

| MONTH | CONTENT | NYS STANDARD/KEY IDEA/PERFORMANCE INDICATOR | LAB THEMES/SKILLS |
|-----------|--|---|---|
| September | Introduction to Chemistry Scientific Method Dimensional Analysis Scientific Notation Significant Figures Metric conversions nanoscale Accuracy and Precision Percent Error Practical Applications Matter Elements Compounds Mixtures Chemical and Physical Reactions Chemical and Physical Properties Homogeneous Heterogeneous Chemical Symbols and Formulas Phases of Matter Conservation of Matter and Energy | 3.1a The modern model of the atom has evolved over a long period of time through the work of many scientists. 3.1b Each atom has a nucleus, with an overall positive charge, surrounded by negatively charged electrons. 3.1c Subatomic particles contained in the nucleus include protons and neutrons. 3.1d The proton is positively charged, and the neutron has no charge. The electron is negatively charged. 3.1e Protons and electrons have equal but opposite charges. The number of protons equals the number of electrons in an atom. 3.1q Matter is classified as a pure substance or as a mixture of substances. 3.1r A pure substance (element or compound) has a constant composition and constant properties throughout a given sample, and from sample to sample. 3.1s Mixtures are composed of two or more different substances that can be separated by physical means. When different substances are mixed together, a homogeneous or heterogeneous mixture is formed. 3.1t The proportions of components in a mixture can be varied. Each component in a mixture retains its original properties. 3.1dd Compounds can be differentiated by their physical and chemical properties. 3.1nn Differences in properties such as density, particle size, molecular polarity, boiling and freezing points, and solubility permit physical separation of the components of the mixture. 3.1kk The three phases of matter (solids, liquids, and gases) have different properties. | <p>LAB THEMES:</p> <ul style="list-style-type: none"> ❑ Linear measurement Mass measurement ❑ Volume measurement Density measurement ❑ Accuracy and Precision Uncertainty of Meas. ❑ Gum Lab Phys. and Chem. Changes ❑ Chromatography Conservation of Matter <p>SKILLS:</p> <ul style="list-style-type: none"> ❖ Use algebraic and geometric representations to describe and compare data to solve problems. ❖ Organize, graph, and analyze data from lab activities. ❖ Use reasoning to reach mathematical conclusions. ❖ Recognize and convert metric scales of volume, length, and mass ❖ Define, identify, classify, and differentiate between elements, mixtures, and compounds in equations and models. ❖ Distinguish between chemical and physical reactions. Give examples of each. ❖ Distinguish between chemical and physical properties. Give examples of each. ❖ Identify and distinguish between solid, liquid, and gas phase. ❖ Describe the processes and uses of filtration, distillation, and chromatography as separation techniques for mixtures. |

| MONTH | CONTENT | NYS STANDARD/KEY IDEA/PERFORMANCE INDICATOR 3.1a-n 3.1aa, bb, g, v, w, x, y, z5.2j5.3k | LAB THEMES/SKILLS | | |
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| October | <p>Atomic Concepts History of the atom Nanotech and chemistry Subatomic Particles Atomic number Atomic Mass Mass number Isotopes</p> <p>Electron Configuration Valence Electrons Principle Energy Levels Excited/Ground States</p> <p>Atomic Theories Periodic Table Periodic Trends Groups Periods</p> | <p>3.1f 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 a neutron.</p> <p>3.1g 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: ^{14}C, ^{14}C, carbon-14, C-14.</p> <p>3.1h In the wave-mechanical model (electron cloud model) the electrons are in orbitals, which are defined as the regions of the most probable electron location (ground state).</p> <p>3.1i Each electron in an atom has its own distinct amount of energy.</p> <p>3.1j When an electron in an atom gains a specific amount of energy, the electron is at a higher energy state (excited state).</p> <p>3.1k 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.</p> <p>3.1l 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.</p> <p>3.1m Atoms of an element that contain the same number of protons but a different number of neutrons are called isotopes of that element.</p> <p>3.1n The average atomic mass of an element is the weighted average of the masses of its naturally occurring isotopes.</p> | <p>LAB THEMES:</p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> ❑ Conservation of Matter ❑ Chemical properties of halides ❑ Interpreting graphing </td> <td style="width: 50%; vertical-align: top;"> <ul style="list-style-type: none"> Candium Edible Atoms Alkaline Earth Metals </td> </tr> </table> <p>SKILLS:</p> <ul style="list-style-type: none"> ❖ Recognize and explain the Plum pudding, Bohr, and Modern Theory of the atom. Describe Dalton’s atomic theory ❖ Know the charge, location and mass of the proton, neutron, and electron. Interpret and write isotopic notation ❖ Calculate atomic mass using relative abundance and mass of isotopes. Manipulate mass number atomic number to calculate neutrons. ❖ Use particle models and diagrams to differentiate between atoms, elements, compounds, and mixtures. Distinguish between valence and nonvalence electrons for any atom or in any electron configuration. ❖ Identify Principle Energy Level by using electron configuration and period on Periodic Table. Distinguish between ground & excited states. ❖ Explain how an electron moves from ground to excited and back to ground state, what is happening at each stage. ❖ Identify elements by comparing bright-line spectrum to given. Differentiate & explain differences between Thomson (Plum pudding), Rutherford, Bohr, and Modern (Quantum mechanical model) of atoms. ❖ Define orbital. Classify elements as metals, nonmetals, metalloids, or noble gases by their location on the Periodic Table and their properties. ❖ Compare/contrast properties of elements within a period or group 1, 2, 13-18 on periodic table. Predict group of an element given chemical formula. Predict group of an element by knowing its electron configuration. Explain placement of an unknown element in Periodic Table based on properties. Know periodic trends for electronegativity, ionization energy, atomic radius, ionic radius, & reactivity of metals & nonmetals. | <ul style="list-style-type: none"> ❑ Conservation of Matter ❑ Chemical properties of halides ❑ Interpreting graphing | <ul style="list-style-type: none"> Candium Edible Atoms Alkaline Earth Metals |
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| <h1 style="writing-mode: vertical-rl; transform: rotate(180deg);">November</h1> | <p>Intramolecular Bonding Ionic compounds Naming Ionic Compounds Covalent compounds Naming Covalent compounds</p> | <p>5.2n 5.2d 5.2h</p> <p>3.1u Elements are substances that are composed of atoms that have the same atomic number. Elements cannot be broken down by chemical change.</p> <p>3.1v 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.</p> <p>3.1w Elements can be differentiated by physical properties. Physical properties of substances, such as density, conductivity, malleability, solubility, and hardness, differ among elements.</p> <p>3.1x Elements can also be differentiated by chemical properties. Chemical properties describe how an element behaves during a chemical reaction.</p> <p>3.1y The placement or location of an element on the Periodic Table gives an indication of the physical and chemical properties of that element. The elements on the Periodic Table are arranged in order of increasing atomic number.</p> <p>3.1z For Groups 1, 2, and 13-18 on the Periodic Table, elements within the same group have the same number of valence electrons (helium is an exception) and therefore similar chemical properties.</p> <p>5.2n Physical properties of substances can be explained in terms of chemical bonds and intermolecular forces. These properties include conductivity, malleability, solubility, hardness, melting point, and boiling point.</p> <p>5.2d Electron-dot diagrams (Lewis structures) can represent the valence electron arrangement in elements, compounds, and ions.</p> <p>5.2h Metals tend to react with nonmetals to form ionic compounds. Nonmetals tend to react with other nonmetals to form molecular (covalent) compounds. Ionic compounds containing polyatomic ions have both ionic and covalent bonding.</p> | <p>LAB THEMES:</p> <ul style="list-style-type: none"> ❑ Molecular model lab <p>SKILLS:</p> <ul style="list-style-type: none"> ❖ Distinguish between ionic, polar covalent, nonpolar covalent, and metallic bonding ❖ Compare physical properties of substances based on chemical bonds & intermolecular forces: conductivity, malleability, solubility, hardness, melting & boiling point. ❖ Determine noble gas configuration an atom will achieve by bonding. ❖ Draw & interpret Lewis dot diagrams for atoms, ionic, and molecular compounds. ❖ Demonstrate bonding concepts using Lewis dot structures representing valence electrons: transferred (ionic bonding), shared (covalent bonding), and in a stable octet. ❖ Distinguish between ionic, molecular (covalent), and metallic substances given location on Periodic Table or properties. ❖ Write chemical compound names from formulas. ❖ Write chemical formulas from names using the appropriate naming system. ❖ Differentiate usage of stock system, and prefix in naming by type of atoms combined. ❖ Name and write formulas for both binary and ternary acids. |

| MONTH | CONTENT | NYS STANDARD/KEY IDEA/PERFORMANCE INDICATOR 3.1a 3.1e 3.1g 3.1dd 5.2 1 5.2 I, m, n | LAB THEMES/SKILLS |
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| <h1 style="writing-mode: vertical-rl; transform: rotate(180deg);">December</h1> | <p>Polyatomic bonding Metallic Intermolecular Bonding Dipoles Nonpolar Molecules Van der Waals Self assembly Hydrogen Bonding Molecule-ion Attraction</p> <p>Chemical Reactions Chemical Equations and balancing Type of chemical reactions</p> | <p>3.1dd Compounds can be differentiated by their physical and chemical properties.</p> <p>5.2l Molecular polarity can be determined by the shape of the molecule and distribution of charge. Symmetrical (nonpolar) molecules include CO₂, CH₄, and diatomic elements. Asymmetrical (polar) molecules include HCl, NH₃, and H₂O.</p> <p>5.2m Intermolecular forces created by the unequal distribution of charge result in varying degrees of attraction between molecules. Hydrogen bonding is an example of a strong intermolecular force.</p> <p>5.2n Physical properties of substances can be explained in terms of chemical bonds and intermolecular forces. These properties include conductivity, malleability, solubility, hardness, melting point, and boiling point.</p> <p>3.1ccA 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.</p> <p>3.3c3.3c 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.</p> | <p>LAB THEMES:</p> <ul style="list-style-type: none"> ❑ Paper ❑ Chromatography of food dyes ❑ Snow Globe ❑ Types of Chemical Reactions ❑ Formation of precipitates ❑ Decomposition of hydrogen peroxide <p>SKILLS:</p> <ul style="list-style-type: none"> ❖ Know polyatomic ions all covalently bonded. ❖ Explain vapor pressure, evaporation rate, & phase changes in terms of intermolecular forces. ❖ Know that intermolecular forces are weaker than intramolecular forces ❖ Compare and contrast the types of intermolecular forces. ❖ Identify reactants and products in a chemical reaction. ❖ Write balanced chemical reactions given either the word or formula for reactants and products. ❖ Determine a missing reactant or product in a balanced equation. ❖ Identify types of chemical reactions: synthesis (direct combination), analysis (decomposition), single replacement, double replacement, combustion. ❖ Predict products of single replacement reactions using activity series from Periodic Table (Table J) ❖ Interpret balanced chemical equations in terms of Conservation of matter. |

| MONTH | CONTENT | NYS STANDARD/KEY IDEA/PERFORMANCE INDICATOR 3.1ee III.1 3.3a,c,d,f 3.2b | LAB THEMES/SKILLS |
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| January | Moles Formula Mass Avogadro's number STP Molar Volume Percentage Composition Empirical and Molecular Formulas | <p>3.1ee Types of chemical formulas include empirical, molecular, and structural.</p> <p>3.2b Types of chemical reactions include synthesis, decomposition, single replacement, and double replacement.</p> <p>3.3a In all chemical reactions there is a conservation of mass, energy, and charge.</p> <p>3.3c 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.</p> <p>3.3d 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.</p> <p>3.3f The percent composition by mass of each element in a compound can be calculated mathematically.</p> | <p>LAB THEMES:</p> <ul style="list-style-type: none"> <input type="checkbox"/> Composition of Hydrates <input type="checkbox"/> Cat Chemistry <input type="checkbox"/> Percent Composition <input type="checkbox"/> Determination of Empirical Formulas <p>SKILLS:</p> <ul style="list-style-type: none"> ❖ Define and manipulate the mole to find particles, atoms, ions, molecules, liters and back to moles. ❖ Memorize and manipulate Avogadro's Number and molar volume to find moles, molecules, atoms, mass and liters. ❖ Define and calculate molecular formula mass, molecular formula, empirical formula by knowing the other two. ❖ Define, differentiate between and calculate molar mass, atomic mass, molecular mass, formulas mass using the Periodic Table. ❖ Differentiate between empirical and molecular formulas. |

| MONTH | CONTENT | NYS STANDARD/KEY IDEA/PERFORMANCE INDICATOR | LAB THEMES/SKILLS |
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| <h1 style="writing-mode: vertical-rl; transform: rotate(180deg);">February</h1> | <p>Stoichiometry Molar Mass Mole-Mole Mole-Mass</p> <p>Kinetic theory Vapor Pressure Boiling points Melting points Sublimation Deposition Allotropes Nano-particle behavior</p> | <p>3.1cc 3.3c, 4.2c V.19, 5.2 f II.6</p> <p>3.1ccA 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.</p> <p>4.1c Energy released or absorbed during a chemical reaction can be represented by a potential energy diagram.</p> <p>5.2f Some elements exist in two or more forms in the same phase. These forms differ in their molecular or crystal structure, and hence in their properties.</p> | <p>LAB THEMES:</p> <ul style="list-style-type: none"> ❑ Mass/Mass relationship ❑ Analysis of Baking Soda ❑ Mole and Mass relationship <p>SKILLS:</p> <ul style="list-style-type: none"> ❖ Calculate molar mass from a chemical formula. ❖ Determine the number of moles of a substance given its mass. ❖ From a balanced chemical formula, calculate simple mole-mole, and mass-mole problems. ❖ Recognize and define allotropes ❖ Distinguish between endothermic and exothermic reactions, using energy terms in an equation, ΔH, potential energy diagrams: PE of reactant, PE of product, PE of activated complex (intermediate product), activation energy for both forward and reverse reactions both with and without catalysts. ❖ Explain vapor pressure, evaporation rate, and phase change in terms of intermolecular forces. |

| MONTH | CONTENT | NYS STANDARD/KEY IDEA/ PERFORMANCE INDICATOR3.4a, b, c, d | LAB THEMES/SKILLS |
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| March | <p>Gas Laws Combined Case Law</p> <p>Solutions Solute/ Solvent Saturated Unsaturated Supersaturated Solubility Rules Solubility Graphs Factors Affecting Solubility Molarity Water of hydration Percent by Volume Parts Per Million Colligative Concepts</p> <p>Thermochemistry Exothermic Endothermic Heat Capacity Calorimetry Heating/Cooling Curve</p> | <p>3.4a The concept of an ideal gas is a model to explain the behavior of gases. A real gas is most like an ideal gas when the real gas is at low pressure and high temperature.</p> <p>3.4b Kinetic molecular theory (KMT) for an ideal gas states that all gas particles:</p> <ul style="list-style-type: none"> • are in random, constant, straight-line motion. • are separated by great distances relative to their size; the volume of the gas particles is considered negligible. • have no attractive forces between them. • have collisions that may result in a transfer of energy between gas particles, but the total energy of the system remains constant. <p>3.4c Kinetic molecular theory describes the relationships of pressure, volume, temperature, velocity, and frequency and force of collisions among gas molecules.</p> <p>3.4d Collision theory states that a reaction is most likely to occur if reactant particles collide with the proper energy and orientation.</p> <p>3.1ooA solution is a homogeneous mixture of a solute dissolved in a solvent. The solubility of a solute in a given amount of solvent is dependent on the temperature, the pressure, and the chemical natures of the solute and solvent.</p> <p>3.1ppThe concentration of a solution may be expressed in molarity (M), percent by volume, percent by mass, or parts per million (ppm).</p> | <p>LAB THEMES:</p> <ul style="list-style-type: none"> ❑ Carbon dioxide from antacid tablets, Electrolytes, ❑ Making a Solution, Acid/base, Filtration, ❑ Cabbage Patch, Chemistry, Hydrolysis of a Salt, ❑ Rates of Reactions, Solubility of a Salt, ❑ Reactions of acids with carbonates, Calorimetry, ❑ Fusion of Ice, Crystallization of Wax <p>SKILLS:</p> <ul style="list-style-type: none"> ❖ Recognize and convert temperature units from °C to K and K to °C ❖ Know that all temperature units must be in Kelvin for all gas law calculations. ❖ Identify direct and indirect(inverse) relationships between pressure, temperature and volume. ❖ Manipulate Combined Gas Law to solve for missing variable. ❖ Identify the parts of a solution. ❖ Describe a solution as unsaturated, saturated, or supersaturated. ❖ Describe the preparation of a solution, given the molarity ❖ Interpret solution concentration data ❖ Calculate solution concentrations in molarity (M), percent mass, and parts per million (ppm) ❖ Determine the solubility of various compounds ❖ Know heat flows from hot to cold. ❖ Explain heat in terms of kinetic molecular theory. ❖ Distinguish between heat energy and temperature. ❖ Explain phase change in terms of changes in kinetic and molecular energy. ❖ Interpret heating and cooling curves in terms of changes in kinetic and potential energy, heat of vaporization, heat of fusion, and phase change. ❖ Calculate heat involved in a phase or temperature change for a sample of matter. ❖ Understand concepts of specific heat and heat capacity. ❖ Manipulate and solve problems using three different heat formulas: ❖ $Q = m c \Delta T$, $Q = m H_f$, and $Q = m H_v$ ❖ Label a heating a cooling curve for phases, phase changes, kinetic and potential energy changes. |

| MONTH | CONTENT | NYS STANDARD/KEY IDEA/PERFORMANCE INDICATOR 3.4 d,f,g,h,i,j 3.1 ll,mm, uu, ww, tt, , zz, | LAB THEMES/SKILLS |
|-------|--|---|--|
| April | <p>Rte of Reactions Collision Theory Factors affecting rate Equilibrium Solution/Phase Equilibrium Catalyst Reversible Reaction Potential Energy Diagrams LeChatelier’s Principle Entropy Haber Process</p> <p>Acid Base Theory Arrhenius Properties Revisit Naming of Acids PH Indicators Titration Neutralization Hydrolysis</p> | <p>3.4d Collision theory states that a reaction is most likely to occur if reactant particles collide with the proper energy and orientation. 3.4f The rate of a chemical reaction depends on several factors: temperature, concentration, nature of the reactants, surface area, and the presence of a catalyst. 3.4g A catalyst provides an alternate reaction pathway, which has a lower activation energy than an uncatalyzed reaction. 3.4h Some chemical and physical changes can reach equilibrium. 3.4i 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. 4.1c V 1.6 4.1d</p> <p>3.1ll Entropy is a measure of the randomness or disorder of a system. A system with greater disorder has greater entropy. 3.1mm Systems in nature tend to undergo changes toward lower energy and higher entropy. 3.1tt On the pH scale, each decrease of one unit of pH represents a tenfold increase in hydronium ion concentration. 3.1uu Behavior of many acids and bases can be explained by the Arrhenius theory. Arrhenius acids and bases are electrolytes. 3.1vv Arrhenius acids yield H+(aq), hydrogen ion as the only positive ion in an aqueous solution. The hydrogen ion may also be written as H3O+(aq), hydronium ion. 3.1ww Arrhenius bases yield OH-(aq), hydroxide ion as the only negative ion in an aqueous solution. 3.1xx In the process of neutralization, an Arrhenius acid and an Arrhenius base react to form a salt and water. 3.1yy There are alternate acid-base theories. One theory states that an acid is an H+ donor and a base is an H+ acceptor. 3.1zz Titration is a laboratory process in which a volume of a solution of known concentration is used to determine the concentration of another solution.</p> | <p>LAB THEMES:</p> <ul style="list-style-type: none"> ❑ Enthalpy and Entrophy ❑ LeChatelier’s Lab ❑ Hydrogen ion with strong and weak acids ❑ The neutralizing power of antacids ❑ Titration <p>SKILLS:</p> <ul style="list-style-type: none"> ❖ Use collision theory to explain how various factors, such as temperature, surface area, and concentration, influence the rate of reaction. ❖ Identify examples of physical equilibrium as solution equilibrium and phase equilibrium, including the concept that a saturated solution is at equilibrium. ❖ Describe the concentration of particles and rates of opposing reactions in an equilibrium system. ❖ Qualitatively describe the effect of stress on equilibrium, using LeChatelier’s principle. ❖ Read and interpret potential energy diagrams: PE of reactants and products, activation energy (with or without a catalyst), heat of reaction. ❖ Identify substances as Arrhenius acids or Arrhenius bases. ❖ Identify solutions as acid, base, or neutral based upon the pH. ❖ Know how to name both binary and ternary acids. ❖ Use powers of ten notation to understand the exponential function of the pH scale. ❖ Interpret changes in acid-base indicator color. ❖ Write neutralization reactions for mono, di, and triprotic acids and mono, di, and trihydroxy bases. ❖ Calculate concentration (M) or volume of a solution using titration data. |

| MONTH | CONTENT | NYS STANDARD/KEY IDEA/PERFORMANCE INDICATOR | LAB THEMES/SKILLS |
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| May | Redox Reduction Oxidation Oxidation Numbers Reducing/Oxidizing agents Balancing Half Reactions Conservation of Energy Activity Series Electrochemical Cells Electroplating Batteries | 3.2c Types of organic reactions include addition, substitution, polymerization, esterification, fermentation, saponification, and combustion. 3.2d An oxidation-reduction (redox) reaction involves the transfer of electrons (e-). 3.2e Reduction is the gain of electrons. 3.2f A half-reaction can be written to represent reduction. 3.2g Oxidation is the loss of electrons. 3.2h A half-reaction can be written to represent oxidation. 3.2i Oxidation numbers (states) can be assigned to atoms and ions. Changes in oxidation numbers indicate that oxidation and reduction have occurred. 3.2j An electrochemical cell can be either voltaic or electrolytic. In an electrochemical cell, oxidation occurs at the anode and reduction at the cathode. 3.2k A voltaic cell spontaneously converts chemical energy to electrical energy. 3.2l An electrolytic cell requires electrical energy to produce a chemical change. This process is known as electrolysis. | LAB THEMES: <ul style="list-style-type: none"> <input type="checkbox"/> Penny Lab Oxidize the color away <input type="checkbox"/> Bleach It! Half-Reactions <input type="checkbox"/> Molar Mass of butane Making of slime <input type="checkbox"/> Making of an ester SKILLS: <ul style="list-style-type: none"> ❖ Write, balance, and label half-reactions for oxidation and reduction of free elements and their monatomic ions. ❖ Recognize and label reducing and oxidizing agents. ❖ Predict and identify oxidation numbers for atoms and ions in compounds. ❖ Identify and label the parts of a voltaic cell: cathode, anode, and salt bridge, as well as the direction of electron flow given the equation for the reaction. ❖ Identify and label the parts of an electrolytic cell : cathode, anode, and power source, as well as the direction of electron flow given the equation for the reaction. ❖ Know electrolytic cells take electrical energy and force a chemical reaction that would not occur spontaneously and that these reactions are commonly used for plating. ❖ Know voltaic cells (galvanic and Daniell cells) use chemical reactions to make electrical energy and we call these devices batteries. ❖ Compare and contrast voltaic and electrolytic cells. ❖ Determine whether a redox reaction is spontaneous. ❖ Draw and name structural and molecular formulas for alkanes, alkenes, and alkynes containing a maximum of 10 carbon atoms. ❖ Classify an organic compound based on its structural or condensed structural formula. ❖ Draw and give IUPAC names to structural formulas with the functional group(s) on a straight chain hydrocarbon. ❖ Identify organic reactions. |
| | Organic Chemistry Naming Homologous series Saturated Unsaturated Isomers Functional Groups Organic Reactions | 3.3b In a redox reaction the number of electrons lost is equal to the number of electrons gained. 3.1ff 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. 3.1gg 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. 3.1hh Organic acids, alcohols, esters, aldehydes, ketones, ethers, halides, amines, amides, and amino acids are categories of organic compounds that differ in their structures. Functional groups impart distinctive physical and chemical properties to organic compounds. 3.1ii Isomers of organic compounds have the same molecular formula, but different structures and properties. | |

| MONTH | CONTENT | NYS STANDARD/KEY IDEA/PERFORMANCE INDICATOR 3.1 o,p 4.4a-f 5.3a-c | LAB THEMES/SKILLS |
|-------------|--|--|--|
| June | Nuclear Chemistry Fusion Fission Natural/Artificial Transmutation Half-life Proton-neutron ratio Stability Nuclear reactors Radioisotopes | <p>3.1o Stability of an isotope is based on the ratio of neutrons and protons in its nucleus. Although most nuclei are stable, some are unstable and spontaneously decay, emitting radiation.</p> <p>3.1p 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.</p> <p>4.4a Each radioactive isotope has a specific mode and rate of decay (half-life).</p> <p>4.4b Nuclear reactions include natural and artificial transmutation, fission, and fusion.</p> <p>4.4c Nuclear reactions can be represented by equations that include symbols which represent atomic nuclei (with mass number and atomic number), subatomic particles (with mass number and charge), and/or emissions such as gamma radiation.</p> <p>4.4d Radioactive isotopes have many beneficial uses. Radioactive isotopes are used in medicine and industrial chemistry for radioactive dating, tracing chemical and biological processes, industrial measurement, nuclear power, and detection and treatment of diseases.</p> <p>4.4e 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.</p> <p>4.4f There are benefits and risks associated with fission and fusion reactions.</p> <p>5.3a 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 with high-energy particles.</p> <p>5.3b Energy released in a nuclear reaction (fission or fusion) comes from the fractional amount of mass that is converted into energy. Nuclear changes convert matter into energy.</p> <p>5.3c Energy released during nuclear reactions is much greater than the energy released during chemical reactions.</p> | <p>LAB THEMES:</p> <ul style="list-style-type: none"> ❑ Penny Lab (statistical) <p>SKILLS:</p> <ul style="list-style-type: none"> ❖ Interpret and write isotopic notation. ❖ Determine decay mode and write nuclear equations to show both artificial and natural transmutation of alpha and beta decay. ❖ Explain the benefits and risks of radioactivity. ❖ Calculate the initial amount, the fraction remaining, or the half-life of a radioactive isotope, given two or the three variables ❖ Compare and contrast fusion and fission reactions. ❖ Complete nuclear equations: predict missing particles from nuclear equations ❖ Identify specific uses of some common radioisotopes: ❖ C-12 to C-14 ratio in dating living things, I-131 in diagnosing and treating thyroid disorders, U-238 to PB-206 ratio in dating geological formations, and Co-60 in treating cancer. |