Chemistry *(Master)*

Teacher: Joe Peatrowsky

September 2020

Content	Skills	Learning Targets	Assessment	Resources & Technology
Matter and Measurements **Standards 9.1.3.4.2-6; 9C.1.3.4.1; 9P.1.3.4.1** 1. Lab Safety 2. Analyzing Data 3. Classifying Matter 4. Reporting Units 5. Scientific Method **CEQ** ● **WHAT MAKES UP MATTER?** ● **HOW DO WE TAKE SCIENTIFIC MEASUREMENTS?** ● **WHAT IS THE NATURE OF SCIENCE?**	**Matter and Measurements** 1. Follow laboratory safety rules. 2. Measure and report data to correct number of significant figures. 3. Measure the density of a substance 4. Identify significant figures in numbers and calculations 5. Report numerical values in scientific notation 6. Analyze data for accuracy and precision 7. Distinguish between a physical and chemical change 8. Classify matter as substance or mixture, and further	**Matter and Measurements** I can... 1. Demonstrate proper lab safety skills. 2. Measure mass and volume using lab equipment. 3. Calculate density and report to proper significant figures. 4. Identify and report significant figures in standard and scientific notation. 5. Analyze data for accuracy and precision. 6. Distinguish between a physical and chemical change. 7. Classify matter as a substance, mixture,	**Matter and Measurements** **Unit 1: Measurement, Matter and Chemical Equations Test** 1. Measurement Lab 2. Density Lab 3. Physical vs. Chemical Change Lab	**Matter and Measurements** **Key vocabulary** · Significant figures · Scientific notation · Conversion factor · Accuracy · Precision · Density · Matter · Physical change · Physical property · Intensive property · Extensive property · Chemical reaction · Chemical property · Substance · Mixture · Aqueous solution · States of matter · Element · Compound · Scientific law · Scientific theory

UEQ ● *How are measurements made and reported?* ● *What is matter made of?* ● *What changes can matter undergo?* ● *What is the nature of science?* **The Atom and the Mole** **Standards 9.2.1.1.1-4; 9C.2.1.1.1-2** 1. Discovery of the Atom 2. Atomic Structure 3. Isotopes 4. Mole *UEQ*	as element, compound, solution **The Atom and the Mole** 1. Describe the relative charges, masses and locations of the protons, neutrons, and electrons in an atom 2. Use the periodic table to find structural information of an atom of a given element 3. Define isotopes 4. Calculate the weighted average	element, compound, and solution. **The Atom and the Mole** I can... 1. Describe the relative charges, masses and locations of the protons, neutrons, and electrons in an atom 2. Use the periodic table to find structural information of an atom of a given element.	**The Atom and the Mole** **Unit 2: Atom, Mole, and Periodic Table Test** 1. Conservation of Matter Lab 2. Mole Lab	**The Atom and the Mole** **Key Vocabulary** ● **atom** ● nucleus ● proton ● neutron ● electron ● atomic number ● atomic mass ● Atomic Mass Units (amu) ● isotope ● relative abundance ● weighted average

● *How is an atom structured?* ● *How is the mole important to measuring atoms/molecules?* **The Periodic Table and Quantum Theory**	atomic mass of an element given mass and percent abundance of the isotopes of that element 5. Define the mole and its numerical value 6. Determine the molar mass of an element or compound 7. Convert mass of a substance to moles of a substance and visa versa **The Periodic Table and Quantum Theory**	3. Categorize an element as a metal, non-metal, or metalloid based on its position on the periodic table. 4. Define isotopes 5. Calculate the weighted average atomic mass of an element given mass and percent abundance of the isotopes of that element 6. Determine the molar mass of an element or compound 7. Define the mole and use its numerical value to convert mass of a substance to moles of a substance and visa versa **The Periodic Table and Quantum Theory**	**The Periodic Table and Quantum Theory**	● Mole ● Avogadro's # ● molar mass (g/mol) **The Periodic Table and Quantum Theory**

1. Electron configurations 2. Periodic trends 3. Bohr Model of the Atom 4. Orbitals *UEQ* ● *How is the periodic table organized?* ● *What trends appear in the periodic table?* ● *Where are electrons located in an atom?*	1. Write an electron configuration for a given element 2. Interpret electron configurations 3. Explain the relationship of an element's position on the periodic table to its atomic number and electron configuration 4. Identify and compare trends on the periodic table 5. Identify the location of the electrons in the atom. 6. Explain the effects of energy on the position of an electron in the atom.	I can... 1. Write electron configuration for a given element and interpret atomic properties and behaviors based on an element's electron configuration 2. Identify and compare regarding changes in atomic radius using the periodic table 3. Identify the location of electrons in an atom using the Bohr model and quantum model of the atom 4. Explain the effects of energy on the position of an electron in the atom	**Unit 3: The Periodic Table and Quantum Theory Test** Flame Test Lab Paper Plate Atom Building Activity	● Electron configuration ● quantum number ● principal energy level ● atomic orbital ● energy sublevels (s,p,d,f) ● valence electrons ● periodic table ● Groups ● Periods ● metals(alkali, alkaline, transition) ● non-metals (halogens, noble gases) ● Metalloids ● Orbital ● Energy Level

October

Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ	**Chemical Bonding and Nomenclature**	**Chemical Bonding and Nomenclature**	**Chemical Bonding and Nomenclature**	**Chemical Bonding and Nomenclature**

• *In what ways does atomic behavior reflect the octet rule?* • *How can the naming of substances be used to write formulas?* • *In what ways are ratios important to formulas and balanced equations?* **Standards** 9.2.1.2.1-3; 9C.2.1.2.2 **Chemical Bonding and Nomenclature** 1. Electron dot structures 2. Ionic compounds 3. Covalent Molecules 4. Precipitation Reactions	1. Write valence dot structures 2. Describe the role of valence electrons in the formation of chemical bonds. 3. Demonstrate how ions and ionic compounds are formed 4. Demonstrate how covalent molecules are formed. 5. Use IUPAC (International Union of Pure and Applied Chemistry) nomenclature to write chemical formulas and name molecular and ionic compounds, including those that contain polyatomic ions. 6. Determine which ions are left unused in a precipitation reaction.	I can... 1. Write valence (Lewis) dot structures and describe the role of valence electrons in the formation of chemical bonds (ionic, covalent). 2. Identify a compound as ionic or molecular using chemical formulas. 3. Compare and contrast the characteristics of ionic and molecular compounds. 4. Demonstrate how ions and ionic bonds are formed using dot structures. 5. Demonstrate how covalent bonds are formed using dot structures. 6. Use IUPAC nomenclature system to write chemical formulas and name molecular	**CFA - Lewis Dot Structure Activities** **CSA 1-6 Chemical Bonding and Nomenclature Unit 3 Test**	**Key Vocabulary** metals/non-metals cation anion ion electron dot structure ionic bond covalent bond supernatent precipitate soluble insoluble electrolyte spectator ions polyatomic ion diatomic molecule prefixes (mono - tetra) suffixes (ide, ite, ate) ratio

		and ionic compounds, including those that contain polyatomic ions. 7. Determine which io ns are left unused in a precipitation reaction.		

November

Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ ● How are the different type of reactions classified? ● How are chemical equations balanced? ● How are activity and solubility charts used to predict chemical reactivity? **Standards** **9C.2.1.2.6-7; 9C.2.1.3.1-2**	**Chemical Equations** 1. Classify chemical reactions as synthesis, decomposition, combustion, single replacement, or double replacement 2. Determine the product of a single replacement reaction using the activity series	**Chemical Equations** I can... 1. Classify chemical reactions as synthesis, decomposition, combustion, single replacement, or double replacement 2. Determine the product of a single replacement	**Chemical Equations** **CA 1-6 Chemical Equations Unit 4 Test**	**Chemical Equations** **Key Vocabulary** combustion reaction decomposition reaction synthesis reaction double-replacement reaction single-replacement reaction

Chemical Equations 1. Classifying reactions 2. Predicting products of a reaction 3. net-ionic equations 4. Word and symbol equations UEQ ● How is a mole used to measure a gas? ● What factors affect a gas? ● How are the gas laws used? **Standards** **9C.2.1.2.4-5; 9C.2.1.4.2** **Gases** 1. Molar conversions	3. Determine the product of a double replacement reaction using a solubility chart 4. Write complete ionic and net-ionic equations for double replacement reactions 5. Predict the products of simple synthesis, decomposition, and hydrocarbon combustion reactions 6. Convert word equations to symbol equations and visa versa **Gases** 1. Convert between mass, moles, molecules, and volume of a gas 2. Solve problems using the gas laws	reaction using the activity series 3. Determine the product of a double replacement reaction using a solubility chart 4. Write complete ionic and net-ionic equations for double replacement reactions 5. Predict the products of simple synthesis, decomposition, and hydrocarbon combustion reactions 6. Convert word equations to symbol equations and visa versa **Gases** 1. Convert between mass, moles, molecules, and volume of a gas	**Gases** **CA 1-3 Gases Unit 5 Test**	complete ionic equation net ionic equation spectator ion dissociate precipitate Chemical equation Chemical reaction Coefficient product reactant aqueous solution solute solvent **ıses** **Unit Vocabulary** Molar volume

2. Gas laws	3. Determine the effect of changes in pressure, temperature, or volume on a gas	2. Solve problems using Boyle's Law, Charles' Law, Gay-Lussac's Law, Ideal Gas Law, and Combined Gas Law 3. Describe the relationship between the changes in pressure, temperature, and volume of a gas by identifying it as being direct or inverse.		Diffusion Kinetic Molecular Theory Pressure atmosphere Temperature Kelvin Celsius Volume Standard Temperature and Pressure (STP) Boyle’s Law Charles’ Law Combined Gas Law Ideal Gas Law mole molar mass

December

Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ ● *How is a balanced equation essential to stoichiometry?* ● *How can amount of product formed be predicted if the amount of reactants available are known?* ● *How can stoichiometry allow us to identify reactants in excess and limiting reactants?* **Standards** **9C.2.1.3.4-5** **Stoichiometry** 1. Balanced equations as molar ratios 2. Calculations to determine limiting factors, reactants in excess, and products formed.	**Stoichiometry** 1. Use coefficients of balanced equations as molar ratios 2. Convert between moles, grams, volume of gas for a given substance. 3. Calculate amount of product made from a given amount of reactant. 4. Calculate excess reactants and limiting reactants.	**Stoichiometry** I can... 1. Determine molar ratios by using the coefficients of a balanced chemical equation 2. Convert between moles, grams, volume of gas for a given substance. 3. Calculate the amount of product made from a given amount of reactant using stoichiometry. 4. Identify excess reactants and limiting reactants. 5. Calculate the amount of excess reactants that remains in a chemical reaction.	**Stoichiometry** **CA 1-4 Unit 6 Stoichiometry test**	**Stoichiometry** **Key Vocabulary** ● stoichiometry ● mole ratio ● excess reactant ● limiting reactant ● molar mass ● molar volume of gas ● balanced equation ● coefficient

January

Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ ● What are the different forms of energy? ● How is energy conserved? ● How does energy flow? ● How can energy change be measured? **Standards** **9.2.1.2.4; 9.2.3.2.1; 9C.2.1.3.6; 9C.2.1.4.1; 9P.2.3.4.1** **Energy** 1. Enthalpy diagrams 2. Heat and enthalpy calculations 3. Thermochemical equations 4. Energy conservation	**Energy** 1. Create and interpret enthalpy diagrams 2. Identify kinetic, activation, and potential energy 3. Calculate changes in heat content. 4. Compare and contrast endothermic and exothermic reactions 5. Use thermochemical equations to interpret heat loss or heat gain in a given reaction 6. Describe the role of a catalyst in a chemical reaction	**Energy** I can... 1. Create and interpret enthalpy diagrams 2. Identify kinetic, activation, and potential energy 3. Calculate changes in heat content. 4. Compare and contrast endothermic and exothermic reactions 5. Use thermochemical equations to interpret heat loss or heat gain in a given reaction 6. Describe the role of a catalyst in a chemical reaction	**Energy** **CA - 1-6 Unit 7 Energy Unit Test**	**Energy** **Key vocabulary** ● temperature ● heat ● enthalpy ● Q = m x C x deltaT ● law of conservation of energy ● chemical potential energy ● calorie ● joule ● specific heat ● heat capacity ● calorimeter ● thermochemistry ● system ● surroundings ● exothermic ● endothermic ● catalyst ● activation energy

				• kinetic energy

February

Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ • How are balanced equations used to determine equilibrium expressions? • What is equilibrium? • How does LeChatelier's Principle relate to factors affecting chemical equilibrium? • What is molarity and how is it determined? **Standards** **9C.2.1.3.7** **Molarity and Equilibrium** 1. Molarity and dilution 2. Keq	**Molarity and Equilibrium** 1. Calculate the molarity of a solution 2. Calculate quantities needed to prepare an aqueous solution from a solid reagent 3. Use the equation $M_1V_1 = M_2V_2$ to calculate quantities needed to prepare a solution from a stock solution. 4. Write an equilibrium constant expression (K_{eq}) for a given chemical reaction. 5. Calculate K_{eq} from concentrations data. 6. Interpret equilibrium constants to determine if a	**Molarity and Equilibrium** I can... 1. Calculate the molarity of a solution 2. Calculate quantities needed to prepare an aqueous solution from a solid reagent 3. Use the equation $M_1V_1 = M_2V_2$ to calculate quantities needed to prepare a solution from a stock solution. 4. Write an equilibrium constant expression (K_{eq}) for a given chemical reaction. 5. Calculate K_{eq} from concentrations data. 6. Interpret equilibrium	**Molarity and Equilibrium** **CA 1-12 Molarity and Equilibrium Unit 8 Test**	**Molarity and Equilibrium** **Unit Vocabulary** Concentration Molarity Solute Solvent Dilution Chemical equilibrium Reversible reaction K_{eq} equilibrium constant Le Chetelier's principle Stress K_{sp} solubility proeduct constant S Solubility Q_{sp} ion product Soluble Insoluble Unsaturated Saturated Supersaturated

3. Ksp 4. LeChatelier's Principle	reaction is reactant or product favored 7. Apply Le Chatelier's principle to determine how a system at equilibrium will be affected by an applied stress 8. List factors that will stress an equilibrium system 9. Write solubility product constant expression (K_{eq}) for a given ionic compund in aqueous solution 10. Calculate solubility (S) for an ionic compound 11. Compare ion product (Q_{sp}) to K_{sp} to determine whether a system is at equilibrium 12. Calculate K_{sp} from laboratory data	constants to determine if a reaction is reactant or product favored 7. Apply Le Chatelier's principle to determine how a system at equilibrium will be affected by an applied stress 8. List factors that will stress an equilibrium system 9. Write solubility product constant expression (K_{eq}) for a given ionic compund in aqueous solution 10. Calculate solubility (S) for an ionic compound 11. Compare ion product (Q_{sp}) to K_{sp} to determine whether a system is at equilibrium		Dissociate Common ion effect

		12. Calculate K_{sp} from laboratory data		

March

Content	Skills	Learning Targets	Assessment	Resources & Technology
UEQ ● What is the difference between an acid and a base? ● What is the difference between a weak or strong acid or base? ● How is hydrogen ion concentration used to determine pH? ● How is Kw defined and used in contrasting hydrogen and hydroxide concentration? **Standards** **9C.2.1.3.3** **Acid Base** 1. Bronsted-Lowry acids and bases	**Acid Base** 1. Use the Bronsted-Lowry definition of acids and bases to identify acids, bases, and their conjugates 2. Write an ionization equation for a given acid or base 3. Interpret the amphoteric behavior of water 4. Write the self-ionization equation and K_w expression of water 5. Calculate pH, $[H^+]$, and $[OH^-]$ 6. Determine whether a solution	**Acid Base** I can... 1. Use the Bronsted-Lowry definition of acids and bases to identify acids, bases, and their conjugates 2. Write an ionization equation for a given acid or base 3. Interpret the amphoteric behavior of water 4. Write the self-ionization equation and K_w expression of water 5. Calculate pH, $[H^+]$, and $[OH^-]$	**Acid Base** **CA 1-10 Acid Base Test Unit 9**	**Acid Base** **Key Vocabulary** · Acid (Bronsted-Lowry) · Base (Bronsted-Lowry) · Conjugate base · Conjugate acid · Salt · Neutralization · K_a · K_w · pH

2. Water, Kw 3. pH 4. weak vs. strong 5. titration UEQ ● How are hydrocarbon structures drawn? ● What are the form and function of functional groups?	is acidic, basic or neutral 7. Solve for K_a of a weak acid 8. Write and balance neutralization equations 9. Complete titration of acid or base in lab 10. Use titration data to calculate molar concentration of an acid or a base	6. Determine whether a solution is acidic, basic or neutral using pH, $[H^+]$, and $[OH^-]$ 7. Solve for K_a of a weak acid 8. Write and balance neutralization equations 9. Complete titration of acid or base in lab and use titration data to calculate the molar concentration of and acid of a base	**Hydrocarbons**	· hydrogen ion · hydronium ion · amphoteric · ionize · ionization equation · litmus paper · indicator · titration **Tech Integration:** acid base animations **Hydrocarbons** **Key Vocabulary** ● **hydrocarbon** ● **structural formula** ● **functional group**

Standards **9C.2.1.2.1** **Hydrocarbons** 1. Structural formulas and models 2. Functional groups	**Hydrocarbons** 1. Create Structural formulas from models and models from structural formulas 2. Recognize and name functional groups	**Hydrocarbons** I can... 1. Create Structural formulas from models and vice versa. 2. Recognize and name functional groups (Alkanes, Alkenes, Alkynes, Ketons, Aldehydes, Esters, Ethers, Alcohols).		