

Unit 1: Introduction to Chemistry

Content Area: **Science**
Course(s):
Time Period: **Full Year**
Length: **7 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

Science and engineering—significant parts of human culture that represent some of the pinnacles of human achievement—are not only major intellectual enterprises but also can improve people’s lives in fundamental ways. Although the intrinsic beauty of science and a fascination with how the world works have driven exploration and discovery for centuries, many of the challenges that face humanity now and in the future—related, for example, to the environment, energy, and health—require social, political, and economic solutions that must be informed deeply by knowledge of the underlying science and engineering.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Learning Set 1: How Can I Make New Stuff from Old Stuff? How is Stuff the Same and Different? How can one explain the structure, properties, and interactions of matter? How Can I Make New Substances? How do particles combine to form the variety of matter one observes? Do New Substances Always Come from Old Substances? How do substances combine or change (react) to make new substances? How does one characterize and explain these reactions and make predictions about them?

Learning Set 2: How Can I Make New Stuff from Old Stuff? How Can I Make New Substances? What Determines How Fast or High an Object Will Go? How can one explain the structure, properties, and interactions of matter? How do particles combine to form the variety of matter one observes? Why Do Some Things Stop? Why Do Some Things Keep Going? How do substances combine or change (react) to make new substances? How does one characterize and explain these reactions and make predictions about them? What is energy?

Learning Set 3: How Can I Make New Stuff from Old Stuff? Do New Substances Always Come from Old Substances? How can one explain the structure, properties, and interactions of matter? How do particles combine to form the variety of matter one observes? How do substances combine or change (react) to make new substances? How does one characterize and explain these reactions and make predictions about them? What is energy?

CONTENT AREA STANDARDS

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-PS1-4

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-PS1-3

Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
LA.RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts.
LA.RST.6-8.3	Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.
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.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.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.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.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.WHST.6-8.2.D	Use precise language and domain-specific vocabulary to inform about or explain the topic.
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.6-8.6	Use technology, including the Internet, to produce and publish writing and present the relationships between information and ideas clearly and efficiently.
LA.WHST.6-8.9	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.
TECH.9.4.8.CT.1	Evaluate diverse solutions proposed by a variety of individuals, organizations, and/or agencies to a local or global problem, such as climate change, and use critical thinking skills to predict which one(s) are likely to be effective (e.g., MS-ETS1-2).
TECH.9.4.8.CT.2	Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option (e.g., MS-ETS1-4, 6.1.8.CivicsDP.1).
TECH.9.4.8.CT.3	Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
- 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.
- Each pure substance has characteristic physical and chemical properties (for any bulk quantity under given conditions) that can be used to identify it.
- Gases and liquids are made of molecules or inert atoms that are moving about relative to each other.
- 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.
- The changes of state that occur with variations in temperature or pressure can be described and predicted using these models of matter.
- 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.
- 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.
- 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.

Procedural Knowledge

Students will be able to:

- Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
- Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
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- 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.
- Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
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- 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.

EVIDENCE OF LEARNING

Formative Assessments

MS-PS1-2: Introduction to Chemistry 1: Activity 7.1: gases All Look the Same to Me, Reading 7.1: How Can I Tell Whether Things that Look the Same Really Are the Same?, Reading 7.2: Detectors Work Because of Properties, Activity 8.1: Investigating Elements, Reading 8.2: Why Do Properties of Materials Matter?

MS-PS1-3: Introduction to Chemistry 1: Homework 7.1: When Are Properties Useful to Me?

MS-PS1-4:

Introduction to Chemistry 1: Activity 1.2: Developing an Initial Model, Activity 2.1: Can Something Have Mass Even if I Cannot Feel It?, Reading 2.1: Can Something Have Mass Even if I Cannot Feel It?, Activity 2.2: Measuring Volume, Activity 2.3: What Happens to My Lungs When I Breathe in Air?, Reading 2.3: What Happens to My Lungs When I Breathe in Air?, Homework 2.3: Mass and Volume, Activity 3.1: Investigating Matter, Reading 3.1: Three Forms of Matter: Solid, Liquid, Gas, Homework 3.1: Classifying Forms of Matter, Activity 3.2: Why Does Water Have many Names?, Reading 3.2: What Needs to Happen to a Material so that I Can Smell It?, Activity 4.1: How Can I Model the Things Gases Do?, Reading 4.1: How Can I Model the Things Gases Do?, Activity 5.1: What Else Can Gases Do?, Reading 5.1: How Can I Model the Things Gases Do?, Activity 5.2: Developing Models, Activity 5.3: Developing and Using a Consensus Model, Activity 6.1: Comparing Two Clear Liquids, Activity 6.2: How Does the Odor Get to My Nose?, Activity 9.2: Summarizing the Idea "Odors in the Air", Activity 11.1: How Can I Make Molecules Move Faster?, Reading 11.1: How Can I Make Particles Move Faster?, Activity 11.2: How Else Can I Model Odor Moving?, Activity 12.1: What Happens When Gases Are Cooled and Heated?, Reading 12.1: How Can the Volume of a Balloon Change Without Removing or Adding Air?, Activity 12.2: A Physical Model of Heating and Cooling a Gas, Activity 13.1: What Happens to Bromine as It Is Cooled or Heated?, Reading 13.1: How Do Substances Become part of the Air?, Activity 13.2: Modeling the Bromine Tube, Activity 13.3: What Happens When Water Boils?, Activity 13.4, Where Did the Water Come From?, Reading 13.4: Where Do Drops of Water Come From?, Activity 14.1: What Happens to molecules of a Liquid at Higher Temperatures?, Reading 14.1: How Do Odor Molecules Move?, Activity 14.2: Which Liquid Moves Faster?, Reading 14.2: How Does an Oven Make Hot Chocolate Hot?, Homework 14.2: What Happens When Ice Melts?, Activity 15.1: What Happens to the Molecules as a Solid Melts?, Reading 15.1: What Happens to Molecules When a Substance Melts?, Activity 15.2: Does Menthol Have to Melt Before I Smell It?, Reading 15.2:

How Can I Smell Something that Is Solid?, Reading 16.1: Summarizing This Unit: What Have I Learned about Matter?, Activity 16.2: what Else Can My Model Explain?

Summative Assessments

- Benchmark Assessments
 - Multiple Choice Assessment administered at the end of each marking period.

Alternative Assessments

- Oral Presentations
- Questions for Comprehension
- Performance Tasks
- Scientific Journals/Notebooks
- Self-Assessment
- WebQuests

RESOURCES (Instructional, Supplemental, Intervention Materials)

IQWST Unit Materials for Introduction to Chemistry 1: Learning Set 1-3

A Framework For K-12 Science Education

Online Resources provided by IQWST not included in the program (to be used as support/reinforcement/enrichment): https://docs.google.com/spreadsheets/d/1VpyFCL4_50_-1w2NhcGpdNNZ2jj6aJJegeIUNCy_uzQ/pubhtml

INTERDISCIPLINARY CONNECTIONS

Collaboration with Math and Language Arts teachers is an essential part of the IQWST curriculum.

Information Writing

Current Events

Topography

Data Collection/ Analysis

Computations

Statistics

Engineering

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.

IQWST provides audio recording for all readings in student workbook-available through teacher portal online

Reading differentiation strategies are embedded in the IQWST program and all students prepare for reading through a 'Getting Reading' section which begins each reading.

The sections are designed to engage students, generate interest, activate prior knowledge and provide a purpose for reading. Teachers use advance organizers for desired readings and to encourage students to plan and annotate the passages.

A word wall is developed through vocabulary acquisition in the program. Students develop the word wall as words are learned in context and through experience in class. This helps to build meaning and understanding which support students when reading text.

Students are encouraged to ask questions and post them to the Driving Question Board. This DQB helps students develop a greater level of understanding and encourages students to work together to solve problems in and outside of class.

Support will be provided to students when writing in the student manual and use of the computer, printing, and pasting into the manual is acceptable if there is a present need.