Unit 2 Chemistry

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Department of Curriculum and Instruction

Belleville Public Schools

Curriculum Guide

ADVANCED PHYSICAL SCIENCE, GRADE 6

CHEMISTRY

Belleville Board of Education

102 Passaic Avenue

Belleville, NJ 07109

Prepared by: Mr. Terrence McCaffrey

Dr. Richard Tomko, Ph.D., M.J., Superintendent of Schools

Dr. Giovanni Cusmano, Director of Elementary Education K -8

Mr. George Droste, Director of Secondary Education

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Unit Overview

In Unit 2, Chemistry, the students are expected to:

- use models to describe molecules, compare composition and structure in order to explain differences among substances, and analyze the arrangement of extended structures.
- explore physical properties of solids, liquids, and gases, model perticles of matter and explain why different states of matter have different physical properties.
- analyze physical and chemical properties and how they can be used to indentify substances, explain how chemical reactions can form new substances and use specific indicators to help indentify chemical reactions.
- develop an understanding of materials scienceand how scientists identify properties of substances; investigate a chemical reaction that produces synthetic material; and explore hw synthetic materials are produced and used for specific functions based on their composition.

Enduring Understanding

- Substances are made from different kinds of atoms which combine with one another in various ways to make up all the matter in the universe.
- Each pure substance has characteristic physical and chemical properties.
- The changes of state of matter is brought about by change in temperature or pressure. These changes can be predicted using molecular or repeating subunit models.
- Water is an anomaly in regards to density. Ice is less dense than liquid water.
- Substances react characteristically in chemical process regrouping the reactants into new produces, each with different properties.
- Chemical reactions take place both inside and outside the laboratory.
- Chemical reactions either give off or store energy.
- The total mass of the reactants will always equal the mass of the products. Matter can not be destroyed.
- Thermal energy refers to the motion of atoms or molecules in an object. Heat refers to the transfer of that energy between two objects of different temperature.
- Crude oil can be used for fuel and also for to create synthatic subsatnces.
- Materials enegineers test and design new materials with structures and properties that meet the needs of society.

Essential Questions

- What is it the smallest unit of matter?
- How does the structure of an atom of an element determine its propeties?
- How does the structure of a molecule of a compound determine its properties?
- Why do ice cubes float in liguid water?
- How does matter undergo changes?
- How do we use chemical equations?
- How are mixture different from pure substances?
- How do matter and energy interact?
- What are the characteristics and reactions of acids and bases?
- What happens when chemicals react?
- What causes crash airbags to inflate?
- Can matter be created or destroyed?
- What is the difference between thermal energy and heat?

Exit Skills

By the end of Grade 6 Science Unit 2, the student will be able to:

- Develop models to describe the atomic composition of simple molecules and extended structures.
- Balance chemical equations.
- Analyze and interpert data on the properties of substances before and after the substances interact to determine if a chemical reaction has occured.
- Gather and interpret informatiom to describe that synthetic materials come from natural resources and impact society.
- Develop a model that predicts and describes changes in particle motion, temperaturess, and state of a pure substance when thermal energy is added or removed.
- Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and that the total mass is conserved.
- Undertake a design project to construct, test, and modify a device that releases or absorbs thermal energy by chemical processes.

New Jersey Student Learning Standards (NJSLS-S)

6-8.MS-PS1-5	Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
6-8.MS-PS1-6	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
6-8.MS-PS1-1	Develop models to describe the atomic composition of simple molecules and extended

	structures.
6-8.MS-PS1-4	Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
6-8.MS-PS1-2	Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
6-8.MS-PS1-3	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
6-8.MS-PS1-2.1.1	students recognize that macroscopic patterns are related to the nature of microscopic and atomic-level structure. They identify patterns in rates of change and other numerical relationships that provide information about natural and human designed systems. They use patterns to identify cause and effect relationships, and use graphs and charts to identify patterns in data.
6-8.MS-PS1-4.2.1	Cause and effect relationships may be used to predict phenomena in natural or designed systems.
6-8.MS-PS1-1.2.1	Develop a model to predict and/or describe phenomena.
6-8.MS-PS1-5.2.1	Develop a model to describe unobservable mechanisms.
6-8.MS-PS1-4.2.1	Develop a model to predict and/or describe phenomena.
6-8.MS-PS1-1.3.1	students observe time, space, and energy phenomena at various scales using models to study systems that are too large or too small. They understand phenomena observed at one scale may not be observable at another scale, and the function of natural and designed systems may change with scale. They use proportional relationships (e.g., speed as the ratio of distance traveled to time taken) to gather information about the magnitude of properties and processes. They represent scientific relationships through the use of algebraic expressions and equations.
6-8.MS-PS1-2.4.1	Analyze and interpret data to determine similarities and differences in findings.
6-8.MS-PS1-5.5.1	students learn matter is conserved because atoms are conserved in physical and chemical processes. They also learn within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter. Energy may take different forms (e.g., energy in fields, thermal energy, energy of motion). The transfer of energy can be tracked as energy flows through a designed or natural system.
6-8.MS-PS1-3.6.1	Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.
6-8.MS-PS1-6.6.1	Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.
6-8.MS-PS1-3.8.1	Gather, read, and synthesize information from multiple appropriate sources and assess the credibility, accuracy, and possible bias of each publication and methods used, and describe how they are supported or not supported by evidence.
6-8.MS-PS1-2.PS1.A.1	Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
6-8.MS-PS1-1.PS1.A.1	Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms.
6-8.MS-PS1-4.PS1.A.1	Gases and liquids are made of molecules or inert atoms that are moving about relative to each other.
6-8.MS-PS1-1.PS1.A.2	Solids may be formed from molecules, or they may be extended structures with repeating subunits (e.g., crystals).
6-8.MS-PS1-4.PS1.A.2	In a liquid, the molecules are constantly in contact with others; in a gas, they are widely spaced except when they happen to collide. In a solid, atoms are closely spaced and may vibrate in position but do not change relative locations.
6-8.MS-PS1-4.PS1.A.3	The changes of state that occur with variations in temperature or pressure can be

	described and predicted using these models of matter.
6-8.MS-PS1-2.PS1.B.1	Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.
6-8.MS-PS1-6.PS1.B.1	Some chemical reactions release energy, others store energy.
6-8.MS-PS1-5.PS1.B.1	Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.
6-8.MS-PS1-3.PS1.B.1	Substances react chemically in characteristic ways. In a chemical process, the atoms that make up the original substances are regrouped into different molecules, and these new substances have different properties from those of the reactants.
6-8.MS-PS1-5.PS1.B.2	The total number of each type of atom is conserved, and thus the mass does not change.
6-8.MS-PS1-4.PS3.A.1	The term “heat” as used in everyday language refers both to thermal energy (the motion of atoms or molecules within a substance) and the transfer of that thermal energy from one object to another. In science, heat is used only for this second meaning; it refers to the energy transferred due to the temperature difference between two objects.
6-8.MS-PS1-4.PS3.A.2	The temperature of a system is proportional to the average internal kinetic energy and potential energy per atom or molecule (whichever is the appropriate building block for the system’s material). The details of that relationship depend on the type of atom or molecule and the interactions among the atoms in the material. Temperature is not a direct measure of a system's total thermal energy. The total thermal energy (sometimes called the total internal energy) of a system depends jointly on the temperature, the total number of atoms in the system, and the state of the material.
6-8.MS-PS1-6.ETS1.B.1	A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.
6-8.MS-PS1-6.ETS1.C.1	Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of the characteristics may be incorporated into the new design.
6-8.MS-PS1-6.ETS1.C.2	The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution.

Interdisciplinary Connections

LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RST.6-8.2	Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
LA.RST.6-8.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.
LA.RST.6-8.5	Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.
LA.RST.6-8.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version

	of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
LA.RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.
LA.RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
LA.RST.6-8.10	By the end of grade 8, read and comprehend science/technical texts in the grades 6-8 text complexity band independently and proficiently.
LA.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
LA.WHST.6-8.3	(See note; not applicable as a separate requirement)
LA.WHST.6-8.4	Produce clear and coherent writing in which the development, organization, voice, and style are appropriate to task, purpose, and audience.
LA.WHST.6-8.5	With some guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on how well purpose and audience have been addressed.
LA.WHST.6-8.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
LA.WHST.6-8.7	Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration.
LA.WHST.6-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation.
LA.WHST.6-8.9	Draw evidence from informational texts to support analysis, reflection, and research.
LA.WHST.6-8.10	Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Learning Objectives

- Explain the behavior of a substances by the physical and chemical properties of its matter.
- Discuss the relationship between atoms and elements.
- Design models of simple atoms, simple molecules and extended structures.
- Model three states of matter to show how they differ in physical characteristics, particle motion, and kinetic energy.
- Develop models that show how the state of a pure substance can change with a change in thermal energy or pressure.
- Evaluate the loss of thermal energy from samples of matter.
- Analyze the properties of substances before and after they interact to determine whether or not a chemical reaction has occurred.
- Model chemical reactions to show the rearrangement of atoms and to demonstrate the conservation of matter.
- Design a device that uses a chemical process to transfer thermal energy.
- Explain how how the chemical and physical properties of synthetic materials are designed for their uses.
- Gather and synthesize information on how synthetic materials impact society.

Suggested Activities

From HMH Curriculum Activities:

- Engage: Lesson Phenomenons
- Explore/Explain: Hands on Labs and Engineer It
- Unit Projects
- Unit Performance Tasks

From Defined Stem:

- Performance Tasks
- Literacy Tasks
- Constructed Response

Evidence of Student Learning - Checking for Understanding (CFU)

- Admit Tickets
- Anticipation Guide
- Common benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Newspaper Headline

- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit tests

Primary Resources & Materials

HMH Module J Workbook

Laboratory Kits and Materials

Defined Stem

BrainPop

Ancillary Resources

Guest Speakers

Other Internet sources

Outdoor area of school

Laptop Carts for further research

Technology Infusion

- Smart board
- DefinedStem.com
- Document Camera
- Pod-casts video streams
- Discovery Education video streams
- You Tube video streams
- Brain-pop video streams

- Laptops
- Khan Academy
- Power Point presentation
- MS Word

Alignment to 21st Century Skills & Technology

These skills will be aligned to the following core content areas:

- English Language Arts; reading informational text, following procedural steps, orally presenting predictions and opinions, and creating written laboratory reports
- Mathematics; measuring
- Science and Scientific Inquiry (Next Generation); see above
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics; hisitory of science and how the Scientific method has connections to World and American history expansion. Discuss the inpactof scence on society and what kind of moral questions scientists must address.
- World languages; discussion of root words and linguistic origin of vocabulary words.
- Technology; see above
- Visual and Performing Arts: oral and graphic presentation of procedures, results, and conclusion.

21st Century/Interdisciplinary Themes

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

21st Century Skills

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills

- Media Literacy

Differentiation

Upon completion of this section, please remove all remaining descriptions, notes, outlines, examples and/or illustrations that are not needed or used.

Effective educational **Differentiation** in a lesson lies within content, process, and/or product.

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Token economy
- Study guides
- Teacher reads assessments allowed
- Scheduled breaks
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Story guides
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Large print edition
- Dictation to scribe
- Small group setting

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Choice boards
- Games and tournaments
- Group investigations
- Guided Reading

- Independent research and projects
- Interest groups
- Learning contracts
- Leveled rubrics
- Literature circles
- Multiple intelligence options
- Multiple texts
- Personal agendas
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
- Varying organizers for instructions

Lo-Prep Differentiations

- Choice of books or activities
- Cubing activities
- Exploration by interest
- Flexible grouping
- Goal setting with students
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Reading buddies
- Varied journal prompts
- Varied supplemental materials

Intervention Strategies

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes

- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

Special Education Learning

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multiple test sessions
- multi-sensory presentation
- preferential seating
- preview of content, concepts, and vocabulary
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarif
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of workpresented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- Provide native laguage translation when possible
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

Sample Lesson

Unit Name: Chemistry

CCSS/NJCCCS: See link

Interdisciplinary Connection: see link

Statement of Objective: SWDAT create a model of atoms out of marshmallows.

Anticipatory Set/Do Now: Hot seat

Learning Activity:
1. Do Now
2. SW follow along as directions for the lab are explained
3. SW will work with their science partners to construct atoms for two common elements out of marshmallows. SW then turn those atoms into ions and isoptopes. Then they can eat them! :)
4. SW complete Atomic Model W.S. (see attached)
5. Closure - self assessment, teacher prepared rubric.

Student Assessment/CFU's: Atom model, Atomic Model W.S., Think Pair Share. Fist to Five

Materials: Bag of Large Marshmallows, Bag of Small Marshmallows, tooth picks, food coloring pens, paper plates, self assessment rubric.

21st Century Themes and Skills: Communicatuion and Collaboration, Creativity and Innovation, Critial Thinking and Problem Solving

Differentiation: small group activity, group investigation, read and restate directions, pair oral and visual instructions, use of manipulatives

Integration of Technology: Smartboard

MA.6.NS.C.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
LA.RST.6-8.7	Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
LA.RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.
MA.6.NS.C.7b	Write, interpret, and explain statements of order for rational numbers in real-world contexts.
LA.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
6-8.MS-PS1-1	Develop models to describe the atomic composition of simple molecules and extended structures.
6-8.MS-PS1-2.1.1	students recognize that macroscopic patterns are related to the nature of microscopic and atomic-level structure. They identify patterns in rates of change and other numerical relationships that provide information about natural and human designed systems. They use patterns to identify cause and effect relationships, and use graphs and charts to identify patterns in data.
6-8.MS-PS1-1.2	Modeling in 6–8 builds on K–5 and progresses to developing, using and revising models to describe, test, and predict more abstract phenomena and design systems.
6-8.MS-PS1-1.2.1	Develop a model to predict and/or describe phenomena.
6-8.MS-PS1-1.PS1.A.1	Substances are made from different types of atoms, which combine with one another in various ways. Atoms form molecules that range in size from two to thousands of atoms.
6-8.MS-PS1-2.PS1.A.1	Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.