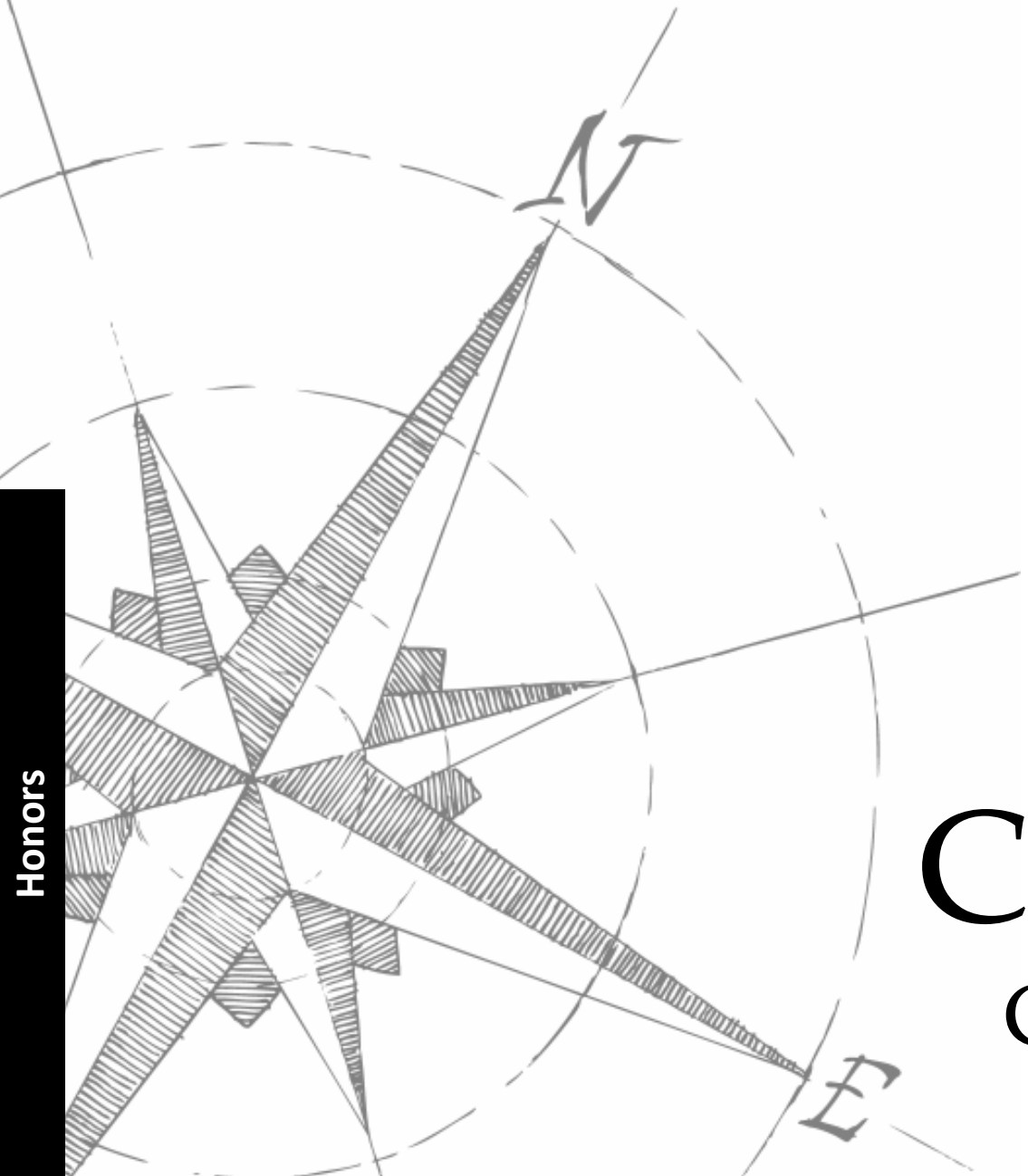
2012-2013

Volusia County Schools



Honors

Chemistry

Curriculum Map

Parts of the Curriculum Map

Body of Knowledge: the broadest organizational structure used to group content and concepts within the curriculum map

Pacing: time frames created by teacher committees, using EOC data, within which the course should be taught in preparation for the Biology EOC

Measurement Topics: concepts grouped together by related benchmarks used in Pinnacle for standards-referenced grading

Learning Targets and Skills: the content knowledge, processes, and enabling skills that will ensure successful mastery of the measurement topics

Benchmark: the Next Generation Sunshine State Standards required in the course descriptions posted on CPALMS by FLDOE

Academic Language: the content-specific vocabulary or phrases both teachers and students should use, and be familiar with, during instruction

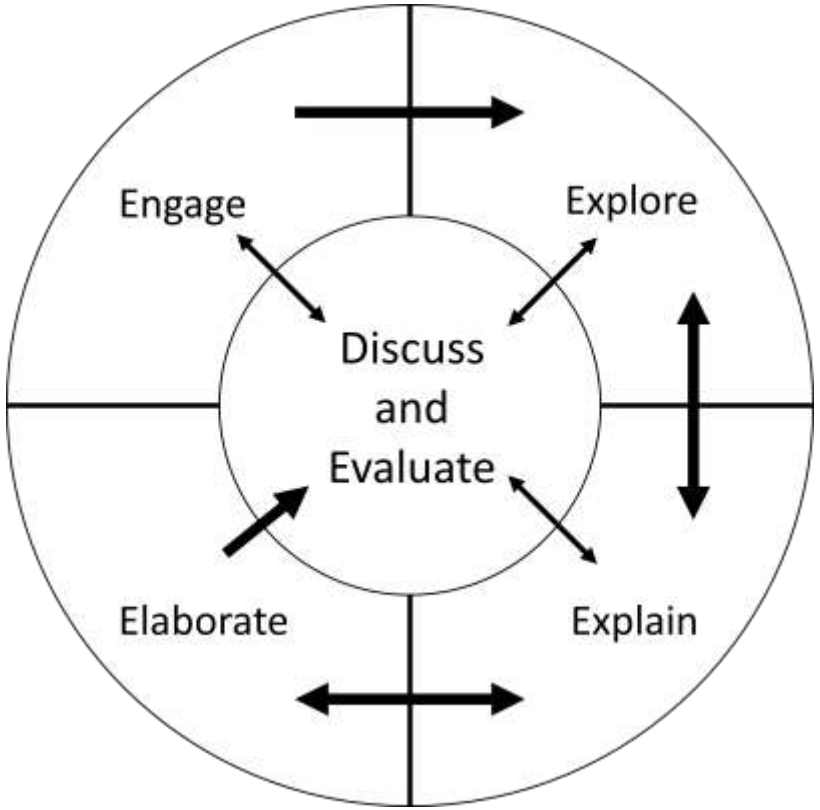
Resources: a listing of available, high quality and appropriate materials, including: strategies, lessons, textbooks, videos and other media sources, that are aligned with the measurement topics

RARE week: (Review, Assess, Re-teach, and Enrich) specific days set aside for teachers to administer district assessments, go over the test items in class with students, and identify students who need additional remediation or enrichment

DIA:B: (District Interim Assessments: Biology) are content-specific tests developed by the district and teacher committees to assist teachers in monitoring student progress. The secondary goal is to prepare students for the EOC through similar rigor, complexity, and style guidelines as in state assessments.

Volusia County Science 5E Instructional Model

	Description	Implementation
Engage	Learners engage with an activity that captures their attention, stimulates their thinking, and helps them access prior knowledge. A successful engagement activity will reveal existing misconceptions to the teacher and leave the learner wanting to know more about how the problem or issue relates to his/her own world. *(e.g. ISN-preview, Probe, Teacher Demonstration…)*	The diagram below shows how the elements of the 5E model are interrelated. Although the 5E model can be used in linear order (engage, explore, explain, elaborate and evaluate), the model is most effective when it is used as a cycle of learning.
Explore	Learners explore common, hands-on experiences that help them begin constructing concepts and developing skills related to the learning target. The learner will gather, organize, interpret, analyze and evaluate data. *(e.g. investigations, labs…)*	
Explain	Learners explain through analysis of their exploration so that their understanding is clarified and modified with reflective activities. Learners use science terminology to connect their explanations to the experiences they had in the engage and explore phases. *(e.g. Lecture, ISN-notes, Research, Close-reading, reading to learn, videos, websites…)*	
Elaborate	Learners elaborate and solidify their understanding of the concept and/or apply it to a real world situation resulting in a deeper understanding. Teachers facilitate activities that help the learner correct remaining misconceptions and generalize concepts in a broader context. *(e.g. labs, web-quest, presentations, debate, discussion, ISN-reflection…)*	
Evaluate	Teachers and Learners evaluate proficiency of learning targets, concepts and skills throughout the learning process. Evaluations should occur before activities, to assess prior knowledge, after activities, to assess progress, and after the completion of a unit to assess comprehension. *(i.e. formatives and summatives)*	Each lesson begins with an engagement activity, but evaluation occurs throughout the learning cycle. Teachers should adjust their instruction based on the outcome of the evaluation. In addition, teachers are encouraged to differentiate at each state to meet the needs of individual students.



*Adapted from The BSCS 5E Instructional Model: Origins, Effectiveness, and Applications, July 2006, Bybee, et.al, pp. 33-34.

Cognitive Complexity

The benchmarks in the Next **Generation Sunshine State Standards (NGSSS)** identify knowledge and skills students are expected to acquire at each grade level, with the underlying expectation that students also demonstrate critical thinking.

The categories—**low complexity**, **moderate complexity**, **high complexity**—form an ordered description of the demands a test item may make on a student. Instruction in the classroom should match, at a minimum, the complexity level of the learning target in the curriculum map.

Low	Moderate	High
This category relies heavily on the recall and recognition of previously learned concepts and principles. Items typically specify what the student is to do, which is often to carry out some procedure that can be performed mechanically. It is not left to the student to come up with an original method or solution.	This category involves more flexible thinking and choice among alternatives than low complexity items. They require a response that goes beyond the habitual, is not specified, and ordinarily has more than a single step or thought process. The student is expected to decide what to do—using formal methods of reasoning and problem-solving strategies—and to bring together skill and knowledge from various domains.	This category makes heavy demands on student thinking. Students must engage in more abstract reasoning, planning, analysis, judgment, and creative thought. The items require that the student think in an abstract and sophisticated way often involving multiple steps.
Students will: • **identify** a common example or **recognize** a concept; • **retrieve information** from a chart, table, diagram, or graph; • **recognize** a standard scientific representation of a simple phenomenon; or • **calculate** or **complete** a familiar single-step procedure or equation using a reference sheet.	Students will: • **apply** or **infer** relationships among facts, terms, properties, or variables; • **describe** examples and non-examples of scientific processes or concepts; • **predict** or **determine** the logical next step or outcome; • **compare** or **contrast** structures or functions of different organisms or systems; • **choose** the appropriate formula or equation to solve a problem and then solve it; or • **apply** and **use concepts** from a standard scientific model or theory.	Students will: • **construct** models for research; • **generalize** or **draw conclusions**; • **design** an experiment, given data and conditions; • **explain** or **solve** a problem in more than one way; • **provide a justification** for steps in a solution or process; • **analyze** an experiment to identify a flaw and propose a methods for correcting it; • **interpret**, **explain**, or **solve** a problem involving spatial relationships; or • **predict** a long-term effect, outcome, or result of a change within a system.

*Adapted from Webb's Depth of Knowledge and FLDOE FCAT 2.0 Specification Documentation

Chemistry I Instruction and Assessment Calendar

Week #	Days of Instruction	Dates	Common Formative Assessment Units	Measurement Topics	Notes
1–3	12	Aug. 20 – Sept. 5	Unit 1: Measurement and Lab Skills	T01, T02, T04	Sept. 3 Labor Day
3–4	7	Sept. 6 – Sept. 14	Unit 2: Properties of Matter	T04	
5–7	15	Sept. 17 – Oct. 8	Unit 3: Atomic Theory and Structure (including the mole)	T02, T03, T06, T07, T16	Sept. 21 PD Day
8–10	10	Oct. 9 – Oct. 23	Unit 4: Electrons and Modern Atomic Theory	T02, T03, T05, T06, T08	Oct. 19 PD Day Oct. 23 Mole Day Assessment given in 2nd Quarter
10–11	8	Oct. 24 – Nov. 2	Unit 5: The Periodic Table	T01, T03, T04, T08	
12–15	14	Nov. 5 – Nov. 28	Unit 6: Ionic Bonding and Nomenclature	T08, T09	Nov. 12 Veterans Day
15–17	10	Nov. 29 – Dec. 12	Unit 7: Covalent Bonding and Nomenclature	T08, T09	Nov. 21-23 Thanksgiving Holiday
17–18	6	Dec. 13 – Dec. 20	**Review and Semester Exams**	**Semester Exam**	
19–20	7	Jan. 7 – Jan. 15	Unit 8: Chemical Composition	T01, T08, T07	
20–22	12	Jan. 16 – Feb. 1	Unit 9: Chemical Reactions and Rates	T04, T05, T07, T11, T16	Jan. 21 MLK Day
23–26	16	Feb. 4 – Feb. 27	Unit 10: Stoichiometry	T01, T11, T07	Feb. 18 Presidents' Day
26–29	13	Feb. 28 – Mar. 19	Unit 11: Kinetic-Molecular Theory and Gas Laws	T01, T03, T04, T07, T12	Mar. 11 PD Day
29-31	10	Mar. 20 – Apr. 9	Unit 12: States of Matter	T04, T05, T10, T12	Mar. 25 – 31 Spring Break Assessment given in 3rd Quarter
31–33	12	Apr. 10 – Apr. 25	Unit 13: Solutions and Chemical Equilibrium	T07, T10, T14, T13	FCAT Reading Scheduled
33–36	13	Apr. 26 – May 14	Unit 14: Acids and Bases	T10, T14, T13, T15	EOC Subject Exams and AP Exams
36–37	5	May 15 – May 21	Unit 15: Environmental Chemistry	T02, T05, T16, T17	
37–39	9	May 22 – May 29	**Review and Final Exams**	**End of Course Exam**	May 27 Memorial Day

Chemistry I Measurement Topics

(T01) Science Process
- SC.912.N.1.1
- SC.912.N.1.4
- SC.912.N.1.5
- SC.912.N.4.1
- SC.912.N.4.2

(T02) What is Science?
- SC.912.N.1.2
- SC.912.N.1.3
- SC.912.N.1.6
- SC.912.N.1.7
- SC.912.N.2.1
- SC.912.N.2.2
- SC.912.N.2.3
- SC.912.N.2.4
- SC.912.N.2.5

(T03) Theories, Laws, and Models
- SC.912.N.3.1
- SC.912.N.3.2
- SC.912.N.3.3
- SC.912.N.3.4
- SC.912.N.3.5

(T04) Properties of Matter
- SC.912.P.8.1
- SC.912.P.8.2

54 NGSSS Benchmarks

grouped into

17 Chemistry Measurement Topics

assessed by

15 Common Formative Assessment Units

(T05) Energy Transformations
- SC.912.P.10.1
- SC.912.P.10.2
- SC.912.P.10.6
- SC.912.P.10.7

(T06) Atomic Theory and Structure
- SC.912.P.8.3
- SC.912.P.8.4
- SC.912.P.10.9
- SC.912.P.10.18
- SC.912.E.5.1

(T07) The Mole Concept
- SC.912.P.8.9

(T08) Periodicity
- SC.912.P.8.5

(T09) Bonding and Chemical Formulas
- SC.912.P.8.7
- SC.912.P.8.12

(T10) Intermolecular Forces
- SC.912.P.8.6
- SC.912.L.18.12

(T11) Chemical Reactions and Stoichiometry
- SC.912.P.8.8
- SC.912.P.12.12

(T12) Kinetic-Molecular Theory and Gas Behavior
- SC.912.P.10.5
- SC.912.P.12.10
- SC.912.P.12.11

(T13) Equilibrium
- SC.912.P.12.13

(T14) Solutions
- Volusia Specific Benchmark*

(T15) Acids and Bases
- SC.912.P.8.11

(T16) Nuclear Chemistry
- SC.912.P.10.10
- SC.912.P.10.11
- SC.912.P.10.12

(T17) Environmental Chemistry
- SC.912.L.15.2
- SC.912.L.16.10
- SC.912.L.17.15
- SC.912.L.17.16
- SC.912.L.17.19
- SC.912.L.17.20
- SC.912.L.17.11

*Describe solutions as homogeneous mixtures of two or more substances in terms of composition and properties.

Body of Knowledge: UNIT 1 – Measurement and Lab Skills		August 20 – September 5	
Measurement Topics	**Learning Targets and Skills**	**Benchmarks**	**Academic Language**

Weeks 1-3
 	
Science Process
(T01)
 	
What is Science
(T02)
	Students will:
	• **(T01) design** a controlled experiment on a chemistry topic
	• **(T01) use tools** *(this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs)*
	• **(T01) collect**, **analyze**, and **interpret** data from the experiment to draw conclusions
	• **(T01) determine** an experiment's validity and **justify** its conclusions based on:
	  ○ control group
	  ○ limiting variables and constants
	  ○ multiple trials (repetition) or large sample sizes
	  ○ bias
	  ○ method of data collection, analysis, and interpretation
	  ○ communication of results
	• **(T01) describe** the difference between an observation and inference
	• **(T01) use appropriate evidence** and reasoning to justify explanations to others
	• **(T01) discriminate** between independent and dependent variables and **recognize** the correct placement of variables on the axes of a graph
	• **(T01) convert** numbers in scientific notation and standard notation
	• **(T01) convert** between metric measurements
	• **(T01) interpret** metric prefixes in terms of relative size
	• **(T01) select** and correctly **utilize** appropriate tools for determining mass, volume, and temperature
	• **(T01) read** the meniscus of a graduated cylinder and record the volume correctly
	• **(T01) differentiate** between accuracy and precision
		SC.912.N.1.3
		SC.912.N.1.6
		SC.912.N.1.7
		SC.912.N.2.1
		SC.912.N.2.2
		SC.912.N.2.4
		SC.912.N.2.5
			Reliability
			Validity
			Bias
			Peer review
			Inference
			Observation
			Analysis
			Interpretation
			Evidence
			Scientific notation
			Meniscus
			Independent variable
			Dependent variable
			Control variables
			Multiple trials
			Accuracy
			Precision

	Students will: • **(T02) explain** that science is the study of the natural world through observation and experimentation • **(T02) explain** that chemists study matter and the changes it undergoes • **(T02) differentiate** between science and non-science • **(T02) identify** which questions can be answered through science and which questions cannot	**SC.912.N.1.1** **SC.912.N.1.4** **SC.912.N.1.5** **SC.912.N.4.1** **SC.912.N.4.1**	Science Non-science Pseudoscience

Properties of Matter **(T04)**	Students will: • **(T04) describe** density as a physical property that depends only on the *type* of substance, not the *amount* of substance • **(T04) recognize** that the density of water is 1 g/mL at room temperature • **(T04) calculate** the volume of objects by displacement and by formula (LxWxH) • **(T04) calculate** the mass, volume, and density of an object from real world data • **(T04) predict** whether an object floats or sinks in a liquid based on density	**SC.912.P.8.2**	Density

Resources	
Text book	
Lab / Demos	
Safari Montage	
Websites / PhET	
Keeley Probes	
Teacher Hints	

Prefix / Suffix	**Sample Assessment**
No/Non - not *Sciencia- wisdom* *Pre-* before *Dici- to say* *-ology- study*	During the early 1900's, Albert Einstein proposed a set of mathematical models that explain the motion of objects approaching the speed of light, 300,000,000 m/s. His now-famous theory is called Special Relativity and is the accepted method to describe almost all motion scientists observe. Why is the Relativity a theory of motion and a law of motion? A. Theories are subject to change as new scientists become famous. B. Theories are subject to change as new evidence is discovered. C. Laws are subject to change as new scientists become famous. D. Laws are subject to change as new evidence is discovered.

Body of Knowledge: UNIT 2 – Properties of Matter		August 27 – September 14	
Measurement Topics	**Learning Targets and Skills**	**Benchmarks**	**Academic Language**
Weeks 3-4 **Properties of Matter** **(T04)**	Students will: • **(T04) recognize** that all matter is made up of atoms, has mass, and takes up space • **(T04) differentiate** among the four states of matter in terms of particle distance, particle motion, and definite/indefinite shapes and volumes	**SC.912.P.8.1**	Matter Solid Liquid Gas Plasma Definite Indefinite
	Students will: • **(T04) differentiate** between physical and chemical properties • **(T04) differentiate** between a physical change and a chemical change • **(T04) describe** the phase changes that occur between solids, liquids, and gases as physical changes • **(T04) distinguish** between pure substances (elements and compounds) and mixtures (heterogeneous and homogeneous)	**SC.912.P.8.2**	Physical property Chemical property Physical change Chemical change Mixture Heterogeneous Homogeneous

Resources	
Text book	
Lab / Demos	
Safari Montage	
Websites / PhET	
Keeley Probes	
Teacher Hints	

Prefix / Suffix	Sample Assessment

The table below contains data for mercury and water at standard pressure.
Substance Melting

Substance	Melting Point (°C)	Boiling Point (°C)
mercury	−39	357
water	0.0	100

Based on the data in the table, which of the following pairs of substances could exist at the same temperature?

A. ice and liquid mercury
B. liquid water and solid mercury
C. water vapor and solid mercury
D. liquid water and mercury vapor

Body of Knowledge: UNIT 3 - Atomic Theory and Structure		September 17 – October 8	
Measurement Topics	**Learning Targets and Skills**	**Benchmarks**	**Academic Language**
Weeks 5-7 **What is Science** **(T02)** **Theories, Laws, and Models** **(T03)** **Atomic Theory and Structure** **(T06)**	Students will: • **(T02) explain** scientific knowledge can change because it is often re-examined by new investigations which makes it more durable and robust • **(T02) recognize** the Rutherford experiment and how it yielded evidence for the existence of the atomic nucleus	**SC.912.N.2.4**	Rutherford experiment Atomic nucleus
	Students will: • **(T03) recognize** that a scientific theory represents the most powerful explanation scientists have to offer based on current evidence from many scientific investigations • **(T03) describe** the law of definite proportions as a description of what Dalton observed when combining elements, but not an explanation • **(T03) recognize** that atomic theories will not become laws, because theories explain observations while laws summarize or describe them • **(T03) describe** the function of atomic models as representations of atoms based on evidence from experiments	**SC.912.N.3.1** **SC.912.N.3.3** **SC.912.N.3.4** **SC.912.N.3.5**	Theory Law Model
	Students will: • **(T06) describe** and **differentiate** atomic models according to Dalton, Thomson, and Rutherford • **(T06) describe** how changes in atomic models resulted from new experimental evidence	**SC.912.P.8.3**	Dalton model Plum Pudding model Rutherford model

Atomic Theory and Structure (T06)
 	
Mole Concept (T07)
 	
Nuclear Chemistry (T16)
	• **(T06) describe** the structure of atoms in terms of subatomic particles:
	  ○ protons, neutrons, electrons
	• **(T06) differentiate** the three subatomic particles in terms of:
	  ○ mass, charge, and location within the atom
	• **(T06) explain** how isotopes of the same element are alike and different
	• **(T06) recognize** that the atomic number of an atom is the number of protons in the nucleus
	• **(T06) recognize** and **apply** the mass number of an atom as the number of protons and neutrons in the nucleus
	• **(T06) describe** the average atomic mass of an element is the weighted averages of the commonly occurring isotopes of that element
		SC.912.P.8.4	Nucleus
			Proton
			Neutron
			Electron
			Isotope
			Atomic number
			Mass number
			Average atomic mass

	Students will: • **(T07) identify** a mole as unit of measure containing 6.02 x 10^{23} particles of any substance • **(T07) define** molar mass as the mass of one mole of particles of any substance • **(T07) calculate** the molar mass of any substance from the average atomic masses of its elements • **(T07) convert** particles to moles and moles to particles of a substance • **(T07) convert** grams to moles and moles to grams of a substance	**SC.912.P.8.9**	Mole Avogadro's' number
	Students will: • **(T16) describe** radioactivity and **explain** its source based on electrostatic and nuclear forces in the atomic nucleus • **(T16) describe** three primary types of radioactive decay (alpha, beta, gamma) in terms of mass, charge, and penetration through various materials	**SC.912.P.10.10**	Electromagnetic force Weak nuclear force Strong nuclear force Radioactivity/Radiation Alpha particle Beta particle Gamma ray

Resources	
Text book	
Lab / Demos	
Safari Montage	
Websites / PhET	
Keeley Probes	
Teacher Hints	
Prefix / Suffix	**Sample Assessment**
	Which of the following statements best describes a difference between nuclear fission and nuclear fusion reactions? A. Nuclei split during fission and combine during fusion. B. Fission forms heavier elements, and fusion forms lighter elements. C. Fission generates potential energy, and fusion generates kinetic energy. D. Nuclei gain electrons during fission and release electrons during fusion.

Body of Knowledge: UNIT 4: Electrons and Modern Atomic Theory		October 9 – October 23	
Measurement Topics	**Learning Targets and Skills**	**Benchmarks**	**Academic Language**
Weeks 8-10 **What is Science** **(T02)** **Theories, Laws, and Models** **(T03)** **Energy Transformations** **(T05)** **Atomic Theory and Structure** **(T06)** **Periodicity** **(T08)**	Students will: • **(T02) interpret** the evidence of the hydrogen emission spectrum in support of the Bohr atomic model with specific quantized energy levels	**SC.912.N.2.4**	Emission spectrum Energy levels
	Students will: • **(T03) describe** the role consensus played in the historical development of the quantum mechanical model of the atom.	**SC.912.N.3.2**	Consensus
	Students will: • **(T05) recognize** that when electrons change energy levels they absorb or release energy by moving between excited and ground states	**SC.912.P.10.1**	Excited state Ground state
	Students will: • **(T06) describe** the quantization of energy through the behavior of electrons changing energy levels that correspond to specific amounts of energy • **(T06) describe** the Bohr model and the quantum mechanical model of the atom • **(T06) describe** the *s*, *p*, *d*, *f* atomic orbitals in terms of shape and number of electrons held • **(T06) write** electron configurations for the first 20 elements	**SC.912.P.10.9**	Bohr model Quantum mechanical model Atomic orbital Electron configuration Quantum
	Students will: • **(T06) compare** and **contrast** the different parts of the electromagnetic spectrum in terms of wavelength, frequency, and energy, and relate them to phenomena and applications	**SC.912.P.10.18**	Electromagnetic spectrum Wavelength Frequency
	Students will: • **(T08) identify** the *s*, *p*, *d*, *f* blocks of atomic orbitals in the periodic table • **(T08) determine** how many valence electrons are in a representative (main-group) element by: Lewis dot structure, electron configuration, location in the periodic table. • **(T08) identify** an element if given its atomic number and a periodic table • **(T08) determine** the electron configuration of an element based on its position I the periodic table and vice versa	**SC.912.P.8.5**	Valence electron Lewis dot structure

Resources	
Text book	
Lab / Demos	
Safari Montage	
Websites / PhET	
Keeley Probes	
Teacher Hints	

Prefix / Suffix	Sample Assessment	
	Cobalt has an atomic mass of 59 and an atomic number of 27. What does this information reveal about most cobalt atoms? A. They contain more neutrons than protons. B. They naturally have a net negative charge. C. They attract protons more strongly than electrons. D. They form ions with a charge of +27 in compounds.	Which of the following ideas was proposed by Niels Bohr? A. Electrons occupy specific energy levels within an atom. B. The nucleus of an atom contains neutrons as well as protons. C. An atom is a solid sphere that cannot be separated into smaller parts. D. An atom consists of negative charges embedded in a positively charged sphere.

Body of Knowledge: UNIT 5 – The Periodic Table		October 24 – November 2	
Measurement Topics	**Learning Targets and Skills**	**Benchmarks**	**Academic Language**
Weeks 10-11 **Science Process** **(T01)** **Theories, Laws, and Models** **(T03)** **Properties of Matter** **(T04)** **Periodicity** **(T08)**	Students will: • **(T01) describe** the development of the periodic table by Mendeleev by ordering elements in average atomic mass and chemical properties	**SC.912.N.1.6**	Periodic table
	Students will: • **(T03) describe** the periodic law as the repetition of predictable chemical and physical properties observed when elements are arranged in a table	**SC.912.N.3.3**	Periodic law
	Students will: • **(T04) classify** elements as metals, nonmetals, or metalloids based on their physical and chemical properties or position in the periodic table	**SC.912.P.8.2**	Metal Nonmetal Metalloid
	Students will: • **(T08) name** and **describe** properties of groups 1, 2, 17, and 18 in the periodic table in terms of electron configuration, metallic character, and reactivity • **(T08) predict** the properties of elements within a group and period based upon the properties of another element in the same group • **(T08) recognize** that properties of elements change across a period and repeat in the next period (periodicity) • **(T08) arrange** elements by atomic radius within any group or period using a periodic table • **(T08) compare** the atomic radius of an atom to the ionic radius of its ion formed by gaining or losing electrons • **(T08) define** ionization energy and electronegativity • **(T08) interpret** ionization energy trends and electronegativity trends from graphed data and a periodic table in terms of electronic configuration • **(T08) predict** the reactivity of an element based on its position in the periodic table	**SC.912.P.8.5**	Periodicity Group Period Alkali metals Alkaline earth metals Halogens Nobel gases Atomic radius Ionic radius Ionization energy Electronegativity Cation Anion

Resources	
Text book	
Lab / Demos	
Safari Montage	
Websites / PhET	
Keeley Probes	
Teacher Hints	

Prefix / Suffix	Sample Assessment	
	A sealed flask contains molecules of CO_2. How many moles of CO_2 are in the flask? A. 0.046 mol B. 22 mol C. 3.0×10^{23} mol D. 7.8×10^{48} mol	In which of the following lists are the elements shown in order of increasing electronegativity? A. Li, Be, O, F B. O, F, Be, Li C. F, Li, O, Be D. Li, F, Be, O

Body of Knowledge: UNIT 6 – Ionic Bonding and Nomenclature		November 5 – November 28	
Measurement Topics	**Learning Targets and Skills**	**Benchmarks**	**Academic Language**
Weeks 12-15 **Periodicity** **(T08)** **Bonding and Chemical Formulas** **(T09)**	Students will: • **(T08) predict** the charge (oxidation number) for ions of representative (main-group) elements based on the octet rule and their position in the periodic table	**SC.912.P.8.5**	Oxidation number
	Students will: • **(T09) recognize** that electrostatic forces of attraction between positive ions (cations) and negative ions (anions) formed by the transfer of electrons result in an ionic bond • **(T09) recognize** that ionic bonds will form between metals and nonmetals • **(T09) describe** the properties of ionic compounds such as high melting point, brittle, and crystalline structure • **(T09) determine** the number of electrons an atom will lose or gain in order to obtain a stable electron arrangement or octet • **(T09) define** and **interpret** the concept of formula unit as the simplest ratio of ions of elements in an ionic compound • **(T09) write** chemical formulas and names for ionic compounds using the Stock system • **(T09) recognize** the Lewis dot structure for an ionic compound • **(T09) explain** that chemical bonds form between atoms to create more stable electron arrangements • **(T09) interpret** chemical formulas for the number of ions and charge of each element	**SC.912.P.8.7**	Ionic bond Octet rule Polyatomic ion Formula unit

Resources	
Text book	
Lab / Demos	
Safari Montage	
Websites / PhET	
Keeley Probes	
Teacher Hints	

Prefix / Suffix	Sample Assessment	
	Which of the following is a correct Lewis dot structure for potassium chloride? A. $K^+[:\ddot{C}l:]^-$ B. $K^-[:\ddot{C}l:]^+$ C. $K^{2+}[:\ddot{C}l:]^{2-}$ D. $K^{2-}[:\ddot{C}l:]^{2+}$	Barium and iodine combine to form an ionic compound. What is the chemical formula for this compound? A. BaI B. BaI_2 C. Ba_2I D. Ba_2I_2

Body of Knowledge: UNIT 7 – Covalent Bonding and Nomenclature		November 29 – December 12	
Measurement Topics	**Learning Targets and Skills**	**Benchmarks**	**Academic Language**
Weeks 15-17 **Periodicity** **(T08)** **Bonding and Chemical Formulas** **(T09)**	Students will: • **(T08) identify** the seven elements that exist as diatomic molecules (H_2, N_2, O_2, F_2, Cl_2, Br_2, I_2) • **(T08) identify** ionic, and polar and nonpolar covalent bonds between atoms based on position in the periodic table and electronegativity trends	**SC.912.P.8.5**	Diatomic

	Students will:
	• **(T09) identify** a compound as ionic or covalent from its chemical formula
	• **(T09) write** chemical formulas and names for binary molecular compounds
	• **(T09) draw** Lewis dot structures for common molecules
	• **(T09) differentiate** between polar and nonpolar covalent bonds between atoms based on electronegativity difference
	• **(T09) distinguish** between simple polar and nonpolar molecules based on shape and polar bonds (e.g. CO_2, H_2O, NH_3, CCl_4, CH_4, F_2)
	• **(T09) explain** that chemical bonds form between atoms to create more stable electron arrangements
	• **(T09) compare** and **contrast** ionic and covalent bonds in three ways:
	  ○ transfer vs. sharing of electrons
	  ○ metal/nonmetal vs. nonmetal/nonmetal
	  ○ formula unit vs. molecule
	• **(T09) compare** and **contrast** the properties of ionic and covalent compounds:
	  ○ melting point
	  ○ solubility
	  ○ conductivity
		SC.912.P.8.7	Binary molecular compound
			Covalent bond
			Molecule
			Polar
			Nonpolar

	Students will: • **(T09) describe** the properties of carbon that make the diversity of carbon compounds possible such as having 4 valence electrons, forming up to 4 bonds, and forming double and triple bonds	**SC.912.P.8.12**	

Resources	
Text book	
Lab / Demos	
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Websites / PhET	
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Teacher Hints	

Prefix / Suffix	Sample Assessment	
	Which of the following statements best explains why atoms bond? A. Atoms bond to make new substances. B. Atoms bond to become less chemically stable. C. Atoms bond to change from a liquid to a solid. D. Atoms bond to become more chemically stable.	Two compounds that contain the elements carbon and chlorine are carbon tetrachloride (CCl_4) and chloroform ($CHCl_3$). Which of the following statements describes the geometry around carbon in these two compounds? A. CCl_4 and $CHCl_3$ have bent geometries. B. CCl_4 and $CHCl_3$ have tetrahedral geometries. C. CCl_4 has linear geometry and $CHCl_3$ has bent geometry. D. CCl_4 has tetrahedral geometry and $CHCl_3$ has trigonal planar geometry.

Body of Knowledge: UNIT 8 – Chemical Composition		January 7 – January 15	
Measurement Topics	**Learning Targets and Skills**	**Benchmarks**	**Academic Language**
Weeks 19-20 **Science Process** **(T01)** **Bonding and Chemical Formulas** **(T09)** **Mole Concept** **(T07)**	Students will: • **(T01)** **collect**, **analyze**, and **interpret** data in an experiment to draw conclusions regarding the percent composition of a substance	**SC.912.N.1.1**	

	Students will:
	• **(T09)** **distinguish** between empirical and molecular chemical formulas
	• **(T09)** **calculate** the percent composition of each element in a compound given:
	  ○ total masses of each element, or
	  ○ chemical formula
	• **(T09)** **calculate** the mass of each element in a compound from the percent composition
	• **(T09)** **calculate** the empirical formula of a compound from the percent composition
	• **(T09)** **calculate** the molecular formula of a compound from the empirical formula and molecular mass
		SC.912.P.8.7	Percent composition
			Empirical formula
			Molecular formula

	Students will: • **(T07)** **calculate** the molar mass of any compound from the average atomic masses of its elements • **(T07)** **calculate** the molar mass of a substance from its chemical formula • **(T07)** **calculate** the number of moles of each element in a compound given the chemical formula and the mass	**SC.912.P.8.9**	Molar mass

Resources	
Text book	
Lab / Demos	
Safari Montage	
Websites / PhET	
Keeley Probes	
Teacher Hints	

Prefix / Suffix	Sample Assessment	

Body of Knowledge: UNIT 9 – Chemical Reactions and Rates		January 16 – February 1	
Measurement Topics	**Learning Targets and Skills**	**Benchmarks**	**Academic Language**
Weeks 20-22 **Properties of Matter** **(T04)** **Energy Transformations** **(T05)** **Mole Concept** **(T07)**	Students will: • **(T04) recognize** a chemical reaction as a chemical change forming new substances with new properties • **(T04) list** four clues that a chemical reaction has probably occurred: ○ color change, gas formation, precipitate, temperature change	**SC.912.P.8.2**	Chemical reaction
	Students will: • **(T05) recognize** that chemical bonds store chemical potential energy in the form of attractions between atoms • **(T05) recognize** that energy is absorbed to break bonds and released when bonds form • **(T05) describe** stronger bonds as those that require more energy to break and release more energy when formed	**SC.912.P.10.1**	Potential energy
	Students will: • **(T05) describe** activation energy (E_a) as the minimum energy required to cause a reaction • **(T05) recognize** a system that has lost energy as exothermic • **(T05) recognize** a system that has gained energy as endothermic	**SC.912.P.10.7**	Activation energy Endothermic Exothermic
	Students will: • **(T05) interpret** energy diagrams and their components: reactants, products, energy change (ΔE or ΔH), activation energy (E_a) • **(T05) interpret** energy diagrams for catalyzed and uncatalyzed reactions • **(T05) distinguish** between endothermic and exothermic energy diagrams	**SC.912.P.10.6**	Energy diagram Catalyzed
	Students will: • **(T05) recognize** and **apply** the law of conservation of energy in chemical reactions	**SC.912.P.10.2**	Law of conservation of energy
	Students will: • **(T07) apply** the law of conservation of mass to **balance** chemical equations • **(T07) apply** the law of conservation of mass **calculate** the initial and final masses of reactants and products in a chemical reaction	**SC.912.P.8.9**	Law of conservation of mass Chemical equation

Chemical Reactions and Stoichiometry (T11)
 	
Nuclear Chemistry (T16)
	Students will:
	• **(T11) interpret** chemical equations in terms of:
	  ○ reactants, products, and symbols (s, l, g, aq, →, Δ)
	• **(T11) identify** and **describe** the five main types chemical reactions:
	  ○ synthesis, decomposition, single replacement, double replacement, and combustion
	• **(T11) describe** oxidation and reduction as the loss or gain of electrons
	• **(T11) recognize** which reactants are oxidized and reduced in redox reactions
	• **(T11) identify** most reactions (except double replacement) as oxidation-reduction (redox) reactions
	• **(T11) describe** oxidation-reduction reactions in living and non-living systems
		SC.912.P.8.8
		SC.912.P.8.10
			Synthesis
			Decomposition
			Single replacement
			Double replacement
			Combustion
			Oxidation
			Reduction

	Students will: • **(T11) describe** the three conditions necessary for a chemical reaction according to collision theory • **(T11) express** reaction rates with proper units (amount/time) • **(T11) explain** how increasing concentration increases the rate of a reaction by increasing the frequency of collisions • **(T11) explain** how increasing temperature increases the rate of a reaction by increasing the frequency and energy of collisions • **(T11) explain** how increasing surface area (smaller particles) increases the rate of a reaction by increasing the amount of reactant available for collisions • **(T11) predict** how changes in concentration, temperature, and surface area (particle size) affect reaction rates • **(T11) recognize** that a catalyst increases the rate of reversible chemical reactions by lowering the activation energy and remaining unchanged	**SC.912.P.12.12**	Collision theory Rate Catalyst

	Students will:
	• **(T16) differentiate** between chemical reactions and nuclear reactions in that nuclear reactions:
	  ○ produce much more energy
	  ○ produce different elements by a change in atomic number
		SC.912.P.10.12	Nuclear reaction

	Students will: • **(T16) compare** and **contrast** nuclear fission and fusion in terms of energy, process, and sustainability • **(T16) describe** radioactive decay occurring at a constant rate (half-life) that depends only on the type of substance, not the amount of conditions • **(T16) interpret** radioactive decay and half-life data from graphs	**SC.912.P.10.11**	Fission Fusion Half-life

Resources	
Text book	
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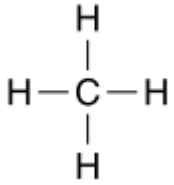
Teacher Hints	

Prefix / Suffix	Sample Assessment	
	The diagram below represents one molecule of methane (CH_4).  Which of the following is a balanced equation for the synthesis of methane from carbon and hydrogen? A. $C + H \rightarrow CH_4$ B. $C_4 + H \rightarrow CH_4$ C. $C + 2H_2 \rightarrow CH_4$ D. $C_2 + 4H \rightarrow CH_4$	Which of the following statements best describes a difference between nuclear fission and nuclear fusion reactions? A. Nuclei split during fission and combine during fusion. B. Fission forms heavier elements, and fusion forms lighter elements. C. Fission generates potential energy, and fusion generates kinetic energy. D. Nuclei gain electrons during fission and release electrons during fusion.

Body of Knowledge: UNIT 10 – Stoichiometry		February 4 – February 27	
Measurement Topics	**Learning Targets and Skills**	**Benchmarks**	**Academic Language**
Weeks 23-26 **Science Process** **(T01)** **Chemical Reactions and Stoichiometry** **(T11)** **Mole Concept** **(T07)**	Students will: • **(T01) collect**, **analyze**, and **interpret** data in an experiment to determine the percent yield of a product in a chemical reaction	**SC.912.N.1.1**	
	Students will: • **(T11) recognize** that chemicals react in simple whole number ratios given by the coefficients in a balanced chemical equation	**SC.912.P.8.8**	Ratio
	Students will: • **(T07) apply** the law of conservation of mass **calculate** the amounts grams or moles of reactants and products in a chemical reaction (stoichiometry) • **(T07) identify** and **apply** mole-to-mole ratios of reactants and products in a balanced chemical equation • **(T07) identify** which amounts (atoms, mass, moles, or molecules) are conserved in a balanced chemical equation • **(T07) convert** moles or grams of one substance to moles or grams of another substance • **(T07) define** and **calculate** theoretical yield in grams of a product • **(T07) calculate** the percent yield of a product	**SC.912.P.8.9**	Stoichiometry Mole-to-mole ratio Theoretical yield Percent yield

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Prefix / Suffix	Sample Assessment
	The chemical equation below represents sulfur trioxide (SO_3) in the atmosphere mixing with rainwater to form sulfuric acid (H_2SO_4), which is a major component of acid rain. $SO_3(g) + H_2O(l) \rightarrow H_2SO_4(l)$ The molar mass of SO_3 is 80.1 g/mol and the molar mass of H_2SO_4 is 98.1 g/mol. How much H_2SO_4 is produced when 128.0 g of SO_3 mixes with rainwater? A. 98.1 g B. 105 g C. 128 g D. 157 g

Body of Knowledge: UNIT 11 – Kinetic-Molecular Theory Ideal and Gas Laws		February 28 – March 19	
Measurement Topics	**Learning Targets and Skills**	**Benchmarks**	**Academic Language**
Weeks 26-29 **Science Process** **(T01)** **Theories, Laws, and Models** **(T03)** **Properties of Matter** **(T04)** **Kinetic-Molecular Theory and Gas Behavior** **(T12)**	Students will: • **(T01) collect**, **analyze**, and **interpret** data relating to changes in gas pressure, volume, and/or temperature • **(T01) convert** temperature between degrees Celsius (^{o}C) and kelvins (K)	**SC.912.N.1.1**	Celsius scale Kelvin scale
	Students will: • **(T03) describe** the main points of kinetic-molecular theory as the best explanation for gas properties and behavior	**SC.912.N.3.1**	Kinetic-molecular theory
	Students will: • **(T04) recognize** the physical properties of gases including low density, compressibility, and expansion to fill any container	**SC.912.P.8.1**	Compressibility Expansion
	Students will: • **(T12) describe** temperature as a measure of the average kinetic energy of the particles in a substance • **(T12) describe** matter at absolute zero (0 K)	**SC.912.P.10.5**	Temperature Kinetic energy Absolute zero

	Students will:
	• **(T12) explain** the cause of gas pressure as the collisions of particles with the walls of a container
	• **(T12) convert** gas pressures between units of atm, kPa, and mmHg
	• **(T12) describe** how changes in volume, temperature, and number of particles affect gas pressure
	• **(T12) apply** gas laws to **predict** gas behavior based on changes in:
	  ○ pressure
	  ○ volume
	  ○ temperature
	  ○ number of particles
	• **(T12) define** standard temperature and pressure (STP) as 273 K and 1 atm
	• **(T12) apply** the combined gas law to **calculate** changes in pressure, volume, and temperature
		SC.912.P.12.10	Gas pressure
			atm
			kPa
			mmHg
			Gas laws
			STP

Resources	
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Prefix / Suffix	Sample Assessment	
	Which of the following actions decreases the entropy of a system? A. boiling water B. freezing water C. dissolving salt in water D. mixing baking soda and salt	Three identical balloons each contain one mole of gas. One balloon contains oxygen, one contains nitrogen, and one contains argon. Which of the following changes in volume will happen if the balloons are placed in a warmer room? A. The balloon with argon will decrease most in volume because argon is a noble gas. B. All of the balloons will decrease in volume equally because the temperature increased. C. The balloon with oxygen will increase most in volume because oxygen has the largest molecules. D. All of the balloons will increase in volume equally because they have equal numbers of molecules.

Body of Knowledge: UNIT 12 – States of Matter		March 20 – April 9	
Measurement Topics	**Learning Targets and Skills**	**Benchmarks**	**Academic Language**
Weeks 29-31 **Properties of Matter** **(T04)** **Energy Transformations** **(T05)** **Kinetic-Molecular Theory and Gas Behavior** **(T12)** **Intermolecular Forces** **(T10)**	Students will: • **(T04) differentiate** among the four states of matter in terms of particle distance, particle motion, and definite/indefinite shapes and volumes	**SC.912.P.8.1**	
	Students will: • **(T05) describe** heat as the flow of energy from objects of higher to lower temperature • **(T05) explain** the role of added or released energy in phase changes • **(T05) interpret** heating/cooling curves in terms of heat absorbed/released, temperature changes, and phase changes	**SC.912.P.10.1** **SC.912.P.10.7**	Heat Heating/cooling curve
	Students will: • **(T12) describe** phase transitions in terms of kinetic-molecular theory considering forces of attraction between particles and molecular motion	**SC.912.P.12.11**	Phase transition
	Students will: • **(T10) describe** three intermolecular forces in terms of their causes and relative strengths of attraction (dispersion forces, dipole-dipole forces, hydrogen bonds) • **(T10) differentiate** between *intra*molecular forces (bonds – ionic, covalent, metallic) in chemical reactions and *inter*molecular forces in phase changes • **(T10) explain** the phase of a substance at room temperature in terms of type and strength of intermolecular forces, for example: ○ $Cl_2(g)$ vs. $Br_2(l)$ vs. $I_2(s)$ or ○ $NH_3(l)$ vs. $CH_4(g)$	**SC.912.P.8.6**	Intermolecular forces Dispersion forces Dipole-dipole forces Hydrogen bonds Intramolecular forces
	Students will: • **(T10) recognize** hydrogen bonding in water as the source of its special physical properties (surface tension, cohesion/adhesion, high boiling point, liquid/solid density, “universal” solvent) making it suitable for life	**SC.912.L.18.12**	Surface tension Cohesion/adhesion Boiling point Solvent

Resources	
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Prefix / Suffix	Sample Assessment	

Body of Knowledge: UNIT 13 – Solutions and Chemical Equilibrium		April 10 – April 25	
Measurement Topics	**Learning Targets and Skills**	**Benchmarks**	**Academic Language**

Weeks 31-33
 	
Mole Concept
(T07)
 	
Intermolecular Forces
(T10)
 	
Solutions
(T14)
	Students will:
	• **(T07) define** molarity as a unit of concentration (moles of solute per liter of solution)
	• **(T07) solve** solution composition problems in terms of:
	  ○ molarity
	  ○ molar mass
	  ○ moles
	  ○ volume
	  ○ mass
	• **(T07) solve** dilution problems using the equation: $M_1V_1 = M_2V_2$
		SC.912.P.8.7	Molarity

	Students will: • **(T10) recognize** that intermolecular attractions break and form in solution formation (solute-solute, solvent-solvent, and solute-solvent)	**SC.912.P.8.6**	

	Students will:
	• **(T14) differentiate** solutions (homogeneous) from other mixtures (heterogeneous)
	• **(T14) identify** the solute and solvent in a solution
	• **(T14) apply** the general principle *"like dissolves like"* regarding two polar or nonpolar substances to determine whether they will form a solution
	• **(T14) describe** three factors that affect the rate of dissolving for solids or gases in liquid solvents:
	  ○ temperature
	  ○ surface area
	  ○ stirring
	• **(T14) recognize** electrolytes as substances that dissociate into ions in solution to conduct electricity
	• **(T14) differentiate** between concentrated and dilute solutions in terms of the relative amounts solute and solvent
	• **(T14) describe** and **classify** solutions as unsaturated, saturated, or supersaturated with a seed crystal test
	• **(T14) interpret** a solubility curve for a given substance dissolved in water (classify saturation and quantify solubility)
		Volusia County Specific	Solute
			Solvent
			Solution
			Electrolyte
			Concentration
			Dilution
			Unsaturated
			Saturated
			Supersaturated
			Seed crystal test
			Solubility curve

Equilibrium
(T13)
	Students will:
	• **(T13) describe** dynamic equilibrium as a reversible process with equal forward and reverse rates
	• **(T13) recognize** that both reactants and products are present at equilibrium
	• **(T13) describe** examples of dynamic equilibrium such as:
	  ○ saturated solutions
	  ○ melting-freezing or vaporization-condensation
	  ○ chemical reactions
		SC.912.P.12.13	Dynamic equilibrium
			Reversible

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Prefix / Suffix	**Sample Assessment**	
	The reduction of carbon dioxide by hydrogen gas takes place at 420°C to produce water vapor and carbon monoxide as shown in the reaction: $H_2(g) + CO_2(g) \rightleftharpoons H_2O(g) + CO(g)$ Which of the following changes in concentration occur when more water vapor is added to the system under equilibrium conditions? A. [H2] decreases, [CO2] decreases, [CO] increases B. [H2] decreases, [CO2] decreases, [CO] decreases C. [H2] increases, [CO2] increases, [CO] increases D. [H2] increases, [CO2] increases, [CO] decreases	Which of the following statements best explains why ionic solids dissolve in water? A. Water has high surface tension. B. Water is a highly polar molecule. C. Water is more dense as a liquid than as a solid. D. Water has a higher boiling point than predicted by its molar mass.

Body of Knowledge: UNIT 14 – Acids and Bases		April 26 – May 14	
Measurement Topics	**Learning Targets and Skills**	**Benchmarks**	**Academic Language**
Weeks 33-36 **Mole Concept** **(T10)** **Solutions** **(T14)** **Acids and Bases** **(T15)** **Equilibrium** **(T13)**	Students will: • **(T01) collect**, **analyze**, and **interpret** titration data relating to concentrations of acids and bases in neutralization reactions	**SC.912.N.1.1**	
	Students will: • **(T07) define** titration and **differentiate** between equivalence point and end point • **(T07) determine** the concentration of an unknown solution using titration techniques and the equation: $M_aV_a = M_bV_b$ (for 1:1 acid-base mole ratios only)	**SC.912.P.8.7**	Titration Indicator Equivalence point End point
	Students will: • **(T14) recognize** acids and bases as electrolytes that produce ions in solution to conduct electricity	**Volusia County Specific**	
	Students will: • **(T15) describe** the properties of Brönsted-Lowry acids and bases • **(T15) recognize** conjugate acid-base pairs • **(T15) describe** a neutralization reaction as an acid and a base reacting to produce water and a salt • **(T15) relate** pH to hydronium ion concentration with the equation: $pH = -\log[H_3O^+]$ or $pH = -\log[H^+]$ • **(T15) interpret** the pH scale for acidic, basic, and neutral solutions • **(T15) classify** solutions as acidic, basic, or neutral if given: ○ hydronium ion concentration $[H_3O^+]$ ○ hydroxide ion concentration $[OH^-]$ ○ pH • **(T15) calculate** $[H_3O^+]$, $[OH^-]$, or pH of a solution based on its identity and concentration	**SC.912.P.8.11**	Brönsted-Lowry acid Brönsted-Lowry base Conjugate acid-base pair Neutralization pH Hydronium ion Hydroxide ion Neutral
	Students will: • **(T13) describe** the auto-ionization of water and its constant, K_w , using the reaction: $H_2O + H_2O \leftrightarrow H_3O^+ + OH^-$ and the equation: $K_w = [H_3O^+][OH^-] = 1 \times 10^{-14}$	**SC.912.P.12.13**	Auto-ionization K_w

Resources	
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Prefix / Suffix	Sample Assessment	
	The compound NH_3 is classified as _____ because it _____ when dissolved in water. A. acid, donates hydrogen ions B. acid, accepts hydrogen ions C. base, donates hydrogen ions D. base, accepts hydrogen ions	

Body of Knowledge: UNIT 15 – Environmental Chemistry		May 15 – May 21	
Measurement Topics	**Learning Targets and Skills**	**Benchmarks**	**Academic Language**
Weeks 36-37 **What Is Science** **(T02)** **Energy Transformations** **(T05)** **Nuclear Chemistry** **(T16)** **Environmental Chemistry** **(T17)**	Students will: • **(T02) explain** scientific knowledge can change because it is often re-examined by new investigations which makes it more durable and robust	**SC.912.N.2.4**	
	Students will: • **(T05) describe** and **distinguish** between the various forms of energy ○ mechanical, electrical, chemical, thermal, electromagnetic, nuclear • **(T05) define** and **distinguish** between potential (stored) energy and kinetic (motion) energy • **(T05) trace** the flow of energy from one form to another • **(T05) describe** the process of generating electricity from nuclear energy in nuclear power plants	**SC.912.P.10.1**	Mechanical energy Electrical energy Chemical energy Thermal energy Electromagnetic energy Nuclear energy Potential energy Kinetic energy
	Students will: • **(T16) compare** and **contrast** nuclear fission and fusion in terms of energy, process, and sustainability • **(T16) describe** nuclear fission chain reactions and their applications	**SC.912.P.10.11**	Chain reaction
	Students will: • **(T17) evaluate** the impact of biotechnology on the individual, society and the environment, including medical and ethical issues • **(T17) evaluate** the costs and benefits of renewable and nonrenewable resources of energy including fossil fuels (coal, oil, natural gas), nuclear (uranium), biomass, solar, wind, geothermal, hydroelectric, fuel cell (hydrogen) • **(T17) discuss** the effects of technology on environmental quality • **(T17) discuss** the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution • **(T17) predict** the impact of individuals on environmental systems and examine how human lifestyles affect sustainability • **(T17) describe** how different natural resources are produced and how their rates of use and renewal limit availability including fossil fuels (coal, oil, natural gas), nuclear (uranium), biomass, solar, wind, geothermal, hydroelectric, fuel cell (hydrogen) • **(T17) discuss** the use of molecular clocks to estimate how long ago various groups of organisms diverged evolutionarily from one another	**SC.912.L.16.10** **SC.912.L.17.11** **SC.912.L.17.15** **SC.912.L.17.16** **SC.912.L.17.19** **SC.912.L.17.20** **SC.912.L.15.2**	Biotechnology Renewable Nonrenewable Fossil fuel Biomass Geothermal Hydroelectric Hydrogen fuel cell Greenhouse gases Ozone Sustainability Molecular clock

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Prefix / Suffix	Sample Assessment	

Unit	Unit Title	Chemistry I HONORS Learning Targets
1	Measurement & Lab Skills	I can…**apply** significant figures correctly to measurements with scientific instruments with one digit of uncertainty. I can…**identify** the number of significant figures in a measurement. I can…**determine** the correct number of significant figures to include in a sum, difference, product, or quotient of two measurements.
2	Properties of Matter	I can…**describe** colloids and suspensions. I can…**identify** mixtures as solutions, colloids, or suspensions if given information about particle settling, particle size, ability to be filtered, and Tyndall effect.
3	Atomic Theory & Structure	I can…**identify** which isotope of an element is the most abundant based on average atomic mass. I can…**calculate** the average atomic mass of an element from its isotopic masses and relative abundance.
4	Electrons & Modern Atomic Theory	I can…**calculate** the frequency, wavelength, and energy of an electromagnetic wave (or a photon) using the equations: $c = \lambda\upsilon$ and $E = h\upsilon$. I can…**write** electron configurations for elements 21-36.
5	The Periodic Table	
6	Ionic Bonding & Nomenclature	I can…**recall** the name, formula, and charge of 10 common polyatomic ions (NH_4^+, NO_3^-, OH^-, $C_2H_3O_2^-$, ClO_3^-, MnO_4^-, HCO_3^-, CO_3^{2-}, SO_4^{2-}, PO_4^{3-}).
7	Covalent Bonding & Nomenclature	I can…**apply** VSEPR theory to **determine** molecular shapes including: linear (AB_2 , e.g. CO_2), trigonal planar (AB_3 , e.g. BF_3), tetrahedral (AB_4 , e.g. CH_4), trigonal pyramidal (AB_3E , e.g. NH_3), and bent (AB_2E_2 , e.g. H_2O , AB_2E , e.g. SO_2). I can…**predict** bond angles (180^o, 120^o, or 109.5^o) based on molecular shape.
8	Chemical Composition	
9	Chemical Reactions & Rates	I can…**predict** the products of a reaction given reactants and reaction type (synthesis, single replacement, double replacement). I can…**determine** the activity series for a group of metals based on the observed results of several single replacement reactions. I can…**describe** oxidation-reduction reactions in living (photosynthesis, cellular respiration, etc.) and nonliving (rusting, batteries, etc.) systems. I can…**solve** half-life calculations to determine the amount or age of a substance.
10	Stoichiometry	I can…**determine** the limiting reactant and excess reactant(s) for a chemical reaction if given masses or moles of reactants. I can…**calculate** the theoretical yield of products if given masses or moles of reactants (using limiting reactant).
11	Kinetic-Molecular Theory & Gas Laws	I can…**solve** problems using the ideal gas law ($PV = nRT$) including determination of the molar mass of a gas. I can…**recall** or **calculate** the molar volume of a gas at STP as 22.4 L/mol. I can…**perform** stoichiometric calculations for gas reactions using volume ratios, ideal gas law, or molar volume at STP.

12	States of Matter	I can…**define** heat of fusion (ΔH_{fus}) and heat of vaporization (ΔH_{vap}) as applied to phase changes. I can…**calculate** the heat change between two points on a heating/cooling curve for a substance using the equation $q = mc\Delta T$. I can…**interpret** a phase diagram of a substance including the triple point and critical point of a substance. I can…**predict** the effect of changes in temperature or pressure on the phase of a substance using a phase diagram.
13	Solutions & Chemical Equilibrium	I can…**perform** stoichiometric calculations for aqueous reactions using the molarity and volume of reactants or products.
14	Acids & Bases	I can…**calculate** the $[H_3O^+]$, $[OH^-]$, pH, and pOH of a solution if given any of these four measurements and K_w . I can…**perform** calculations for acid-base titrations with non 1:1 mole ratios, e.g. $HCl + Ca(OH)_2$ or $H_2SO_4 + NaOH$.
15	Environmental Chemistry	