analyze data accurately and use techniques and equipment appropriately
	d. Interpret results and draw conclusions, revising hypotheses as necessary and/or formulating additional questions or explanations
	e. Write and speak effectively to present and explain scientific results, using appropriate terminology and graphics
	f. Safely use laboratory equipment and techniques when conducting scientific investigations
	g. Routinely make predictions and estimations
I.A.2. Mathematics and Measurement in Science	b. Use appropriate SI units for length, mass, time, temperature, quantity of matter, area, volume, and density; describe the relationships among SI unit prefixes (e.g., centi-, milli-, kilo-); recognize commonly used non-SI units
	c. Use the correct number of significant figures in reporting measurements and the results of calculations
	g. Use graphical, mathematical, and/or statistical models to express patterns and relationships inferred from sets of scientific data
V.B.1. Chemical Equilibrium and Factors Affecting Reaction Rates; Le Châtelier's Principle	c. Relate reaction mechanism, rate-determining step, activated complex, heat of reaction, and activation energy to reaction kinetics
	d. Interpret potential energy diagrams for chemical reactions

V.B.2. Mechanism, Rate-Determining Step, Activation Energy, and Catalysts	a. Relate the rate of a chemical reaction to the appearance of products and the disappearance of reactants
	b. Describe the meaning of reaction mechanism and rate-determining step
	c. Relate collision theory to the factors that affect the rate of reaction
	d. Describe the meaning of activation energy and activated complex
	e. Interpret and label a plot of energy versus reaction coordinate
	f. Explain the effects of catalysts on reaction rates (e.g., mechanism, activation energy/activated complex)

**Purpose of the Unit:** Students will be able to compare rates of reactions based on appearance of products and disappearance of reactants. They will also be able to identify possible mechanisms for chemical reactions and identify the rate determining step of a reaction based on experimental data. Students should be able to interpret a potential energy diagram, comparing energy to the reaction coordinate, relating it to the reaction mechanism, rate determining step, activated complex, heat of reaction, and activation energy for the reaction. Students will also use the collision theory to explain reaction rates and be able to explain the effects of a catalyst on the reaction.

**Prerequisites:** Students should be able to:

- Use the collision theory to explain chemical reactions
- Balance chemical equations
- Add chemical reactions to obtain a net reaction
- Explain the difference between endothermic and exothermic reactions
- Identify biological catalysts

## Daily Lesson Guide

Day	Lesson Content and Objectives	Focus Questions	Critical Thinking (High Yield / Literacy /LTF/etc.)	Engagement	Assessment and/or Accommodations
1	<ul style="list-style-type: none"> <li>* Relative rates of reactions</li> <li>* Reaction mechanisms and rate-determining step</li> </ul> V.B.2.a, b	<ul style="list-style-type: none"> <li>* How is the rate of a reaction related to the appearance/ disappearance of reactants/ products?</li> <li>* What ultimately determines the rate of a reaction?</li> </ul>	<ul style="list-style-type: none"> <li>* Summarizing and note taking</li> <li>* Analysis/ application</li> <li>* Identifying similarities and differences</li> <li>* I Do – We Do – You Do</li> </ul>	<ul style="list-style-type: none"> <li>* Pre-test</li> <li>* ACT bell ringer</li> <li>* Modeled notes</li> <li>* Work sample problems together, alone (formative)</li> </ul>	<ul style="list-style-type: none"> <li>* Evaluate pre-test</li> <li>* Evaluate sample problems for understanding</li> </ul> Enrichment: Less guidance in note taking, more independence in practice, more challenging examples in formative
2-3	<ul style="list-style-type: none"> <li>* Potential energy diagrams</li> <li>* activation energy, activated complex, heat of reaction</li> <li>* collision theory</li> </ul> V.B.1.c, d V.B.2.c, d, e	<ul style="list-style-type: none"> <li>* What does a potential energy diagram tell us about a reaction?</li> <li>* How are reactions related to collisions?</li> </ul>	<ul style="list-style-type: none"> <li>* Summarizing and note taking</li> <li>* Evaluation/ analysis/ application</li> <li>* Identifying similarities and differences</li> <li>* I Do – We Do – You Do</li> </ul>	<ul style="list-style-type: none"> <li>* ACT bell ringer</li> <li>* Modeled notes</li> <li>* Work sample problems together, alone (formative)</li> </ul>	<ul style="list-style-type: none"> <li>* Evaluate sample problems for understanding</li> </ul> Enrichment: Less guidance in note taking, more independence in practice, more challenging examples in formative
4	<ul style="list-style-type: none"> <li>* Effects of catalysts on reaction rates</li> </ul> V.B.2.f	<ul style="list-style-type: none"> <li>* How does a catalyst work on a reaction?</li> <li>* What are applications of catalysts?</li> </ul>	<ul style="list-style-type: none"> <li>* Summarizing and note taking</li> <li>* Identifying similarities and differences</li> <li>* Analysis/ application</li> </ul>	<ul style="list-style-type: none"> <li>* ACT bell ringer</li> <li>* Modeled notes</li> <li>* Work sample problems together (formative)</li> <li>* Article on biological catalysts</li> </ul>	<ul style="list-style-type: none"> <li>* Evaluate sample problems and article for understanding/ comprehension</li> </ul> Enrichment: Less guidance in note taking, more independence in practice, more challenging examples in formative

5	<p><b>* Laboratory:</b>  <b>Qualitatively exploring factors affecting reaction rates</b>  I.A.1.a, b, c, d, e, f, g  I.A.2.b, c, g  V.B.1.c, d  V.B.2.a, b, c, d, e, f</p>	<p><b>* How can I use what I know to alter the rates of a reaction?</b></p>	<p><b>* Synthesis</b>  <b>* Application/ Analysis</b>  <b>* Identifying similarities and differences</b>  <b>* Learning with others</b>  <b>* Authenticity</b>  <b>* Novelty and Variety</b>  <b>* Generating and testing hypotheses</b></p>	<p><b>* ACT bell ringer</b>  <b>* Conduct lab according to procedures provided (summative)</b></p>	<p><b>* Evaluate lab report</b>  <b>Enrichment: Student development of lab procedures with less guidance</b></p>
6	<p><b>* Review</b>  I.A.1.a, b, c, d, e, f, g  I.A.2.b, c, g  V.B.1.c, d  V.B.2.a, b, c, d, e, f</p>	<p><b>* What can I do to be better prepared for the exam?</b></p>	<p><b>* Use clickers to test students' knowledge and clarify and misconceptions before the exam with immediate feedback.</b></p>	<p><b>* ACT bell ringer</b>  <b>* Use clickers to review with exam like questions (summative)</b></p>	<p><b>* Students participate in review</b>  <b>Enrichment: Less time to solve problems and limited use of aides</b></p>
7	<p><b>* Exam</b>  I.A.1.a, b, c, d, e, f, g  I.A.2.b, c, g  V.B.1.c, d  V.B.2.a, b, c, d, e, f</p>	<p><b>* Can I demonstrate my knowledge on the exam?</b></p>	<p><b>* Evaluation</b>  <b>* Analysis</b>  <b>* Application</b>  <b>* Synthesis</b></p>	<p><b>* ACT bell ringer</b>  <b>* Students take exam (summative)</b></p>	<p><b>* Evaluate exam</b>  <b>Enrichment: No use of supports with exemption of periodic table, periodic table only has element symbols, not names</b></p>