Unit 01: Summer Review/Attractive Forces (Weeks 1-6)

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **FY**
Status: **Published**

Standards Alignment

New Jersey Student Learning Standards

Practice 4. Analyzing and interpreting data

Analyzing data in 9–12 builds on K–8 experiences and progresses to introducing more detailed statistical analysis, the comparison of data sets for consistency, and the use of models to generate and analyze data.

Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution.

Analyze data to identify design features or characteristics of the components of a proposed process or system to optimize it relative to criteria for success.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.

Make a quantitative and/or qualitative claim regarding the relationship between dependent and independent variables.

Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.

SCI.HS-PS1	Matter and Its Interactions
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-PS1-3	Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles.

Integration of Career Readiness, Life Literacies and Key Skills

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.

CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.

Technology / Integration of Computer Science and Design Thinking

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	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.A.2	Produce and edit a multi-page digital document for a commercial or professional audience and present it to peers and/or professionals in that related area for review.
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.

Interdisciplinary Connections: NJSLS for ELA, Social Studies, Science and/or Math Section

LA.K-12.NJSLSA.R	Reading
LA.K-12.NJSLSA.R3	Analyze how and why individuals, events, and ideas develop and interact over the course of a text.
LA.K-12.NJSLSA.W	Writing
	Text Types and Purposes
LA.RI.11-12.3	Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.
LA.K-12.NJSLSA.W1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
LA.W.11-12.1	Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media LiteracyNew Section

see Crosswalks

21st Century Life and Careers

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP6.1	Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

Stage I: Desired Results

Transfer/Overview/Rationale

Transfer / Overview / Rationale

Unit Rationale

The purpose of this unit…

...is to draw relationships between physical properties like melting point and states of matter and the structure of the molecule. This is vital when students are asked to predict properties of matter.

Meaning

Essential Questions

Essential Questions

How can physical properties of materials be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them? [BI 2]

How can the chemical properties of materials be explained by the structure and the arrangement of atoms, ions, or molecules and the forces between them? [BI 2]

Why are macroscale properties affected by microscale qualities?

Enduring Understanding/Indicators of Understanding

Enduring Understanding/Indicators of Understanding

Students will understand that:

1) Matter can be described by its physical properties. The physical properties of a substance generally depend on the spacing between the particles (atoms, molecules, ions) that make up the substance and the forces of attraction among them. [EU 2.A]

2) The strong electrostatic forces of attraction holding atoms together in a unit are called chemical bonds. [EU 2.C]

3) The type of bonding in the solid state can be deduced from the properties of the solid state. [EU 2.D]

4) Electrostatic forces exist between molecules as well as between atoms or ions, and breaking the resultant intermolecular interactions requires energy. [EU 5.D]

Acquisition (Student Learning Objectives)

Knowledge

Knowledge

Students will know…

1) ... the different properties of solids and liquids can be explained by differences in their structures, both at the particulate level and in their supramolecular structures. [EK 2.A.1]

2) ... solutions are homogenous mixtures in which the physical properties are dependent on the concentration of the solute and the strengths of all interactions among the particles of the solutes and solvent. [EK 2.A.3]

3) ... intermolecular forces play a key role in determining the properties of substances, including biological structures and interactions. [EK 2.B.3]

4) ... metallic bonding describes an array of positively charged metal cores surrounded by a sea of mobile valence electrons. [EK 2.C.3]

5) ... metallic solids are good conductors of heat and electricity, have a wide range of melting points, and are shiny, malleable, ductile, and readily alloyed. [EK 2.D.2]

6) ... covalent network solids generally have extremely high melting points, are hard, and are thermal insulators. some conduct electricity. [EK 2.D.3]

7) ... potential energy is associated with a particular geometric arrangement of atoms or ions and the electrostatic interactions between them.

8) ... potential energy is associated with the interaction of molecules; as molecules draw near each other, they experience an attractive force.

9) ... at the particulate scale, chemical processes can be distinguished from physical processes because chemical bonds can be distinguished from intermolecular interactions.

10) ... London dispersion forces are attractive forces present between all atoms and molecules. London dispersion forces are often the strongest net intermolecular force between large molecules. [EK 2.B.1]

11) ... noncovalent and intermolecular interactions play important roles in many biological and polymer systems. [EK 5.D.3]

12) … to use aspects of particulate models (i.e., particle spacing, motion, and forces of attraction) to reason about observed differences between solid and liquid phases and among solid and liquid materials. [LO 2.3]

13) … to explain observations regarding the solubility of ionic solids and molecules in water and other solvents on the basis of particle views that include intermolecular interactions and entropic effects. [LO 2.15]

14) … to explain the properties (phase, vapor pressure, viscosity, etc.) of small and large molecular compounds in terms of the strengths and types of intermolecular forces. [LO 2.16]

15) … to compare the properties of metal alloys with their constituent elements to determine if an alloy has formed, identify the type of alloy formed, and explain the differences in properties using particulate level reasoning. [LO 2.25]

16) … to explain a representation that connects properties of a metallic solid to its structural attributes and to the interactions present at the atomic level. [LO 2.28]

17) … to explain a representation that connects properties of a covalent solid to its structural attributes and to the interactions present at the atomic level. [LO 2.30]

18) … to explain a representation that connects properties of a molecular solid to its structural attributes and to the interactions present at the atomic level. [LO 2.32]

19) … to explain the trends in properties and/or predict properties of samples consisting of particles with no permanent dipole on the basis of London dispersion forces. [LO 2.11]

20) … to describe the relationships between the structural features of polar molecules and the forces of attraction between the particles. [LO 2.13]

21) … to use the electron sea model of metallic bonding to predict or make claims about the macroscopic properties of metals or alloys. [LO 2.26]

22) … to explain how a bonding model involving delocalized electrons is consistent with macroscopic properties of metals (e.g., conductivity, malleability, ductility, and low volatility) and the shell model of the atom. [LO 2.20]

23) … to explain a representation that connects properties of an ionic solid to its structural attributes and to the interactions present at the atomic level. [LO 2.24]

23) … to identify the noncovalent interactions within and between large molecules, and/or connect the shape and

function of the large molecule to the presence and magnitude of these interactions. [LO 5.11]

Skills

Skills

Student will be skilled at …

1) ... creating or using graphical representations in order to connect the dependence of potential energy to the distance between atoms and factors, such as bond order (for covalent interactions) and polarity (for intermolecular interactions), which influence the interaction strength.

2) … predicting properties of substances based on their chemical formulas, and provide explanations of their properties based on particle views. [LO 2.1]

3) … drawing and/or interpreting representations of solutions that show the interactions between the solute and solvent. [LO 2.8]

4) … creating a representation of a metallic solid that shows essential characteristics of the structure and interactions present in the substance. [LO 2.27]

5) … creating a representation of a covalent solid that shows essential characteristics of the structure and interactions present in the substance. [LO 2.29]

6) …creating a representation of a molecular solid that shows essential characteristics of the structure and interactions present in the substance. [LO 2.31]

7) … creating visual representations of ionic substances that connect the microscopic structure to macroscopic properties, and/or use representations to connect the microscopic structure to macroscopic properties (e.g., boiling point, solubility, hardness, brittleness, low volatility, lack of malleability, ductility, or conductivity). [LO 2.19]

8) … designing or evaluating a plan to collect and/or interpret data needed to deduce the type of bonding in a sample of a solid. [LO 2.22]

9) … making claims and/or predictions regarding relative magnitudes of the forces acting within collections of interacting molecules based on the distribution of electrons within the molecules and the types of intermolecular forces through which the molecules interact. [LO 5.9]

Stage 3: Learning Plan

Resource and Mentor Texts

Resources and Mentor Texts

Walsh's YouTube Channel

https://www.youtube.com/channel/UCNxaVQOaYbnBjpf3fZ9k33Q?view_as=subscriber

Print Texts

Chemistry by Kotz and Treichel

Princeton Reveiw

Digital Resources

Chemistry, The Central Science by Brady and Holum

Old AP Exams

Albert.io

Formative Assessment Strategies

Formative Assessment Strategies

POGIL activity

Pyramid of understanding

Questions during lecture

Sample AP questions

Homework problems

Learning Activities/Unit of Study

Learning Activities/Unit of Study

Do nows

Students will be delivered all notes through flipped learning best practices

WSQs

At home assessments

Video watching

Self Assessments

During class, students will work through practice problems

Students will engage in peer learning

When appropriate, Albert.io will be used in class.

Students will work through old AP problems that apply to this unit

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, GIfted, At-risk of Failure)

English Language Learners

Native language support: The teacher provides auditory or written content to students in their native language.

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy

to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.