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Attachments	

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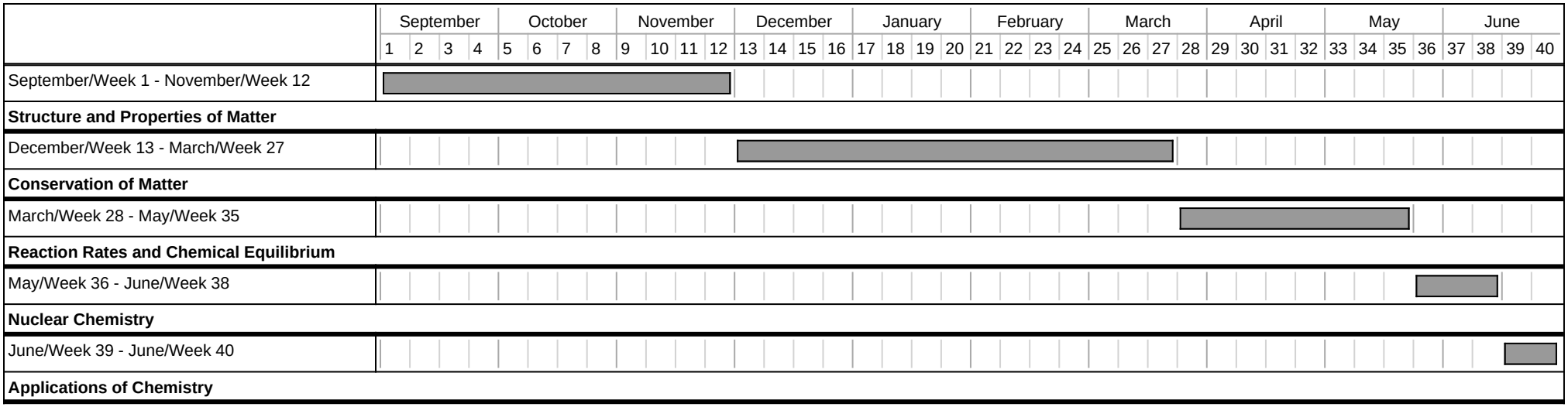

Title : Roxbury High School Chemistry A
Type : Consensus

Duration: September/Week 1 - November/Week 12					
UNIT NAME: Structure and Properties of Matter					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. Much of science deals with constructing explanations of how things change and how they remain stable. Science assumes the universe is a vast single system in which basic laws are consistent.	How can properties used to describe matter be classified? Why do all samples of a substance have the same intensive properties? How can mixtures be classified? How is a compound different from an element? How can you distinguish a substance from a mixture? What are chemical symbols and chemical formula used for? What are the three types of subatomic particles? What distinguishes the atoms of one element from the atoms of another? How do the isotopes of a given element differ from one another? What does the quantum mechanical model determine about electrons in atoms?	Properties can be intensive or extensive. Every sample of a given substance has the same chemical composition. Mixtures can be heterogeneous or homogeneous. Compounds can be broken down into simpler substances by chemical mean, but elements cannot. A substance has a fixed composition. The composition of a mixture may vary. Chemical symbols are used to represent elements. Chemical formulas are used to represent compounds. Protons, neutrons and electrons. Atoms of different elements contain different numbers of protons. They have different mass numbers and different numbers of neutrons.	Develop a model based on evidence to illustrate the relationships between systems or between systems or between components of a system. Use a model to predict the relationships between systems or between systems or between components of a system. Students plan investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data. Analyze data using a model (Periodic Table) in order to make a valid scientific claim.		PS1.A-Structure and Properties of Matter (09-12)[Regional:Next Generation Science Standards (NGSS)] PS1.C-Nuclear Processes (09-12)[Regional:Next Generation Science Standards (NGSS)] PS2.B-Types of Interactions (09-12) [Regional:Next Generation Science Standards (NGSS)] PS1.A-Structure and Properties of Matter (09-12)[Regional:Next Generation Science Standards (NGSS)] 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 atoms. (09-12)[Regional:Next Generation Science Standards (NGSS)] PS1.A-Structure and Properties of Matter (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.PS1.3-Plan and conduct an investigation to gather evidence to

	How is the change in electron energy related to the frequency of light emitted in atomic transitions? How are elements arranged in the modern periodic table? How does atomic size change within groups and across periods? How does electronegativity vary within groups and across periods?	It determines the allowed energy levels an electron can have and the likelihood of finding an electron in various locations around the nucleus. The light emitted in an electronic transition from a higher to lower energy level has a frequency that is directly proportional to the energy change of the electron. Elements are arranged in order of increasing atomic number. Atomic size generally increases within a group and decreases across a period. Electronegativity decreases from top to bottom and increases across a period.	Student construct explanations and design solutions that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories. Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future.		compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. (09-12) [Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School Chemistry A
Type : Consensus

Duration: December/Week 13 - March/Week 27					
UNIT NAME: Conservation of Matter					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. In nuclear processes, atoms are not conserved, but the total number of proton plus neutrons is conserved. The total amount of energy and matter in closed systems is conserved. Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. Much of science deals with constructing explanations of how things change and how they remain stable. Science assumes the universe is a vast single system in which basic laws are consistent.	How can you determine the number of valence electrons in an atom of a representative element? How to cations form? How do anions form? What properties characterize ionic compounds? How do chemists model the valence electrons in metal atoms? What electron configuration do atoms usually achieve by forming bonds? Explain how the VSEPR theory can be used to predict the shapes of molecules. How can you calculate the mass of a mole of a substance? What quantities are always conserved in chemical reactions? How are mole ratios used	Look up the group number of that element. Cations form when an atom loses valence electrons. Anions form when an atom gain valence electrons. Ionic compounds are usually solids at room temperature; have high melting points; conduct electricity when melted or dissolved in water. Metal cations are surrounded by sea of mobile valence electrons. Atoms attain a noble gas configuration. Each molecule assumes the shape that places valence electron pairs as far apart as possible. Add together the masses, expressed in grams, of each element in one mole of the compound. Mass and atoms are always conserved.	Develop a model based on evidence to illustrate the relationships between systems or between systems or between components of a system. Use a model to predict the relationships between systems or between components of a system. Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data and refine the design accordingly. Use mathematical representations of phenomena to support claims. Apply scientific principles and evidence to provide an explanation of phenomena and solve design problems, taking		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. (09-12)[Regional:Next Generation Science Standards (NGSS)] PS1.B-Chemical Reactions (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.7-Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. (09-12) [Regional:Next Generation Science Standards (NGSS)] PS1.A-Structure and Properties of Matter (09-12)[Regional:Next Generation Science Standards (NGSS)]

	chemical calculations? How can you gauge the efficiency of a reaction carried out in the laboratory? In what direction does heat flow between two objects? What enthalpy changes occur when a solute dissolves in a solvent?	Mole ratios are written using the coefficients from a balanced chemical equations. They are used to relate moles of reactants and products in stoichiometric calculations. The efficiency of a reaction can be measured by calculating the percent yield. Heat flows from the object of higher temperature to the object of lower temperature. Heat is either released or absorbed in the formation of a solution.	into account possible unanticipated effects. Construct and revised an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. Refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.		
Plans:					

Title : Roxbury High School Chemistry A
Type : Consensus

Duration: March/Week 28 - May/Week 35					
UNIT NAME: Reaction Rates and Chemical Equilibrium					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. The total amount of energy and matter in closed systems is conserved. Changes of energy and matter in a system can be described in terms of energy and matter flows into, out of, and within that system. Much of science deals with constructing explanations of how things change and how they remain stable. Science assumes the universe is a vast single system in which basic laws are consistent.	How is the rate of a chemical reaction expressed? What are four factors that affect the rate of a chemical reaction? How do the amounts of reactants and products change after a reaction has reached chemical equilibrium? What are three stresses that can upset the equilibrium of a chemical system? What are two characteristics of spontaneous reactions? What two factors determine the spontaneity of a reaction? How does the size of the specific rate constant (*k*) for a reaction relate to the speed of reaction?	The rate of chemical reaction is the amount of reactant changing per unit of time. Four factors are temperature, concentration, particle size and use of a catalyst. They do not change. Three stresses are changes in concentration, changes in temperature, or changes in pressure of the reactants and products. They produce substantial amounts of products at equilibrium and release free energy. The size and direction of enthalpy and entropy changes together determine whether a reaction is spontaneous. The larger the specific rate constant, the faster the reaction.	Students synthesize, and develop models to predict and show relationships among variables between systems and their components in the natural and designed worlds. Develop a model based on evidence to illustrate the relationships between systems or between components of a system. Use a model to predict the relationships between systems or between components of a system. Students planning and carrying out investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models. Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the		PS1.A-Structure and Properties of Matter (09-12)[Regional:Next Generation Science Standards (NGSS)] 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. (09-12) [Regional:Next Generation Science Standards (NGSS)] PS1.B-Chemical Reactions (09-12) [Regional:Next Generation Science Standards (NGSS)] 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. (09-12) [Regional:Next Generation Science Standards (NGSS)] PS1.B-Chemical Reactions (09-12) [Regional:Next Generation Science Standards (NGSS)]

			precision of the data, and refine the design accordingly. Mathematical and computational thinking at the 9-12 level builds on K-8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions. Use mathematical representations of phenomena to support claims. Constructing explanations and designing solutions in 9-12 builds on K-8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific ideas, principles, and theories.		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.* (09-12) [Regional:Next Generation Science Standards (NGSS)]

			Apply scientific principles and evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects. Construct and revised an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. Refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations.		
Plans:					

Title : Roxbury High School Chemistry A
Type : Consensus

Duration: May/Week 36 - June/Week 38					
UNIT NAME: Nuclear Chemistry					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. Energy drives the cycling of matter within and between systems. Science and engineering complement each other in the cycle known as research and development. Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise. Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible. Modern civilization depends on major technological systems.	How does an unstable nucleus release energy? What are the three main types of nuclear radiation? What determines the type of decay a radioisotope will undergo? How much of a sample of radioisotope remains after one half-life? What are two ways that transmutation can occur? Why are spent fuel rods from a nuclear reaction stored in water? How are fusion reactions different from fission reactions?	An unstable nucleus releases energy by emitting radiation during radioactive decay. The three types are alpha, beta and gamma radiation. The neutron to proton ratio will determine the type of decay. 50% of the sample will remain after one half-life. Radioactive decay and particle bombardment of a nucleus. Water cools spent fuel rods and provides a radiation shield. Fission reactions involve splitting nuclei. Fusion reactions combine small nuclei and release much more energy.	Develop a model based on evidence to illustrate the relationships between systems or between components of a system. Plan and conduct an investigations individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data, and refine the design accordingly. Communicate scientific and technical information in multiple formats. Create a computational model or simulation of a phenomenon, designed device, process, or system. Use a computational representation of phenomena or design solutions to describe and/ or support claims and/or explanations.		PS1.C-Nuclear Processes (09-12)[Regional:Next Generation Science Standards (NGSS)] PS1.B-Chemical Reactions (09-12) [Regional:Next Generation Science Standards (NGSS)] 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. (09-12) [Regional:Next Generation Science Standards (NGSS)]

Science is a result of human endeavors, imagination, and creativity.			Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and trade-off considerations. Construct an explanation based on valid and reliable evidence obtained from a variety of sources and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. Design or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and trade-off considerations.		
Plans:					

Title : Roxbury High School Chemistry A
Type : Consensus

Duration: June/Week 39 - June/Week 40					
UNIT NAME: Applications of Chemistry					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. Energy drives the cycling of matter within and between systems. Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects. Change and rates of change can be quantified and modeled over very short or very long periods of time. Some system changes are irreversible.	Explain how the properties of a laser beam make it useful for eye surgery. How does steel-frame construction differ from reinforced concrete construction? Explain why you don't see the points of light on a plasma TV. Drug testing - what is the purpose of the separation column in a GC/MS? How can it help to roll on the ground if your clothes are on fire?	The laser beam is a narrow beam of intense light that can be aimed in a specific direction. Steel frames allow for more flexible interior spaces. Reinforced concrete construction takes up less vertical space, so more floors can be contained in a building of a certain height. They are too small. The column concentrates and separates the components of the mixture by causing each to move at a different rate. Rolling on the ground deprives the burning clothes of oxygen.	Develop a model based on evidence to illustrate the relationships between systems or between components of a system. Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data and refine the design accordingly. Plan and conduct and investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data. Communicate scientific and technical information in multiple formats.		PS1.C-Nuclear Processes (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.PS3.3-Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.* (09-12)[Regional:Next Generation Science Standards (NGSS)] PS2.B-Types of Interactions (09-12) [Regional:Next Generation Science Standards (NGSS)]

			Create a computational model or simulation of a phenomenon, designed device, process, or system. Use a computational representation of phenomena or design solutions to describe and/ or support claims and/or explanations. Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. Construct an explanation based on valid and reliable evidence obtained from a variety of sources and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do in the future.		
Plans:					