Ganado Unified School District (Chemistry/Grade 10, 11, 12)

PACING Guide SY 2014-2015

Timeline & Resources	AZ College and Career Readiness Standard	Essential Question (HESS Matrix)	Learning Goal	Vocabulary (Content/Academic)
Quarter 1 Chapter 1 – Chemistry: The Science of Matter (1 week) GLENCOE SCIENCE – Chemistry Concepts and Applications	Sci 5.1 PO1. Describe substances based on their physical properties. Sci 5.1 PO2. Describe properties based on their chemical properties. 11-12.RST.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. 11-12.WHST.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	How is matter classified according to its composition? How are elements, compounds, mixtures different? How does the structure of matter relate to its properties? What are physical and chemical properties? How do chemical and physical changes differ? How does the law of conservation of matter apply to chemical changes?	I will be able to: -define chemistry as it relates to the classification of matter and changes of state. -compare and contrast elements, compounds, and mixtures. -identify two types of mixtures. -explain how a pure substance is different from a mixture. -define physical and chemical properties and changes.	chemistry matter mass property scientific model qualitative quantitative substance mixture alloy solute solvent aqueous solution element compound formula
Chapter 2 – Matter is Made of Atoms (2 weeks)	Sci 5.1 PO7. Describe the historical development of models of the atom. 11-12.RST.2 Determine central ideas or conclusions of a text; summarize	How have historic experiments led to the development of the modern model of the atom?	I will be able to: -discuss the timeline which led to the development of the modern atomic theory. -investigate experimental evidence	atom atomic theory law of definite proportions hypothesis

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	complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. 11-12.WHST.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.	How is the modern model of an atom different from previous models? What information is available in an element block of the periodic table? How does the electron relate to modern atomic theory? How do electron energy levels in an atom differ from one another? How are Lewis dot diagrams used to illustrate valence electrons?	and contributions of influential scientists including Lavoisier, Proust, Dalton, Thomson, and Rutherford. -describe the electromagnetic spectrum and how it relates to elemental emission spectra. -investigate valence electron structure and describe procedures for drawing Lewis dot diagrams.	theory scientific law atomic mass unit electromagnetic spectrum emission spectrum energy level electron cloud valence electron Lewis dot diagram
Chapter 3 – Introduction to the Periodic Table (1 week)	Sci 5.1 PO3. Predict properties of elements and compounds using trends of the periodic table (e.g. metals, non-metals)	What are the steps in the historical development of the periodic table? How is the periodic table used to predict similarities in properties of the elements? How does an element's valence electron structure relate to its position in the periodic table? How is the periodic table used to classify an	I will be able to: -explain the structure of the periodic table. -compare the properties of metals, nonmetals, and metalloids with the number of their valence electrons. -discuss the use of metalloids in semiconductors.	period periodicity periodic law noble gas transition element lanthanide actinide metalloid semiconductor

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		element as a metal, nonmetal, or metalloid? What are the properties of metals, nonmetals, and metalloids?		
Chapter 4 – Formation of Compounds (2 weeks)	Sci 5.1 PO3. Predict properties of elements and compounds using trends of the periodic table (e.g. bonding-ionic/covalent)	How are the properties of compounds different from those of the elements of which the compounds are composed? In what ways are the properties of sodium chloride, water, and carbon dioxide similar? How are they different? How can the formation of ionic and covalent compounds be modeled at the submicroscopic level? How do atoms achieve chemical stability by bonding? How do the physical properties of covalent compounds compare to those of ionic compounds?	I will be able to: -relate the formation of ionic and covalent compounds to the submicroscopic structure of the constituent elements. -discuss the general characteristics of ionic and covalent compounds and relate them to the type of bonding.	octet rule noble gas configuration ion ionic compound ionic bond crystal covalent bond covalent compound molecule electrolyte interparticle force
Chapter 5 – Types of	Sci 5.1 PO5. Describe the properties of electrical charge and the conservation of electric charge.	If charges of ions are known, how can proper formulas be written for	I will be able to: -define the rules for writing formulas and naming ionic	binary compound formula unit oxidation number

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Compounds (2 weeks)		ionic compounds? How can the formula of an ionic compound be determined from the name for the compound? What kind of information can be gathered from a chemical formula? How do the properties of covalent substances compare with those of ionic substances? How can a formula of a covalent compound be used to generate a name for the compound?	compounds. -explain how to interpret chemical formulas and relate them to the individual charges of ions combining within the compound. -compare and contrast ionic and covalent compounds. -identify the rules to follow in naming binary compounds, common acids and bases, and hydrocarbons.	polyatomic ion hydrate hygroscopic deliquescent anhydrous distillation molecular element allotrope organic compound inorganic compound hydrocarbon
Quarter 2 Chapter 6 – Chemical Equations and Reactions (2 weeks)	Sci 5.4 PO3. Represent a chemical reaction by using a balanced equation. Sci 5.4 PO9. Predict the products of a chemical reaction using types of reactions (e.g. synthesis, decomposition, replacement, combustion).	How do chemical equations describe chemical reactions? How are chemical reactions balanced by changing coefficients? How are the five major types of chemical reactions classified? What factors influence the direction of a reaction?	I will be able to: -use the law of conservation of mass to write and balance chemical equations. -describe the five reaction types in detail and identify examples of each type. -investigate the reactants and products for each of these reactions and emphasize how they can be used to interpret the reaction. -define reversible reaction and relate this concept to equilibrium -discuss Le Chatelier's principle	reactant product coefficient synthesis decomposition single displacement double displacement combustion equilibrium soluble insoluble activation energy catalyst enzyme inhibitor

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			and the driving force behind chemical change.	
Chapter 7 – Completing the Model of the Atom (1 week)	5.1 PO 7. Describe the historical development of models of the atom. 5.1 PO 8. Explain the details of atomic structure (e.g., electron configuration, energy levels, isotopes).	How do emission spectra relate to the electron configurations of atoms? What are the energy sublevels and orbitals within an atom? Where are the s, p, d, and f blocks on the periodic table and how do they relate to an element's electron configuration?	I will be able to: -describe the evidence that led to current theories about atomic structure, and relate this evidence to the distribution of electrons in energy levels, sublevels, and orbitals. -explain the correlation between the electron configuration of the elements, the organization of the periodic table, and the periodicity of chemical properties. -relate characteristics of the noble gases and transition elements to their electron arrangements. -discuss relative orbital sizes.	sublevel aufbau principle Heisenberg uncertainty principle orbital electron configuration
Chapter 8 – Periodic Properties of the Elements (2 weeks)	5.1 PO 1. Describe substances based in their physical properties. 5.1 PO 8. Explain the details of atomic structure (e.g., electron configuration, energy levels, isotopes).	How does the position of main group elements on the periodic table relate to their electron configuration? How does an element's electron configuration and atomic size relate to its chemical behavior? What are the chemical behaviors of transition elements in the periodic table?	I will be able to: -discuss the properties of the main group elements and how they relate to electron configuration and atomic size. -examine the properties of several of the most important transition elements in group 3-12 and relate them to their electron configurations. -discuss how the inner transition elements are characterized by f sublevels, and describe a few of	Alkali metal Alkaline earth metal Halogens

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			the most important elements.	
Chapter 9 – Chemical Bonding (2 weeks)	5.1 PO 3. Predict properties of elements and compound using trends of the periodic table (e.g., metals, non-metals, bonding – ionic/covalent).	How are ionic, covalent, and polar covalent bonds similar? How are they different? How can a Lewis dot diagram be used to formulate the three-dimensional geometry of a molecule?	I will be able to: -define electronegativity as a key to differentiate between covalent, polar covalent, and ionic bonds. -examine Lewis dot diagrams of molecules and analyze electron-pair repulsions in order to determine molecular geometries and polarities. -discuss properties of covalent compounds and compare it to the properties of ionic compounds.	electronegativity shielding effect polar covalent bond malleable ductile conductivity metallic bond double bond triple bond polar molecule
Chapter 10 – The Kinetic Theory of Matter (2 weeks)	5.5 PO 4. Describe the basic assumptions of kinetic molecular theory.	What are the characteristics of a solid, liquid, and gas? How are changes in temperature and changes in temperature and state of a substance explained in terms of the kinetic theory of matter? How do temperature and pressure affect changes of state?	I will be able to: -examine the characteristics of solids, liquids, and gases and the changes between these physical states. -relate the changes between physical states to the kinetic theory of matter. -explain that temperature is a measure of the average kinetic energies of particles.	Brownian motion Kinetic theory of matter ideal gas pressure crystal lattice amorphous solid liquid crystal absolute zero vapor pressure boiling point
Quarter 3 Chapter 11 – Behavior of Gases (2 weeks)	5.5 PO 5. Apply kinetic molecular theory to the behavior of matter (e.g., gas laws)	How does kinetic theory explain the effects of changing the mass, temperature, pressure, and volume of a gas? How are temperature, pressure, and volume of	I will be able to: -relate gas pressure to volume, temperature, and the number of gas particles. -define units of pressure -express and define the behavior of gases using Boyle's law, Charles's	barometer standard atmosphere pascal Boyle's law Charles's law Combined gas law Standard temperature

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		a gas related?	law, and the combined gas law.	and pressure (STP)
Chapter 12 – Chemical Quantities (2 weeks)	5.4 PO 5. Describe the mole concept and its relationship to Avogadro's number. 5.4 PO 6. Solve problems involving such quantities as moles, mass, molecules, volume of a gas, and molarity using mole concept and Avogadro's number.	How is the mole a counting number? How are stoichiometric problems solved using molar mass? How are quantities of reactants and products predicted in chemical reactions? How are mole ratios determined from formulas for compounds?	I will be able to: -express large numbers using Avogadro's constant, mole concept, and molar masses. -calculate theoretical yield, actual yield, percent yield of compounds.	stoichiometry mole Avogadro's number molar mass molecular mass formula mass molar volume ideal gas law theoretical yield percent yield
Chapter 13 – Water and Its Solutions (2 weeks)	5.4 PO 11. Predict the effect of various factors (e.g., temperature, concentration, pressure, catalyst) on the equilibrium state and on the rates of chemical reaction.	In what ways is water unique as a chemical substance? How are concentrations of solutions calculated? What are the different colligative properties of solutions?	I will be able to: -discuss the unique physical characteristics of water. -examine the formation and characteristics of aqueous solutions. -explain solution concentration. -learn about molarity and how to calculate it.	hydrogen bonding surface tension capillarity specific heat dissociation unsaturated solution saturated solution supersaturated solution osmosis colloid Tyndall effect
Chapter 14 – Acids, Bases, and pH (2 weeks)	5.4 PO 12. Compare the nature, behavior, concentration, and strengths of acids and bases.	What properties distinguish acids from bases? How do strong acids and bases compare to weak acids and bases in terms of degree of dissociation	I will be able to: -explore the properties of acids and bases and relate their reactions in water. -explain the difference between strong and weak acids and bases and relayed to the degree of	acid hydronium ion acidic hydrogen ionization base acidic anhydride basic anhydride

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		or ionization? How is pH related to the acidity of a solution?	ionization or dissociation of the compounds. -learn about the pH scale and relate to the concentrations of hydronium and hydroxide ions.	strong base strong acid weak acid weak base pH
Chapter 15 – Acids and Bases React (1 week)	5.4 PO 12. Compare the nature, behavior, concentration, and strengths of acids and bases.	What is the difference between an overall, an ionic, and a net equation for an acid-base reaction? How is an acid-base titration performed? How can the data from an acid-base titration be used to calculate the concentration of an unknown sample?	I will be able to: -examine strong acid-strong base, strong acid-weak base, weak acid-strong base, and weak acid-weak base neutralization reactions. -represent each type by writing molecular, ionic, and net ionic equations for the reactions. -explain the hydrogen-ion transfer definitions of acids and bases.	neutralization reaction salt ionic equation spectator ion net ionic equation Bronsted-Lowry model
Quarter 4 Chapter 16 – Oxidation-Reduction Reactions (2 weeks)	5.4 PO 13. Determine the transfer of electrons in oxidation/reduction reactions.	What are the defining characteristics of an oxidation-reduction reaction? How can you identify the substance being oxidized in a redox reaction? How can you identify the substance being reduced? What are some redox reactions that take place in living cells?	I will be able to: -define oxidation-reduction reactions and identify characteristics of these reactions.	oxidation reduction oxidizing agent reducing agent
Chapter 17 –	5.3 PO 1. Describe the following	How is the construction of a voltaic cell related	I will be able to: -examine the electrochemical	electric current voltaic cell

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Electrochemistry (2 weeks)	ways in which energy is stored in a system: mechanical, electrical, chemical, nuclear.	to the way it produces a voltage and electric current? How do electrons move in a voltaic cell? In what ways do the principles of electrolysis apply to the processes of chemical synthesis, refining, plating, and cleaning?	processes that occur in voltaic cells and batteries. -examine the function of electrolytic cells and identify several applications of electrolysis.	anode cathode potential difference voltage cation anion electrolysis electrolytic cell
Chapter 20 – Chemical Reactions and Energy (2 weeks)	5.4 PO 10. Explain the energy transfers within chemical reactions using the law of conservation of energy. 5.4 PO 11. Predict the effect of various factors (e.g., temperature, concentration, pressure, catalyst) on the equilibrium state and on the rates of chemical reaction.	How are exothermic chemical reactions similar to endothermic chemical reactions? How are they different? What role does entropy change play in determining whether a process is spontaneous? What are the steps involved in the technique of calorimetry?	I will be able to: -use energy diagrams to examine exothermic and endothermic reactions. -explain activation energy and the effects of catalysts on chemical reactions. -describe entropy as a measure of how dispersed the energy of a system is, and explain how this relates to reaction spontaneity.	heat law of conservation of energy fossil fuel entropy
Chapter 21 – Nuclear Chemistry (2 weeks)	5.3 PO 1. Describe the following ways in which energy is stored in a system: mechanical, electrical, chemical, nuclear.	How was radioactivity discovered? What are the properties of alpha, beta, and gamma radiation? How are the half-lives of various radioactive elements used to date	I will be able to: -discuss the discovery and early study of radioactivity by Becquerel and Curies. -learn nuclear notation and use it in the explanation of alpha, beta, and gamma decay. -describe the characteristics and	radioactivity alpha particle beta particle gamma ray half-life nuclear fission nuclear reactor nuclear fusion

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		materials? How do nuclear fission and nuclear fusion compare and contrast?	detection of the three types of radiation. -explain half-life and its use in radioactive dating.	deuterium tritium