

Grade	10-12
Unit of Study	Unit 10: Kinetics and Equilibrium
Length of Unit	4 weeks
Sample Essential Questions	Sample Corresponding Big Ideas
How can the rate of a chemical reaction be adjusted?	Factors such as temperature that affect reactant collisions can be changed. The introduction of catalysts or inhibitors can also be utilized.
Under what conditions can equilibrium occur?	Equilibrium requires reversible processes where the forward and reverse reactions can occur at the same rate.
How is Le Chatelier Principle similar to homeostasis?	Le Chatlier is the chemical version of stimulus, response, and restoration.

Missouri Learning Standards	
Priority Standard(s)	Supporting Standard(s)
I can explain how matter is structured, how its properties are determined by its structure, and how it changes during chemical reactions.	9-12.PS1.B.1, 9-12.PS1.B.2

Unit 10 Sequence			
MLS	Topic(s)	Learning Targets	Academic Vocabulary
PS1.B.1, PS1.B.2	Collision Theory	I can explain how various factors increase/decrease the number of effective collisions per second. (rate) I can draw and explain an energy profile. I can use a reaction mechanism to determine the rate-determining step, overall reaction, catalysts, and intermediates.	Effective Collisions Ineffective Collisions Kinetic Energy Orientation Activation Energy Transition State Mechanism Elementary Steps Rate Determining Step Catalyst Intermediate Inhibitor
	Equilibrium	I can explain which systems are good candidates for equilibrium. I can use K_{eq} to determine the equilibrium position. I can use an ICE box calculation to determine equilibrium concentrations that are established based on initial system concentrations.	Rate Reversibility
	Le Chatlier	I can use Le Chatlier to qualitatively predict the direction of the shift when a stress is applied. I can use the reaction quotient (Q) to quantitatively predict the direction of the shift.	Stress Shift

MLS	Learning Activities	
<i>PS1.B.1,</i>	Le Chatelier Lab (Fe + SCN ⁻)	Must Do ▾
<i>PS1.B.2</i>	NSTA ADI: Chemical Reactants and Rate Lab (HCl + Na ₂ S ₂ O ₃)	Must Do ▾

Assessments		
MLS	Description or Location	Rubric/Location
<i>PS1.B.1,</i> <i>PS1.B.2</i>	Unit 10 Test	Paper

Additional Resources	
Phet, OpenStax, Javalab	