Classical Magnet School

Course __Chemistry _____

	Sept	Oct	Nov	Dec	Jan	Feb	March	April	May	June
Themes/ Topics	The Scientific Method Scientific Notation & Significant Digits	Atomic Theory The Periodic Table Electron Configurations	Chemical Bonding Lewis Structures	Chemical Formulas Naming Compounds	Types of Chemical Reactions Balancing Chemical Reactions	The Gas Laws	Kinetic Theory Thermal Energy & the Law of Thermodynamics	Stoichiometry The Mole	Organic Chemistry	Final Exams
Essential Questions	What basic skills are needed to succeed in chemistry?	What do the atomic theory and periodic law mean? How does the structure of the atom help explain periodic trends? How is the periodic table used to write electron configurations for elements? How do the characteristics and behavior of groups/families of the periodic table change?	How do atoms form bonds? What are the two major types of bonding? How is the dot diagram useful? Who cares if elements combine or not? What would the world be like if things did not bond?	What recognized system is used to name molecules and compounds? In what quantities do atoms come together to form molecules? Why do we even need chemical formulas anyway? Why do different molecules have different shapes?	How and why are chemical reactions classified? Why and how do chemical reactions occur? What are the five types of chemical reactions? What patterns can be identified and used to predict reaction outcomes?	What are the gas laws? How do these laws interact with one another?	What role does energy play in chemical reactions? What is the Law of Thermodynamics?	Is a "mole" like an animal or something? So, I have to do math in chemistry too…how does dimensional analysis make it easier? How do I use percent composition and empirical formula? How do chemical reactions obey the law of conservation of mass?	Why is there such variety in carbon-based compounds? How are organic compounds classified and how are they named? What are polymers and how are they used?	
Standards	D INQ.1 Identify questions that can be answered through scientific investigation. D INQ. 2 Read, interpret and examine the credibility and validity of scientific claims in different sources of information. D INQ.3 Formulate a testable hypothesis and demonstrate logical connections between the scientific concepts guiding the hypothesis and the design of the experiment. D INQ. 4 Design and conduct appropriate types of scientific investigations to answer different questions. D INQ. 5 Identify independent and dependent variables, including those that are kept constant and those used as controls. D INQ.8 Use mathematical operations to analyze and interpret data, and present relationships between variables in appropriate forms.	A1. The nucleus of the atom is much smaller than the atom, yet contains most of its mass. A2. The quantum model of the atom is based on experiments and analyses by many scientists, including Dalton, Thomson, Bohr, Rutherford, Millikan and Einstein. A3. The position of an element in the periodic table is related to its atomic number. A4. The periodic table can be used to identify metals, semimetals, non-metals and halogens A5. The periodic table can be used to identify trends in ionization energy, electronegativity, the relative sizes of ions and atoms, and the number of electrons available for bonding. A6. The electronic configuration of elements and their reactivity can be identified based on their position in the periodic table.	B1. Lewis dot diagrams can provide models of atoms and molecules. B2. Atoms combine to form molecules or formula units by sharing electrons to form covalent or metallic bonds (respectively), or by exchanging electrons to form ionic bonds. B3. Chemical bonds between atoms in molecules such as H_2, CH_4, NH_3, H_2CCH_2, N_2, Cl_2 and many large biological molecules are covalent. B4. Chemical and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules D11. Describe how atoms combine to form new substances by transferring electrons (ionic bonding) or sharing electrons (covalent bonding). D13. Explain how the structure of the carbon	B2. Atoms combine to form molecules or formula units by sharing electrons to form covalent or metallic bonds (respectively), or by exchanging electrons to form ionic bonds. B3. Chemical bonds between atoms in molecules such as H_2, CH_4, NH_3, H_2CCH_2, N_2, Cl_2 and many large biological molecules are covalent. D INQ.10 Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.	D12. Explain the chemical composition of acids and bases, and explain the change of pH in neutralization reactions. E1. There are many different types of chemical reactions. F1. Chemical reactions can be described by writing balanced equations. High School Chemistry – Chemical reaction rates depend on factors that influence the frequency of collision of reactant molecules.	D INQ. 8 Use mathematical operations to analyze and interpret data, and present relationships between variables in appropriate forms. D INQ.9 Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation.	D1. Describe the effects of adding energy to matter in terms of the motion of atoms and molecules, and the resulting phase changes. D INQ.8 Use mathematical operations to analyze and interpret data, and present relationships between variables in appropriate forms.	F1. The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants. F2. The molar mass of a substance can be determined from its chemical formula and a table of atomic masses (Periodic Table). F3. The mass of a substance can be converted to moles. D INQ.8 Use mathematical operations to analyze and interpret data, and present relationships between variables in appropriate forms. High School Chemistry – The conservation of atoms in chemical reactions leads to the principle of conservation of matter and the ability to calculate the mass of products and reactants.	D13. Explain how the structure of the carbon atom affects the type of bonds it forms in organic and inorganic molecules. D15. Explain the general formation and structure of carbon-based polymers, including synthetic polymers, such as polyethylene, and biopolymers, such as carbohydrate. D16. Explain how simple chemical monomers can be combined to create linear, branched and/or cross-linked polymers. D17. Explain how the chemical structure of polymers affects their physical properties. High School Chemistry – The bonding characteristics of carbon allow the formation of many different organic molecules of varied sizes, shapes and chemical properties, and provide the biochemical basis of life.	

	D INQ.9 Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation. D INQ. 10 Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic.	D10. Describe the general structure of the atom, and explain how the properties of the first 20 elements in the Periodic Table are related to their atomic structures. D INQ.1 Use appropriate tools and techniques to make observations and gather data. D INQ.2 Read, interpret and examine the credibility and validity of scientific claims in different sources of information. D INQ.10 Communicate about science in different formats, using relevant science vocabulary, supporting evidence and clear logic. High School Chemistry – The periodic table displays the elements in increasing atomic number and shows how periodicity of the physical and chemical properties of the elements relates to atomic structure.	atom affects the type of bonds it forms in organic and inorganic molecules. D INQ.9 Articulate conclusions and explanations based on research data, and assess results based on the design of the investigation. High School Chemistry – Biological, chemical and physical properties of matter result from the ability of atoms to form bonds from electrostatic forces between electrons and protons and between atoms and molecules.							
Major Skills	Identifying experimental variables Converting metric units	Create a timeline outlining the major contributions of select scientists (Dalton, Thomson, Bohr, Rutherford, Millikan, Einstein, Democritus), to the development of the atomic model (A2). Use the atomic number and mass number, in a neutral atom, to determine protons, neutrons and electrons (A1). Recognize that the position of an element in the periodic table is based on its atomic number (A3). Identify elements (e.g., metals, semi-metals, non-metals and halogens), based on their properties and position in the Periodic Table (A3 & A4). Identifying atomic models Calculating PEN Calculating atomic weight from isotope data	Utilize the periodic table to write electron configurations for elements Identify changes and patterns of element characteristics using the periodic table Compare and contrast characteristics and behavior of groups/families of the periodic table Recognize that the electron configuration of elements can be determined based on their position in the periodic table (A6). Recognize that the reactivity of the elements can be identified based on their position in the periodic table (A6).	Define the two major types of bonding Calculate the electrons used in bonding for compounds and molecules Draw the Lewis Structures for elements, molecules, and simple compounds Use the Periodic Table to draw Lewis dot diagrams and make predictions. Draw dot diagrams and use them to demonstrate how ionic bonds are formed. Draw dot diagrams and use them to demonstrate how covalent bonds are formed.	Name Ionic & Covalent Compounds Utilize the criss-cross method to write the formulas for ionic compounds	Classify the different types of chemical reactions. Identify Types of Chemical Reactions Balance Chemical Equations Predict Products of Chemical Reactions		Calculate molar mass of a compound using the Periodic Table (STD. F2) Calculate the moles from grams (grams from moles) using dimensional analysis. (STD. F3) Calculate the percent composition and the empirical formula of a compound given the mass of the elements. (STD. F3) Write balanced equations. (STD. F4) Use balanced equations to establish the ratio of reactants to products in a chemical reaction. (STD. F4) Calculate the mass of reactants and theoretical product yield using a balanced chemical. (STD. F1)		

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Field Trips / Guest Speakers		CT Renaissance Faire in Hebron						Museum of Jewish Heritage in NY		
Coached Projects	Lab – Observing a Candle Lab – Thickness of Aluminum Foil	Renaissance Faire Lab – Diffraction Grating & Spectra Lab – Activity of Metals	Renaissance Faire Lab – Models of Ionic Compounds Lab – Molecular Models of Alkanes	Lab – Molecular Models Lab – The Smallest Xmas Tree	Lab – Types of Chemical Reactions Lab – Chemical Reactions	Gas Law Projects Lab – Boyle's Law	Holocaust Project Lab – Kinetic Theory Lab – Calorimetry	Holocaust Project Lab – Moles of Chalk	Lab – Models of Organic Compounds Lab – Esterfication	
Seminars	Agassiz and the Fish	Particle Poems The Periodic Table of the Elements	Bond and Free/Ionic Bonding	What's in a Name?	Catalyst		Kinetic Theory			