Chemistry

Teacher: Carolyn Shields

Month	Content and Essential Questions	Skills/Standards	Assessment/Standards	Resources
September 2010	**Unit Three: Atomic Concepts** Safety; Content: Measurement in Chemistry • Density • Scientific notation • Sig figs • Accuracy vs Precision • Reading instruments Content: *The Atom* Explain the property of materials in terms of the arrangement of the properties of the atoms that compose them (NYS Chemistry PI 3.1) *Parts of the Atom* *History of the Atom* *Experiments involving the Atom* *Isotopes* Essential Questions: What is an atom? What makes up an atom? Who discovered the atom? How has the atom evolved? What is an isotope? Why are isotopes important? What do the parts of the atom tell us about the element?	Students will be able to round off calculated values depending on Significant digits. Some values will be written in scientific notation. Major Understandings: The modern model of the atom has evolved over a long period of time through the work of many scientists. (3.1a) Each atom has a nucleus, with an overall positive charge, surrounded by negatively charged electrons. (3.1b) Subatomic particles contained in the nucleus include protons and neutrons. (3.1c) The proton is positively charged, and the neutron has no charge. The electron is negatively charged. (3.1d) Protons and electrons have equal but opposite charges. The number of protons is equal to the number of electrons	Quiz on safety ans MSDS sheets Assessment: Weekly Quizzes Test at end of unit Laboratory Activites: 1: Measurement 2: Density	Resources: Time line of discoveries and development of the atomic concept (Swanson J, Walter Panas HS) Demo: Plum pudding model – chocolate chip cookie model (Hilf-Levine A; Scarsdale HS) Demo: Rutherford experiment (Lemay, et. al., Chemistry – connections to our changing world – videodisc) Demo: Crookes tube (old TVs) Static electricity Lasers Glow in the dark beads Fireworks Forensic analysis Film: CSI “Blood Drops” use of infrared to detect blood Film: CSI “Boom” use of uv to detect explosions

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		in an atom. (3.1e) The mass of each proton and each neutron is approximately equal to one atomic mass unit. An electron is much less massive than a proton or neutron. (3.1f) Given an atomic mass, determine the most abundant isotope (3.1xi) Calculate the atomic mass of an element, given the masses and ratios of naturally occurring isotopes (3.1xii) The outermost electrons in an atom are called the valence electrons. In general, the number of valence electrons affects the chemical properties of an element. (3.1l) Interpret and write isotopic notation (3.1x) Atom (atomic number) identifies the element. The sum of proton and neutrons = the mass number. In the wave-mechanical model (electron cloud), the electrons are in orbitals, which are defined as regions of most probable electron location (ground state). (3.1h) Each electron in an atom has its own distinct amount of energy. (3.1 i) When an electron in an atom gains a specific amount of energy, the electron is at a higher energy state		

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		(excited state). (3.1j) When an electron returns from a higher energy state to a lower energy state, a specific amount of energy is emitted. This emitted energy can be used to identify an element. (3.1k) The outermost electrons in an atom are called the valence electrons. In general, the number of valence electrons affects the chemical properties of an element. (3.1l) <u>Skills:</u> The student should be able to: Relate experimental evidence to models of the atom (3.1ii) Use models to describe the structure of an atom (3.1i) Determine the number of protons or electrons in an atom or ion when given one of these values (3.1iii) Calculate the mass of an atom, the number of neutrons or the number of protons, given the other two values (3.1iv) the same number of protons but a different number of neutrons are called isotopes of that element.		

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October 2010	**<u>Unit Two: Moles/Stoichometry</u>** <u>Content:</u> *Moles and Naming* Explain the properties of materials in terms of the arrangement and properties of the atoms that compose them (NYS Chemistry PI 3.1) *Stoichometry* Use atomic and molecular models to explain common chemical reactions (NYS Chemistry PI 3.2) Apply the principle of conservation of mass to chemical reactions (NYS Chemistry PI 3.3) *Percent Composition* *Empirical/Molecular Formulas* <u>Essential Questions:</u> *Moles and Naming* What is a mole? How are moles calculated? Why do scientists use moles? How are chemicals named? Why is a name important? *Stoichometry* Why must a reaction be balanced? How are reactions balanced? How do we predict the quantity of a product in a reaction? *Percent Composition* How is percent composition calculated? What does percent composition tell	<u>Major Understandings:</u> *Moles and Naming:* A compound is a substance composed of two or more different elements that are chemically combined in a fixed proportion. A chemical compound can be broken down by chemical means. A chemical compound can be represented by a specific chemical formula and assigned a name based on the IUPAC system. (3.1cc) The formula mass of a substance is the sum of the atomic masses of its atoms. The molar mass (gram formula mass) of a substance equals one mole of that substance. (3.3e) *Stoichometry* In all chemical reactions there is a conservation of mass, energy, and charge. (3.3a) A balanced chemical equation represents conservation of atoms. The coefficients in a balanced chemical equation can be used to determine mole ratios in the reaction. (3.3c) The percent composition by mass of	<u>Assessment:</u> Weekly Quizzes Test at end of Unit Laboratory Activities: 1: Formula's and Oxidation Numbers 2: Mole Concept 3: Types of Chemical Reactions 4: Percent Composition 1 (Oreo Cookie Lab) 5: Percent of water in popcorn 6: Percent Composition 2 (Model Kit Lab) 7: Composition of a Hydrate 8: Determining an Empirical Formula	<u>Resources:</u> Smarties Formulas Demo: Hydrolysis of water (characteristics of hydrogen, oxygen and water) Demo: Hindenburg explosion Consumer chemistry (reading food labels) Mole day 10-23 Making of a mole Dozen concept Finding a mole amount of something Percentages by weight Film: Father of the Bride (hot dogs and hot dog buns) Stiochiometry song Demo: Zn + HCl Demo: KClO3 + O2 Demo: PbNO3 + KCl Demo: C2H3OH + O2 Demo: KCr2O7

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	us? What can percent composition be used for?	each element in a compound can be calculated mathematically. (3.3f) Types of chemical reactions include synthesis, decomposition, single replacement, and double replacement. (3.2b) *Empirical/Molecular Formulas:* Types of chemical formulas include: empirical, molecular, and structural. (3.1ee) The empirical formula of a compound is the simplest whole-number ratio of atoms of the elements in a compound. It may be different from the molecular formula, which is the actual ratio of atoms in a molecule of that compound. (3.3d) <u>Skills:</u> The student should be able to: Determine the molecular formula, given the empirical formula and molecular mass (3.3vii) Determine the empirical formula from a molecular formula (3.3v) Interpret balanced chemical equations in terms of conservation of matter and energy (3.3ii) Balance equations, given the formulas for reactants and		

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		products (3.3i) Create and use models of particles to demonstrate balanced equations (3.3iii) Calculate simple mole-mole stoichiometry problems, given a balanced equation (3.3iv) Calculate the formula mass and the gram-formula mass (3.3viii) Determine the number of moles of a substance, given its mass (3.3ix) Determine the mass of a given number of moles of a substance (3.3vi) Identify types of chemical reactions (3.2ii)		
November 2010	**Unit Three: Atomic Concepts** Content: *The Atom* Explain the property of materials in terms of the arrangement of the properties of the atoms that compose them (NYS Chemistry PI 3.1) *Parts of the Atom* *History of the Atom* *Experiments involving the Atom* *Isotopes* Essential Questions:	Major Understandings: The modern model of the atom has evolved over a long period of time through the work of many scientists. (3.1a) Each atom has a nucleus, with an overall positive charge, surrounded by negatively charged electrons. (3.1b) Subatomic particles contained in the nucleus include protons and	Assessment: Weekly Quizzes Test at end of unit Laboratory Activites: 1: Mystery Reaction Lab 2: Hydrogen Atom Model 3: Bohr Model Lab 4: Isotopes of Pennuim	Resources: Time line of discoveries and development of the atomic concept (Swanson J, Walter Panas HS) Demo: Plum pudding model – chocolate chip cookie model (Hilf-Levine A; Scarsdale HS) Demo: Rutherford experiment (Lemay, et. al., Chemistry – connections to our changing world – videodisc) Demo: Crookes tube (old TVs)

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	What is an atom? What makes up an atom? Who discovered the atom? How has the atom evolved? What is an isotope? Why are isotopes important? What do the parts of the atom tell us about the element?	neutrons. (3.1c) The proton is positively charged, and the neutron has no charge. The electron is negatively charged. (3.1d) Protons and electrons have equal but opposite charges. The number of protons is equal to the number of electrons in an atom. (3.1e) The mass of each proton and each neutron is approximately equal to one atomic mass unit. An electron is much less massive than a proton or neutron. (3.1f) In the wave-mechanical model (electron cloud), the electrons are in orbitals, which are defined as regions of most probable electron location (ground state). (3.1h) Each electron in an atom has its own distinct amount of energy. (3.1 i) When an electron in an atom gains a specific amount of energy, the electron is at a higher energy state (excited state). (3.1j) When an electron returns from a higher energy state to a lower energy state, a specific amount of energy is emitted. This emitted energy can be used to identify an element. (3.1k)		Static electricity Lasers Glow in the dark beads Fireworks Forensic analysis Film: CSI “Blood Drops” use of infrared to detect blood Film: CSI “Boom” use of uv to detect explosions

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		The outermost electrons in an atom are called the valence electrons. In general, the number of valence electrons affects the chemical properties of an element. (3.1l) Atoms of an element that contain the same number of protons but a different number of neutrons are called isotopes of that element. (3.1 m) The average atomic mass of an element is the weighted average of the masses of its naturally occurring isotopes. (3.1 n) The number of protons in an atom (atomic number) identifies the element. The sum of the protons and neutrons in an atom (mass number) identifies an isotope. Common notations that represent isotopes include: 14C, 14C, carbon-14, C-14. (3.1g) <u>Skills:</u> The student should be able to: Relate experimental evidence to models of the atom (3.1ii) Use models to describe the structure of an atom (3.1i) Determine the number of protons or electrons in an atom or ion when given one of these values (3.1iii)		

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		Calculate the mass of an atom, the number of neutrons or the number of protons, given the other two values (3.1iv) Distinguish between ground state and excited state electron configurations, e.g., 2-8-2 vs. 2-7-3 (3.1v) Identify an element by comparing its bright-line spectrum to given spectra (3.1vi) Draw a Lewis electron-dot structure of an atom (3.1viii) Distinguish between valence and non-valence electrons, given an electron configuration, e.g., 2-8-2 (3.1vii) Given an atomic mass, determine the most abundant isotope (3.1xi) Calculate the atomic mass of an element, given the masses and ratios of naturally occurring isotopes (3.1xii) Interpret and write isotopic notation (3.1x) Atom (atomic number) identifies the element. The sum of		
	Unit Four: The Periodic Table Content: *The Elements*	Major Understandings: The placement or location of an	Assessments: Weekly Quizzes	Resources: Film: “Evolution” use of the

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	Explain the properties of materials in terms of the arrangement and properties of the atoms that compose them. (NYS Chemistry PI 3.1) *Groups of the Periodic Table* *Trends within the Periodic Table* <u>Essential Questions:</u> What are the elements? Why are the elements arranged in the way they are? What are the groups in the Periodic Table? What do the groups represent? What are the trends within the Periodic Table? What can we interpret from the trends within the table? Do the trends relate to the amount of the element? How does the position of the element tell us the reactivity of the element? What is a metal, non-metal or a metalloid?	element on the Periodic Table gives an indication of physical and chemical properties of that element. (3.1y) The elements on the Periodic Table are arranged in order of increasing atomic number. (3.1 y) Elements can be classified by their properties, and located on the Periodic Table, as metals nonmetals, metalloids (B, Si, Ge, As, Sb, Te), and noble gases. (3.1v) Elements can be differentiated by their physical properties. Physical properties of substances, such as density, conductivity, malleability, solubility, and hardness, differ among elements. (3.1w) Elements can be differentiated by chemical properties. Chemical properties describe how an element behaves during a chemical reaction. (3.1x) Some elements exist as two or more forms in the same phase. These forms differ in their molecular or crystal structure, and hence in their properties. (5.2f) For Groups 1, 2, and 13-18 on the Periodic Table, elements within the same group have the same number of valence electrons	Test at end of unit Laboratory Activities: 1: Alien Nation 2: Vulcan Periodic Table 3: A Comparison of Atomic Radii 4: Periodic Law	periodic table to kill the alien invaders (concept of family/groups of elements) Compare and contrast different elements in the periodic table Demo: Transition elements have color (possible uses) Semiconductors Explain the placement of particular elements Define the uses of particular elements in everyday products Demo: Allotropes of sulfur (videodiscs) Demo: Allotropes of phosphorus (matches) Demo: Allotropes of carbon (diamond and graphite Buckminster) Demo: Oxygen vs. ozone Analog dog walking with atomic and ionic radii

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		(helium is an exception) and therefore similar chemical properties. (3.1z) The succession of elements within the same group demonstrates characteristic trends: differences in atomic radius, ionic radius, electronegativity, first ionization energy, and metallic/nonmetallic properties. (3.1aa) The succession of elements across the same period demonstrates characteristic trends: differences in atomic radius, ionic radius, electronegativity, first ionization energy, and metallic/nonmetallic properties. (3.1bb) <u>Skills:</u> The student should be able to: Explain the placement of an unknown element in the Periodic Table based on its properties (3.1xvi) Classify elements as metals, nonmetals, metalloids, or noble gases by their properties (3.1xiii) Describe the states of the elements at STP (3.1xviii) Determine the group of an element, given the chemical formula of a compound, e.g., XCl or XCl2 (3.1xv)		

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		Compare and contrast properties of elements within a group or a period for Groups 1, 2, 13-18 on the Periodic Table (3.1xiv)		
December 2010	**Unit Five: Chemical Bonding** Content: *Types of Bonds* Explain the properties of materials in terms of the arrangement of the atoms that compose them. (NYS Chemistry PI 3.1) *How Bonds Form* Explain chemical bonding in terms of the behavior of electrons (NYS Chemistry PI 5.1) Essential Questions: *Types of Bonds* Why do atoms bond? How do atoms bond? What are ions? What types of bonds are there? How can we determine the type of bond that is formed? *How Bonds Form* What holds a bond together? How can bonds be broken? What makes a bond strong? What affects bonds? What is the difference between bonds and attraction?	**December 2010**	**Unit Eleven: Nuclear Chemistry** Content: *Radiation* *Radioactivity* *Radioactive Particles* *Natural Radiation* *Transmutation* *Fission vs. Fusion* *Half Life* Explain the properties of materials in terms of the arrangement and properties of the atoms that compose them. (NYS Chemistry PI 3.1) Explain the risks and benefits of radioactivity. (NYS Chemistry PI 4.4) Compare energy relationships within an atoms nucleus to those outside the nucleus. (NYS Chemistry PI 5.3) Essential Questions: What is radioactivity? What makes something radioactive? How is half-life determined? What are radioactive particles? How does radioactive emissions occur? What is transmutation? What is fission? What is fusion?	Major Understandings: Nuclear reactions include natural and artificial transmutation, fission, and fusion. There are benefits and risks associated with fission and fusion reactions. Nuclear reactions can be represented By equations that include symbols which represent atomic nuclei (with the mass number and atomic number), subatomic particles (with mass number and charge), and/or emissions such as gamma radiation. Energy released in a nuclear reaction (fission or fusion) comes from the fractional amount of mass converted into energy. Nuclear changes convert matter into energy. Energy released during nuclear reactions is much greater than the energy released during chemical reactions. There are inherent risks associated

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			How is nuclear chemistry beneficial in our lives? How is nuclear chemistry harmful to our lives? Why study nuclear chemistry? What medical uses does nuclear chemistry have? Would you live near a nuclear power plant or a nuclear waste dump sight? Review for State Regents Examination given at end of the month	with radioactivity and the use of radioactive isotopes. Risks can include biological exposure, long-term storage and disposal, and nuclear accidents. Radioactive isotopes have many beneficial uses. Radioactive isotopes are used in medicine and industrial chemistry, e.g., radioactive dating, tracing chemical and biological processes, industrial measurement, nuclear power, and detection and treatment of diseases. Stability of isotopes is based on the ratio of the neutrons and protons in its nucleus. Although most nuclei are stable, some are unstable and spontaneously decay emitting radiation. Each radioactive isotope has a specific mode and rate of decay (half-life). A change in the nucleus of an atom that converts it from one element to another is called transmutation. This can occur naturally or can be induced by the bombardment of the nucleus by high-energy particles. Spontaneous decay can involve the

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				release of alpha particles, beta particles, positrons, and/or gamma radiation from the nucleus of an unstable isotope. These emissions differ in mass, charge, ionizing power, and penetrating power. Skills: The student should be able to: Compare and contrast fission and fusion reactions (4.4ii) Complete nuclear equations; predict missing particles from nuclear equations (4.4iii) Identify specific uses of some common radioisotopes, such as: I-131 in diagnosing and treating thyroid disorders; C-14 to C-12 ratio in dating living organisms; U-238 to Pb-206 ratio in dating geological formations; Co-60 in treating cancer (4.4iv) Calculate the initial amount, the fraction remaining, or the half-life of a radioactive isotope, given two of the three variables (4.4i) Determine decay mode and write nuclear equations showing alpha and beta decay (3.1ix)
January 2011	**Unit Six: Kinetics and Equilibrium** Content:	Major Understandings: Collision theory states that a	Assessments: Weekly Quizzes	Resources: Demo: Mouse trap

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	Kinetics *Thermodynamics* *Chemical Kinetics* *Potential Energy Diagrams* *Keq* *Chemical Equlibrium* *Le Chatelier's Principle* *Solutions* Use the Kinetic Molecular Theory (KMT) to explain rates of reaction and the relationships among temperature, pressure, and volume of a substance. (NYS Chemistry PI 3.4) Observe and describe various transfers of energy (NYS Chemistry PI 4.1) Matter is made up of particles whose properties determine the observable characteristic of matter and its reactivity. (NYS Chemistry PI 3.1) Use atomic and molecular models to explain common chemical reactions (NYS Chemistry PI 3.2) <u>Essential Questions</u> What are the factors of chemical kinetics? What is Chemical Kinetics? What does a potential energy diagram represent? How do you interpret a potential energy diagram? When does chemical equilibrium occur? What is Le Chatelier's Principle? How does Le Chatelier's Princple	reaction is most likely to occur if reactant particles collide with the proper energy and orientation. The rate of a chemical reaction depends on several factors: temperature, concentration, nature of reactants, surface area, and the presence of a catalyst. Some chemical and physical changes can reach equilibrium. At equilibrium the rate of the forward reaction equals the rate of the reverse reaction. The measurable quantities of reactants and products remain constant at equilibrium. LeChatelier's principle can be used to predict the effect of stress (change in pressure, volume, concentration, and Temperature) on a system at equilibrium. Energy released or absorbed by a chemical reaction can be represented by a potential energy diagram. Energy released or absorbed by a chemical reaction (heat of reaction) is equal to the difference between the potential energy of the products and the potential energy of the reactants.	Test at the end of the unit Laboratory Activities: 1: Kinetics Mini Lab 2: Chemical Equilibrium and Le Chateliers Principle	Demo: Mg and HCl Demo: Alka Seltzer Demo: Sugar vs. salt dissolving Catalysts and inhibitors Demo: assembly lines Demo: CoCl2 and temp Demo: water works Demo: Paper throwing Demo: Jenga Mass actions expressions, Rate determining step, multi step processes (toll-booths) Demo: Haber process Demo: Rock over hill Hess law (Demmin – A learning program for chemistry) Demo: KmnO4 and glycerin (water catalyst) (Shahkashiri, Z; chemistry education) Demo: Genie in a bottle Demo: Box of peanuts Film: explosions Film: Jurassic Park “Chaos theory”

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	affect a chemical reaction? How do you define kinetics? Why would chemistry be interested in kinetics? What will Keq tell us about a reaction? What is a solution? What are the parts of a solution? How can we measure the concentration of a solution? What does "like dissolves like" mean?	A catalyst provides an alternate reaction pathway which has a lower activation energy than an uncatalyzed reaction. Entropy is a measure of the randomness or disorder of a system. A system with greater disorder has greater entropy. Systems in nature tend to undergo changes toward lower energy and higher entropy. <u>Skills:</u> The student should be able to: Use collision theory to explain how various factors, such as temperature, surface area, and concentration, influence the rate of reaction (3.4vi) Identify examples of physical equilibria as solution equilibrium and phase equilibrium, including the concept that a saturated solution is at equilibrium (3.4 vii) Describe the concentration of particles and rates of opposing reactions in an equilibrium system (3.4iv) Qualitatively describe the effect of stress on equilibrium, using LeChatelier's principle (3.4v) Read and interpret potential energy diagrams: PE of reactants and		

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		products, activation energy (with or without a catalyst), heat of reaction (4.1ii)		
April 2011	**Unit Eight: Oxidation and Reduction** Content: *Oxidation Reactions* *Reduction Reactions* *Electrochemical Cells* *Balancing Chemical Reactions using oxidation and reduction* Use atomic and molecular models to explain common chemical reactions. (NYS Chemistry PI 3.2) Apply the principles of conservation of matter to chemical reactions (NYS Chemistry PI 3.3) Essential Questions: What is oxidation? What is reduction? When does redox occur? Why does redox occur? How does redox effect a chemical reaction? Where could we use redox reactions? What is the definition of a spontaneous reaction? How does a battery work? What does a battery do in a reaction?	Major Understandings: An oxidation-reduction (redox) reaction involves transfer of electrons (e-). (3.2d) Reduction is the gain of electrons. (3.2e) A half-reaction can be written to represent reduction. (3.2f) Oxidation is the loss of electrons. (3.2g) A half-reaction can be written to represent oxidation. (3.2h) In a redox reaction the number of electrons lost is equal to the number of electrons gained. (3.3b) Oxidation numbers (states) can be assigned to atoms and ions. Changes in oxidation numbers indicate that oxidation and reduction has occurred. (3.2i) An electrochemical cell can be either voltaic or electrolytic. In an electrochemical cell, oxidation occurs at the anode and reduction at the cathode. (3.2j)	Assessment: Weekly quizzes Test at end of unit Laboratory Activities: 1: Redox Reactions\ 2:Copper to Gold 3:Penny Percent, Acid/Metal Stoich Redox Lab 4: Silver Needles and Copper Trees 5: Corrosion of the Statue of Liberty, A Simulation	Resources: Demo: Rusting Fe Demo: Catalysis of Co Electrochemical cells Corrosions/Rusting Electrolysis Photography Demo: thermite reaction LEO says GER/ OIL RIG Recovery of active nonmetals Demo: the electric pickle Statue of Liberty/ Patina Demo: Lemon battery Car battery/ Li Battery/ Ni-Cd battery/ Rechargeable battery Demo: Electroplating Demo: Hydrolysis Demo: Haber process Refining metals Metallurgy of iron

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		A voltaic cell spontaneously converts chemical energy to electrical energy. (3.2k) An electrolytic cell requires electrical energy to produce chemical change. This process is known as electrolysis. (3.2l) <u>Skills:</u> The student should be able to: Determine a missing reactant or product in a balanced equation (3.2iii) Write and balance half-reactions for oxidation and reduction of free elements and their monatomic ions (3.2vi) Compare and contrast voltaic and electrolytic cells (3.2ix) Identify and label the parts of a voltaic cell (cathode, anode, salt bridge) and direction of electron flow, given the reaction equation (3.2vii) Use an activity series to determine whether a redox reaction is spontaneous (3.2x) Identify and label the parts of an electrolytic cell (anode, cathode) and direction of electron flow, given the reaction equation		

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		(3.2viii)		
March 2011	**<u>Unit Nine: Acids, Bases and Salts</u>** <u>Content:</u> *Electrolytes* *Acid Characteristics* *Base Characteristics* *Indicators* *Amphoteric/amphiprotic substances* *Neutralization/Salts* *Conjugate acid base pairs* *Arrenius Acids and Bases* *Bronsted-Lowery Acids and Bases* *Lewis Acids and Bases* *Ionization of Acids and Bases* *pH* *pOH* *Buffers* *Titration* *Hydrolysis of Salts* Explain the properties of materials in terms of the arrangement and properties of the atoms that compose them. (NYS Chemistry PI 3.1) <u>Essential Questions:</u> What is an electrolyte? What is an acid? What is a base? What are characteristics of acids and bases? What is a conjugate acid-base pair? What makes a substance amphoteric or ampoprotic? How do you neutralize an acid or a base? What is an arrehenius acid or base? What is a Brondsted Lowery acid or base?	<u>Major Understandings:</u> Behavior of many acids and bases can be explained by the Arrhenius theory. Arrhenius acids and bases are electrolytes. An electrolyte is a substance which, when dissolved in water, forms a solution capable of conducting an electric current. The ability of a solution to conduct an electric current depends on the concentration of ions. Arrhenius acids yield H+ (aq), hydrogen ion as the only positive ion in aqueous solution. The hydrogen ion may also be written as H3O+(aq), hydronium ion. Arrhenius bases yield OH- (aq), hydroxide ion as the only negative ion in an aqueous solution. In the process of neutralization, an Arrhenius acid and an Arrhenius base react to form salt and water. Titration is a laboratory process in which a volume of solution of known concentration is used to determine the concentration of another solution.	<u>Assessments:</u> Weekly Quizzes Test at the end of the unit Laboratory Activities: 1: Acid Base Titration and Volumetric Analysis 2: Is household vinegar really 5% 3: Chemistry of dyeing eggs	<u>Resources:</u> Demo: electrolyte (sport drinks, ocean water, blood, nervous system) Demo: safety Lewis acid and bases Cleaning agents Demo: shirt and ball (Bronsted Lowry acid-base) Hydrolysis of a salt Antacid Buffers Demo: Molarity of Kool-Aid Solution concentrations Acid rain Swimming pools ph Blood acidosis/alkalosis Water quality Demo: indicator rainbow

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	What is a Lewis acid or base? What is pH and pOH? How does a buffer work? How does titration work? What is hydrolysis?	There are alternate acid-base theories. One such theory states that an acid is an H+ donor and a base is an H+ acceptor. The acidity and alkalinity of an aqueous solution can be measured by its pH value. The relative level of acidity or alkalinity of a solution can be shown by using indicators. On the pH scale, each decrease of one unit of pH represents a tenfold increase in hydronium ion concentration. <u>Skills:</u> The student should be able to: Given properties, identify substances as Arrhenius acids or Arrhenius bases (3.1xxxi) Write simple neutralization reactions when given the reactants (3.1xxxiv) Calculate the concentration or volume of a solution, using titration data (3.1xxxv) Interpret changes in acid-base indicator color (3.1xxxiii) Identify solutions as acid, base, or neutral based upon the pH (3.1xxxii)		
May	**<u>Unit Ten: Organic Chemistry</u>**			

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2011	Content: *Carbon Bonding* *Carbon Compounds* *Alkanes* *Alkenes* *Alkynes* *Functional Groups* *Naming Organic Compounds* *Substitution* *Organic Reactions* *Polymers* Matter is made up of particles whose properties determine the observable characteristics of mater and its; reactivity (NYS Chemistry PI 3.1) Use atomic and molecular models to explain common chemical reactions (NYS Chemistry PI 3.2) Essential Questions: What is the definition of organic? What is a saturates/unsaturated fat? Why is understanding organic chemistry important to our lives? What organic reaction helps "clean" us in our everyday lives? What are polymers?	Major Understandings: Organic compounds contain carbon atoms which bond to one another in chains, rings, and networks to form a variety of structures. Organic compounds can be named using the IUPAC system. Hydrocarbons are compounds that contain only carbon and hydrogen. Saturated hydrocarbons contain only single carbon-carbon bonds. Unsaturated hydrocarbons contain at least one multiple carbon-carbon bond. Organic acids, alcohols, esters, aldehydes, ketones, ethers, halides, amines, amides, and amino acids are types of organic compounds that differ in their structures. Isomers of organic compounds have the same molecular formula, but different structures and properties. In a multiple covalent bond, more than one pair of electrons are shared between two atoms. Unsaturated organic compounds contain at least one double or triple bond. Types of organic reactions include:	Assessments: Weekly Quizzes Test at the end of the unit Laboratory Activities: Organic Problems Preparation of Soap Glurch and Glax Nylon Rope - A Synthetic Polymer Slime time and Silly Putty Light sticks	Resources: Demo: Ball and stick Demo: NMR photos Demo: Missing volume Demo: Leggos (isomers) Demo: happy and sad balls Demo: nylon Demo: Styrofoam Film: "Fight Club" Saponification

Month	Content and Essential Questions	Skills/Standards	Assessment/Standards	Resources
		addition, substitution, polymerization, esterification, fermentation, saponification Functional groups impart distinctive physical and chemical properties to organic compounds. <u>Skills:</u> The student should be able to: Identify types of organic reactions (3.2iv) Determine a missing reactant or product in a balanced equation (3.2iii) Classify an organic compound based on its structural or condensed structural formula (3.1xvii) Draw structural formulas for alkanes, alkenes, and alkynes containing a maximum of ten carbon atoms (3.1xxi) Classify an organic compound based on its structural or condensed structural formula (3.1xvii) Draw a structural formula with the functional group(s) on a straight chain hydrocarbon backbone, when given the correct IUPAC name for the compound (3.1xx)		
December	**<u>Unit Eleven: Nuclear Chemistry</u>**			

Month	Content and Essential Questions	Skills/Standards	Assessment/Standards	Resources
2010	Content: *Radiation* *Radioactivity* *Radioactive Particles* *Natural Radiation* *Transmutation* *Fission vs. Fusion* *Half Life* Explain the properties of materials in terms of the arrangement and properties of the atoms that compose them. (NYS Chemistry PI 3.1) Explain the risks and benefits of radioactivity. (NYS Chemistry PI 4.4) Compare energy relationships within an atoms nucleus to those outside the nucleus. (NYS Chemistry PI 5.3) Essential Questions: What is radioactivity? What makes something radioactive? How is half-life determined? What are radioactive particles? How does radioactive emissions occur? What is transmutation? What is fission? What is fusion? How is nuclear chemistry beneficial in our lives? How is nuclear chemistry harmful to our lives? Why study nuclear chemistry? What medical uses does nuclear chemistry have?	Major Understandings: Nuclear reactions include natural and artificial transmutation, fission, and fusion. There are benefits and risks associated with fission and fusion reactions. Nuclear reactions can be represented By equations that include symbols which represent atomic nuclei (with the mass number and atomic number), subatomic particles (with mass number and charge), and/or emissions such as gamma radiation. Energy released in a nuclear reaction (fission or fusion) comes from the fractional amount of mass converted into energy. Nuclear changes convert matter into energy. Energy released during nuclear reactions is much greater than the energy released during chemical reactions. There are inherent risks associated with radioactivity and the use of radioactive isotopes. Risks can include biological exposure, long-term storage and disposal, and nuclear accidents. Radioactive isotopes have many	Assessments: Weekly quizzes Test at the end of the unit Laboratory Activities: 1: Atomic M&M's, Understanding Half Life 2: Licorice Half Life	Resources: Demo: Don't tip the waiter Radioactive dating Chemotherapy Medical diagnosis Radioisotopes Tracers Breeder reactors Syncotrons/cyclotrons Indian Point UVA rays/Gamma rays/ Beta particles Skin cancer X rays Preservatives Parts of a nuclear reactor Sun Nuclear waste High temp fusions reactions Production of nuclear reactions Discussion: Pros and cons of nuclear energy Nuclear bombs Hiroshima/ Chernobyl/Three mile island/ Film: The Simpson's "nuclear reactor field trip" Film: Silkwood Film: Teenage mutant ninja turtles Film: X Men Radon Death valley

Month	Content and Essential Questions	Skills/Standards	Assessment/Standards	Resources
	Would you live near a nuclear power plant or a nuclear waste dump sight? Review for State Regents Examination given at end of the month	beneficial uses. Radioactive isotopes are used in medicine and industrial chemistry, e.g., radioactive dating, tracing chemical and biological processes, industrial measurement, nuclear power, and detection and treatment of diseases. Stability of isotopes is based on the ratio of the neutrons and protons in its nucleus. Although most nuclei are stable, some are unstable and spontaneously decay emitting radiation. Each radioactive isotope has a specific mode and rate of decay (half-life). A change in the nucleus of an atom that converts it from one element to another is called transmutation. This can occur naturally or can be induced by the bombardment of the nucleus by high-energy particles. Spontaneous decay can involve the release of alpha particles, beta particles, positrons, and/or gamma radiation from the nucleus of an unstable isotope. These emissions differ in mass, charge, ionizing power, and penetrating power.		

Month	Content and Essential Questions	Skills/Standards	Assessment/Standards	Resources
		Skills: The student should be able to: Compare and contrast fission and fusion reactions (4.4ii) Complete nuclear equations; predict missing particles from nuclear equations (4.4iii) Identify specific uses of some common radioisotopes, such as: I-131 in diagnosing and treating thyroid disorders; C-14 to C-12 ratio in dating living organisms; U-238 to Pb-206 ratio in dating geological formations; Co-60 in treating cancer (4.4iv) Calculate the initial amount, the fraction remaining, or the half-life of a radioactive isotope, given two of the three variables (4.4i) Determine decay mode and write nuclear equations showing alpha and beta decay (3.1ix)		