Unit 2 Chemistry

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Belleville Public Schools

Curriculum Guide

PHYSICAL SCIENCE, 6th GRADE

CHEMISTRY

Belleville Board of 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.
- Substances react characteristically in chemical process regrouping the reactants into new produces, each with different properties.
- Chemical reactions either give off or store energy.
- The total mass of the reactants will alawys 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.

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?
- How does matter undergo changes?
- How do we use chemical equations?
- How are mixtures 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?
- 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.
- 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)

SCI.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.
SCI.MS	Structure and Properties of Matter
SCI.6-8.MS-PS1-2.1.1	Macroscopic patterns are related to the nature of microscopic and atomic-level structure.
SCI.MS-PS1-6	Undertake a design project to construct, test, and modify a device that either releases or

	absorbs thermal energy by chemical processes.
SCI.MS-PS1-3	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
SCI.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.
SCI.MS-PS1	Matter and Its Interactions
SCI.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.
SCI.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.
SCI.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.
SCI.MS-PS1-3	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
SCI.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.
SCI.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.
SCI.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.
SCI.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.
SCI.6-8.MS-PS1-1.3.1	Time, space, and energy phenomena can be observed at various scales using models to study systems that are too large or too small.
SCI.6-8.MS-PS1-3.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.
SCI.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.
SCI.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.
SCI.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.
SCI.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.
SCI.MS-PS1-6	Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.
SCI.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.
SCI.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.

SCI.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.
SCI.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).
SCI.6-8.MS-PS1-5.2	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.
SCI.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.
SCI.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.
SCI.MS-PS1-1	Develop models to describe the atomic composition of simple molecules and extended structures.
SCI.6-8.MS-PS1-2.4.1	Analyze and interpret data to determine similarities and differences in findings.
SCI.6-8.MS-PS1-4.2.1	Cause and effect relationships may be used to predict phenomena in natural or designed systems.
SCI.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.
SCI.6-8.MS-PS1-4.2.1	Develop a model to predict and/or describe phenomena.

Interdisciplinary Connections

MA.6.6.G.A	Solve real-world and mathematical problems involving area, surface area, and volume.
LA.6-8.WHST.6-8.1	Write arguments focused on discipline-specific content.
LA.6-8.WHST.6-8.1.A	Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.
LA.6-8.WHST.6-8.1.B	Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.
LA.6-8.WHST.6-8.1.C	Use words, phrases, and clauses to create cohesion and clarify the relationships among claim(s), counterclaims, reasons, and evidence.
LA.6-8.WHST.6-8.1.D	Establish and maintain a formal/academic style, approach, and form.
LA.6-8.WHST.6-8.1.E	Provide a concluding statement or section that follows from and supports the argument presented.
LA.6-8.WHST.6-8.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.
MA.6.6.EE.C	Represent and analyze quantitative relationships between dependent and independent variables.
LA.6-8.WHST.6-8.2.A	Introduce a topic and organize ideas, concepts, and information using text structures (e.g. definition, classification, comparison/contrast, cause/effect, etc.) and text features (e.g. headings, graphics, and multimedia) when useful to aiding comprehension.
LA.6-8.WHST.6-8.2.B	Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.
LA.6-8.WHST.6-8.2.C	Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

LA.6-8.WHST.6-8.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
LA.6-8.WHST.6-8.2.E	Establish and maintain a formal/academic style, approach, and form.
MA.6.6.EE.A.2a	Write expressions that record operations with numbers and with letters standing for numbers.
LA.6-8.WHST.6-8.2.F	Provide a concluding statement or section that follows from and supports the information or explanation presented.
MA.6.6.SP.A	Develop understanding of statistical variability.
MA.6.6.RP.A.3a	Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
MA.6.6.EE.A.2b	Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.
MA.6.6.RP.A.3b	Solve unit rate problems including those involving unit pricing and constant speed.
LA.6-8.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
MA.6.6.EE.A.2c	Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).
LA.6-8.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.6-8.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
MA.6.6.RP.A.3c	Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
MA.6.6.NS.C.6a	Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite.
MA.6.6.RP.A.3d	Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
MA.6.6.NS.C.6b	Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.
LA.6-8.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.
MA.6.6.NS.C.6c	Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.
LA.6-8.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.6-8.RST.6-8.6	Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.
MA.6.6.SP.B	Summarize and describe distributions.
LA.6-8.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.6-8.RST.6-8.8	Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

LA.6-8.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.
MA.6.6.RP.A	Understand ratio concepts and use ratio reasoning to solve problems.
LA.6-8.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.6-8.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.
MA.6.6.SP.B.5a	Reporting the number of observations.
MA.6.6.EE.B	Reason about and solve one-variable equations and inequalities.
MA.6.6.SP.B.5b	Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.

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
- Compare & Contrast
- Create a Multimedia Poster
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets
- Explaining
- Fist- to-Five or Thumb-Ometer
- Human Bar Graph
- 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

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 - Science Dollars

- Guided Notes
- Teacher reads assessments allowed
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Dictation to scribe

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Multiple texts
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
-

Lo-Prep Differentiations

- Exploration by interest
- Flexible grouping
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Varied journal prompts
- Correcting summative and formative assessments
- Retaking the test

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 translated versions of study guides and assessments whenever 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

Lesson: Wiil It Float, measuring volume and desnity

NGSS or NJSLS:See attached

Interdisciplinary Connection:Math- Reason abstractly and quantitatively, Model with mathmatics, use ratio and reason.

ELA- Integrate quantitative or technical information expressed in words in text and visual model. (graph, flow chart, table)

Statement of Objective: SWDAT predict the buoyancy of different different, based on their density.

Anticipatory Set/Do Now: SW read over lab instructions and answer pre- lab questions. TW explain how substances that are less dense will float on substances that are more dense. Density is determined dividing the mass of an object by it's volume or *d=m/v.*

Learning Activity:

1. Do Now
2. Anticipatory Set
3. SW follow along as teacher explains directions for the Will It Float lab. Teacher will ask two students to repeat the directions.
4. Teacher will model how to calculate density by caalcutaing 100 ml of water.
5. SW be grouped into pre-assigned homogenuous groups to collaborate in calculating the density of cubes of different materials. They will then predict whether each will float or not. Then they will place the cube in water and observe results. All data including predictions and results will be recorded in a data table.
6. Clossure/CFU completed lab report

Student Assessment/CFU's:

Materials: Plastic cups, 5 sets of Density cubes, Teacher prepared Will It Float Lab W.S. (see attached), electric balances.

21st Century Themes and Skills: Creativity and IInovaction, Critical Thinking and Problem Solving, Information Literacy, Life and Career Skills, Communication and Collaboration.

Differentiation/Modifications: homogenous groupings based on pre-assessment, hands on inquiry, highlight inportant vocabulary terms, translation for ELL's
repeat directions as eeded, modified expectations for task completion

Integration of Technology: Smartboard, digital balances.

SCI.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.
SCI.6-8.1	Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.
SCI.6-8.2	Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.
SCI.6-8.3	Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.
SCI.6-8.4	Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.
SCI.6-8.5	Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.
SCI.6-8.6	Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.
SCI.6-8.7	Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).
SCI.6-8.8	Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences

	and progresses to evaluating the merit and validity of ideas and methods.
SCI.MS-PS1	Matter and Its Interactions