Chemistry A Pacing Guide

Ongoing and Integrated

Theme/Big Ideas	Objectives (Common Code or GLCE)	Essential/ Focus Questions	Teaching Strategy *(our current performance indicator)*	Assessment	Vocabulary/ Concepts	Resources	Board Objectives
Science Inquiry	**CI.1A** Generate new questions that can be investigated in the laboratory or field. **CI.1B** Evaluate the uncertainties or validity of scientific conclusions using an understanding of sources of measurement error, the challenges of controlling variables, accuracy of data analysis, logic of argument, logic of experimental design, and/or the dependence on underlying assumptions. **CI.1C** Conduct scientific investigations using appropriate tools and techniques (e.g., selecting an instrument that measures the desired quantity—length, volume, weight, time interval, temperature—with the						

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	appropriate level of precision). **Cl.1D** Identify patterns in data and relate them to theoretical models. **Cl.1E** Describe a reason for a given conclusion using evidence from an investigation. **C1.lf** Predict what would happen if the variables, methods, or timing of an investigation were changed. **C1.lg** Based on empirical evidence, explain and critique the reasoning used to draw a scientific conclusion or explanation. **Cl.lh** Design and conduct a systematic scientific investigation that tests a hypothesis. Draw conclusions from data presented in charts or tables. **C1.1i** Distinguish between scientific						

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	explanations that are regarded as current scientific consensus and the emerging questions that active researchers investigate. **C1.2A** Critique whether or not specific questions can be answered through scientific investigations. **C1.2B** Identify and critique arguments about personal or societal issues based on scientific evidence. **C1.2C** Develop an understanding of a scientific concept by accessing information from multiple sources. Evaluate the scientific accuracy and significance of the information. **C1.2D** Evaluate scientific explanations in a peer review process or discussion format. **C1.2E** Evaluate the future career and occupational prospects of science fields.						

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	C1.2f Critique solutions to problems, given criteria and scientific constraints. **C1.2g** Identify scientific tradeoffs in design decisions and choose among alternative solutions. **Cl.2h** Describe the distinctions between scientific theories, laws, hypotheses, and observations. **C1.2i** Explain the progression of ideas and explanations that lead to science theories that are part of the current scientific consensus or core knowledge. **C1.2j** Apply science principles or scientific data to anticipate effects of technological design decisions. **C1.2k** Analyze how science and society interact from a						

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	historical, political, economic, or social perspective.						

Unit 1: Atomic Theory 4 Weeks

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	C4.8 *Atomic Structure* Electrons, protons, and neutrons are parts of the atom and have measurable properties, including mass and, in the case of protons and electrons, charge. The nuclei of atoms are composed of protons and neutrons. A kind of force that is only evident at nuclear distances holds the particles of the nucleus together against the electrical repulsion between the protons. **C4.8A** Identify the location, relative mass, and charge for electrons, protons, and neutrons. **C4.8B** Describe the atom as mostly empty space with an extremely small, dense nucleus consisting of the protons and neutrons and an electron cloud surrounding the nucleus.	What are the subatomic particles that make up an atom? Draw the structure of an atom? Determine the number of protons, neutrons, and electrons of an atom? What keeps an atom together? Draw the atomic structure of a carbon atom including: atomic number, mass number and ions?	Draw an atom and include protons, neutrons, and electrons. Calculate the mass, and charge of the atom. Identify the location of each of the subatomic particles. Label the nucleus and the electron cloud. Describe the force that holds the nucleus together.	Element Quiz Comprehensive Test Construct Atomic Models Evaluate Dalton's theory	Atom atomic mass atomic nucleus atomic number atomic theory charged particle decay rate neutral electron electron cloud ion isotope nuclear reaction neutron proton radioactive dating	http://allperiodictables.com/ClientPages/AAEpages/apt_3_ElementNamesLanguages.htm http://web.jjay.cuny.edu/~acarpi/NSC/3-atoms.htm http://www.bbc.co.uk/worldservice/sci_tech/features/elementary/dyncon/atoms.shtml http://www.chemcases.com/nuclear/index.htm http://csep10.phys.utk.edu/astr162/lect/light/bohr.html http://www.chem4kids.com/files/atom_intro.html http://ull.chemistry.uakron.edu/genobc/ http://education.jlab.org/elementhangman/index.html http://education.jlab.org/elementflashcards/index.html http://education.jlab.org/atomtour/index.html http://www.fearofphysics.com/Atom/atom1.html http://www.fnal.gov/pub/inquiring/matter/index.html http://www.bbc.co.uk/worldservice/sci_tech/features/	Write the charge of an electron, a proton and a neutron. Draw an atom and label protons, neutrons and electrons.

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	C4.8C Recognize that protons repel each other and that a strong force needs to be present to keep the nucleus intact. **C4.8D** Give the number of electrons and protons present if the fluoride ion has a -1 charge. **C4.10** *Neutral Atoms, Ions, and Isotopes* A neutral atom of any element will contain the same number of protons and electrons. Ions are charged particles with an unequal number of protons and electrons. Isotopes are atoms of the same element with different numbers of neutrons and essentially the same chemical and physical properties. **C4.10A** List the number of protons, neutrons, and electrons for any given ion or isotope. **C4.10B** Recognize that an element always	Describe ions, neutral atoms and isotopes? What happens when a neutral atom loses or gains electrons? Explain why isotopes of the same atom contain the same chemical and physical properties?	Describe what makes an atom neutral. Distinguish between cations and anions. Differentiate between Carbon 12 and Carbon 14. List the number of protons, neutrons and electrons in Carbon 12 and Carbon 14. Compare a Carbon 12 atom and a	Compare neutral atoms and ions- venn diagram	radioactive decay radioactive isotope	elementary/dyncon/atoms.shtml http://csep10.phys.utk.edu/astr162/lect/light/bohr.html http://www.rockwood.k12.mo.us/rvalley/8_Red/Kubasta/07-RVMS/01-Challenge/02-Challenge_Science_Units/08-Atomic_Structure_and_the_Periodic_Table/07-Ions_and_Isotopes/Ions_and_Isotopes.htm http://www.visionlearning.com/library/module_viewer.php?mid=51	Explain why protons repel each other. Draw a fluorine ion. Label protons, neutrons and electrons. Compare a Carbon 12 atom and a Carbon 14 atom. Identify the number of protons, neutrons,

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	contains the same number of protons.	Determine the number of protons, neutrons and electrons of any ion of isotope?	Carbon 14 atom.				and electrons. Compare the isotopes of Neon.
	C4.10x *Average Atomic Mass* The atomic mass listed on the periodic table is an average mass for all the different isotopes that exist, taking into account the percent and mass of each different isotope. **C4.10c** Calculate the average atomic mass of an element given the percent abundance and mass of the individual elements.	How do you calculate the average atomic mass of an element?	Calculate the average atomic mass of an element. Compare the calculated mass to the mass on the	Calculate average atomic mass.		http://dbhs.wvusd.k12.ca.us/webdocs/Mole/AverageAtomicWeight.html http://micro.magnet.fsu.edu/electromag/java/rutherford/	Calculate the average atomic mass of Carbon.

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			periodic table.				
	C4.10d Predict which isotope will have the greatest abundance given the possible isotopes for an element and the average atomic mass in the periodic table.	What is an isotope?	Given the different isotopes of an element predict which is the most abundant by looking at the periodic table.				Explain why Carbon 12 is the most abundant Carbon atom.
	C4.10e Write the symbol for an isotope, ${}^{A}_{Z}X$, where *Z* is the atomic number, *A* is the mass number, and *X* is the symbol for the element.	Write ${}^{A}_{Z}X$ of any isotope.	Find the atomic mass and atomic number and write out the X model for a variety of isotopes.				Write the X model for Carbon 12 and Carbon 14.
	C2.5x *Nuclear Stability* Nuclear stability is related to a decrease in potential energy when the nucleus forms from protons and neutrons. If the neutron/proton ratio is unstable, the element will undergo radioactive decay. The rate of decay is characteristic of each isotope; the time for half the parent nuclei to decay is called the half-life. Comparison of the parent/daughter nuclei can be used to determine		Discuss fission and fusion. Give examples of each.	Write balance nuclear equations. Create a visual representation of fission and fusion.		http://www.colorado.edu/physics/2000/isotopes/radioactive_decay3.html http://www.visionlearning.com/library/module_viewer.php?mid=51 http://www.sciencenetlinks.com/lessons.cfm?DocID=176 http://www.chemcases.com/nuclear/index.htm http://reactor.engr.wisc.edu/fission.htm http://www.sasked.gov.sk.ca/docs/physics/u8c3phy.html	

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	the age of a sample. Heavier elements are formed from the fusion of lighter elements in the stars. **C2.5a** Determine the age of materials using the ratio of stable and unstable isotopes of a particular type. **C2.5b** Illustrate how elements can change in nuclear reactions using balanced equations.	What is carbon dating? Explain how Carbon 14 undergoes radioactive decay? What are the 5 types of nuclear reactions?	Explain how Carbon 14 is used in radioactive dating. Identify the 5 types of nuclear reactions. Write out balanced nuclear reaction equations.	Calculate half-life. Graph half-life data			Explain how Carbon 14 dating is used. Identify the 5 types of nuclear reactions.

Unit 2: Periodic Table 3 Weeks

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	C4.8x *Electron Configuration* Electrons are arranged in main energy levels with sublevels that specify particular shapes and geometry. Orbitals represent a region of space in which an electron may be found with a high level of probability. Each defined orbital can hold two electrons, each with a specific spin orientation. The specific assignment of an electron to an orbital is determined by a set of 4 quantum numbers. Each element and, therefore, each position in the periodic table are defined by a unique set of quantum numbers. **C4.8e** Write the complete electron configuration of elements in the first four rows of the periodic table.	Draw electron configuration for each element in	Locate the s, p, d, and f regions on the periodic table. Identify the different energy levels on the periodic table. Write the electron configurations for elements on the periodic table. Write the Kernel structure configurations for	Verbal assessment- recite electron configurations Draw Electron diagrams Label the Periodic Table	Orbital Quantum Number Octet rule Family Group Energy level Electronegativity Alkali metal Alkaline Earth metal Halogen Noble Gas Ionic Covalent Metallic Metalloid Non metal Metal	http://www.fordhamprep.org/gcurran/sho/sho/lessons/lesson36.htm http://www.chem4kids.com/files/atom_intro.html http://www.lon-capa.org/%7Emmp/period/electron.htm http://library.thinkquest.org/10429/low/eleconfig/electron.htm	Write the electron configuration for Phosphorus. Write the Kernel

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	C4.8f Write kernel structures for main group elements. **C4.8g** Predict oxidation states and bonding capacity for main group elements using their electron structure. **C4.9** *Periodic Table* In the periodic table, elements are arranged in order of increasing number of protons (called the atomic number). Vertical groups in the periodic table (families) have similar physical and chemical properties due to the same outer electron structures. **C4.9A** Identify elements with similar chemical and physical properties using the periodic table. **C4.9x** *Electron Energy Levels* The rows in the periodic table represent the main electron energy levels of the atom. Within each main energy level are	the first four rows. Draw the Kernel structure for main group elements. What is the Octet Rule? Distinguish between groups/families and periods on the periodic table. Why do elements in the same group have similar chemical and physical properties?	electrons on the periodic table. Identify the groups/ families on the periodic table. Discuss the similarities between elements in the same family on the periodic table. Identify patterns on the periodic table. Color code the periodic table. Locate metals, nonmetals, and metalloids on the periodic table.	Classify elements Adopt an element project	Chemical property Physical property	http://allperiodictables.com/aptpages/apt_1_CC_Active.html http://www.chemsoc.org/viselements/pages/periodic_table.html http://www.webelements.com/	Structure configuration for Bromine. Write the oxidation number for Lithium. Identify the families on the periodic table. List the similarities in the families.

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	sublevels that represent an orbital shape and orientation. **C4.9b** Identify metals, non-metals, and metalloids using the periodic table. **C4.9c** Predict general trends in atomic radius, first ionization energy, and electro negativity of the elements using the periodic table. **C5.5** *Chemical Bonds Trends* An atom's electron configuration, particularly of the outermost electrons, determines how the atom can interact with other atoms. The interactions between atoms that hold them together in molecules or between oppositely charged ions are called chemical bonds. **C5.5A** Predict if the bonding between two atoms of different elements will be primarily ionic or covalent.	Distinguish between metals, nonmetals, and semimetals on the periodic table. What are	Determine the patterns in atomic radius, ionization energy, and electronegativity on the periodic table. Determine the number of valence electrons an element has. Distinguish between ionic and molecular bonds. Write formulas for main group elements.				Describe the characteristics of a metal, non metal and metalloid. Locate each on the periodic table. Describe what happens to atomic radius as you move right across the periodic table. Identify two elements that will form an ionic bond.

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	C5.5B Predict the formula for binary compounds of main group elements. **C5.5x** *Chemical Bonds* Chemical bonds can be classified as ionic, covalent, and metallic. The properties of a compound depend on the types of bonds holding the atoms together. **C5.5c** Draw Lewis structures for simple compounds. **C5.5d** Compare the relative melting point, electrical and thermal conductivity, and hardness for ionic, metallic, and covalent compounds.	an atom's valence electrons? Describe the characteristics of an ionic bond and a covalent bond. Draw Lewis diagrams. What type of bonding is represented in Lewis Dot Structures?	Determine the steps for writing a Lewis Structure. Draw Lewis Structures. Compare Ionic, covalent and metallic compounds.	Draw Lewis structures for molecular compounds. Compare ionic, covalent and metallic compounds using a venn diagram.			List the formula for a binary compound. Draw the Lewis structure for water. Give the properties for a metallic compound. Give the properties of an ionic compound Give the properties of a covalent compound.

Unit 3: Nomenclature 3 Weeks

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	C4.2 *Nomenclature* All compounds have unique names that are determined systematically. **C4.2A** Name simple binary compounds using their formulae. **C4.2B** Given the name, write the formula of simple binary compounds. **C4.2x** *Nomenclature* All molecular and ionic compounds have unique names that are determined systematically. **C4.2c** Given a formula, name the compound. **C4.2d** Given the name, write the formula of ionic and molecular compounds.	What is a binary compound? . Give five examples of binary compounds and write their chemical formulas. What is the difference between ionic and molecular compounds ? What is the formula for a given compound?	Identify the method used for naming binary compounds. Name different binary compounds. Differentiate between ionic and molecular nomenclature. Write molecular and ionic formulas. Give the name for ionic and molecular compounds.	Nomenclature Test Graphic organizer- flow chart Demonstration of nomenclature	Binary compound Molecular Ionic Covalent Formula Isomer Polymer Hydrocarbon Organic chemistry	http://dbhs.wvusd.k12.ca.us/webdocs/Nomenclature/Nomenclature.html http://www.shodor.org/unchem/basic/nomen/index.html http://www.chem.vt.edu/RVGS/ACT/notes/Nomenclature.html	Name two binary compounds given the formula. Give the formula for a binary compound. Explain the difference between molecular and ionic naming.

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	C5.8 *Carbon Chemistry* The chemistry of carbon is important. Carbon atoms can bond to one another in chains, rings, and branching networks to form a variety of structures, including synthetic polymers, oils, and the large molecules essential to life. **C5.8A** Draw structural formulas for up to ten carbon chains of simple hydrocarbons **C5.8B** Draw isomers for simple hydrocarbons. **C5.8C** Recognize that proteins, starches, and other large biological molecules are polymers.	Draw the structure of hexane. Draw the structural isomers of pentane. Give two examples of isomers. What are polymers?	Discuss the importance of Carbon. Draw the structural formula for Carbon chains one through ten. Draw the isomers of different hydrocarbons. Discuss polymers. Identify common polymers.	Interpret Graphics Identify structural formulas for carbon chains. Identify Isomers.			Draw a hydrocarbon. Draw two isomers of a hydrocarbon. Identify 3 polymers.

Unit 4: The Mole 2 Weeks

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	C4.6x *Moles* The mole is the standard unit for counting atomic and molecular particles in terms of common mass units. **C4.6a** Calculate the number of moles of any compound or element given the mass of the substance. **C4.6b** Calculate the number of particles of any compound or element given the mass of the substance.	What is a mole?. Calculate the number of moles in a substance. What is Avogadro's number? Name the three particles used to convert moles to particles.	Discuss the mole and its importance in Chemistry. Determine the steps needed to calculate moles when given the mass of a substance.	Demonstrate molar calculations List steps to calculate moles Discussion questions	Mole Molar Mass Dimensional Analysis Particle Formula unit Avogadro's number	http://www.visionlearning.com/library/module_viewer.php?mid=53	Calculate the number of moles in a substance. Calculate the number of particles in a compound.

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