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Title : Roxbury High School Chemistry Honors
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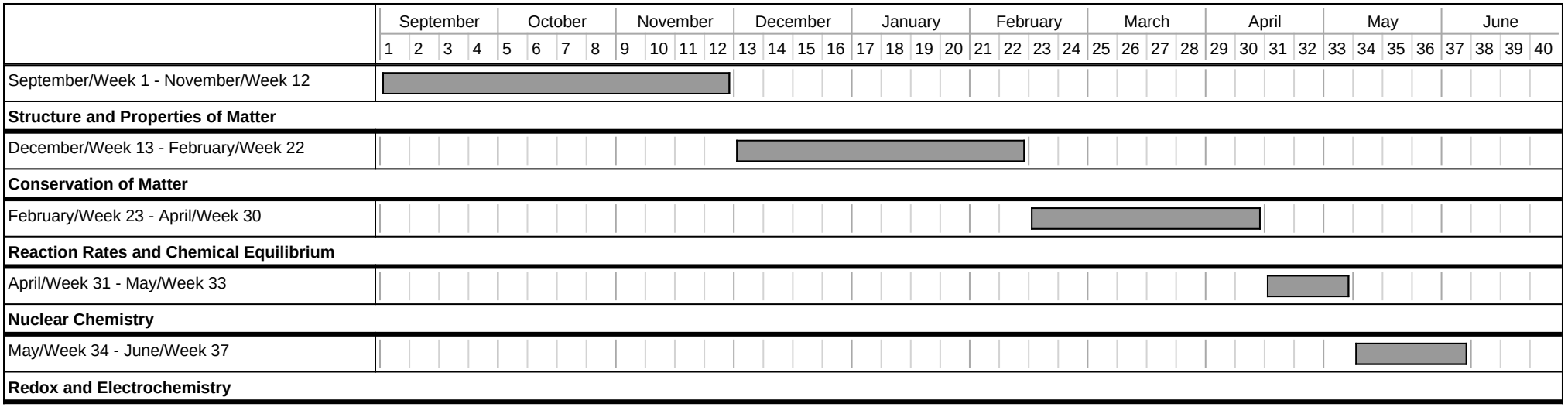

Title : Roxbury High School Chemistry Honors
Type : Consensus

Duration: September/Week 1 - November/Week 12					
UNIT NAME: Structure and Properties of Matter					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
All matter is made up of atoms of known elements Patterns of valence electrons justify the organization of the periodic table of the elements. The patterns of the periodic table influence the number and types of bonds formed by an element and between elements. Periodic table can be used to predict the relative properties of the elements based on the patterns of valence electrons	How are the elements determined? How are the elements organized in the periodic table? How many valence electrons does each element have? What types of bonds form between given elements in the periodic table? Is it possible to determine the number of bonds formed from given elements on the periodic table? Which elements are larger or smaller? Which elements have higher/ lower ionization energies or electronegativities? Why are certain	Number of protons determine an element. The number of electrons and neutrons do not determine the element. Periodic table is ordered such that a repeating pattern of eight occurs from left to right with respect to the representative elements and their number of valence electrons. Each successive representative element group corresponds to an increase of one valence electrons. All elements within the same group contain the same number of valence electrons Location of elements can guide determination of types of bonds between elements. Ionic bonding occurs between metals and non-metals. Covalent bonding occurs between nonmetals. Using patterns of valence electrons from the periodic table, Lewis structures can be drawn to determine number of bonds between given	Students can use periodic table of elements to differentiate different elements based on their number of protons. Students can use periodic table to identify the number of valence electrons for each element. Students can use periodic table to determine location of elements and infer likely type of bonding. Students can use patterns of periodic table to determine valence electrons and from there draw Lewis structures to determine number of bonds between elements. Students can use understanding of periodicity in the periodic table to determine relative sizes, ionization energies,		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)] HS.PS1.1.SEP.1-Use a model to predict the relationships between systems or between components of a system. (HS-PS1-1) (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.DCI.PS1.A.1-Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. (HS-PS1-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.1.DCI.PS1.A.2-The periodic table orders elements horizontally by

Aspects of particulate models such as the Localized Electron Model and Particle Spacing Model can help reason about observed differences between solid, liquid, and gas phases of certain materials. Properties of gases can best be understood by considering the Kinetic-Molecular Theory of Gases Forces of attraction/ repulsion help explain how bonds are formed and overcome. Changes occur in chemical potential energy of substances when bonds are formed/ broken Science and Engineering Practices: Biochemistry of animal digestion directly related to bonding and energy.	molecules more polar than others? What type of intermolecular forces occur in a given substance? Which elements will have greater melting/boiling points and why? Why do gases behave the way they do? Why is the behavior of gases so easily predictable regardless of what type of gas? What is the difference between an ideal gas and a real gas? What causes pressure? How does a chemical bond form on the molecular level? What forces are involved in the formation/disruption of chemical bonds/ intermolecular forces? How does the potential energy of matter change when these forces undergo changes? What happens to your food once you eat it? Where does the energy of food come from? How does your body utilize the	elements. There are definite trends in the periodic table for atomic radius (size), ionization energy, and electronegativity Intermolecular forces and an understanding of their relative strengths assist in making qualitative determinations of the differences between solids, liquids, and gases Kinetic-Molecular Theory of gases; Boyle's Law, Charles's Law, Gay-Lussac's Law, Combined Gas Law, Avogadro's Principle, molar volume of a gas, Ideal Gas Law, Dalton's Law of Partial Pressures Balance between attractive forces and repulsive forces of protons and electrons help explain how bonds are formed or broken. The distance between these forces is also important in the	and electronegativities of given elements. Students will be able to draw Lewis structures based on the Localized Electron Model and determine polarity and types of intermolecular forces present in a given substance. They will then be able to infer relative physical properties such as melting/boiling points of substances and explain observations of differences in solids, liquids, and gases. Students will be able to explain physical relationships of gases with respect to pressure, temperature, volume, and number of moles of gas Students will be able to use knowledge of attractive/repulsive forces to explain formation/ breakage of bonds and relative strengths of bonds. Students will be able to predict the energy changes when bonds are formed / broken.		the number of protons in the atom's nucleus and places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (HS-PS1-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.1.DCI.PS2.B.3-Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. (HS-PS1-1),(HS-PS1-3), (HSPS2-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.1.CCC.1-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. (HS-PS1-1), (HS-PS1-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.3.DCI.PS1.A.1-The structure and interactions of matter at the bulk scale are

Disciplinary Core Ideas: Structure and Properties of Matter Crosscutting Concepts: Patterns; Stability and Change	energy? What are the Core Ideas for Structure and Properties of Matter? What is a main unifying theme of structure and properties of matter?	strengths of the bonds present. Energy is required to break bonds and is released when bonds are formed. Food is matter that contains chemical potential energy. When food is ingested, bonds are broken and the energy released is utilized for cellular, organismal functions. Repeating patterns of the periodic table reflect patterns of valence electron states; structure and interactions of matter at the bulk scale are determined by electrostatic forces within and between atoms. 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.	Student will be able to explain how/why the food is vital to life and how the energy is transferred from ingested matter to physiological processes. Students will be able to explain the core ideas of structure and properties of matter as stated above. Students will be able to identify and explain how much of science deals with constructing explanations of how things change and how they remain stable		determined by electrical forces within and between atoms. (HS-PS1-3), (secondary to HS-PS2-6) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.PS1.3.DCI.PS2.B.2-Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. (HS-PS1-1),(HS-PS1-3), (HSPS2-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] Patterns (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.8.SEP.1-Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-PS1-8) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.8.DCI.PS1.C.1-Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number

					of neutrons plus protons does not change in any nuclear process. (HSPS1-8) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.8.CCC.1-In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. (HS-PS1-8) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.PS2.6.SEP.1-Communicate scientific and technical information (e.g. about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-PS2-6) (09-12) [Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School Chemistry Honors
Type : Consensus

Duration: December/Week 13 - February/Week 22					
UNIT NAME: Conservation of Matter					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
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 Write a balanced chemical equation that symbolically represents the description of a chemical reaction Chemical reactions can be classified. Based on the classification system, their products can be more easily predicted Use mathematical representations to support the claim that atoms, and therefore mass, are conserved during a chemical reaction. Determine the mass of reactants required to produce the desired mass of product for a given reaction. Connect the number of	What products could be predicted from the reactants given? How can you use the patterns learned from the periodic table to do so? What is the balanced chemical equation for this given reaction? What type of reaction is a given chemical reaction? What mass of product will be produced from the given mass of reactants? What is the mole? How would you convert grams to moles, moles to grams, grams to particles, etc. What is dimensional analysis? Based on a given amount of reactants, determine which reactant is limiting and calculate	Reactivity of elements, valence electrons, and patterns of chemical properties can guide in prediction of products of a chemical reaction. Solubility rules. Use of atomic symbols, states of matter, and Law of Conservation of Mass. Synthesis, Decomposition, Combustion, Single Replacement, and Double Replacement Reactions. Law of Conservation of Mass. Basic mathematics. Mole concept, dimensional analysis, mole-particle conversions, stoichiometry, limiting reactant determination.	Students will be able to predict the products of combustion of hydrocarbons, products of single and double replacement reactions, and when no reaction will occur. Students will be able to use atomic symbols to represent reactants and products and use simple mathematics to balance the reaction to follow the Law of Conservation of Mass Students will be able to determine from given reactants, what type of chemical reaction a given reaction is and then predict what the products would be. Students will be able to mathematically calculate mass of reactants/ products given one or the other. Students will be able to		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)] HS.PS1.2.SEP.1-Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' ow n 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. (HS-PS1-2) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.2.DCI.PS1.A.1-The periodic table orders elements horizontally by the number of protons in the atom's nucleus and

particles, moles, mass, and volume of substances to one another, both qualitatively and quantitatively. Aqueous solutions can most easily be understood if one considers bonding type, polarity, and molar relationships. As a chemical reaction proceeds, there are changes in energy from reactant to products. Energy is either absorbed or released when a chemical reaction takes place. Science and Engineering Practices: Students synthesize and develop models to predict and show relationships among variables between systems and their components in the natural and designed worlds. Disciplinary Core Ideas: Structure and Properties of Matter and Chemical	the theoretical yield of product. What volume of gas would be made based on the number of moles present at STP? How does a substance dissolve? How does one predict if a dissolved substance will behave as an electrolyte? What is the difference between concentrated solutions and dilute solutions? Is a given reaction either endothermic or exothermic? How does a combustion engine work? What basic chemical principles can explain chemical reactions, their energy changes and conservation?	Principles of solvation, nature of solvents vs. solutes, energy changes upon dissolving,; concentration of solutions (Molarity, molality, percent solution), making and diluting solutions. Bond energies, Hess's Law, Energy diagrams, calorimetry. Use of models to predict relationships between systems or between components of a system. Electron configurations and valence electrons, bonding; stable molecules have less energy than the same set of atoms separated; one must provide at least this energy in order to take the molecule apart; the same amount of energy is released when the molecule is formed as that amount of energy put in to	mathematically convert particles to mass and volume, use stoichiometric calculations to determine yield and limiting reactant of a reaction. Students will be able to explain the process of solvation on the molecular level, differentiate between a dilute and concentrated solution, calculate solution concentration using Molarity, molality, and percent solution; physically make a stock solution and then dilute it as directed. Students can determine whether a chemical reaction is endo or exothermic based on experimentation or mathematical calculations. Students will be able to design a model for a given conservation of matter system through use of chemical equations. Students will be able to use above concepts to		places those with similar chemical properties in columns. The repeating patterns of this table reflect patterns of outer electron states. (HS-PS1-2) (Note: This Disciplinary Core Idea is also addressed by HS-PS1-1.) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.2.DCI.PS1.B.2-The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (HS-PS1-2),(HS-PS1-7) (09-12) [Regional:Next Generation Science Standards (NGSS)] Patterns (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.4.CCC.1-Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-PS1-4) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.4.DCI.PS1.A.1-A stable molecule has less energy than the same set

Reactions Crosscutting Concepts: Patterns, Energy and Matter, Stability and Change		disrupt the bonds.	explain the principles of Chemical Reactions and Conservation of Matter.		of atoms separated; one must provide at least this energy in order to take the molecule apart. (HS-PS1-4) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.4.DCI.PS1.B.2-Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy . (HSPS1-4), (HS-PS1-5) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.PS1.4.CCC.1-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. (HS-PS1-4) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.PS1.7.SEP.1-Use mathematical representations of phenomena to support claims. (HS-PS1-7) (09-12)

					[Regional:Next Generation Science Standards (NGSS)] HS.PS1.7.CNS.1-Science assumes the universe is a vast single system in which basic laws are consistent. (HS-PS1-7) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.PS2.3.DCI.ETS1.C.3-Criteria may need to be broken down into simpler ones that can be approached systematically, and decisions about the priority of certain criteria over others (tradeoffs) may be needed. (secondary to HS-PS2-3) (09-12)[Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School Chemistry Honors
Type : Consensus

Duration: February/Week 23 - April/Week 30					
UNIT NAME: Reaction Rates and Chemical Equilibrium					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
Rates of chemical reactions Explain factors that affect the rate of a chemical reaction. Connect the rate law to the frequency and success of molecular collisions, considering the sufficient energy needed to overcome the activation energy barrier Explain concept of chemical equilibrium and predict was to disturb equilibrium and the corrective shifts that occur. Applications of equilibrium: Acid/base equilibria and solubility equilibria Science and Engineering	What happens during a chemical reaction at the molecular level? How is the rate of a chemical reaction altered? Determine the rate law for this reaction. Determine if the given mechanism is scientifically acceptable. Which is the rate determining step? Which direction does the equilibrium position shift when a given change occurs Define acids and bases using Bronsted-Lowry model, Arrhenius Model, and Lewis Model. How can our	Collision Theory Temperature, concentration of reactants, nature of reactants, catalysts Rate laws, reaction mechanisms, elementary steps, reaction intermediates, catalysts, elementary step rate laws Equilibrium, Equilibrium Constants, and Le Chatelier's Principle Models of Acids and Bases, Conjugate Acids and Bases, pH concepts, pH indicators, Acid-Base titrations, Solubility Product Rule, Reaction quotient, Buffered Solutions Collective knowledge of	Students should be able to explain the three main concepts of collision theory and use them to explain how a chemical reaction occurs. Students will apply knowledge of Collision Theory to explain how temperature, concentration of reactants, nature of reactants, and catalysts affect rates of chemical reactions. Students will be able to determine the rate law from experimental data, write rate laws for each elementary step of the mechanism, determine if the proposed mechanism is scientifically acceptable. Students will apply understanding of Le Chatelier's principle to a variety of scenarios when chemical equilibrium is altered via temperature, volume/pressure, changes in concentration of reactants. This can also be further described using knowledge of Collision Theory		PS1.B-Chemical Reactions (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.2.DCI.PS1.B.2-The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (HS-PS1-2),(HS-PS1-7) (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)] HS.PS1.8.SEP.1-Develop a model based on evidence to illustrate the relationships between systems or between

Practices: There are many equilibrium systems in our world. Acid rain, buffering systems within the human body, hard water deposition in household pipes, manipulation of an equilibrium system by the application of LeChatelier's Principle to modify reaction rates in commercial industry Disciplinary Core Ideas Crosscutting Concepts	understanding of equilibrium and kinetics be meaningful in our world today?	kinetics and equilibrium. Structure and properties of matter, chemical reactions, energy in chemical processes, developing possible solutions Patterns, Energy and Matter, Stability and Change	Students will apply knowledge of acid base chemistry and solubility, perform acid-base titrations, determine concentration of a known acid or base using acid-base titrations. Developing and using models, planning and carrying out investigations, using mathematical computational thinking, constructing explanations and designing solutions. Designing a system to optimize yield and efficiency.		components of a system. (HS-PS1-8) (09-12) [Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School Chemistry Honors
Type : Consensus

Duration: April/Week 31 - May/Week 33					
UNIT NAME: Nuclear Chemistry					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
Explain using evidence the very strong force holding the protons and neutrons of an atomic nucleus together. Compare and contrast chemical and nuclear reactions Construct representations, at the particle level and graphically, of the changes that occur in a given radioactive sample Science and Engineering: Explain the energy transformations and transfers occurring in a nuclear power plant. Crosscutting Concepts: Energy and Matter; Cause and Effect; Stability and Change	How do subatomic particles in the nucleus stay close together when they have the same charges? How do chemical and nuclear reactions differ in energy and subatomic particles? What mass of product would you have remaining after 4 half-lives of decay for a given reaction? How does a nuclear power plant provide power?	Strong and weak nuclear forces Beta emission, alpha emission, electron capture, positron emission. Radioactive decay, half life calculations Nuclear energy transfer, nuclear chemical reactions, structure of nuclear power reactor. 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; empirical evidence is required to differentiate between	Explain the concepts of strong and weak nuclear forces and how this can be applied to any element. Write reactions and predict products of nuclear reactions, accounting for protons and neutrons. Calculate mass of product remaining after a given number of half lives have occurred. Explain how energy from a nuclear reaction can be harnessed, transformed, and delivered to your home for every day use. Explain safety issues/ problems with nuclear power. Students will be able to assimilate multiple crosscutting concepts in their understanding of nuclear chemistry.		PS1.C-Nuclear Processes (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.PS1.8.DCI.PS1.C.1-Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process. (HSPS1-8) (09-12) [Regional:Next Generation Science Standards (NGSS)] PS1.B-Chemical Reactions (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.2.DCI.PS1.B.2-The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (HS-PS1-2),(HS-PS1-7) (09-12) [Regional:Next Generation Science Standards (NGSS)] Energy and Matter (09-12) [Regional:Next Generation

		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 systems changes are irreversible			Science Standards (NGSS)] HS.PS1.8.CCC.1-In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. (HS-PS1-8) (09-12)[Regional:Next Generation Science Standards (NGSS)]
Plans:					

Title : Roxbury High School Chemistry Honors
Type : Consensus

Duration: May/Week 34 - June/Week 37					
UNIT NAME: Redox and Electrochemistry					
Enduring Understandings	**Essential Questions**	**Knowledge**	**Skills**	**Assessment**	**Standards**
Transfer of electrons occurs in some chemical reactions. These are oxidation-reduction reactions. Certain chemical species are more likely to be oxidized than reduced. Certain chemical species are more likely to act as the oxidizing agent than the reducing agent. Use mathematical representations to support the concept that electrons are conserved during a redox reaction. Chemical potential energy is converted into electrical energy during electrochemical processes. The amount of energy transferred can be measured.	What type of chemical reaction requires transfer of electrons? How can you tell if a transfer of electrons has occurred? Which species is oxidized and which is reduced in a given chemical reaction? Which species is acting as the oxidizing agent and which is acting as a reducing agent for a given reaction. How can you balance a redox reaction? How does a Galvanic cell work? How many volts of electrical energy are generated from two given half cells in a Galvanic cell?	Transfer of electrons from one species to another during a chemical reaction is considered an oxidation-reduction reaction. These are also known as redox reactions. Understanding the rules for assignment of oxidation numbers. The chemical species that loses an electron or electrons is the oxidized species; the chemical species that gains an electron or electrons is the reduced species. The reduced species acts as the oxidizing agent and the oxidized species acts as the reducing agent. In order for a redox reaction to be balanced, the number of electrons lost, must equal the number of electrons gained. Redox reactions can be balanced using either the oxidation number method or the half reaction method. Structure and function of Galvanic cells. Calculation of electrical cell potential.	Applying the rules for assignment of oxidation numbers, students will be able to determine if a given reaction includes transfer of electrons. Applying the rules for assignment of oxidation numbers and an understanding of oxidation-reduction, students will be able to determine which species is oxidized/ reduced and which species is acting as the oxidizing agent/reducing agent. Students will be able to balance redox equations applying the rules of oxidation number and using the oxidation number method. Students will be able to write oxidation and reduction half reactions and balance the redox reaction using the half reaction method. Students will be able to design, draw, and construct a Galvanic cell.		HS.PS1.1.SEP.1-Use a model to predict the relationships between systems or between components of a system. (HS-PS1-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.1.DCI.PS1.A.1-Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. (HS-PS1-1) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.1.CCC.1-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. (HS-PS1-1), (HS-PS1-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.3.SEP.1-Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the

Science and Engineering: Rechargeable batteries are indispensable in the current technology of the world.	What elements are used in rechargeable batteries and how do they work? How do rechargeable batteries incorporate both Galvanic and electrolytic cells?	Understanding of the redox/electrochemical principles behind rechargeable batteries; How rechargeable batteries work.	Students will be able to calculate the theoretical cell potential of a given cell and compare it to the actual potential measured of the constructed cell. Designing a rechargeable battery.		design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly . (HS-PS1-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.3.DCI.PS2.B.2-Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. (HS-PS1-1),(HS-PS1-3), (HSPS2-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.3.CCC.1-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. (HS-PS1-1), (HS-PS1-3) (09-12) [Regional:Next Generation Science Standards (NGSS)] 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)] HS.PS1.2.SEP.1-Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' ow n 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. (HS-PS1-2) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.2.DCI.PS1.B.2-The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (HS-PS1-2),(HS-PS1-7) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.2.CCC.1-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. (HS-PS1-2), (HS-PS1-5) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.4.CCC.1-Develop a model based on evidence to illustrate the relationships between systems or between components of a system. (HS-PS1-4) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.4.CCC.1-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. (HS-PS1-4) (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)] HS.PS1.5.DCI.PS1.B.1-Chemical processes, their rates, and whether or not energy is stored or released can be understood in terms of the collisions of molecules and the rearrangements of atoms into new molecules, with consequent changes in the sum of all bond energies in the set of molecules that are matched by changes in kinetic energy . (HSPS1-4) (HS-PS1-5) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.6.SEP.1-Refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations. (HS-PS1-6) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.6.DCI.PS1.B.1-In many situations, a dynamic and condition-dependent balance between a reaction and the reverse reaction determines the numbers of all types of molecules present. (HS-PS1-6) (09-12)[Regional:Next

					Generation Science Standards (NGSS)] HS.PS1.6.DCI.ETS1.C.2-Criteria may need to be broken down into simpler ones that can be approached systematically , and decisions about the priority of certain criteria over others (tradeoffs) may be needed. (secondary to HS-PS1-6) (09-12)[Regional:Next Generation Science Standards (NGSS)] HS.PS1.7.SEP.1-Use mathematical representations of phenomena to support claims. (HS-PS1-7) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.7.DCI.PS1.B.1-The fact that atoms are conserved, together with knowledge of the chemical properties of the elements involved, can be used to describe and predict chemical reactions. (HS-PS1-2),(HS-PS1-7) (09-12) [Regional:Next Generation Science Standards (NGSS)] HS.PS1.7.CCC.1-The total amount of energy and matter in closed systems is conserved. (HS-PS1-7) (09-12) [Regional:Next Generation

Title : Roxbury High School Chemistry Honors
Type : Consensus

					Science Standards (NGSS)]
Plans:					