

Grade	10-12
Unit of Study	Unit 9: Thermodynamics
Length of Unit	3 weeks
Sample Essential Questions	Sample Corresponding Big Ideas
What is the fundamental difference between exothermic and endothermic processes?	Exothermic reactions occur then there is a surplus of energy available in the bonds of the reactants compared to the energy needed to create products. By the law of conservation of mass energy can not be created or destroyed so the excess energy flows to the surrounding making the temperature rise. Endothermic reactions occur then there is a deficit of energy available in the bonds of the reactants compared to the energy needed to create products. By the law of conservation of mass energy can not be created or destroyed so the missing energy flows from the surrounding making the temperature drop.
How can endothermic reactions occur even when no energy is absorbed?	The spontaneity of chemical reaction is dependent on both enthalpy and entropy.

Missouri Learning Standards	
Priority Standard(s)	Supporting Standard(s)
I can explain how energy is stored, transferred, and changed in physical and chemical systems.	PS1.A.5, PS3.A.1, ETS1.A.2, ETS1.B.1

Unit 9 Sequence			
MLS	Topic(s)	Learning Targets	Academic Vocabulary
PS1.A.5, PS3.A.1, ETS1 .A.2, ETS1.B.1	Heating Curves	I can use the heating curve of water to predict the amount of energy needed/released based on the temperature change.	Specific Heat Enthalpy Heating Curve
	Hess's Law	I can use Hess's Law to indirectly calculate the enthalpy of a chemical reaction.	Hess's Law
	Gibbs Free Energy	I can use Gibb's Free Energy to determine if a reaction is spontaneous.	Entropy Gibb's Free Energy Endothermic Exothermic Spontaneity

MLS	Learning Activities	
PS1.A.5, PS3.A.1, ETS1.A.2, ETS1.B.1	Hess's Law MgO calorimetry Lab	Must Do ▾
	NSTA ADI: Designing a Practical Cold Pack Lab	Must Do ▾

Assessments		
MLS	Description or Location	Rubric/Location
PS1.A.5, PS3.A.1,	Unit 9 Test	Paper

Additional Resources
Phet, OpenStax, Javalab