Building:

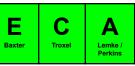
RCHS

Course:

Chemistry

Grade: 10,11,12 Tier: DC

Approved: E



PLC Question #1: What do we want all students to know and be able to do?

Unit 1: Measurement and Classification of Mat	Unit 2: Atoms, Molecules, and Ions 🔽		Unit 3: Electronic Structure and Periodic Properties of Elements ✓			
 Priority Standard(s) HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. Develop mathematical and visual models of error analysis, and apply this analysis to experimentation utilizing the scientific method. Develop models to illustrate the concept of an atom vs a molecule, a pure substance vs a mixture, and a homogeneous mixture vs a heterogeneous mixture 		 Priority Standard(s) HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. Develop models to illustrate the subatomic particles in an atom, and use that model to explain size ratio, location, and composition of the subatomic particles in the atom Construct a timeline and explanation on the development of our current understanding of atomic theory 		 Priority Standard(s) HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of an atom. HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media. 		
 Utilize techniques of observation to differentiate betwee chemical and physical changes, chemical and physical properties. Use measurements to support mathematical representations support the Law of Conservation of Matter 		 Supporting Standard(s) HS-PS4-2. Evaluate questions about the advantage digital transmission and storage of information. Use laboratory measurement techniques to construated in understanding atomic structure 		 Supporting Standard(s) HS-PS2-4. Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects. HS-PS4-3. Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described either by a wave model or a particle model, and that for some situations one model is more useful than the other. 		
Learning Outcomes		Learning Outcomes		Learning Outcomes		
Students need to know (concrete knowledge) • Ex. vocabulary, facts, concepts, etc.	OK Level	Students need to know (concrete knowledge) • Ex. vocabulary, facts, concepts, etc.	DOK Level	Students need to know (concrete knowledge) • Ex. vocabulary, facts, concepts, etc.	DOK Level	
 Distinguish between elements and compounds Distinguish between mixtures and pure substances. Distinguish between chemical and physical changes. Distinguish between solid, liquid, and gas. Distinguish between accuracy and precision. 		 Know contributions of Dalton, JJ Thomson, Rutherford, Millikan Count protons, neutrons, and electrons in atoms and ions. Define and recognize isotopes. Know what Z indicates. formulas. 		 Name the three phenomena observed that eventually led to our understanding of electron arrangement Know how to use n2 and 2n2, know how many sublevels are in an energy level Know how Coulomb's law influences periodic trends and ion formation. 		
Students will understand (abstract ideas) • Ex. connections, relationships, frameworks, etc.		Students will understand (abstract ideas) • Ex. connections, relationships, frameworks, etc.	DOK Level	Students will understand (abstract ideas) • Ex. connections, relationships, frameworks, etc.	DOK Level	
 How atoms of different elements are different from each other How atoms of the same elements are different from each other Necessity and purpose of the atomic mass unit Purpose, value, and application of ratios in 		 Dalton's atomic theory and how it has changed with new discoveries Distinguish between elements and compounds. Recognize and explain Dalton's atomic theory. Read a periodic table entry. Count the number of atoms in a molecule/formula 		 Relate an element's electron configuration to its position in the periodic table Understand periodic trends in atomic radii (size), electron affinity, and ionization energy, and electronegativity Identify elements with similar valence electron 		

Building: RCHS Course:	Chemistry	Grade: 10,11,	12 Tier:	C Approved: E C Troxel	Lemke / Perkins	
scientific problem solving • Explain the difference between a theory and a law.	unit.			configuration and relate this to the concept of periodicity Recognize s, p, and d orbitals based on shape, and know that the angular momentum quantum number (I) designates shape. Decide the relative energy of electron sublevels Predict the relative ionization energy of elements Predict ions formed by main-group elements Predict whether a compound is ionic or molecular and predict the formulae of these compounds (including polyatomic ions) Understand the organization of the electromagnetic spectrum		
Students will do (active application)	DOK Level Students will do (a	ctive application)	DOK Level	Students will do (active application)	DOK Level	
 Be able to perform dimensional analysis problems. How to calculate and graph data to find density Convert °C to K, and K to °C. 	(atoms or mo	lar mass, grams, moles, particles lecules). npirical formulas from molecular		 Write and interpret electron configuration for atoms and ions Be able to convert between wavelength, frequency and energy of photons Assign quantum numbers. 		
Domain-specific Vocabulary	Domain-specific Vo	cabulary		Domain-specific Vocabulary		
accuracy, atom, Celsius (°C), chemical change, chemi property, chemistry, compound, cubic centimeter (cm³ cubic meter (m³), density, dimensional analysis, eleme number, extensive property, Fahrenheit, gas, heteroge mixture, homogeneous mixture, hypothesis, intensive kelvin (K), kilogram (kg), law, law of conservation of mlength, liquid, liter (L), macroscopic domain, mass, ma (m), microscopic domain, milliliter (mL), mixture, molecular physical change, physical property, plasma, precision, substance, rounding, scientific method, second (s), SI (International System of Units), significant figures, solid domain, temperature, theory, uncertainty, unit, unit confactor, volume, weight	or cc), nt, exact neous oroperty, atter, tter, meter cule, pure units d, symbolic (amu), atomic nu Dalton's atomic t unit of charge, io composition, law proportions, mas nucleus, proton, isomer, unified an	particle), anion, atomic mass, atomic mamber (Z), cation, chemical symbol, Daltoneory, electron, empirical formula, fundan, isomers, isotopes, law of constant of definite proportions, law of multiples number (A), molecular formula, neutrospatial isomers, structural formula, structural mass unit (u)	ton (Da) amental on,	actinide, alkali metal, alkaline earth metal, amplitude, at orbital, Aufbau principle, blackbody radiation, Bohr's modern continuous spectrum, core electron, covalent bond, covalent radius, d orbital, effective nuclear of electromagnetic radiation, electromagnetic spectrum, eleaffinity, electron configuration, electron density, energy lexcited state, f orbital, frequency, ground state, group, he Heisenberg uncertainty principle, hertz (Hz), Hund's rule gas, inner transition metal, intensity, ionic bond, ionization energy, isoelectric, lanthanide, line spectrum, main ground element, metalloid, molecular compound, monatomic iongas, node, orbital diagram, p orbital, Pauli exclusion principeriod, periodic law, periodic table, photon, polyatomic inquantum numbers, representative element, s orbital, set sublevel, transition metal, valence electrons, wave, wave	odel,, valent charge, lectron level, nalogen, e, inert ion up on, noble nciple, ion,	

Building:

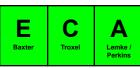
RCHS

Course:

Chemistry

Grade: 10,11,12 Tier: DC

Approved: E



PLC Question #1: What do we want all students to know and be able to do?

Unit 4: Chemical Bonding and Molecular Geometry Unit 5: Advanced Theories of Bonding V Unit 6: Composition of Substances and Solution							
V	onit of Advanced Theories of Bollaing		✓ Composition of Substances and Solutions				
 Priority Standard(s) HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important functioning of designed materials. Use models to determine spatial arrangement and geomolecule and polyatomic ions Apply understanding of electrostatic forces to electronarrangement in molecules, and how this arrangement macroscopic properties of substances 	 Priority Standard(s) HS-PS1-3. Plan and conduct an investigation to go evidence to compare the structure of substances a scale to infer the strength of electrical forces between the structure. HS-PS2-6. Communicate scientific and technical in about why the molecular-level structure is important functioning of designed materials. Construct an explanation for the phenomenon of mand be able to identify various types (ferro vs. parallel) 	t the bulk een particles. nformation at in the nagnetism,	 Priority Standard(s) Use mathematical models to represent element and compound compositions Use mathematical models to represent composition of mixtures, with an emphasis on aqueous solutions Recognize and understand the use of mathematical models that pertain to various classifications of matter 				
 Supporting Standard(s) HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of an atom. HS-PS1-2. Construct and revise an explanation for the outcome of a simple chemical reaction based on the outermost electron states of atoms, trends in the periodic table, and knowledge of the patterns of chemical properties. 		Use various models to represent organic molecules evaluate these models based on how effectively the communicate pertinent information about these organic molecules Make connections between the micro properties of and the macro properties of substances through la investigation	ey ganic molecules	 Supporting Standard(s) Analyze chemical compounds in the laboratory setting to learn their composition Analyze solutions in the laboratory setting to learn their composition 			
Learning Outcomes		Learning Outcomes		Learning Outcomes			
Students need to know (concrete knowledge) • Ex. vocabulary, facts, concepts, etc.	DOK Level	Students need to know (concrete knowledge) • Ex. vocabulary, facts, concepts, etc.	DOK Level	Students need to know (concrete knowledge) • Ex. vocabulary, facts, concepts, etc.	DOK Level		
 Name and write the formula of covalent compounds. Name and write the formula of ionic compounds, including compounds with various charge metals, compounds containing polyatomic ions, and ionic hydrates Name and write the formula of acids. 		 Know what valence bond theory is Name the types of hybridization found in molecules 		 Know the difference between atomic mass, formula mass, molecular mass, and molar mass Know how to use the periodic table as a reference 			
Students will understand (abstract ideas) • Ex. connections, relationships, frameworks, etc.		Students will understand (abstract ideas) • Ex. connections, relationships, frameworks, etc. DOK Level		Students will understand (abstract ideas) • Ex. connections, relationships, frameworks, etc.	DOK Level		
 Predict ions formed by common main-group elements Predict whether a compound is ionic or molecular (or covalent) Predict the formula of ionic compounds (including polyatomic ions) Predict the relative electronegativity of atoms Decide whether a Lewis structure satisfies the 		 Understand how determined bond angles could not be explained using valence bond theory Decipher molecular shape from central atom hybridization 		 Use the periodic table to determine elements and compounds Use the periodic table to determine element and compound masses Differentiate between particle mass and molar mass 			

Building: RCHS Course:	Ch	emistry	Grade: 10,11	,12 Tier:	DC	Approved: E	Troxel A Lemke / Perkins
octet rule Recognize exceptions to the octet rule Predict and name the arrangement of electron groups around a central atom Describe the shapes of molecules, including bond angles Predict whether molecules are polar or nonpolar							
 Students will do (active application) Draw the Lewis dot diagram of a main group atom or common atomic ion Count the valence electrons in a molecule or 	DOK Level S		al overlap in forming bonds gth and energy of chemical	DOK Level	mass, and mola	c mass, formula mass, molec	DOK Level ular
 Polyatomic ion Count bonding and nonbonding electron pairs in a Lewis structure Write Lewis structures for molecules Write the Lewis structures for a molecule with resonance Calculate formal charge 		Count sigma and pi boIdentify hybridization irIdentify intermolecular molecule	n a molecule forces present in a macro properties (boiling		 Calculate percel Calculate empiri Calculate molecie Calculate molari Interconvert moles or mass Calculate concesolutions Calculate mole for alculate moles 	nt composition from a formula ical formula from data (g or % cular formula ity larity of solutions with solute entration or volume of diluted fraction ity from various "percentage" by mass, 30% by volume, 30	
Domain-specific Vocabulary		Domain-specific Vocabulary			Domain-specific Voca	bulary	
axial position, binary acid, binary compound, bond ang dipole moment, bond distance, bond length, covalent be dipole moment, double bond, electron-pair geometry, electronegativity, equatorial position, formal charge, free hypervalent molecule, inert pair effect, ionic bond, Lew structures, Lewis symbol, linear, lone pair, molecular structures, because the molecule, pure covalent bond, resonance, single bond structure, tetrahedral, trigonal bipyramidal, trigonal plan bond, VSEPR	ee radical, ris tructure, and, polar , skeleton	antibonding orbital, bond order, bonding orbital, degenerate orbitals, diamagnetism, homonuclear diatomic molecules, hybrid orbital, hybridization, linear combination of atomic orbitals, molecular orbital, molecular orbital diagram, molecular orbital theory, node, overlap, paramagnetism, pi bond, s-p mixing, sigma bond, sp hybrid orbital, sp² hybrid orbital, sp³ hybrid orbital, sp³ hybrid orbital, sp³d hybrid orbital, sp³d² hybrid orbital, valence bond theory			concentration, dilute empirical formula mass-volume percentraction, molecular for	evogadro's number, concentrale, dilution, dissolved, empiricales, dilution, dissolved, empiricales, formula mass, mass per nt, molar mass, molarity (M), formula, molecular mass, partion (ppm), percent composition centage	Il formula, centage, mole, mole s per billion

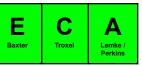
RCHS

Course:

Chemistry

Grade: 10,11,12 Tier: DC

Approved: E



PLC Question #1: What do we want all students to know and be able to do?

Unit 7: Stoichiometry of Chemical Reaction	ns 🔽	Unit 8: Gases 🔽	Unit 9: Thermochemistry				
 Priority Standard(s) HS-PS1-7. Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. HS-PS1-6. Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium. Identify reactants and products in a chemical reaction, and use these to understand how matter rearranges during reactions 		 Priority Standard(s) Use graphical models to illustrate the interconnected variables that describe a quantity of gas Recognize and describe the behaviour of the gased matter Develop graphical and mathematical models based observations of how one variable in a scientific investigation and mathematical models based observations of how one variable in a scientific investigation. 	ous state of	 Priority Standard(s) HS-PS1-5. Apply scientific principles and evidence to provide an explanation about the effects of changing the temperature or concentration of the reacting particles on the rate at which a reaction occurs. HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known. HS-PS3-4. Plan and conduct an investigation to provide evidence that the transfer of thermal energy when two components of different temperature are combined within a closed system results in a more uniform energy distribution among the components in the system (second law of thermodynamics). 			
 Supporting Standard(s) Explore the Law of Conservation of Matter through multiple cycles Refine measurement and data collection skills in the chemistry laboratory 		 Supporting Standard(s) HS-PS3-2. Develop and use models to illustrate the the macroscopic scale can be accounted for as a connected energy associated with the motions of particles (observed) associated with the relative positions of part (objects). Recognize the complexity of various units of measurements. 	combination of ojects) and ticles	 Supporting Standard(s) HS-PS3-2. Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative positions of particles (objects). HS-PS1-4. Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy. 			
Learning Outcomes		Learning Outcomes		Learning Outcomes			
Students need to know (concrete knowledge) • Ex. vocabulary, facts, concepts, etc.	DOK Level	Students need to know (concrete knowledge) • Ex. vocabulary, facts, concepts, etc.	DOK Level	Students need to know (concrete knowledge) • Ex. vocabulary, facts, concepts, etc.	DOK Level		
 Understand/interpret/know how to use the Activity Series Define and predict precipitation reactions Define and recognize oxidation-reduction reactions, and classify redox reactions as combustion, combination/synthesis, decomposition, or single displacement 		 Know the variables that are used to describe a quantity of gas Recognize various units to measure pressure, temperature, volume and quantity Know how variables that describe gases are related to one another and how these relationships are graphically represented 		 Use examples to define and describe the difference between system and surroundings, and temperature and heat Recall temperature scales and absolute zero Know that temperature is measured, while heat is calculated 			
Students will understand (abstract ideas) • Ex. connections, relationships, frameworks, etc. DOK Level		Students will understand (abstract ideas) • Ex. connections, relationships, frameworks, etc.	DOK Level	Students will understand (abstract ideas) • Ex. connections, relationships, frameworks, etc.	DOK Level		
 Interpret stoichiometric coefficients in terms of molecules or moles 		 Use kinetic molecular theory to explain properties of ideal gases 		 Interpret the First Law of Thermodynamics Distinguish exothermic and endothermic 			

Building:	RCHS Course:	С	hemistry	Grade: 10,11,	12 Tier:	DC	Approved: E C Tr	Lemke / Perkins
 Identify acids and bases Use a chemical equation to relate amounts and products (mass, moles, or molarity) Identify a limiting reactant 			 Understand how kinetic energy scales compare with temperature Understand how molecular speeds vary with temperature and molar mass Describe effusion and diffusion Describe factors that lead to deviation from ideal gas behavior Use the van der Waals equation to find properties of non ideal gases and explain why deviations occur 			processes, and heat vs temperature (short answer with examples) • Write a standard formation reaction • Recognize combustion reactions of hydrocarbons • Determine relative strengths of lattice energies		
Students will do ((active application)	DOK Level	Students will do (active app	lication)	DOK Level	Students wil	II do (active application)	DOK Level
symbols in terms react Use the form of ions in some predict the Calculate the chemical reserved.	products of a neutralization reaction heoretical and percent yields of eactions the volume of base needed to titrate a		gases Use the combined gases of gases Interconvert molar managases Perform stoichiometric gases Calculate partial press	nHg) to calculate properties of s law to calculate properties ss and density of ideal c calculations involving		chang able to substa • Calcu consta • Use conthal • Use Henthal • Calcu enthal • Solve	ulate a molar heat of reaction from formati	on
Domain-specific \	Vocabulary		Domain-specific Vocabulary			Domain-specific Vocabulary		
acid, acid-base reaction, actual yield, analyte, balanced equation, base, buret, chemical equation, coefficient, combustion analysis, combustion reaction, complete ionic equation, end point, equivalence point, excess reactant, gravimetric analysis, half-reaction, indicator, insoluble, limiting reactant, molecular equation, net ionic equation, neutralization reaction, oxidation, oxidation number, oxidation-reduction reaction, oxidizing agent, percent yield, precipitate, precipitation reaction, product, quantitative analysis, reactant, reducing agent, reduction, salt, single-displacement reaction, solubility, soluble, spectator ion, stoichiometric factor, stoichiometry, strong acid, strong base, theoretical yield, titrant, titration, weak acid, weak base			absolute zero, Amonton's law, atmosphere (atm) Avogadro's law, bar, barometer, Boyle's law, Charles's Law, compressibility factor, Dalton's law of partial pressure, diffusion, effusion, Gay-Lussac's Law, Graham's Law of Diffusion/Effusion, hydrostatic pressure, ideal gas, ideal gas constant, ideal gas law, kinetic molecular theory, manometer, mean free path, mole fraction, partial pressure, pascal, pounds per square inch, pressure, rate of diffusion, root mean square speed, standard conditions of temperature and pressure, standard molar volume, torr, van der Waals equation, vapor pressure of water			bomb calorimeter, bond energy, Born-Haber cycle, calorie, calorimeter, calorimetry, chemical thermodynamics, endothermic process, energy, enthalpy, enthalpy change, exothermic process, expansion work (pressure-volume work), first law of thermodynamics, heat, heat capacity, Hess's law, hydrocarbon, internal energy, joule, kinetic energy, lattice energy, nutritional calorie, potential energy, specific heat capacity, standard enthalpy of combustion, standard enthalpy of formation, standard state, state function, surroundings, system, temperature, thermal energy, thermochemistry, work		