Zanesville City Schools

Chemistry

Curriculum Map

Course Title: _______Chemistry__________________________ Grade Level: _________11th

Instructor: ________Haudenschild_______________________

Quarter 1

Unit Title	Unit Description	Unit Duration
1. **Matter and Measurement**	In this course, scientific protocols for quantifying the properties of matter accurately and precisely are studied. Using metric measuring systems, significant digits or figures, scientific notation, error analysis and dimensional analysis are vital to scientific Communication. There are three domains of magnitude in size and time: the macroscopic (human) domain, the cosmic domain and the submicroscopic (atomic and subatomic) domain. Measurements in the cosmic domain and submicroscopic domains require complex instruments and/or procedures. **Standards:** • **Scientific measurement** • **Distinguishing characteristics of different materials Structure of Matter**	**Unit Duration three weeks.** ***Skills and Concepts used in ALL units.**
2. **Atoms, Ions, and Molecules**	In the physical science syllabus, elements are placed in order of increasing atomic number in the periodic table such that elements with similar properties are placed in the same column. How the periodic table is divided into groups, families, periods, metals, nonmetals and metalloids also was in the physical science syllabus. In chemistry, with more information about the electron configuration of elements, similarities in the configuration of the valence electrons for a particular group can be observed. The electron configuration of an atom can be written from the position on the periodic table. The repeating pattern in the electron configurations for elements on the periodic table explain many of the trends in the properties observed. Atomic theory and bonding must be used to explain trends in properties across periods or down columns including atomic radii, ionic radii, first ionization energies, electronegativities and whether the element is a solid or gas at room temperature. Additional ionization energies, electron affinities and periodic properties of the transition elements, lanthanide and actinide series is reserved for more advanced study.	**Six Weeks**

	Atomic models are constructed to explain experimental evidence and make predictions. The changes in the atomic model over time exemplify how scientific knowledge changes as new evidence emerges and how technological advancements like electricity extend the boundaries of scientific knowledge. Based on the quantum mechanical model, it is not possible to predict exactly where electrons are located but there is a region of space surrounding the nucleus in which there is a high probability of finding an electron (electron cloud or orbital). Data from atomic spectra (emission and absorption) gives evidence that electrons can only exist at certain discrete energy levels and not at energies between these levels. Orbital diagrams and electron configurations can be constructed to show the location of the electrons in an atom using established rules. However, the names of these rules will not be assessed. Valence electrons are responsible for most of the chemical properties of elements.	

	Standards:
	• **Periodic Table**
	    • Properties
	    • Trends
	• ***Atomic structure***
	    • Evolution of atomic models/theory
	    • Electrons
	    • Isotopes
	• Electron Configurations and atomic spectra
	• Molar Quantities and Calculations	

3.Quarter Two Compounds and Bonding	Using the periodic table, formulas of ionic compounds containing specific elements can be predicted. This can include ionic compounds made up of elements from groups 1, 2, 17, hydrogen and oxygen and polyatomic ions if given the formula and charge of the polyatomic ion. Given the formula, a compound can be named using conventional systems that include Greek prefixes and Roman numerals where appropriate. Given the name of an ionic or covalent substance, formulas can be written.	**Nine Weeks**

	Many different models can be used to represent compounds including chemical formulas, Lewis structures, and ball and stick models. These models can be used to visualize atoms and molecules and to predict the properties of substances. Each type of representation provides unique information about the compound. Different representations are better suited for particular substances. Lewis structures can be drawn to represent covalent compounds using a simple set of rules and can be combined with valence shell electron pair repulsion (VSEPR) theory to predict the three-dimensional electron pair and molecular geometry of compounds.	

	Standards:
	• ***Representing Compounds***
	  • Formula writing
	• **Nomenclature—ionic and molecular compounds**
	Standards:
	• ***Intramolecular Chemical Bonding***
	  • Ionic
	  • Polar/Covalent
	  • Models and Shapes (Lewis structures, ball and stick, molecular geometries)
	  • Quantifying matter	

4.Quarter Three **Chemical Reactions**	In the physical science syllabus, coefficients were introduced to balance simple equations. Other representations including Lewis structures and three-dimensional models also were used and manipulated to demonstrate the conservation of matter in chemical reactions. In this course, more complex reactions will be studied, classified and represented with chemical equations and three-dimensional models. Classifying reactions into types can be a helpful organizational tool in recognizing patterns of what may happen when two substances are mixed. Reactions occur when reacting particles collide in an appropriate orientation and with sufficient energy. Not all collisions are effective. Stable reactants require the input of energy, the activation energy, to initiate a reaction. A catalyst provides an alternate pathway for a reaction, usually with a lower activation energy.	**Four Weeks**

	Standards: • ***Chemical Reactions*** • Types • Balancing • Energy	
Unit Title	**Unit Description**	**Unit Duration**
1. **Intermolecular Bonding**	The composition of a substance and the shape and polarity of a molecule are particularly important in determining the type and strength of bonding and intermolecular interactions. Types of intermolecular attractions include London dispersion forces (present between all molecules), dipole-dipole forces (present between polar molecules) and hydrogen bonding (a special case of dipole-dipole where hydrogen is bonded to a highly electronegative atom such as fluorine, oxygen or nitrogen), each with its own characteristic relative strengths. The configuration of atoms in a molecule determines the strength of the forces (bonds or intermolecular forces) between the particles and therefore the physical properties (e.g., melting point, boiling point, solubility, vapor pressure) of a material. **Standards:** • **Intermolecular Chemical Bonding** • **Types and Strengths** • **Implications for Properties of Substances**	**Two Weeks**
2.Fourth Quarter Starts in the middle of this unit **Stoichiometry**	A stoichiometric calculation involves the conversion from the amount of one substance in a chemical reaction to the amount of another substance. Molarity is a measure of the concentration of a solution that can be used in stoichiometric calculations. When performing a reaction in the lab, the experimental yield can be compared to the theoretical yield to calculate percent yield. The concept of limiting reagents is treated conceptually and not mathematically.	**Six Weeks**

	• ***Stoichiometry*** • Molar calculations • Limiting reagents • Solutions • Quantifying matter	
3. **Gas Laws**	The kinetic-molecular theory can be used to explain the macroscopic properties of gases (pressure, temperature and volume) through the motion and interactions of its particles. When one of the three properties is kept constant, the relationship between the other two properties can be quantified, described and explained using the kinetic-molecular theory. Real-world phenomena (e.g., why tire pressure increases in hot weather, why a hot air balloon rises) can be explained using this theory. Problems also can be solved involving the changes in temperature, pressure and volume of a gas. When solving gas problems, the Kelvin temperature scale must be used since only in this scale is the temperature directly proportional to the average kinetic energy. Since equal volumes of gases at the same temperature and pressure contain an equal number of particles (Avogadro's law), problems can be solved for an unchanging gaseous system using the ideal gas law (PV = nRT) where R is the ideal gas constant (e.g., represented in multiple formats, 8.31 Joules / (mole K).	**Three Weeks**
	Standards: • ***Gas Laws*** • Boyle's Law • Charles's Law • Ideal Gas Law	
4. **Thermochemistry**	Generally, energy is transferred out of the system (exothermic) when the products have stronger bonds than the reactants and is transferred into the system (endothermic) when	**Three Weeks**

	the reactants have stronger bonds than the products. Predictions of the energy requirements (endothermic or exothermic) of a reaction can be made given a table of bond energies. Specific heat is a measure of how much energy is needed to change the temperature of a specific mass of material a specific amount. Specific heat values can be used to calculate the thermal energy change, the temperature (initial, final or change in) or mass of a material in calorimetry. Water has a particularly high specific heat capacity, which is important to regulate the Earth's temperature.	
	Standards: • **Kinetic Molecular Theory** • **Energy**	

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