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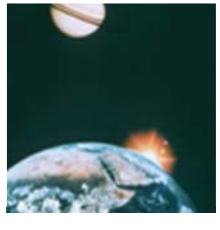
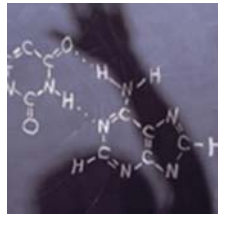
Chemistry

STAAR Field Guide

STAAR

The State of Texas of Assessment of Academic Readiness (STAAR) is based on the Texas Essential Knowledge and Skills (TEKS). Most of the state standards, if they are eligible for assessment in a multiple choice/short answer format, will be assessed on STAAR.

STAAR is designed as a vertical system. Just as the TEKS are structured in a vertically aligned manner, so is STAAR. Learning from one grade level is aligned with learning at the next grade level. Some skills are developed over the course of a student's educational career from kindergarten through high school, while other skills and learning may begin at a particular grade level and serve as the foundation for later learning. STAAR is an assessment of academic readiness. In other words, we can sum up the variation between the current assessment program (TAKS) and STAAR by reframing the questions we are asking.

TAKS: TAKS was designed to help teachers answer this question:
- Did students learn what they were supposed to learn in the current year's grade?

STAAR: STAAR is designed to ensure that teachers answer these questions:
- Did students learn what they were supposed to learn in the current year's grade?
- Are students ready for the next grade?
- And are they also ready for the grade after that?

So what's the big deal about that shift? Fundamentally, it requires that teachers relook at curriculum and instruction in a very different way than they have under previous assessment systems (TABS, TEAMS, TAAS, TAKS). Not only are teachers required to have a deep understanding of the content of the grade level they are teaching, but they must also be firmly grounded in how the content of that current grade level prepares students for subsequent grade levels. Overemphasis on grade level attainment ONLY may create a context where teachers in subsequent grade levels have to reteach foundational skills to accommodate for the gap created by the lack of appropriate emphasis earlier. It may require students "unlearn" previous ways of conceptualizing content and essentially start all over.

STAAR: focus, clarity, depth

[The TEKS] are designed to prepare students to succeed in college, in careers and to compete globally. However, consistent with a growing national consensus regarding the need to provide a more clearly articulated K–16 education program that focuses on fewer skills and addresses those skills in a deeper manner (TEA).

STAAR is designed around three concepts: focus, clarity, and depth:

Focus: STAAR will focus on grade level standards that are critical for that grade level and the ones to follow.

Clarity: STAAR will assess the eligible TEKS at a level of specificity that allow students to demonstrate mastery.

Depth: STAAR will assess the eligible TEKS at a higher cognitive level and in novel contexts.

STAAR: the assessed curriculum – readiness, supporting, and process standards

A key concept that underpins the design of STAAR is that all standards (TEKS) do not play the same role in student learning. Simply stated, some standards (TEKS) have greater priority than others – they are so vital to the current grade level or content area that they must be learned to a level of mastery to ensure readiness (success) in the next grade levels. Other standards are important in helping to support learning, to maintain a previously learned standard, or to prepare students for a more complex standard taught at a later grade.

By assessing the TEKS that are most critical to the content area in a more rigorous ways, STAAR will better measure the academic performance of students as they progress from elementary to middle to high school. Based on educator committee recommendations, for each grade level or course, TEA has identified a set of readiness standards - the TEKS which help students develop deep and enduring understanding of the concepts in each content area. The remaining knowledge and skills are considered supporting standards and will be assessed less frequently, but still play a very important role in learning.

Readiness standards have the following characteristics:

- They are essential for success in the current grade or course.
- They are important for preparedness for the next grade or course.
- They support college and career readiness.
- They necessitate in-depth instruction.
- They address broad and deep ideas.

Supporting standards have the following characteristics:

- Although introduced in the current grade or course, they may be emphasized in a subsequent year.
- Although reinforced in the current grade or course, they may be emphasized in a previous year.
- They play a role in preparing students for the next grade or course but not a central role.
- They address more narrowly defined ideas.

STAAR assesses the eligible TEKS at the level at which the TEKS were written.

STAAR is a more rigorous assessment than TAKS (and TAAS, TEAMS, TABS before that). The level of rigor is connected with the cognitive level identified in the TEKS themselves. Simply stated, STAAR will measure the eligible TEKS at the level at which they are written.

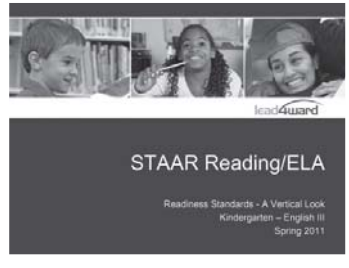
The rigor of items will be increased by
- assessing content and skills at a greater depth and higher level of cognitive complexity
- assessing more than one student expectation in a test item

The rigor of the tests will be increased by
- assessing fewer, yet more focused student expectations and assessing them multiple times and in more complex ways
- including a greater number of rigorous items on the test, thereby increasing the overall test difficulty

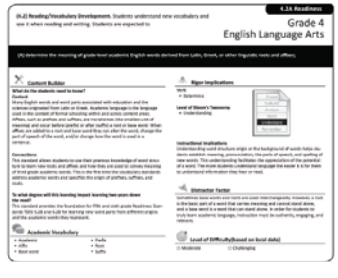
About the STAAR Field Guide

The STAAR Field Guide for Teachers is designed as a tool to help teachers prepare for instruction. The tools and resources in this guide are designed to supplement local curriculum documents by helping teachers understand how the design and components of STAAR are connected to the scope and sequence of instruction. In order to help students attain even higher levels of learning as assessed on STAAR, teachers need to plan for increasing levels of rigor. This guide contains the following components:

STAAR Grade Level Snapshot – one page overview of the standards assessed on STAAR, how those standards are classified (readiness, supporting, or process), the reporting categories around which those standards are clustered, and the number of items that will be on the test from each reporting category and from each type of standard.



STAAR Readiness Standards: A Vertical Look – a vertical look at the readiness standards in grade bands to show the progression of the assessment between grade levels



STAAR Readiness and Supporting Standards Analysis Sheets– overviews of the nature of each readiness and supporting standard assessed on STAAR, designed to be used in planning to build teacher content knowledge and ensure that current grade level instruction reinforces previous learning and prepares students for future grade levels.

STAAR-Curriculum Planning Worksheet – a tool to organize the pages in this guide to be used in planning and professional development

Steps to Success

1. Download the TEA Documents to add to your STAAR Teacher Field Guide
   - STAAR Blueprint
   - Assessed Curriculum Documents
   - STAAR Test Design
   - STAAR Reference Materials

2. Review the STAAR Snapshot for your course/grade level and content area
   - Note the readiness standards
   - With your team, explore why those TEKS are classified as readiness standards – which criteria do they meet
   - Review the supporting standards and note any that may have played a larger role on TAKS

3. Review the STAAR Readiness Standards: A Vertical Look
   - Discuss how the readiness standards connect between grade levels
   - Explore the specific differences between the aligned readiness standards at each grade level

4. Review the components of the STAAR Readiness and Supporting Standards Analysis Sheets
   - Use the samples on pages 6 and 7 to explore the analysis sheets
   - Add additional information based on the discussion on the team

5. Create STAAR-Curriculum Planning Packets for each unit or grading period
   - Collect either the Scope and Sequence document (if it includes the TEKS standards for each unit of instruction) OR Unit Plan documents (where the TEKS standards are bundled together into units of instruction)
   - The STAAR Field Guide is arranged by standard type (readiness or supporting) in numeric order of the standards. You may need to photocopy certain pages/standards if they are repeated throughout multiple units.
   - Use the scope and sequence or unit plan documents to identify the TEKS taught in each unit/grading period
   - Compile the STAAR Readiness and Supporting Standards Analysis Sheets that correspond to the TEKS each unit/grading period
   - After the pages/standards are sorted into their appropriate unit, create a method of organizing the documents (binder, folder, file, etc).

6. Plan for instruction
   - Collect the curriculum documents used for planning
   - Use the STAAR- Curriculum Planning Worksheet as you plan each unit. The worksheet provides guiding questions and reflection opportunities to aide you in maximizing the material in the STAAR Field Guide.
   - Determine where the team needs additional learning
   - Evaluate instructional materials
   - Review the plan for appropriate levels of rigor

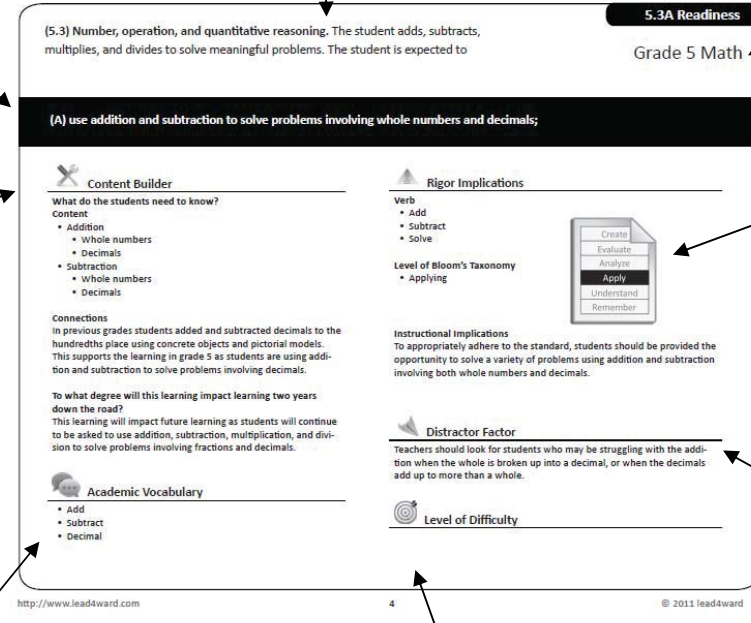
How to read
STAAR Readiness Standards analysis pages

Standard and Indication of "Readiness" or "Supporting"

Texas Essential Knowledge and Skills Statement

Student Expectation

Grade and Subject



Content Builder- The basics of the content within the standard are extracted in a bulleted list. Connections to prior learning/other standards are explained. Future implications of mastery of this standard are described to assist in understanding the impact of this learning in the future.

Rigor Implications- Uses the verb(s) from the Student Expectation to indicate the cognitive complexity of the standard and which level of Bloom's Taxonomy should be addressed during instruction, Instructional implications are also highlighted.

Distractor Factor - Alerts teachers to areas where students traditionally struggle, have misconceptions, or may need reinforcement.

Academic Vocabulary- Vocabulary words are extracted directly from the standard and/or associated with the instruction of the content within the standard.

Level of Difficulty- Standards are labeled either Challenging or Moderate. This determination is made by the campus using previous year data.

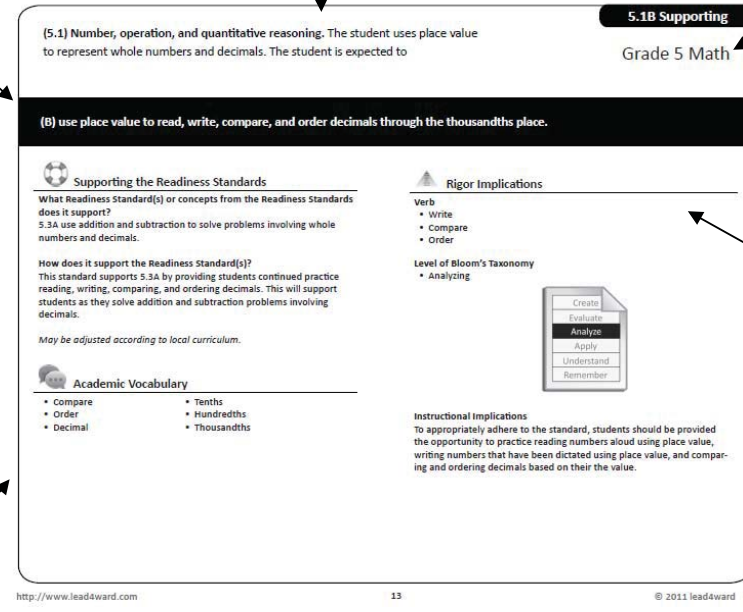
How to read
STAAR Supporting Standards analysis pages

Standard and Indication of "Readiness" or "Supporting"

Texas Essential Knowledge and Skills Statement

Student Expectation

Grade and Subject


5.1B Supporting

(5.1) Number, operation, and quantitative reasoning. The student uses place value to represent whole numbers and decimals. The student is expected to

Grade 5 Math

(B) use place value to read, write, compare, and order decimals through the thousandths place.

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?
5.3A use addition and subtraction to solve problems involving whole numbers and decimals.

How does it support the Readiness Standard(s)?
This standard supports 5.3A by providing students continued practice reading, writing, comparing, and ordering decimals. This will support students as they solve addition and subtraction problems involving decimals.

May be adjusted according to local curriculum.

Academic Vocabulary

- Compare
- Order
- Decimal
- Tenths
- Hundredths
- Thousandths

Rigor Implications

Verb
- Write
- Compare
- Order

Level of Bloom's Taxonomy
- Analyzing

Create
Evaluate
Analyze
Apply
Understand
Remember

Instructional Implications
To appropriately adhere to the standard, students should be provided the opportunity to practice reading numbers aloud using place value, writing numbers that have been dictated using place value, and comparing and ordering decimals based on their the value.

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Supporting the Readiness Standards - Most supporting standards support a readiness standard in the current grade level. This section discusses the relationships of the standards that are often taught together.

Rigor Implications- Uses the verb(s) from the Student Expectation to indicate the cognitive complexity of the standard and which level of Bloom's Taxonomy should be addressed during instruction, Instructional implications are also highlighted.

Academic Vocabulary- Words are extracted directly from the standard and/or associated with the instruction of the content within the standard.

Curriculum – STAAR Planning Worksheet

Course/Grade Level _____

Content Area _____

Grading Period/Unit _____

Readiness Standards	
Supporting Standards	

Action Steps	Guiding Questions & Notes
Read each analysis page.	What stands out? How many of the standards are a "Challenging" level of difficulty? How many of the standards are a high level of rigor (above apply on Bloom's Taxonomy)?
Content Builder (Readiness Standards only)	What other connections could you add to this section? Write them on your analysis pages! This content important for students' future learning. How will you assess retention?
Supporting the Readiness Standards (Supporting Standards only)	How can you use this information as you plan lessons? Do the supporting standards match with the readiness standards in your unit bundle? If not, arrange them according to your curriculum. Address the questions again "Which Readiness Standards does it support? How does it support the Readiness Standard(s)?"

Action Steps	Guiding Questions & Notes
Vocabulary	What strategies will you use to ensure mastery of the vocabulary for each standard in this unit? What is your plan if students do not master the vocabulary?
Use the *Distractor Factor*	How can you address the information in the Distractor Factor section? From your teaching experience, is there anything you would add to this? Write it on your analysis pages!
Reflection	How have you taught this content in the past? How will you teach it differently this year? How will you utilize the readiness and supporting standards for formative and summative assessment?

STAAR Standards Snapshot
Chemistry

Reporting Category	# of Items	Readiness Standards	Supporting Standards
1 Matter and the Periodic Table	12	C.4.A differentiate between physical and chemical changes and properties C.4.D classify matter as pure substances or mixtures through investigation of their properties C.5.B use the Periodic Table to identify and explain the properties of chemical families, including alkali metals, alkaline earth metals, halogens, noble gases, and transition metals C.5.C use the Periodic Table to identify and explain periodic trends, including atomic and ionic radii, electronegativity, and ionization energy	C.4.B identify extensive and intensive properties C.4.C compare solids, liquids, and gases in terms of compressibility, structure, shape, and volume C.5.A explain the use of chemical and physical properties in the historical development of the Periodic Table
2 Atomic Structure and Nuclear Chemistry	9	C.6.E express the arrangement of electrons in atoms through electron configurations and Lewis valence electron dot structures C.12.B describe radioactive decay process in terms of balanced nuclear equations	C.6.A understand the experimental design and conclusions used in the development of modern atomic theory, including Dalton's Postulates, Thomson's discovery of electron properties, Rutherford's nuclear atom, and Bohr's nuclear atom C.6.B understand the electromagnetic spectrum and the mathematical relationships between energy, frequency, and wavelength of light C.6.C calculate the wavelength, frequency, and energy of light using Planck's constant and the speed of light C.6.D use isotopic composition to calculate average atomic mass of an element C.12.A describe the characteristics of alpha, beta, and gamma radiation C.12.C compare fission and fusion reactions
3 Bonding and Chemical Reactions	14	C.7.A name ionic compounds containing main group or transition metals, covalent compounds, acids, and bases, using International Union of Pure and Applied Chemistry (IUPAC) nomenclature rules C.7.B write the chemical formulas of common polyatomic ions, ionic compounds containing main group or transition metals, covalent compounds, acids, and bases C.7.C construct electron dot formulas to illustrate ionic and covalent bonds C.8.B use the mole concept to calculate the number of atoms, ions, or molecules in a sample of material C.8.D use the law of conservation of mass to write and balance chemical equations	C.7.D describe the nature of metallic bonding and apply the theory to explain metallic properties such as thermal and electrical conductivity, malleability, and ductility C.7.E predict molecular structure for molecules with linear, trigonal planar, or tetrahedral electron pair geometries using Valence Shell Electron Pair Repulsion (VSEPR) theory C.8.A define and use the concept of a mole C.8.C calculate percent composition and empirical and molecular formulas C.8.E perform stoichiometric calculations, including determination of mass relationships between reactants and products, calculation of limiting reagents, and percent yield
4 Gases and Thermochemistry	8	C.9.A describe and calculate the relations between volume, pressure, number of moles, and temperature for an ideal gas as described by Boyle's law, Charles' law, Avogadro's law, Dalton's law of partial pressure, and the ideal gas law C.11.C use thermochemical equations to calculate energy changes that occur in chemical reactions and classify reactions as exothermic or endothermic	C.9.B perform stoichiometric calculations, including determination of mass and volume relationships between reactants and products for reactions involving gases C.9.C describe the postulates of kinetic molecular theory C.11.A understand energy and its forms, including kinetic, potential, chemical, and thermal energies C.11.B understand the law of conservation of energy and the processes of heat transfer C.11.D perform calculations involving heat, mass, temperature change, and specific heat C.11.E use calorimetry to calculate the heat of a chemical process
5 Solutions	9	C.10.B develop and use general rules regarding solubility through investigations with aqueous solutions C.10.E distinguish between types of solutions such as electrolytes and nonelectrolytes and unsaturated, saturated, and supersaturated solutions C.10.F investigate factors that influence solubilities and rates of dissolution such as temperature, agitation, and surface area C.10.H understand and differentiate among acid-base reactions, precipitation reactions, and oxidation-reduction reactions	C.10.A describe the unique role of water in chemical and biological systems C.10.C calculate the concentration of solutions in units of molarity C.10.D use molarity to calculate the dilutions of solutions C.10.G define acids and bases and distinguish between Arrhenius and Bronsted-Lowry definitions and predict products in acid-base reactions that form water C.10.I define pH and use the hydrogen or hydroxide ion concentrations to calculate the pH of a solution C.10.J distinguish between degrees of dissociation for strong and weak acids and bases
Total Items	**52 (47 MC & 5 Grid)**	**31-34 test questions from Readiness Standards**	**18-21 test questions from Supporting Standards**

Chemistry

Scientific Process Skils			
Scientific Process Skills	≥ 40% of Items will be dual coded ≈ 21 items will be dual coded	C.1.A	demonstrate safe practices during laboratory and field investigations, including the appropriate use of safety showers, eyewash fountains, safety goggles, and fire extinguishers
		C.1.B	know specific hazards of chemical substances such as flammability, corrosiveness, and radioactivity as summarized on the Material Safety Data Sheets (MSDS)
		C.1.C	demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials
		C.2.A	know the definition of science and understand that it has limitations, as specified in chapter 112.35, subsection (b)(2) of 19 TAC
		C.2.B	know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories
		C.2.C	know that scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but may be subject to change as new areas of science and new technologies are developed;
		C.2.D	distinguish between scientific hypotheses and scientific theories
		C.2.E	plan and implement investigative procedures, including asking questions, formulating testable hypotheses, and selecting equipment and technology, including graphing calculators, computers and probes, sufficient scientific glassware such as beakers, Erlenmeyer flasks, pipettes, graduated cylinders, volumetric flasks, safety goggles, and burettes, electronic balances, and an adequate supply of consumable chemicals
		C.2.F	collect data and make measurements with accuracy and precision
		C.2.G	express and manipulate chemical quantities using scientific conventions and mathematical procedures, including dimensional analysis, scientific notation, and significant figures
		C.2.H	organize, analyze, evaluate, make inferences, and predict trends from data
		C.2.I	communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphs, journals, summaries, oral reports, and technology-based reports
		C.3.A	in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student
		C.3.B	communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials
		C.3.C	draw inferences based on data related to promotional materials for products and services
		C.3.D	evaluate the impact of research on scientific thought, society, and the environment
		C.3.E	describe the connection between chemistry and future careers
		C.3.F	research and describe the history of chemistry and contributions of scientists

Science STAAR Readiness Standards - A Side-by-Side Look (High School)

REVISED 02.23.11

Reporting Category	Biology Readiness Standards	
1 Cell Structure and Function	B.4.B	investigate and explain cellular processes, including homeostasis, energy conversions, transport of molecules, and synthesis of new molecules
	B.4.C	compare the structures of viruses to cells, describe viral reproduction, and describe the role of viruses in causing diseases such as human immunodeficiency virus (HIV) and influenza
	B.5.A	describe the stages of the cell cycle, including deoxyribonucleic acid (DNA) replication and mitosis, and the importance of the cell cycle to the growth of organisms
	B.9.A	compare the structures and functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids
2 Mechanisms of Genetics	B.6.A	identify components of DNA, and describe how information for specifying the traits of an organism is carried in the DNA
	B.6.E	identify and illustrate changes in DNA and evaluate the significance of these changes
	B.6.F	predict possible outcomes of various genetic combinations such as monohybrid crosses, dihybrid crosses and non-Mendelian inheritance
3 Biological Evolution and Classification	B.7.A	analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies, including anatomical, molecular, and developmental
	B.7.E	analyze and evaluate the relationship of natural selection to adaptation and to the development of diversity in and among species
	B.8.B	categorize organisms using a hierarchical classification system based on similarities and differences shared among groups

Reporting Category	Chemistry Readiness Standards	
1 Matter and the Periodic Table	C.4.A	differentiate between physical and chemical changes and properties
	C.4.D	classify matter as pure substances or mixtures through investigation of their properties
	C.5.B	use the Periodic Table to identify and explain the properties of chemical families, including alkali metals, alkaline earth metals, halogens, noble gases, and transition metals
	C.5.C	use the Periodic Table to identify and explain periodic trends, including atomic and ionic radii, electronegativity, and ionization energy
2 Atomic Structure and Nuclear Chemistry	C.6.E	express the arrangement of electrons in atoms through electron configurations and Lewis valence electron dot structures
	C.12.B	describe radioactive decay process in terms of balanced nuclear equations
3 Bonding and Chemical Reactions	C.7.A	name ionic compounds containing main group or transition metals, covalent compounds, acids, and bases, using International Union of Pure and Applied Chemistry (IUPAC) nomenclature rules
	C.7.B	write the chemical formulas of common polyatomic ions, ionic compounds containing main group or transition metals, covalent compounds, acids
	C.7.C	construct electron dot formulas to illustrate ionic and covalent bonds
	C.8.B	use the mole concept to calculate the number of atoms, ions, or molecules in a sample of material
	C.8.D	use the law of conservation of mass to write and balance chemical equations

Reporting Category	Physics Readiness Standards	
1 Force and Motion	P.4.A	generate and interpret graphs and charts describing different types of motion, including the use of real-time technology such as motion detectors or photogates
	P.4.B	describe and analyze motion in one dimension using equations with the concepts of distance, displacement, speed, average velocity, instantaneous velocity, and acceleration
	P.4.D	calculate the effect of forces on objects, including the law of inertia, the relationship between force and acceleration, and the nature of force pairs between objects
2 Gravitational, Electrical, Magnetic, and Nuclear Forces	P.5.B	describe and calculate how the magnitude of the gravitational force between two objects depends on their masses and the distance between their centers
	P.5.F	design, construct, and calculate in terms of current through, potential difference across, resistance of, and power used by electric circuit elements connected in both series and parallel combinations
3 Momentum and Energy	P.6.A	investigate and calculate quantities using the work-energy theorem in various situations
	P.6.B	investigate examples of kinetic and potential energy and their transformations
	P.6.C	calculate the mechanical energy of, power generated within, impulse applied to, and momentum of a physical system
	P.6.D	demonstrate and apply the laws of conservation of energy and conservation of momentum in one dimension

Science STAAR Readiness Standards - A Side-by-Side Look (High School)

REVISED 02.23.11

Reporting Category	Biology Readiness Standards	
4 Biological Processes and Systems	B.10.A	describe the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals
	B.10.B	describe the interactions that occur among systems that perform the functions of transport, reproduction, and response in plants
5 Interdependence within Environmental Systems	B.11.D	describe how events and processes that occur during ecological succession can change populations and species diversity
	B.12.A	interpret relationships, including predation, parasitism, commensalism, mutualism, and competition among organisms
	B.12.C	analyze the flow of matter and energy through trophic levels using various models, including food chains, food webs, and ecological pyramids
	B.12.F	describe how environmental change can impact ecosystem stability

Reporting Category	Chemistry Readiness Standards	
4 Gases and Thermochemistry	C.9.A	describe and calculate the relations between volume, pressure, number of moles, and temperature for an ideal gas as described by Boyle's law, Charles' law, Avogadro's law, Dalton's law of partial pressure, and the ideal gas law
	C.11.C	use thermochemical equations to calculate energy changes that occur in chemical reactions and classify reactions as exothermic or endothermic
5 Solutions	C.10.B	develop and use general rules regarding solubility through investigations with aqueous solutions
	C.10.E	distinguish between types of solutions such as electrolytes and nonelectrolytes and unsaturated, saturated, and supersaturated solutions
	C.10.F	investigate factors that influence solubilities and rates of dissolution such as temperature, agitation, and surface area
	C.10.H	understand and differentiate among acid-base reactions, precipitation reactions, and oxidation-reduction reactions

Reporting Category	Physics Readiness Standards	
4 Waves and Quantum Phenomena	P.7.B	investigate and analyze characteristics of waves, including velocity, frequency, amplitude, and wavelength, and calculate using the relationship between wavespeed, frequency, and wavelength
	P.7.D	investigate behaviors of waves, including reflection, refraction, diffraction, interference, resonance, and the Doppler effect
	P.8.A	describe the photoelectric effect and the dual nature of light

Science STAAR Readiness Standards - A Side-by-Side Look (High School)

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Biology Scientific Process Skills	
B.1.A	demonstrate safe practices during laboratory and field investigations
B.1.B	demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials
B.2.A	know the definition of science and understand that it has limitations, as specified in chapter 112.34, subsection (b)(2) of 19 TAC
B.2.B	know that hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories
B.2.C	know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but they may be subject to change as new areas of science and new technologies are developed;
B.2.D	distinguish between scientific hypotheses and scientific theories
B.2.E	plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology
B.2.F	collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures
B.2.G	analyze, evaluate, make inferences, and predict trends from data
B.2.H	communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports
B.3.A	in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student
B.3.B	communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials
B.3.C	draw inferences based on data related to promotional materials for products and services
B.3.D	evaluate the impact of scientific research on society and the environment
B.3.E	evaluate models according to their limitations in representing biological objects or events
B.3.F	research and describe the history of biology and contributions of scientists

Chemistry Scientific Process Skills	
C.1.A	demonstrate safe practices during laboratory and field investigations, including the appropriate use of safety showers, eyewash fountains, safety goggles, and fire extinguishers
C.1.B	know specific hazards of chemical substances such as flammability, corrosiveness, and radioactivity as summarized on the Material Safety Data Sheets (MSDS)
C.1.C	demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials
C.2.A	know the definition of science and understand that it has limitations, as specified in chapter 112.35, subsection (b)(2) of 19 TAC
C.2.B	know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories
C.2.C	know that scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but may be subject to change as new areas of science and new technologies are developed;
C.2.D	distinguish between scientific hypotheses and scientific theories
C.2.E	plan and implement investigative procedures, including asking questions, formulating testable hypotheses, and selecting equipment and technology, including graphing calculators, computers and probes, sufficient scientific glassware such as beakers, Erlenmeyer flasks, pipettes, graduated cylinders, volumetric flasks, safety goggles, and burettes, electronic balances, and an adequate supply of consumable chemicals
C.2.F	collect data and make measurements with accuracy and precision
C.2.G	express and manipulate chemical quantities using scientific conventions and mathematical procedures, including dimensional analysis, scientific notation, and significant figures
C.2.H	organize, analyze, evaluate, make inferences, and predict trends from data
C.2.I	communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphs, journals, summaries, oral reports, and technology-based reports
C.3.A	in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student
C.3.B	communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials
C.3.C	draw inferences based on data related to promotional materials for products and services
C.3.D	evaluate the impact of research on scientific thought, society, and the environment
C.3.E	describe the connection between chemistry and future careers
C.3.F	research and describe the history of chemistry and contributions of scientists

Physics Scientific Process Skills	
P.1.A	demonstrate safe practices during laboratory and field investigations
P.1.B	demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials
P.2.A	know the definition of science and understand that it has limitations, as specified in chapter 112.39, subsection (b)(2) of 19 TAC
P.2.B	know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories
P.2.C	know that scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but may be subject to change as new areas of science and new technologies are developed
P.2.D	distinguish between scientific hypotheses and scientific theories
P.2.E	design and implement investigative procedures, including making observations, asking well-defined questions, formulating testable hypotheses, identifying variables, selecting appropriate equipment and technology, and evaluating numerical answers for reasonableness
P.2.F	demonstrate the use of course apparatus, equipment, techniques, and procedures, including multimeters (current, voltage, resistance), triple beam balances, batteries, clamps, dynamics demonstration equipment, collision apparatus, data acquisition probes, discharge tubes with power supply (H, He, Ne, Ar), hand-held visual spectroscopes, hot plates, slotted and hooked lab masses, bar magnets, horseshoe magnets, plane mirrors, convex lenses, pendulum support, power supply, ring clamps, ring stands, stopwatches, trajectory apparatus, tuning forks, carbon paper, graph paper, magnetic compasses, polarized film, prisms, protractors, resistors, friction blocks, mini lamps (bulbs) and sockets, electrostatics kits, 90-degree rod clamps, metric rulers, spring scales, knife blade switches, Celsius thermometers, meter sticks, scientific calculators, graphing technology, computers, cathode ray tubes with horseshoe magnets, ballistic carts or equivalent, resonance tubes, spools of nylon thread or string, containers of iron filings, rolls of white craft paper, copper wire, Periodic Table, electromagnetic spectrum charts, slinky springs, wave motion ropes, and laser pointers
P.2.G	use a wide variety of additional course apparatus, equipment, techniques, materials, and procedures as appropriate such as ripple tank with wave generator, wave motion rope, micrometer, caliper, radiation monitor, computer, ballistic pendulum, electroscope, inclined plane, optics bench, optics kit, pulley with table clamp, resonance tube, ring stand screen, four-inch ring, stroboscope, graduated cylinders, and ticker timer
P.2.H	make measurements with accuracy and precision and record data using scientific notation and International System (SI) units
P.2.I	identify and quantify causes and effects of uncertainties in measured data
P.2.J	organize and evaluate data and make inferences from data, including the use of tables, charts, and graphs
P.2.K	communicate valid conclusions supported by the data through various methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports
P.2.L	express and manipulate relationships among physical variables quantitatively, including the use of graphs, charts, and equations
P.3.A	in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student
P.3.B	communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials
P.3.C	draw inferences based on data related to promotional materials for products and services
P.3.D	explain the impacts of the scientific contributions of a variety of historical and contemporary scientists on scientific thought and society
P.3.E	research and describe the connections between physics and future careers
P.3.F	express and interpret relationships symbolically in accordance with accepted theories to make predictions and solve problems mathematically, including problems requiring proportional reasoning and graphical vector addition

(C.4) Science concepts. The student knows the characteristics of matter and can analyze the relationships between chemical and physical changes and properties. The student is expected to

Chemistry

(A) differentiate between physical and chemical changes and properties;

Content Builder

What do the students need to know?
Content

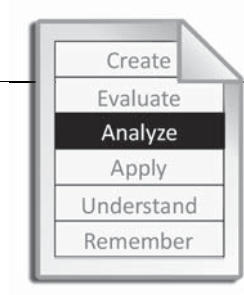
- A physical property is a property of a substance that can be observed. Some are measurable. Examples of physical properties include: mass, volume, texture, malleability, and density.
- A physical change is when a substance changes but no new substance is formed. Examples of physical changes include: changes in the state of matter and changes in the shape of a substance.
- A chemical property relates to the behavior of a substance in a chemical reaction. Examples of chemical properties include: reactivity, conductivity, toxicity, and pH.
- A chemical change has taken place when substances are changed into different substances. Examples of chemical changes include: burning and rusting.
- In 6th grade, students calculate density and test the physical properties of minerals.
- In 6th grade and 8th grade, students are introduced to the evidence of a possible chemical change and that a chemical change means that new substances with different properties are formed. In 7th grade, students looked at chemical and physical changes in the digestive system.
- In IPC, students investigate changes in state as it relates to the arrangement of particle of matter and energy transfer, and recognize that a chemical change has occurred when substances react to form different substances.

Link to The Career and College Readiness Standards:
VII. Chemistry – A.
1. Know that physical and chemical properties can be used to describe and classify matter.
VIII. Physics – A.
4. Understand the concept of density.

Academic Vocabulary

- Physical property
- Physical change
- Chemical property
- Chemical change

Rigor Implications



Verb

- Differentiate

Level of Bloom's Taxonomy

- Analyzing

Instructional Implications
This standard fits well in an early unit introducing and reviewing matter. Students should be given opportunities to see the different signs of a chemical reaction during many different hands on investigations. They should also have opportunities to distinguish between chemical and physical properties of matter and to analyze changes in matter that occur during investigations.

From STAAR Chemistry Reference Materials
Density = mass/volume D = m/v

Distractor Factor

Color changes can be a distractor to the students when identifying if a change in matter is chemical or physical. Although color change is an indicator of a chemical change, it also can occur during some physical changes. Students may also think that mass and weight are the same.
A question for students might be about whether chemical formulas would change after exposure to air or another element or compound. Students will need to be able to recognize that a change in the formula means that a new substance is formed. Follow up questions could be to identify whether it was a physical, mechanical, or nuclear change.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.4) Science concepts. The student knows the characteristics of matter and can analyze the relationships between chemical and physical changes and properties. The student is expected to

Chemistry

(D) classify matter as pure substances or mixtures through investigation of their properties.

Content Builder

What do the students need to know?

Content

- Matter is classified as either pure substances such as elements and compounds or mixtures.
- A pure substance is matter that has consistent physical and chemical properties for all samples of the matter. They also combine atoms in the same ratio. For example, table salt is always made up of 1 atom of sodium combined with 1 atom of chlorine.
- A mixture is a combination of two or more different substances that are not chemically combined and each substance maintains its physical properties. The ratio of the atoms that make up the mixture is not consistent and predictable.
- In 6th grade, students learned that an element is a pure substance.

Link to The Career and College Readiness Standards:

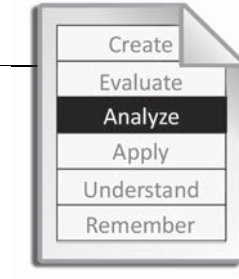
VII. Chemistry – A.

1. Know that physical and chemical properties can be used to describe and classify matter.
2. Recognize and classify pure substances (elements, compounds) and mixtures.

Academic Vocabulary

- Pure substances
- Elements
- Compounds
- Molecules
- Mixtures

Rigor Implications



Verb

- Classify

Level of Bloom's Taxonomy

- Analyzing

Instructional Implications

This standard fits well in an early unit introducing and reviewing matter. Students should be given opportunities to classify a substance as a pure substance or a mixture based on properties of the substance. They should also have opportunities to explain why the pure substance samples are pure and why the mixture samples are mixtures.

Distractor Factor

Students may struggle with the idea that mixtures and compounds are a combination of two or more substances. They need to understand that the difference is related to whether the substances are chemically combined.

A question might describe the properties of four different substances and ask the students to pick out the substance that is a pure substance. Three of the four substances should be mixtures, not pure substances, to make the selection process more straightforward.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.5) Science concepts. The student understands the historical development of the Periodic Table and can apply its predictive power. The student is expected to

Chemistry

(B) use the Periodic Table to identify and explain the properties of chemical families, including alkali metals, alkaline earth metals, halogens, noble gases, and transition metals;

Content Builder

What do the students need to know?

Content

- The periodic table is a chart of all known elements organized by their atomic numbers. The rows (or periods) and columns (or families) are organized in such a way that it is easy to see trends (such as electronegativity) as you move across a row from right to left, and similarities in properties in the vertical columns or chemical families.
- The Group 1 elements found in the first column are called the alkali metals. These elements are highly reactive and thereby do not exist in their pure form in nature. They are soft metals with a low density.
- The Group 2 elements found in the second column are called alkaline earth metals. These elements are silver, soft metals that are reactive with the halogens.
- The Group 17 elements are the halogens. They are nonmetal elements that are highly reactive and therefore only exist in nature in compounds such as diatomic molecules or as ions.
- The Group 18 elements of the first six periods are known as the noble gases. They are relatively unreactive and exist as monatomic gases.
- Groups 3 to 12 in the periodic table make up the group of elements known as the transition metals. Some books include the lanthanide and actinide series elements as transition metals.
- In 8th grade, students studied the arrangement of the elements in the periodic table, including groups and periods.

Link to The Career and College Readiness Standards:

VII. Chemistry – C. Periodic table

1. Know the organization of the periodic table.
2. Recognize the trends in physical and chemical properties as one moves across a period or vertically through a group.

Academic Vocabulary

- Chemical families
- Alkali metals
- Alkaline earth metals
- Halogens
- Noble gases
- Transition metals

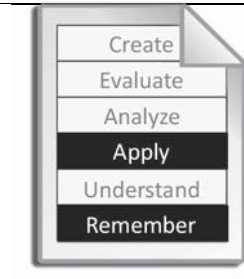
Rigor Implications

Verb

- Use
- Explain
- Identify

Level of Bloom's Taxonomy

- Applying
- Remembering



Instructional Implications

This standard fits well in a unit on the development of the periodic table following a unit on properties of matter. Students need to be given opportunities to understand how the properties of each of the chemical families are related to their positions on the periodic table. They should learn the properties of the families and begin to understand how the placement of each atom of each family is related to the physical properties on subatomic makeup of each atom.

Distractor Factor

Students can often confuse the alkali metals with the alkaline earth metals, and the properties of the transition metals are not as specific as the true families.

A sample question related to this standard is: give the students a list of properties of an element and ask them to determine if it is an alkali metal, alkaline earth metal, halogen, or noble gas. Then ask the students in which family or group the element belongs.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.5) Science concepts. The student understands the historical development of the Periodic Table and can apply its predictive power. The student is expected to

Chemistry

(C) use the Periodic Table to identify and explain periodic trends, including atomic and ionic radii, electronegativity, and ionization energy.

Content Builder

What do the students need to know?

Content

- The properties of elements exist in trends. The properties of the elements can be predicted by an element's placement on the periodic table.
- Electronegativity is the tendency of an atom to attract electrons. The electronegativities of the elements tend to increase along a period from right to left and up a group from bottom to top.
- Ionization energy is the minimum amount of energy required to remove electrons from an atom. Ionization energy increases along a period from right to left and down a group from top to bottom.
- Electron affinity is the amount of energy change that occurs when an electron is added to a neutral atom to create a negative ion. Electron affinity increases along a period from right to left and down a group from top to bottom.
- The atomic radius is the distance from the center of the nucleus of an atom to the edge of the electron cloud of an atom. The atomic radius increases along a period from right to left and down a group from top to bottom.
- In 8th grade, students studied the arrangement of the elements in the periodic table, including groups and periods.

Link to The Career and College Readiness Standards:

I. Nature of Science: Scientific Ways of Learning and Thinking – A. Cognitive skills in science

2. Use creativity and insight to recognize and describe patterns in natural phenomena.

VII. Chemistry – C. Periodic tale

2. Know the organization of the periodic table.

3. Recognize the trends in physical and chemical properties as one moves across a period or vertically through a group.

Academic Vocabulary

- Electronegativity
- Electron affinity
- Ionization energy
- Ionic radius
- Atomic radius

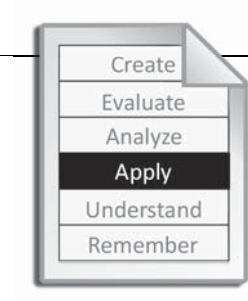
Rigor Implications

Verb

- Use

Level of Bloom's Taxonomy

- Applying



Instructional Implications

This standard fits well in a unit on the periodic table. Students should be given opportunities to understand the periodic trends found in the periodic table and to use the trends to predict properties on the elements as they move from right to left or from top to bottom along the periodic table. Instruction should include the students drawing arrows along a periodic table to demonstrate each periodic trend. Instruction should also include opportunities for the students to understand each of the trends and explain why the trends move a particular way along the periodic table.

Distractor Factor

This is the first time students have been introduced to these chemical trends so they will be unfamiliar to them. It is very easy for the students to confuse the properties of one trend for another.

A sample question related to this standard is: give four sets of elements and ask the students which set show an increase or decrease in a particular periodic property. The instructor may choose to test the students by including sets that do not follow these trends.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.6) Science concepts. The student knows and understands the historical development of atomic theory. The student is expected to

Chemistry

(E) express the arrangement of electrons in atoms through electron configurations and Lewis valence electron dot structures.

Content Builder

What do the students need to know?

Content

- The electron configuration of an atom predicts the likely arrangement of all the electrons in an atom.
- Lewis dot structures are diagrams that show the arrangement of the electrons around an atom and the lone pairs of electrons and bonds in a molecule.
- An understanding of the energy levels and how the electrons pair will be very important.

Link to The Career and College Readiness Standards:

VII. Chemistry – B. Atomic structure

1. Summarize the development of atomic theory. Understand that models of the atom are used to help understand the properties of elements and compounds.

Academic Vocabulary

- Electron configurations
- Hund's rule
- Pauli exclusion principle
- Aufbau principle
- Quantum numbers
- Lewis dot structures

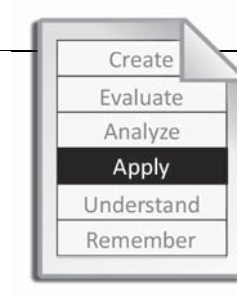
Rigor Implications

Verb

- Express

Level of Bloom's Taxonomy

- Applying



Instructional Implications

This standard fits well in a unit (or just after a unit) on atomic structure. Instruction should include opportunities for the students to express the arrangement of the electrons in an atom by both electron configurations and Lewis dot structures.

Distractor Factor

Students often learn how to write electron configurations and Lewis dot structures without understanding how they represent the arrangement of the electrons in a given atom.

A sample question related to this standard is: ask the students, "Which of the following is the correct arrangement of the electrons?" The answer choices could all be in electron configurations, all in Lewis dot structure, or a combination of both. The distractors would be incorrect electron configurations and/or Lewis dot structures.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.7) Science concepts. The student knows how atoms form ionic, metallic, and covalent bonds. The student is expected to

Chemistry

(A) name ionic compounds containing main group or transition metals, covalent compounds, acids, and bases, using International Union of Pure and Applied Chemistry (IUPAC) nomenclature rules.

Content Builder

What do the students need to know?

Content

- The International Union of Pure and Applied Chemistry (IUPAC) nomenclature rules are the most widely-accepted method for naming compounds in the world.
- Recognize the common polyatomic ions.
- The name of an ionic compound is a combination of the name of the cation and the anion that makes up the compound. A monatomic anion is the name of the element with "ide" added. Negative polyatomic ions are written just like the name of the ion.
- Roman numbers will be used to represent the oxidation state of the cation from the transition metals.
- Many covalent compounds have common names such as "water." Simple covalent compounds are named by using prefixes that indicate the number of atoms of each element that are found in the formula of the compound.

Link to The Career and College Readiness Standards:

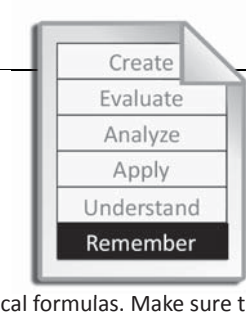
VII. Chemistry – D. Chemical bonding
1. Characterize ionic bonds, metallic bonds, and covalent bonds. Describe the properties of metals and ionic and covalent compounds.

VII. Chemistry – F. Chemical nomenclature
1. Know formulas for ionic compounds.
2. Know formulas for molecular compounds.

Academic Vocabulary

- Chemical nomenclature
- Ionic compounds
- Polyatomic ions
- Main group metals
- Transition metals
- Covalent compounds
- Acids
- Bases

Rigor Implications



Verb

- Name

Level of Bloom's Taxonomy

- Remembering

Instructional Implications

This standard fits well in a unit on chemical formulas. Make sure the students can name chemical formulas that contain polyatomic ions and Roman numerals. They need to understand when to use Roman numerals to name chemical compounds containing transition metals.

From STAAR Chemistry Reference Materials
Polyatomic Ion table

Distractor Factor

Students often struggle with compounds that contain polyatomic ions and Roman numerals. They can get confused on when to use Roman numbers and often do not recognize the polyatomic ions in a chemical formula. A sample question related to this standard is: display a chemical formula with or without polyatomic ions and ask the students the name of the chemical formula. The distractor answer choices may include similar names. The formula may require a roman numeral and one of the answers will not have the roman numeral, or have the incorrect one.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.7) Science concepts. The student knows how atoms form ionic, metallic, and covalent bonds. The student is expected to

Chemistry

(B) write the chemical formulas of common polyatomic ions, ionic compounds containing main group or transition metals, covalent compounds, acids, and bases;

Content Builder

What do the students need to know?
Content

- For ionic compounds, write the electron symbol for the cation followed by the symbol of the anion or polyatomic ion. Check the oxidation states of each ion and add subscripts as needed to balance out the positive charges and the negative charges.
- Recognize the common polyatomic ions.
- For covalent compounds, write the electron symbol for the first element with the subscript represented by the prefix. If there is no prefix, there is no subscript. Write the symbol for the second element followed by the subscript represent by the prefix.

Link to The Career and College Readiness Standards:

VII. Chemistry – D. Chemical bonding

- Characterize ionic bonds, metallic bonds, and covalent bonds. Describe the properties of metals and ionic and covalent compounds.

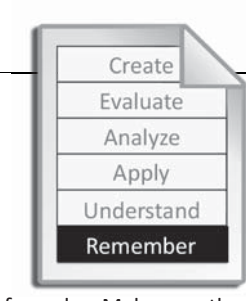
VII. Chemistry – F. Chemical nomenclature

- Know formulas for ionic compounds.

Academic Vocabulary

- Chemical formula
- Oxidation numbers
- Subscripts

Rigor Implications



Verb

- Write

Level of Bloom's Taxonomy

- Remembering

Instructional Implications

This standard fits well in a unit on chemical formulas. Make sure the students understand how to use the polyatomic ion chart and how Roman numerals are used in writing chemical formulas. They also need to understand the use of the parenthesis in a chemical formula containing polyatomic ions. Remind students to refer to the polyatomic ion table in the chemistry resource materials.

From STAAR Chemistry Reference Materials
Polyatomic Ion table

Distractor Factor

Chemical formula names that contain polyatomic ions can be difficult for students who are not very familiar with the polyatomic ions.

A sample question related to this standard is: have the name of a chemical formula with or without polyatomic ions and Roman numerals and ask the students how the chemical formula should be written. The distractor answer choices may include similar formulas.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.7) Science concepts. The student knows how atoms form ionic, metallic, and covalent bonds. The student is expected to

Chemistry

(C) construct electron dot formulas to illustrate ionic and covalent bonds;

Content Builder

What do the students need to know?
Content

- Lewis electron dot formulas are diagrams of an element that include the element's symbol and represent the element's valence electrons using dots.
- Electron dot formulas can be used to show how an element will bond with other elements.

Link to The Career and College Readiness Standards:

VII. Chemistry – D. Chemical boning
1. Characterize ionic bonds, metallic bonds, and covalent bonds. Describe the properties of metals and ionic and covalent compounds.

VII. Chemistry – I. Properties and behavior of gases, liquids, and solids
7. Describe intermolecular forces.

Academic Vocabulary

- Electron dot formulas
- Octet rule
- Ionic bonds
- Covalent bonds
- Metallic bonds

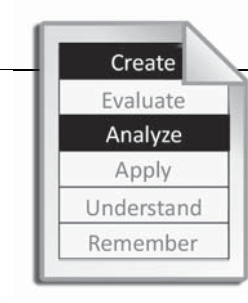
Rigor Implications

Verb

- Construct
- Illustrate

Level of Bloom's Taxonomy

- Creating
- Analyzing



Instructional Implications

This standard fits well in a unit on chemical bonding. Instruction should include opportunities for students to write electron dot formula diagrams of compounds with ionic and covalent bonds and to analyze the bonds that connect the elements in the formula represented by each diagram.

Distractor Factor

Students often confuse ionic and covalent bonds represented in electron dot formula diagrams. Students may think that the electron pairs are equally shared in all covalent bonds and that a particular electron is attached to a particular atom exclusively.

A sample question related to this standard is: show the electron dot formula of a compound with ionic or covalent bonds and ask a question related to the bonds. For example, you could provide a written formula and ask which of the electron dot formula diagrams represent that formula.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.8) Science concepts. The student can quantify the changes that occur during chemical reactions. The student is expected to

Chemistry

(B) use the mole concept to calculate the number of atoms, ions, or molecules in a sample of material;

Content Builder

What do the students need to know?
Content

- One mole equals 6.02 X 1023 particles.
- The mole in chemistry represents the number of atoms of an element that you would have if you changed the atomic weight of the element to grams and measured out that amount of the element.
- Every mole of any element will have 6.02 X 1023 atoms.

Link to The Career and College Readiness Standards:
VII. Chemistry – G. The mole and stoichiometry
1. Understand the mole concept.

Academic Vocabulary

- Mole concept
- Avogadro's constant

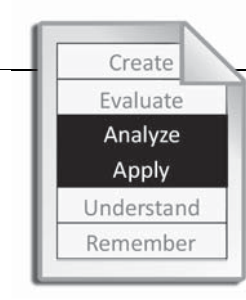
Rigor Implications

Verb

- Use
- Calculate

Level of Bloom's Taxonomy

- Applying
- Analyzing



Instructional Implications
This standard fits well in a unit on the mole. The mole concept is a new idea for students and they will need time to perform calculations and to develop an understanding of the relationship of the mole and the different types of particles that it can represent. Instruction should also include the use of scientific notation in calculations and how to put the numbers into a calculator properly.

From STAAR Chemistry Reference Materials
Avogadro's number = 6.02 X 10^{23} particles

Distractor Factor

This is the first time the students have been introduced to the mole concept and they often get confused by the massive number represented by a mole. Some students do not understand how to use scientific notation in calculations.

This standard could be evaluated with questions where the answers are recorded on griddables. For example, the instructor might give students information related to a sample of material and ask them to record how may atoms, ions, or molecules are in the sample.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.8) Science concepts. The student can quantify the changes that occur during chemical reactions. The student is expected to

Chemistry

(D) use the law of conservation of mass to write and balance chemical equations;

Content Builder

What do the students need to know?

Content

- The law of conservation of mass states that in a closed system mass cannot be created or destroyed.
- In a chemical reaction, the mass of the reactants before the reaction must equal the mass of the products after the reaction.
- In a balanced chemical reaction, the number of any given atom in the reactants of an equation must match the number of the same atom in the products. All elements in the products must be present in the reactants.
- In 8th grade, students are required to recognize whether an equation is balanced or not, as well as the relationship between a balanced equation and the law of conservation of mass.
- In IPC, students are required to demonstrate that mass is conserved when substances undergo chemical changes. This includes an understanding that the number and kind of atoms in a reaction are the same for both the reactants and the products in the reaction.

Link to The Career and College Readiness Standards:

VII. Chemistry – E. Chemical reactions

1. Classify chemical reactions by type. Describe the evidence that a chemical reaction has occurred.

Academic Vocabulary

- Law of conservation of mass
- Reactants
- Products
- Chemical reaction
- Balanced chemical equations

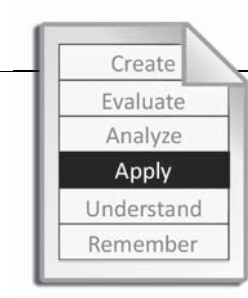
Rigor Implications

Verb

- Use

Level of Bloom's Taxonomy

- Applying



Instructional Implications

This standard works well in a unit on chemical reactions. Students should have many opportunities to write and balance equations. Investigations should include completing chemical reactions in a closed system where the mass of the reactants are measured prior to the reaction and the mass of the products are measured after the reaction.

Distractor Factor

Students often do not understand the connection between balanced equations and the law of conservation of mass. Students may think that mass is conserved in a chemical reaction but the specific atoms are not.

A sample question related to this standard is: have students identify whether a chemical equation is balanced or not. Or provide an equation without coefficients and ask students to balance the equation and pick out the answer that has the corresponding coefficients.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.9) Science concepts. The student understands the principles of ideal gas behavior, kinetic molecular theory, and the conditions that influence the behavior of gases. The student is expected to

Chemistry

(A) describe and calculate the relations between volume, pressure, number of moles, and temperature for an ideal gas as described by Boyle's law, Charles' law, Avogadro's law, Dalton's law of partial pressure, and the ideal gas law;

Content Builder

What do the students need to know?

Content

- The ideal gas law demonstrates the relationship of pressure, volume, temperature and the number of moles of a gas in a perfect system.
- The ideal gas law is a combination of Boyle's, Charles', and Avogadro's laws.
- Boyle's law states that, in an ideal gas at a constant temperature, the pressure and volume of the gas are inversely proportional.
- Charles' law (also called Gay-Lussac's law) states that, in an ideal gas at constant pressure, there is a relationship between temperature and volume.

Link to The Career and College Readiness Standards:

VII. Chemistry – G.
1. Understand the mole concept.
2. Understand molar relationships in reactions, stoichiometric calculations, and percent yield.

VII. Chemistry – I.
1. Understand the behavior of matter in its various states solid, liquid, gas
4. Apply the concept of partial pressures in a mixture of gases.

VIII. Physics – A.
2. Understand states of matter and their characteristics.

Academic Vocabulary

- Ideal gas
- Ideal gas law
- Boyle's law
- Charles' law
- Avogadro's law
- Dalton's law of partial pressure
- Standard temperature and pressure (STP)

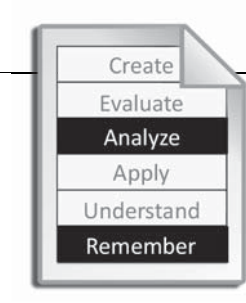
Rigor Implications

Verb

- Describe
- Calculate

Level of Bloom's Taxonomy

- Remembering
- Analyzing



Instructional Implications

This standard works well in a unit on gases and gas laws. Students should have experience manipulating the variables in all the different gas laws.

(Pressure)(volume) = (moles)(ideal gas constant)(temperature. $PV = nRT$

$\frac{\text{(initial pressure)(initial volume)}}{\text{(initial moles)(initial temperature)}} = \frac{\text{(final pressure)(final volume)}}{\text{(final moles)(final temperature)}}$ $\frac{P_1V_1}{n_1T_1} = \frac{P_2V_2}{n_2T_2}$

(initial pressure)(initial volume) = (final pressure)(final volume) $P_1V_1 = P_2V_2$

$\frac{\text{(initial volume)}}{\text{(initial temperature)}} = \frac{\text{(final volume)}}{\text{(final temperature)}}$ $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$\frac{\text{(initial volume)}}{\text{(initial moles)}} = \frac{\text{(final volume)}}{\text{(final moles)}}$ $\frac{V_1}{n_1} = \frac{V_2}{n_2}$

Distractor Factor

If the students have not developed a thorough understanding of the mole concept, parts of this standard can be difficult. Students may think that gases do not have mass or that they are not matter because most are invisible.

This standard could be evaluated with questions where the answers are recorded on griddables. For example, the instructor might give the students all but one of the variables from a specific gas law and ask them to calculate for the missing variable. The question may or may not specify which gas law to use to solve the problem.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.10) Science concepts. The student understands and can apply the factors that influence the behavior of solutions. The student is expected to

Chemistry

(B) develop and use general rules regarding solubility through investigations with aqueous solutions;

Content Builder

What do the students need to know?

Content

- Solubility refers to the amount of a given solute that can be dissolved in a given solvent at a certain temperature to make a solution.
- A solution where water is the solvent is called an aqueous solution.
- The solubility rules are a set of guidelines that help predict if a set of aqueous solutions will dissolve or form a precipitate.

Link to The Career and College Readiness Standards:

VII. Chemistry – I. Properties and behavior of gases, liquids and solids
2. Understand properties of solutions.
5. Know the properties of liquids and solids.

Academic Vocabulary

- Solubility
- Solute
- Solvent
- Aqueous solutions
- Precipitate

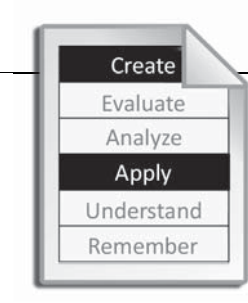
Rigor Implications

Verb

- Developing
- Using

Level of Bloom's Taxonomy

- Creating
- Applying



Instructional Implications

This standard fits well in a unit on solutions. Students should be given an opportunity, through investigation, to develop the solubility rules for aqueous solutions. They should also be given opportunities to use the solubility rules to predict if a given reaction will take place.

From STAAR Chemistry Reference Materials

Solubility of Common Ionic Compounds in Water Chart

Distractor Factor

Students can get confused by some of the solubility rules and how they can be used to predict if a given reaction will take place.

A sample question for this standard is: give students a list of different reactions in aqueous solutions and ask them which reaction would form a precipitate. The distractor answers would all be soluble and would not form a precipitate.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.10) Science concepts. The student understands and can apply the factors that influence the behavior of solutions. The student is expected to

Chemistry

(E) distinguish between types of solutions such as electrolytes and nonelectrolytes and unsaturated, saturated, and supersaturated solutions;

Content Builder

What do the students need to know?

Content

- Electrolytes are substances that form ions when they are dissolved in solutions. The ions give the solution the ability to conduct electricity.
- Nonelectrolytes are substances that do not form ions when they are dissolved in solutions. They are poor conductors of electricity.
- Unsaturated solutions can still dissolve more solute.
- Saturated solutions have all the solute that can be dissolved in it under normal conditions.
- Supersaturated solutions have more solute than can be dissolved in it under normal conditions. This is often accomplished by heating the solution.

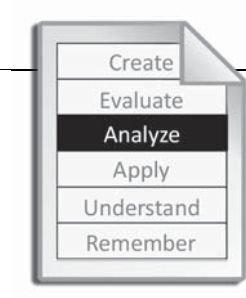
Link to The Career and College Readiness Standards:

VII. Chemistry – I. Properties and behavior of gases, liquids and solids
2. Understand properties of solutions.
5. Know the properties of liquids and solids.

Academic Vocabulary

- Electrolytes
- Nonelectrolytes
- Unsaturated solution
- Saturated solution
- Supersaturated solution

Rigor Implications



Verb

- Distinguish

Level of Bloom's Taxonomy

- Analyzing

Instructional Implications

This standard fits well in a unit on solutions. Students should be given experiences creating and/or analyzing solubility curves. Investigations should include observations of the properties of electrolytes and nonelectrolytes and the opportunity to create an unsaturated, a saturated, and a supersaturated solution.

Distractor Factor

Students can make mistakes analyzing a solubility curve.

A sample question for this standard is: show a solubility curve for several compounds and ask which compound is completely soluble at a particular temperature. The distractor answers would be the other compounds found on the solubility curve.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.10) Science concepts. The student understands and can apply the factors that influence the behavior of solutions. The student is expected to

Chemistry

(F) investigate factors that influence solubilities and rates of dissolution such as temperature, agitation, and surface area;

Content Builder

What do the students need to know?

Content

- In most cases, solubility increases as the temperature solution increases.
- Solubility will increase with agitation or stirring of the solution.
- The surface are of the solute or the amount of exposed area of the solute to the solvent will also influence solubility. The more surface area exposed the faster the solute will dissolve.
- The nature of the solute and solvent will also influence the solubility rate of dissolution

Link to The Career and College Readiness Standards:

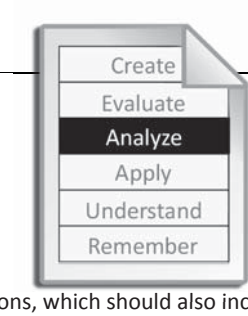
VII. Chemistry – I. Properties and behavior of gases, liquids and solids

1. Understand properties of solutions.
5. Know the properties of liquids and solids.

Academic Vocabulary

- Agitation
- Surface area
- Dissolution

Rigor Implications



Verb

- Investigate

Level of Bloom's Taxonomy

- Analyzing

Instructional Implications

This standard fits well in a unit on solutions, which should also include Chemistry 10E. Students should be given opportunities to do investigations related to the different factors that influence the rate of solubility. Students should understand that the rate of solubility of most compounds increases as the temperature increases, however, there are exceptions where this is not the case. Instruction should also include opportunities for the students to understand the difference between dissolution and solubility.

Distractor Factor

Students often confuse dissolution with solubility.

A sample question on this standard may include an investigation that shows factors that may influence the solubility rate of a solute. A question related to the solubility of the solute in the investigation can be asked. The distractors could include parts of the investigation that do not have an influence on the solubility of the solute.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.10) Science concepts. The student understands and can apply the factors that influence the behavior of solutions. The student is expected to

Chemistry

(H) understand and differentiate among acid-base reactions, precipitation reactions, and oxidation-reduction reactions;

Content Builder

What do the students need to know?

Content

- Acid-base reactions occur when an acid is combined with a base to neutralize the acid and base properties and create a salt.
- A precipitation reaction occurs when two different solutions with soluble ions are mixed together and some of the ions combine to form a solid precipitate that settles out of the solution.
- Oxidation-reduction reactions, also known as redox reactions, occur when electrons are transferred. Oxidation is the loss of electrons and reduction is the gain of electrons. This type of reaction can only happen if both oxidation and reduction occur.
- Some reactions can be classified as more than one type of reaction.

Link to The Career and College Readiness Standards:

VII. Chemistry – E. Chemical reactions

1. Classify chemical reactions by type. Describe the evidence that a chemical reaction has occurred.
2. Describe the properties of acids and bases, and identify the products of a neutralization reaction.
3. Understand oxidation-reduction reactions.

Academic Vocabulary

- Acid-base reactions
- Neutralization reactions
- Precipitation reactions
- Oxidation-reduction reactions

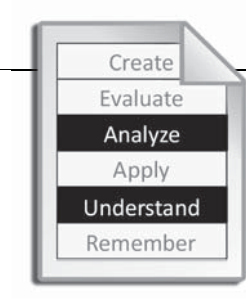
Rigor Implications

Verb

- Understand
- Differentiate

Level of Bloom's Taxonomy

- Understanding
- Analyzing



Instructional Implications

This standard fits well in a unit on chemical reactions. Students should be given opportunities to differentiate between the different types of reactions to see that sometimes a reaction can have the characteristics of more than one type of reaction. Investigations should include opportunities for the students to perform examples of each type of reaction.

Distractor Factor

Students may struggle understanding that some chemical reactions can have more than one classification.

A sample question on this standard is: give the students four different reactions and ask them which of the reactions are an acid-base reaction, and/or a precipitation reaction, and/or an oxidation-reduction reaction. The distractors will be the reactions that do not fit the characteristics of the reaction(s) in the question.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.11) Science concepts. The student understands the energy changes that occur in chemical reactions. The student is expected to

Chemistry

(C) use thermochemical equations to calculate energy changes that occur in chemical reactions and classify reactions as exothermic or endothermic;

Content Builder

What do the students need to know?

Content

- Exothermic reactions are reactions that release energy in the form of heat, light, or sound.
- Endothermic reactions are reactions that absorb energy

To what degree will this learning impact learning two years down the road?

Link to The Career and College Readiness Standards:

VII. Chemistry – E. Chemical reactions

5. Understand energy changes in chemical reactions.

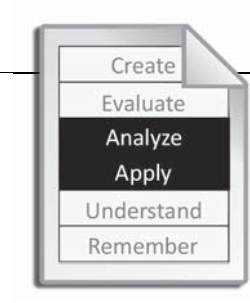
VII. Chemistry – H. Thermochemistry

2. Understand energy changes and chemical reactions.

Academic Vocabulary

- Exothermic
- Endothermic
- Enthalpy

Rigor Implications



Verb

- Use
- Calculate

Level of Bloom's Taxonomy

- Applying
- Analyzing

Instructional Implications

This standard fits well in a unit on chemical reactions. Students should be given opportunities to measure and calculate energy changes that occur in chemical reactions. Investigations should include opportunities for students to run chemical reactions and to use thermochemical equations to calculate energy changes and classify the reactions as endothermic or exothermic.

From STAAR Chemistry Reference Materials

Enthalpy of reaction = (enthalpy of products)(enthalpy of reactants)

$\Delta H = \Delta H^0_f$ (products) - ΔH^0_f (reactants)

Heat gained or lost = mass(specific heat)(change in temperature) $Q = mc_p\Delta T$

Distractor Factor

Students may think that energy is created or used up during a chemical reaction.

This standard could be evaluated by a question where the answer can be put on a griddable. A question may list the equations of four different complete reactions. Three may be exothermic and one endothermic and the students will need to be able to recognize which reaction is endothermic.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.12) Science concepts. The student understands the basic processes of nuclear chemistry. The student is expected to

Chemistry

(B) describe radioactive decay process in terms of balanced nuclear equations;

Content Builder

What do the students need to know?

Content

- Decay rate is measured in terms of half-life.
- initial mass (½)(number of half-lives) = final mass
- mi (½)n = mf
- Nuclear equations illustrate the nuclear decay of one element into another.
- Nuclear energy is contained in the nucleus of an atom.
- Nuclear energy is released by the processes of fusion or fission.
- Radioactive decay occurs by an alpha emission, beta emission or gamma emission.

To what degree will this learning impact learning two years down the road?

Link to The Career and College Readiness Standards:

VII. Chemistry – K. Nuclear chemistry

1. Understand radioactive decay.

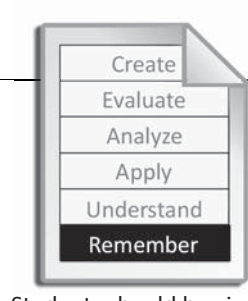
IX. Earth and Space Sciences –F. Energy transfer within and among systems

1. Describe matter and energy transfer in the Earth's systems

Academic Vocabulary

- Radioactive decay
- Half-life
- Net ionic equations

Rigor Implications



Verb

- Describe

Level of Bloom's Taxonomy

- Remembering

Instructional Implications

This standard fits well in a unit on nuclear chemistry. Students should be given an opportunity to model and describe half-life and the different types of emissions that can take place during a nuclear reaction. They should also have the opportunity to create some type of graphic organizer to describe alpha, beta, and gamma decay and relate them to fission and fusion reactions.

From STAAR Chemistry Reference Materials

Alpha particle (α) = 4_2He

Beta particle (β) = $0_{-1}e$

Neutron = 0_1n

Distractor Factor

Students often confuse the study of nuclear chemistry with the study of explosions. Students may think that fission and fusion are the same thing.

A sample question on this standard is: ask the students, "Which of the following is an example of an alpha emission in a nuclear reaction?" The distractors would have examples that describe other types of emissions.

Level of Difficulty (based on local data)

□ Moderate □ Challenging

(C.4) Science concepts. The student knows the characteristics of matter and can analyze the relationships between chemical and physical changes and properties. The student is expected to

Chemistry

(B) identify extensive and intensive properties;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?
This standard supports the Readiness Standard 4.5A which includes differentiating between physical and chemical properties. All physical properties of matter can be classified as extensive or intensive. Extensive properties, such as mass, depend on the amount of matter present in a given sample. Intensive properties, such as luster or density, do not depend on the amount of matter present in a given sample.

How does it support the Readiness Standard(s)?
This supporting standard adds depth to the knowledge of the readiness standard 4.5A by developing a context to classify physical properties.

Link to The Career and College Readiness Standards:
VII. Chemistry – A. Matter and its properties.

1. Know that physical and chemical properties can be used to describe and classify matter.
2. Recognize and classify pure substances (elements, compounds) and mixtures.

Link to The Career and College Readiness Standards:
Density = mass/volume D = m/v

May be adjusted according to local curriculum.

Academic Vocabulary

- Extensive property
- Intensive property

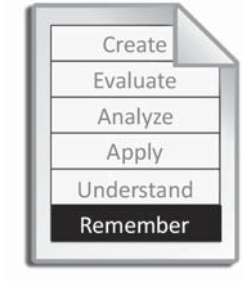
Rigor Implications

Verb

- Identify

Level of Bloom's Taxonomy

- Remembering



Instructional Implications
This standard fits well in a unit of instruction on the characteristics of matter. Students should be given opportunities to identify physical properties of matter as either intensive or extensive.

(C.4) Science concepts. The student knows the characteristics of matter and can analyze the relationships between chemical and physical changes and properties. The student is expected to

Chemistry

(C) compare solids, liquids, and gases in terms of compressibility, structure, shape, and volume;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This standard supports the Readiness Standard 4.5A which includes differentiating between physical and chemical properties. State of matter is a physical property of the matter.

How does it support the Readiness Standard(s)?

This supporting standard adds depth to the knowledge of the readiness standard 4.5A by comparing solids, liquids, and gases.

Link to The Career and College Readiness Standards:

V. Cross-Disciplinary Themes – A. Matter/states of matter
   2. Understand the typical states of matter (solid, liquid, gas) and phase changes among these.

VII. Chemistry – I. Properties and behavior of gases, liquids, and solids
   1. Understand the behavior of matter in its various states of solid, liquid, gas.
   5. Know the properties of liquids and solids.
   6. Understand the effect of vapor pressure on changes in state; explain heating curves and phase diagrams.

VIII. Physics – A. Matter
   2. Understand states of matter and their characteristics.

May be adjusted according to local curriculum.

Academic Vocabulary

- Compressibility
- Structure

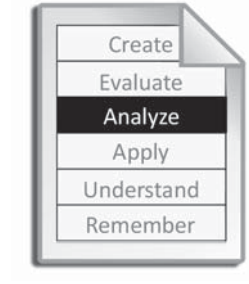
Rigor Implications

Verb

- Compare

Level of Bloom's Taxonomy

- Analyzing



Instructional Implications

This standard fits well in a unit of instruction on the properties of matter. Students should be able to compare solids, liquids, and gases by how the particles that make up each state of matter are compressed, shaped, and structured, and the amount of space they take up in a container. Students should be able to recognize an image of a container of particles and tell if the matter is a solid, liquid, or a gas.

(C.5) Science concepts. The student understands the historical development of the Periodic Table and can apply its predictive power. The student is expected to

Chemistry

(A) explain the use of chemical and physical properties in the historical development of the Periodic Table;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This supporting standard is foundation information that supports the readiness standards chemistry 5B and 5C.

How does it support the Readiness Standard(s)?

The readiness standard chemistry 5B looks at the properties of the elements within families. This gives a vertical perspective of the relationship of the elements. Chemistry 5C looks at periodic trends in properties as the elements go from right to left and gives more of a horizontal perspective of the relationship of the elements. Both perspectives relate to the chemical and physical properties of the elements.

Link to The Career and College Readiness Standards:

VII. Chemistry – A. Matter and its properties
1. Know that physical and chemical properties can be used to describe and classify matter.

VII. Chemistry – C.
1. Know the organization of the periodic table.
2. Recognize the trends in physical and chemical properties as one moves across a period or vertically through a group.

May be adjusted according to local curriculum.

Academic Vocabulary

- Chemical property
- Physical property
- Periodic Table

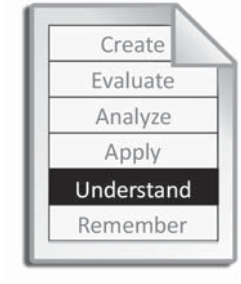
Rigor Implications

Verb

- Explain

Level of Bloom's Taxonomy

- Understanding



Instructional Implications

This standard fits well in a unit of instruction on the periodic table. Students need to understand the roles that the physical and chemical properties of the elements played in the development of the periodic table. Particularly, reactivity, atomic mass, and atomic number.

(C.6) Science concepts. The student knows and understands the historical development of atomic theory. The student is expected to

Chemistry

(A) understand the experimental design and conclusions used in the development of modern atomic theory, including Dalton's Postulates, Thomson's discovery of electron properties, Rutherford's nuclear atom, and Bohr's nuclear atom;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?
This supporting standard provides foundation information that can be used to develop a more complete understanding of the readiness standard chemistry 6E.

How does it support the Readiness Standard(s)?
An understanding of the design and conclusions of experiments by Dalton, Thomson, Rutherford and Bohr give students foundation information that will lead to a better understanding of the electrons in atoms and a more complete picture of what electron configurations and Lewis valence electron dot structures represent.

Link to The Career and College Readiness Standards:
V. Cross-Disciplinary Themes – A. Matter/states of matter
1. Know modern theories of atomic structure.
VII. Chemistry – B. Atomic structure
1. Summarize the development of atomic theory. Understand that models of the atom are used to help us understand the properties of elements and compounds.

May be adjusted according to local curriculum.

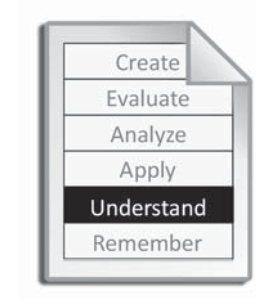
Academic Vocabulary

- Dalton's postulates
- Bohr atom

Rigor Implications

Verb
- Understand

Level of Bloom's Taxonomy
- Understanding



Instructional Implications
This standard fits well in a unit of instruction on atomic theory. Students should be given the opportunity to study the experiments of Dalton, Thomson, Rutherford, and Bohr and relate the conclusions of the experiments to modern atomic theory.

(C.6) Science concepts. The student knows and understands the historical development of atomic theory. The student is expected to

Chemistry

(B) understand the electromagnetic spectrum and the mathematical relationships between energy, frequency, and wavelength of light;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This supporting standard covers important information but is not necessarily required for the body of knowledge in the Readiness Standards for Chemistry. It develops concepts that aid students in the study of historical investigations that lead to the current atomic theory. An understanding of these investigations will develop a much deeper understanding of the Chemistry Readiness Standard 6E.

This supporting standard also scaffolds learning for the Physics Readiness Standard 7B which requires students to investigate and analyze characteristics of waves. This standard builds foundation content for the Physics Supporting Standard 7C.

How does it support the Readiness Standard(s)?

This supporting standard addresses the narrowly defined concepts of the electromagnetic spectrum and the mathematical relationships related to waves but do not directly support a readiness standard. They do however supply foundation information.

Link to The Career and College Readiness Standards:

VII. Chemistry – B. Atomic structure

1. Summarize the development of atomic theory. Understand that models of the atom are used to help us understand the properties of elements and compounds.

VIII. Physics – G. Oscillations and waves

3. Understand wave terminology wavelength, period, frequency, amplitude.

VIII. Physics – J. Optics

1. Know the electromagnetic spectrum.

From STAAR Chemistry Reference Materials

- Speed of light = (frequency)(wavelength) $C=f\lambda$
- C = speed of light = 3.00×10^8 m/s

May be adjusted according to local curriculum.

Academic Vocabulary

- Electromagnetic spectrum
- Frequency
- Wavelength

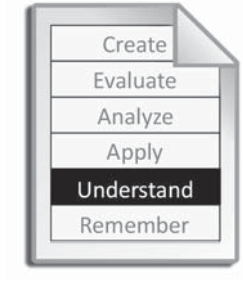
Rigor Implications

Verb

- Understand

Level of Bloom's Taxonomy

- Understanding



Instructional Implications

This standard fits well in a unit of instruction on atomic theory. This standard works well bundled in a unit with 6C and developed before 6A and 6E.

(C.6) Science concepts. The student knows and understands the historical development of atomic theory. The student is expected to

Chemistry

(C) calculate the wavelength, frequency, and energy of light using Planck's constant and the speed of light;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This supporting standard covers important information but is not necessarily required for the Readiness Standards for Chemistry. It develops concepts that aid students in the study of historical investigations that lead to the current atomic theory. An understanding of these investigations will develop a much deeper understanding of the Chemistry Readiness Standard 6E.

This supporting standard also scaffolds learning for the Physics Readiness Standard 7B which requires students to investigate and analyze characteristics of waves.

How does it support the Readiness Standard(s)?

This standard supports the Physics Readiness Standard 7B by laying the foundation understanding on how to calculate wavelength and frequency and by introducing the use of Plank's constant.

Link to The Career and College Readiness Standards:

VIII. Physics – G. Oscillations and waves

3. Understand wave terminology wavelength, period, frequency, amplitude.

VIII. Physics – J. Optics

1. Know the electromagnetic spectrum.

From STAAR Chemistry Reference Materials

- Energy = (Plank's constant)(frequency) $E_{photon} = hf$
- Energy = $\frac{\text{(Plank's constant)(speed of light)}}{\text{(wavelength)}}$ $E_{photon} = \frac{hc}{\lambda}$
- H = Plank's constant = 6.63×10^{-24} J·s
- C = speed of light = 3.00×10^{8} m/s

May be adjusted according to local curriculum.

Academic Vocabulary

- Frequency
- Wavelength
- Plank's Constant
- Speed of light

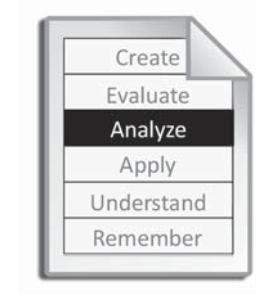
Rigor Implications

Verb

- Calculate

Level of Bloom's Taxonomy

- Analyzing



Instructional Implications

This standard fits well in a unit of instruction on atomic theory. Students need to be given opportunities to calculate the wavelength, frequency, and energy of light using Planck's constant and the speed of light. Make sure that students understand that the characteristics of waves are directly related to the development of atomic theory.

(C.6) Science concepts. The student knows and understands the historical development of atomic theory. The student is expected to

Chemistry

(D) use isotopic composition to calculate average atomic mass of an element;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This standard does not directly support a readiness standard. However, it does add context and foundation information to the Chemistry Readiness Standard 5C.

How does it support the Readiness Standard(s)?

The average atomic mass of each element is listed on the periodic table and follows trends that can be seen as you look at the elements from left to right and top to bottom. There are a few exceptions, such as cobalt and nickel.

Link to The Career and College Readiness Standards:

VII. Chemistry – B. Atomic structure

1. Summarize the development of atomic theory. Understand that models of the atom are used to help us understand the properties of elements and compounds.

May be adjusted according to local curriculum.

Academic Vocabulary

- Average atomic mass (amu)
- Isotope
- Isotopic composition

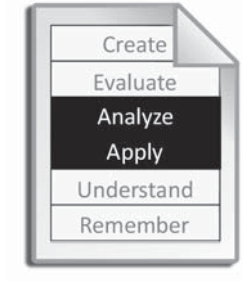
Rigor Implications

Verb

- Use
- Calculate

Level of Bloom's Taxonomy

- Applying
- Analyzing



Instructional Implications

This standard fits well in a unit of instruction on atomic structure or a unit on the periodic table. Instruction should include opportunities for students to calculate the average atomic mass of elements given their isotopic composition.

(C.7) Science concepts. The student knows how atoms form ionic, metallic, and covalent bonds. The student is expected to

Chemistry

(D) describe the nature of metallic bonding and apply the theory to explain metallic properties such as thermal and electrical conductivity, malleability, and ductility;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This supporting standard addresses a narrowly defined idea that does not directly support a readiness standard. However, it does add to the information that is developed in Chemistry Readiness Standard 7C.

How does it support the Readiness Standard(s)?

VII. Chemistry – D. Chemical bonding

1. Characterize ionic bonds, metallic bonds, and covalent bonds. Describe the properties of metals and ionic and covalent compounds.

VII. Chemistry – I. Properties and behavior of gases, liquids, and solids

7. Describe intermolecular forces.

May be adjusted according to local curriculum.

Academic Vocabulary

- Metallic bonds
- Thermal conductivity
- Electrical conductivity
- Malleability
- Ductility

Rigor Implications

Verb

- Describe

Level of Bloom's Taxonomy

- Remembering

Instructional Implications

This standard works well in a unit of instruction on bonding.
Adding the information related to metallic bonds and the properties associated with this type of bond is a nice addition to the unit where the main focus is ionic and covalent bonds.

(C.7) Science concepts. The student knows how atoms form ionic, metallic, and covalent bonds. The student is expected to

Chemistry

(E) predict molecular structure for molecules with linear, trigonal planar, or tetrahedral electron pair geometries using Valence Shell Electron Pair Repulsion (VSEPR) theory.

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This supporting standard addresses a narrowly defined idea that does not directly support a readiness standard. However, it does add to the information that is developed in the Chemistry Readiness Standard 7C related to covalent bonds.

How does it support the Readiness Standard(s)?

VII. Chemistry – D. Chemical bonding
1. Characterize ionic bonds, metallic bonds, and covalent bonds. Describe the properties of metals and ionic and covalent compounds.

VII. Chemistry – I. Properties and behavior of gases, liquids, and solids.
7. Describe intermolecular forces.

May be adjusted according to local curriculum.

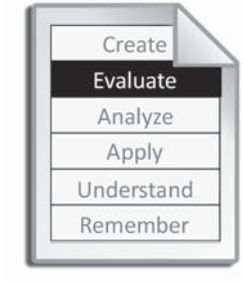
Rigor Implications

Verb

- Predict

Level of Bloom's Taxonomy

- Evaluating



Academic Vocabulary

- Valence Shell Electron Pair Repulsion (VSEPR) theory
- Linear
- Tigonal planar
- Tetrahedral
- Bent
- Polarity

Instructional Implications

This standard fits well in a unit of instruction on chemical bonding. Instruction should include student use of the Valence Shell Electron Pair Repulsion (VSEPR) theory to predict the shapes of molecules. Allowing students to use modeling to show structures helps them understand how each of the structures might look in three dimensions.

(C.8) Science concepts. The student can quantify the changes that occur during chemical reactions. The student is expected to

Chemistry

(A) define and use the concept of a mole;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?
This supporting standard introduces a concept that is more fully developed in Chemistry Readiness Standard 8B.

How does it support the Readiness Standard(s)?
This standard introduces the idea of the mole concept that is then applied in 8B when the concept is used to calculate the number of particles in a sample of material.

Link to The Career and College Readiness Standards:
VII. Chemistry – G. The mole and stoichiometry
1. Understand the mole concept.

May be adjusted according to local curriculum.

Academic Vocabulary

- Mole

Rigor Implications

Verb
- Define

Level of Bloom's Taxonomy
- Remembering

Instructional Implications
This standard belongs in a unit of instruction on the mole that also includes 8B. The concept of the mole is new to students and they should be given time to develop a thorough understanding of the relationship between the mole and the number of particles in a sample of matter.

(C.8) Science concepts. The student can quantify the changes that occur during chemical reactions. The student is expected to

Chemistry

(C) calculate percent composition and empirical and molecular formulas;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This supporting standard includes important information but is not necessarily required for the body of knowledge in any of the Chemistry Readiness Standards. This information can build on the information in Chemistry Readiness Standard 8B.

How does it support the Readiness Standard(s)?

VII. Chemistry – G. The mole and stoichiometry

1. Understand the mole concept.
2. Understand molar relationships in reactions, stoichiometric calculations, and percent yield.

May be adjusted according to local curriculum.

Academic Vocabulary

- Percent composition
- Empirical formula
- Molecular formula
- Atomic mass
- Atomic mas unit
- Formula mass
- Molecular mass

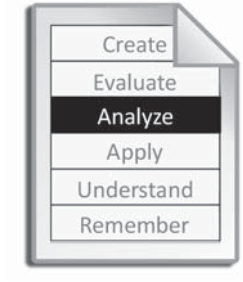
Rigor Implications

Verb

- Calculate

Level of Bloom's Taxonomy

- Analyzing



Instructional Implications

This standard fits well in a unit of instruction on the mole. Students should be given the opportunity to develop working definitions of percent composition, empirical formula, and molecular formula. They should also be able to analyze compounds and calculate the percent composition, empirical formula, and molecular formula of the compound.

(C.8) Science concepts. The student can quantify the changes that occur during chemical reactions. The student is expected to

Chemistry

(E) perform stoichiometric calculations, including determination of mass relationships between reactants and products, calculation of limiting reagents, and percent yield.

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This supporting standard includes important information but is not necessarily required for the body of knowledge in the Chemistry Readiness Standards. The information in this standard builds on the information that was introduced by Chemistry Readiness Standards 8B and 8D.

How does it support the Readiness Standard(s)?

The ability to perform stoichiometric calculations requires that students have a thorough understanding of both the mole concept and the ability to write and balance chemical equations.

Link to The Career and College Readiness Standards:

VII. Chemistry – G. The mole and stoichiometry

2. Understand molar relationships in reactions, stoichiometric calculations, and percent yield.

May be adjusted according to local curriculum.

Academic Vocabulary

- Stoichiometry
- Reactants
- Products
- Limiting reagents
- Percent yield

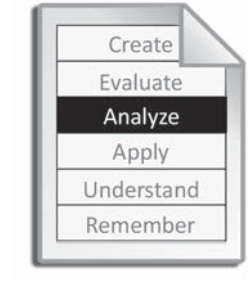
Rigor Implications

Verb

- Perform

Level of Bloom's Taxonomy

- Analyzing



Instructional Implications

This standard fits well in a unit of instruction on stoichiometry. This standard needs to be addressed after students have developed an understanding of the mole concept and balancing chemical equations.

(C.9) Science concepts. The student understands the principles of ideal gas behavior, kinetic molecular theory, and the conditions that influence the behavior of gases. The student is expected to

Chemistry

(B) perform stoichiometric calculations, including determination of mass and volume relationships between reactants and products for reactions involving gases

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This supporting standard addresses a narrowly defined idea that does not directly support a readiness standard. However, this standard relates to the information that is developed in Chemistry Readiness Standard 9B and relates to Chemistry Supporting Standard 8E.

How does it support the Readiness Standard(s)?

VII. Chemistry – G. The mole and stoichiometry
2. Understand molar relationships in reactions, stoichiometric calculations, and percent yield.

VII. Chemistry – I. Properties and behavior of gases, liquids, and solids
1. Understand the behavior of matter in its various states solid, liquid, gas.

VIII. Physics – A. Matter
2. Understand states of matter and their characteristics.

May be adjusted according to local curriculum.

Academic Vocabulary

- Gas stoichiometry

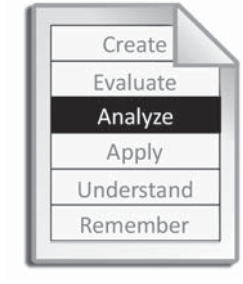
Rigor Implications

Verb

- Perform

Level of Bloom's Taxonomy

- Analyzing



Instructional Implications

This standard fits well in a unit of instruction on gases. It should come sometime after the unit on stoichiometry so that the students are already familiar with the calculations.

Chemistry

(C.9) Science concepts. The student understands the principles of ideal gas behavior, kinetic molecular theory, and the conditions that influence the behavior of gases. The student is expected to

(C) describe the postulates of kinetic molecular theory.

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This supporting standard supports Chemistry Readiness Standard 9A by adding information that will help the students better understand the behavior of gases.

How does it support the Readiness Standard(s)?

The kinetic molecular theory relates to the motion of particles in solids, liquids, and gases. This supporting standard uses the information related to gases to build content that is a foundation for understanding the behavior of gases and the gas laws.

Link to The Career and College Readiness Standards:

VII. Chemistry – E. Chemical reactions
6. Understand chemical kinetics.

VII. Chemistry – I. Properties and behavior of gases, liquids, and solids
3. Understand principles of ideal gas behavior and kinetic molecular theory.

May be adjusted according to local curriculum.

Academic Vocabulary

- Kinetic molecular theory

Rigor Implications

Verb

- Describe

Level of Bloom's Taxonomy

- Remembering

Instructional Implications

This standard fits well in a unit of instruction on gases. Students should be introduced to and able to describe the postulates of kinetic molecular theory.

(C.10) Science concepts. The student understands and can apply the factors that influence the behavior of solutions. The student is expected to

Chemistry

(A) describe the unique role of water in chemical and biological systems;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?
This supporting standard supports Chemistry Readiness Standards 10B and 10F.

How does it support the Readiness Standard(s)?
An understanding of the role that water plays in solubility is a foundation that will help as the students begin to develop and use general solubility rules with aqueous solutions.

Link to The Career and College Readiness Standards:
VII. Chemistry – I. Properties and behavior of gases, liquids, and solids
2. Understand properties of solutions.
5. Know the properties of liquids and solids.

May be adjusted according to local curriculum.

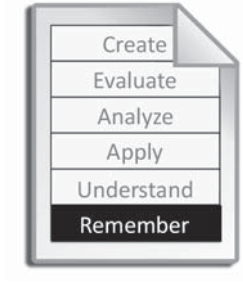
Academic Vocabulary

- Hydrogen bonding
- Surface tension
- Solvent
- Polarity

Rigor Implications

Verb
- Describe

Level of Bloom's Taxonomy
- Remembering



Instructional Implications
This standard fits well in a unit of instruction on solutions. An understanding of the role of water will be a foundation for this unit.

(C.10) Science concepts. The student understands and can apply the factors that influence the behavior of solutions. The student is expected to

Chemistry

(C) calculate the concentration of solutions in units of molarity;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This supporting standard addresses a narrowly defined idea related to solutions, but it does not directly support a readiness standard. It does have a direct link to Chemistry Supporting Standard 10D, where students will be asked to use molarity to calculate dilutions of solutions.

Link to The Career and College Readiness Standards:

VII. Chemistry – I. Properties and behavior of gases, liquids, and solids

2. Understand properties of solutions.
5. Know the properties of liquids and solids.

From STAAR Chemistry Reference Materials

- Molarity = $\frac{\text{moles of solute}}{\text{liter of solution}}$ M = mol/L

May be adjusted according to local curriculum.

Academic Vocabulary

- Molarity
- Solute
- Solvent

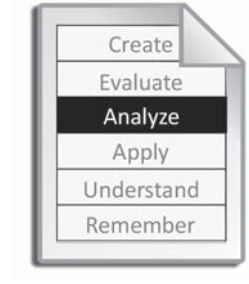
Rigor Implications

Verb

- Calculate

Level of Bloom's Taxonomy

- Analyzing



Instructional Implications

This standard fits well in a unit of instruction on solutions. Students should be given opportunities to calculate the molarity of solutions and to make solutions that have a particular molarity.

(C.10) Science concepts. The student understands and can apply the factors that influence the behavior of solutions. The student is expected to

Chemistry

(D) use molarity to calculate the dilutions of solutions;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This supporting standard addresses a narrowly defined idea related to solutions, but it does not directly support a readiness standard. It does have a direct link to Chemistry Supporting Standard 10C.

Link to The Career and College Readiness Standards:

VII. Chemistry – I. Properties and behavior of gases, liquids, and solids

2. Understand properties of solutions.
5. Know the properties of liquids and solids.

From STAAR Chemistry Reference Materials

(Volume of solution 1)(Molarity of solution 1) = (Volume of solution 2)(Molarity of solution 2) $V_1M_1 = V_2M_2$

May be adjusted according to local curriculum.

Academic Vocabulary

- Molarity
- Dilution

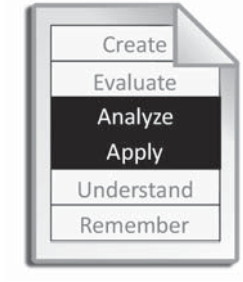
Rigor Implications

Verb

- Use
- Calculate

Level of Bloom's Taxonomy

- Applying
- Analyzing



Instructional Implications

This standard fits well in a unit of instruction on solutions. Students should be given many opportunities to use molarity to calculate the dilution of solutions and to dilute a given solution into different concentrations.

(C.10) Science concepts. The student understands and can apply the factors that influence the behavior of solutions. The student is expected to

Chemistry

(G) define acids and bases and distinguish between Arrhenius and Bronsted-Lowry definitions and predict products in acid-base reactions that form water;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?
This supporting standard supports some of the content in Chemistry Readiness Standard 10H.

How does it support the Readiness Standard(s)?
This supporting standard builds the foundation information students will need to know to thoroughly understand what is taking place in an acid-base reaction.

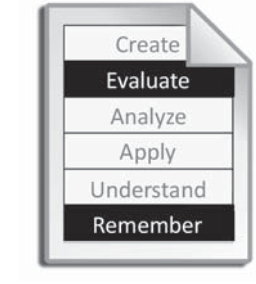
Link to The Career and College Readiness Standards:
VII. Chemistry – E. Chemical reactions
2. Describe the properties of acids and bases, and identify the products of a neutralization reaction.

May be adjusted according to local curriculum.

Rigor Implications

Verb
- Define
- Predict

Level of Bloom's Taxonomy
- Remembering
- Evaluating



Academic Vocabulary

- Arrhenius acids and bases
- Bronsted-Lowery acids and bases
- Lewis acids and bases
- Neutralization reaction

Instructional Implications
This standard fits well in a unit of instruction on acids and bases. Students should be given opportunities to predict if a substance can be classified as an acid or a base under any of the different definitions, and to predict products in an acid-base reaction.

(C.10) Science concepts. The student understands and can apply the factors that influence the behavior of solutions. The student is expected to

Chemistry

(I) define pH and use the hydrogen or hydroxide ion concentrations to calculate the pH of a solution;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This supporting standard does not directly support a readiness standard. However, it does build on the content introduced in Chemistry Readiness Standard 10H.

How does it support the Readiness Standard(s)?

VII. Chemistry – E. Chemical reactions

2. Describe the properties of acids and bases, and identify the products of a neutralization reaction.

From STAAR Chemistry Reference Materials

pH = logarithm (hydrogen ion concentration) $pH = -\log[H^+]$

May be adjusted according to local curriculum.

Academic Vocabulary

- pH
- pOH
- Hydroxide ion
- Hydrogen ion
- Ionization
- Titration

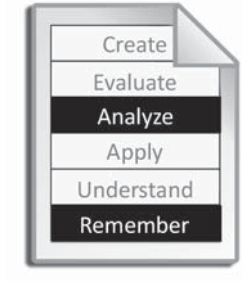
Rigor Implications

Verb

- Define
- Calculate

Level of Bloom's Taxonomy

- Remembering
- Analyzing



Instructional Implications

This standard fits well in a unit of instruction on acids and bases. This unit should follow an instructional unit on solutions.

Students may not have had any experience with the use of logs. It will be very important to show how to put the log information into the calculator.

(C.10) Science concepts. The student understands and can apply the factors that influence the behavior of solutions. The student is expected to

Chemistry

(J) distinguish between degrees of dissociation for strong and weak acids and bases

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This supporting standard does not directly support a readiness standard. However, it builds on some of the knowledge developed in Chemistry Readiness Standard 10C and directly relates to Supporting Standard 10I.

How does it support the Readiness Standard(s)?

This standard requires the students to develop a more complete understanding of acids and bases by introducing the idea of weak and strong acids and bases.

Link to The Career and College Readiness Standards:

VII. Chemistry – E. Chemical reactions

2. Describe the properties of acids and bases, and identify the products of a neutralization reaction.

May be adjusted according to local curriculum.

Academic Vocabulary

- Dissociation
- Strong acids
- Strong bases
- Weak acids
- Weak bases

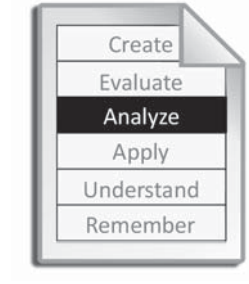
Rigor Implications

Verb

- Distinguish

Level of Bloom's Taxonomy

- Analyzing



Instructional Implications

This standard fits well in a unit of instruction on acids and bases. Students need to develop an understanding of the difference between a strong acid and a concentrated acid. Students need to understand that the terms strong and weak relate to the degree of disassociation of the ions in solution.

(C.11) Science concepts. The student understands the energy changes that occur in chemical reactions. The student is expected to

Chemistry

(A) understand energy and its forms, including kinetic, potential, chemical, and thermal energies;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?
This supporting standard supports Chemistry Readiness Standard 11C and more fully supports Physics Readiness Standard 6B.

How does it support the Readiness Standard(s)?
This standard builds content that will be important to the understanding of the use of thermochemical equations in Chemistry 11C. This standard more fully supports Physics 6B, where the students are asked to investigate examples of kinetic and potential energy and their transformations.

Link to The Career and College Readiness Standards:
VII. Chemistry – E. Chemical reactions
4. Understand energy changes in chemical reactions.
VII. Chemistry – H. Thermochemistry
1. Understand the Law of Conservation of Energy and processes of heat transfer.
2. Understand energy changes and chemical reactions.
VII. Chemistry – I. Properties and behavior of gases, liquids, and solids
3. Understand principles of ideal gas behavior and kinetic molecular theory.
VIII. Physics – D. Mechanical energy
1. Understand potential and kinetic energy.
VIII. Physics – H. Thermodynamics
1. Understand the gain and loss of heat energy in matter.
2. Understand the basic laws of thermodynamics.

May be adjusted according to local curriculum.

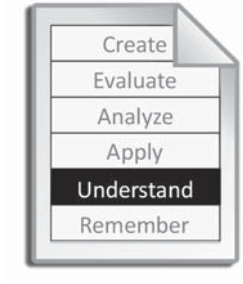
Academic Vocabulary

- Kinetic energy
- Potential energy
- Chemical energy
- Thermal energy

Rigor Implications

Verb
- Understand

Level of Bloom's Taxonomy
- Understanding



Instructional Implications
This standard fits well in a unit of instruction on thermochemistry. Students need to understand the different forms of energy and be able to distinguish between them.

(C.11) Science concepts. The student understands the energy changes that occur in chemical reactions. The student is expected to

Chemistry

(B) understand the law of conservation of energy and the processes of heat transfer;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This supporting standard supports Chemistry Readiness Standard 11C and also supports Physics Readiness Standard 6D.

How does it support the Readiness Standard(s)?

An understanding of the law of conservation of energy and heat transfer will be crucial to the students' ability to calculate energy changes in Chemistry 11C. This standard also supports Physics 6D, where the students are asked to demonstrate and apply the laws of conservation of energy.

Link to The Career and College Readiness Standards:

VII. Chemistry – E. Chemical reactions
- 4. Understand energy changes in chemical reactions.

VII. Chemistry – H. Thermochemistry
- 1. Understand the Law of Conservation of Energy and processes of heat transfer.
- 2. Understand energy changes and chemical reactions.

VIII. Physics – H. Thermodynamics
- 1. Understand the gain and loss of heat energy in matter.
- 2. Understand the basic laws of thermodynamics.

May be adjusted according to local curriculum.

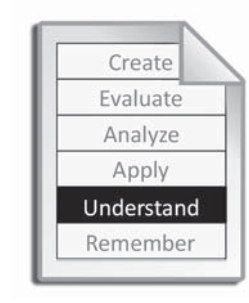
Academic Vocabulary

- Law of conservation of energy
- Phase change
- Heat transfer

Rigor Implications

Verb
- Understand

Level of Bloom's Taxonomy
- Understanding



Instructional Implications

This standard fits well in a unit of instruction onthermochemistry.

(C.11) Science concepts. The student understands the energy changes that occur in chemical reactions. The student is expected to

Chemistry

(D) perform calculations involving heat, mass, temperature change, and specific heat;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?
This supporting standard is directly related to Chemistry Readiness Standard 11C.

How does it support the Readiness Standard(s)?
To perform the calculations required in this supporting standard, students must be able to calculate the energy changes from Readiness Standard 11C.

Link to The Career and College Readiness Standards:
VII. Chemistry – E. Chemical reactions
4. Understand energy changes in chemical reactions.
VII. Chemistry – H. Thermochemistry
2. Understand energy changes and chemical reactions.
VIII. Physics – H. Thermodynamics
1. Understand the gain and loss of heat energy in matter.
2. Understand the basic laws of thermodynamics.

From STAAR Chemistry Reference Materials
- Heatgained or lostQ = (m)(ΔT)(Cp)
- 1 calorie (cal) = 4.18 joules (J)
- 1000 calories (cal) = 1 Calorie (Cal) = 1 kilocalorie (kcal)

May be adjusted according to local curriculum.

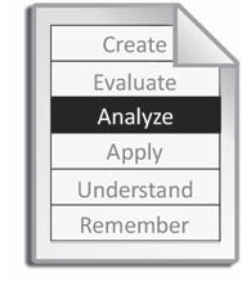
Academic Vocabulary

- Specific heat

Rigor Implications

Verb
- Perform

Level of Bloom's Taxonomy
- Analyzing



Instructional Implications
This standard fits well in a unit of instruction on thermochemistry. Students should have opportunities to perform calculations with both joules and calories.

(C.11) Science concepts. The student understands the energy changes that occur in chemical reactions. The student is expected to

Chemistry

(E) use calorimetry to calculate the heat of a chemical process.

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?

This supporting standard is directly related to Chemistry Readiness Standard 11C and Chemistry Supporting Standard 11D.

How does it support the Readiness Standard(s)?

Calorimetry is the process used to measure the heat released or absorbed in a chemical reaction. This process will measure the temperature change in a reaction that is used in both Chemistry 11C and 11D.

Link to The Career and College Readiness Standards:

VII. Chemistry – E. Chemical reactions
- 5. Understand energy changes in chemical reactions.

VII. Chemistry – H. Thermochemistry
- 3. Understand the Law of Conservation of Energy and processes of heat transfer.
- 4. Understand energy changes and chemical reactions.

VIII. Physics – H. Thermodynamics
- 1. Understand the gain and loss of heat energy in matter.
- 2. Understand the basic laws of thermodynamics.

May be adjusted according to local curriculum.

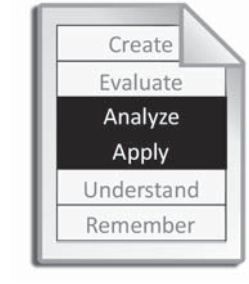
Academic Vocabulary

- Calorimetry

Rigor Implications

Verb
- Use
- Calculate

Level of Bloom's Taxonomy
- Applying
- Analyzing



Instructional Implications

This standard fits well in a unit of instruction on thermochemistry. Students should be given investigational opportunities to use calorimetry and measure the amount of heat released in a reaction.

(C.12) Science concepts. The student understands the basic processes of nuclear chemistry. The student is expected to

Chemistry

(A) describe the characteristics of alpha, beta, and gamma radiation;

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?
This supporting standard supports the information developed in Chemistry Readiness Standard 12B.

How does it support the Readiness Standard(s)?
This standard supports 12B by building the foundation knowledge that radioactive decay occurs by an alpha emission, beta emission, or gamma emission.

Link to The Career and College Readiness Standards:
VII. Chemistry – K. Nuclear chemistry
1. Understand radioactive decay.

May be adjusted according to local curriculum.

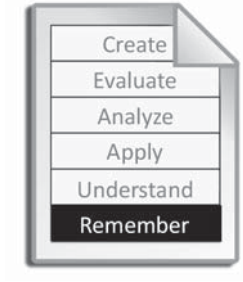
Academic Vocabulary

- Alpha radiation
- Beta radiation
- Gamma radiation

Rigor Implications

Verb
- Describe

Level of Bloom's Taxonomy
- Remembering



Instructional Implications
This standard fits well in a unit of instruction on nuclear chemistry. Students should be able to distinguish between the different types of radiation.

(C.12) Science concepts. The student understands the basic processes of nuclear chemistry. The student is expected to

Chemistry

(C) compare fission and fusion reactions.

Supporting the Readiness Standards

What Readiness Standard(s) or concepts from the Readiness Standards does it support?
This supporting standard supports Chemistry Readiness Standard 12B.

How does it support the Readiness Standard(s)?
An understanding of the processes of fusion and fission is fundamental to the overall understanding of the process of nuclear chemistry and radioactive decay.

Link to The Career and College Readiness Standards:
VII. Chemistry – K. Nuclear chemistry
1. Understand radioactive decay.

May be adjusted according to local curriculum.

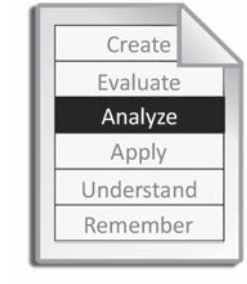
Academic Vocabulary

- Fission
- Fusion

Rigor Implications

Verb
- Compare

Level of Bloom's Taxonomy
- Analyzing



Instructional Implications
This standard fits well in a unit of instruction on nuclear chemistry. Students should be able to compare fission reactions to fusion reactions and distinguish between the two.