2020 Unit 07: Thermodynamics

Content Area: **Science**
Course(s): **Advanced Placement Chemistry**
Time Period: **March**
Length: **1 Month**
Status: **Published**

Unit Overview:

This unit focuses on thermodynamics. The laws of thermodynamics describe the essential role of energy and expalin and predict the direction of changes in matter.

Enduring Understandings:

- Breaking bonds requires energy, while forming bonds releases energy.
- Chemical or physical processes are driven by a decrease in enthalpy or an increase in enthalpy, or both.
- Electrostatic forces exist between molecules, as well as between atoms or ions, and breaking the resultant intermolecular interactions requires energy.
- Energy is neither created nor destroyed, but only transformed from on form to another.
- Two systems with different temperature that are in thermal contact will exchange energy. The quantity of thermal energy transferred from one system to another is called heat.

Essential Questions:

- How can calorimetry be used to determine the heat exchanged/transferred in a chemical system.
- How does a particular geometric arrangement of atoms or ions and the electrostatic interactions between them effect the potential energy in a system.
- How does the breaking and making of bonds in a reaction affect the net change in energy for a system?
- What is entropy and enthalpy and how can it be used to determine if a reaction will take place?

Standards/Indicators/Student Learning Objectives (SLOs):

SCI.HS-PS1-2	Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties.
SCI.HS-PS3-4	Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system

	(second law of thermodynamics).
SCI.HS-PS1-4	Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy.
SCI.HS-PS3-1	Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.
SCI.HS-PS3-3	Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.
SCI.HS-PS3-2	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).

Lesson Titles:

- Bond Energies
- Calorimetry
- Entropy
- Gibbs Free Energy
- Heat of Formation and Enthalpy
- Hess's Law

Career Readiness, Life Literacies & Key Skills

WRK.K-12.P.1	Act as a responsible and contributing community members and employee.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

Inter-Disciplinary Connections:

LA.RH.11-12.7	Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, qualitatively, as well as in words) in order to address a question or solve a problem.
LA.RST.11-12.9	Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
LA.RST.11-12.10	By the end of grade 12, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently.
LA.WHST.11-12.1.A	Introduce precise, knowledgeable claim(s), establish the significance of the claim(s), distinguish the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence.

LA.WHST.11-12.1.B	Develop claim(s) and counterclaims using sound reasoning and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases.
LA.WHST.11-12.1.C	Use transitions (e.g., words, phrases, clauses) to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims.
LA.WHST.11-12.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.11-12.2.E	Provide a concluding paragraph or section that supports the argument presented.
LA.WHST.11-12.10	Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK:

- Chromebook Activity
- Computer Simulations
- Delsea One Tutoring
- Independent Studies
- Lectures
- Problem Solving
- Science Labs

Modifications

ELL Modifications:

- Digital translators
- Focus on domain specific vocabulary and keywords
- Offer resources for specific topics in primary language (Youtube web resources)
- Repeat, reword, clarify
- Use real objects when possible

IEP & 504 Modifications:

- have formula's available on the test and/or sample problems
- modeling and showing lots of examples
- scaffolded notes

- students could use calculator and/or other math tools

G&T Modifications:

- Extra Labs to Do Outside the Classroom
- Give students Challenge Problems
- Send Links to Videos of Interest

At Risk Modifications

- Have Students See Me During Delsea One
- Reach out to Parents

Formative Assessment:

- Anticipatory Set
- Closure
- Enthalpy of Solutions Lab
- Hess's Law Lab
- Quizzes on topics throughout the Unit
- Warm-Up

Summative Assessment:

- Alternate Assessment
- Benchmark assessment on topics covered
- Marking Period Assessment

Benchmark Assessments

Skills-based assessment
Reading response
Writing prompt
Lab practical

Alternative Assessments

Performance tasks
Project-based assignments

Problem-based assignments
Presentations
Reflective pieces
Concept maps
Case-based scenarios
Portfolios

Resources & Materials:

- AP Chemistry Website designed for the class - https://sites.google.com/site/delseaapchemistry/
- Lab Equipment
- PhET Lab Simulations - https://phet.colorado.edu/en/simulations/category/chemistry
- Vernier Chemistry Probes

Technology:

- Chromebooks
- Desmos
- Graphing Calculators
- Interactive Boards
- Pocket Lab
- Smart Phones
- Venier Probes

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A.4	Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.B.CS2	Create original works as a means of personal or group expression.
TECH.8.1.12.C	Communication and Collaboration: Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
TECH.8.1.12.C.CS1	Interact, collaborate, and publish with peers, experts, or others by employing a variety of digital environments and media.
TECH.8.1.12.D.CS1	Advocate and practice safe, legal, and responsible use of information and technology.
TECH.8.1.12.D.CS2	Demonstrate personal responsibility for lifelong learning.
TECH.8.1.12.E	Research and Information Fluency: Students apply digital tools to gather, evaluate, and

	use information.
TECH.8.1.12.E.CS2	Locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.
TECH.8.1.12.E.CS4	Process data and report results.
TECH.8.1.12.F.1	Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.
TECH.8.1.12.F.CS3	Collect and analyze data to identify solutions and/or make informed decisions.
TECH.8.2.12	Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
TECH.8.2.12.A.2	Analyze a current technology and the resources used, to identify the trade-offs in terms of availability, cost, desirability and waste.
TECH.8.2.12.C	Design: The design process is a systematic approach to solving problems.
TECH.8.2.12.C.4	Explain and identify interdependent systems and their functions.
TECH.8.2.12.C.CS3	The role of troubleshooting, research and development, invention and innovation and experimentation in problem solving.
TECH.8.2.12.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.
TECH.8.2.12.E.1	Demonstrate an understanding of the problem-solving capacity of computers in our world.
TECH.8.2.12.E.3	Use a programming language to solve problems or accomplish a task (e.g., robotic functions, website designs, applications, and games).
TECH.8.2.12.E.CS1	Computational thinking and computer programming as tools used in design and engineering.