YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: CHEMISTRY 2013-2014

Unit Title: UNIT # 1: "SAFETY/SCIENTIFIC METHOD, AND MEASUREMENTS"	Timeframe: Quarter 1 4 weeks
Cluster of Standards	**Literacy Standards**
I. SAFETY, SCIENTIFIC METHOD, AND MEASUREMENTS A. Proper use and identification of laboratory equipment B. Proper use of safety equipment (e.g., fire extinguisher, eye wash station, first aid kit) C. Proper first aid procedures for accidents (e.g., acid spills, cuts, burns, chemicals in eyes) D. Proper procedures for fires, waste disposal, broken glass, and unlabeled chemicals E. Use and understanding of MSDS sheets F. Identify questions and concepts that guide scientific investigations G. Design and conduct scientific investigations 1. Proper way of writing lab reports: objectives, procedures, data tables, sample calculations, concluding questions 2. Safely use a variety of tools (e.g., hand tools, measuring instruments, calculators, and computers) H. Use technology and mathematics to perform and improve investigations and communications I. Formulate and revise explanations and models using logic and evidence (critical thinking) J. Recognize and analyze explanations and models K. Communicate and support a scientific argument L. Use correct scientific protocols for quantifying the properties of matter accurately and precisely 1. Derive and interpret data from mathematical relationships using graphs, charts, and tables 2. Apply mathematical concepts in problem solving (e.g., geometry, trigonometry, and logarithms M. Use metric measuring systems, significant figures, scientific notation, error analysis, and dimensional analysis 1. Demonstrate difference between precision and accuracy 2. Apply rules of significant digits and use correct units of measurement 3. Mathematically determine metric and temperature conversions 4. Experimentally determine the density of specific substances 5. Read and understand graphs, charts, and tables	**RST.2** Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms. **RST.3** Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text. **WHST.10** Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single setting or a day or two) for a range of discipline- specific tasks, purposes and audiences.

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: CHEMISTRY 2013-2014

Unit Title: UNIT # 2: "ENERGY AND MATTER"	Timeframe: Quarter 1- 4 weeks
Cluster of Standards	**Literacy Standards**

Unit Title: UNIT # 2: "ENERGY AND MATTER"	Timeframe: Quarter 1- 4 weeks
Cluster of Standards	**Literacy Standards**
II. ENERGY AND MATTER A. Construct atomic models to explain experimental evidence and make predictions 1. Changes in the atomic model over time exemplify how scientific knowledge changes as new evidence emerges and how technological advancements like electricity extend the boundaries of scientific knowledge 2. Thompson's study of electrical discharges in cathode-ray tubes led to the discovery of the electron and the development of the plum pudding model of the atom B. Based on the Quantum mechanical model, it is not possible to predict exactly where electrons are located but there is a region of space surrounding the nucleus in which there is a high probability of finding an electron (electron cloud or orbital) C. Properties and locations of protons, neutrons, electrons, atomic number, mass number, cations, anions, isotopes, and the strong nuclear force that hold atoms together 1. All atoms of the same element contain the same number of protons, but may have a different number of neutron (isotopes) 2. Atoms acquire an unbalanced charge by gaining or losing electrons (ions) 3. Electrically neutral atoms have the same number of positively charged protons and negatively charged electrons D. Historical development of the atom and position of electrons 1. Rutherford's gold foil experiment led to the discovery that most of the atom was empty space with a relatively small, positively charged nucleus 2. Bohr used data from atomic spectra to propose a planetary model of the atom in which electrons orbit the nucleus, like planets around the sun 3. Schrodinger used the idea that electrons travel in waves to develop a model in which electrons travel randomly in regions of space called orbitals (quantum mechanical model) E. Energy may change form or distribution, the total quantity of energy in the universe remains constant F. All substances have identifiable physical and chemical properties 1. Changes in these properties can occur without changing the chemical nature of the substance 2. Matter can exist as either a pure substance or a mixture 3. Explain physical properties of elements, compounds, and mixtures in terms of the nature of interactions of their particles	**WHST.1 Write arguments focused on discipline-specific content**. **a.** Introduce precise, knowledgeable claim(s), establish the significance of the claim(s) from alternate or opposing claims, and create an organization that logically sequences the claim(s), counterclaims, reasons, and evidence. **b.** develop claim(s) and counterclaims fairly and thoroughly, supplying the most relevant data and evidence for each while pointing out the strengths and limitations of both claim(s) and counterclaims in a discipline appropriate form that anticipates the audience's knowledge level, concerns, values, and possible biases. **c.** use words, phrases and clauses as well as varied syntax to link the major sections of the text, create cohesion, and clarify the relationships between claim(s) and reasons, between reasons and evidence, and between claim(s) and counterclaims. **d.** establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing **e.** provide a concluding statement or section that follows from or supports the argument presented.

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: CHEMISTRY 2013-2014

Unit Title: UNIT #3: "THE PERIODIC TABLE"	Timeframe: Quarter 1-2 2weeks
Cluster of Standards	**Literacy Standards**
III. HISTORY OF THE PERIODIC TABLE A. Elements are arranged in order of increasing atomic number on the periodic table such that elements with similar properties are placed in the same column 1. Recognize the contributions of individuals in the development of the periodic table 2. Demonstrate understanding that when elements are listed in order according to atomic number, repeating patterns of physical and chemical properties identify families of elements with similar properties 3. The periodic table is a consequence of the repeating patterns of outermost electrons B. Periodic trends and arrangements of elements 1. Alkali metals 2. Alkaline earth metals 3. Transition metals 4. Boron family 5. Carbon family 6. Chalcogens 7. Halogens 8. Noble gases 9. Lanthanide series 10. Actinide series C. Similarities in the configuration of valence electrons for a particular group can be predicted 1. Electron configuration can be written from the position on the periodic table 2. Repeating patterns in electron configurations explain many of the trends in the properties observed. D. Atomic theory and bonding must be used to explain trends in properties across periods or down columns including atomic radii, ionic radii, first ionization energies, electronegativities, and whether the element is a solid or a gas at room temperature	**RST.9** Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: CHEMISTRY 2013-2014	
Unit Title: UNIT # 4: "IONIC AND COVALENT BONDING"	Timeframe: Quarter 2 3 weeks
Cluster of Standards	**Literacy Standards**

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: CHEMISTRY 2013-2014

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<tr><th colspan="2">Unit Title: UNIT # 4: "IONIC AND COVALENT BONDING"   Timeframe: Quarter 2   3 weeks</th></tr>
<tr><th>Cluster of Standards</th><th>Literacy Standards</th></tr>
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IV. IONIC AND COVALENT BONDING

A. Atoms with unpaired electrons tend to form ionic and covalent bonds with other atoms forming molecules, ionic lattices or network covalent structures

B. Electron configurations, electronegativity values, and energy considerations will be applied to bonding and the properties of materials with different types of bonding

1. Atoms of many elements are more stable as they are bonded to other atoms. In such cases, as atoms bond, energy is released to the surroundings resulting in a system with lower energy.
2. An atom's pattern of valence electrons determines how an atom interacts with other atoms
3. Using the periodic table, formulas of ionic compounds can be predicted including ionic compounds from groups 1,2, 17, hydrogen and oxygen and polyatomic ions if given the formula and charge of the polyatomic ion.

C. Molecules, ionic lattices, and network covalent structures have different, yet predictable, properties that depend on the identity of the elements and the types of bonds formed

1. Differences in electronegativity values can be used to predict where a bond fits on the continuum between ionic and covalent bonds
2. Polarity of a bond depends on the electronegativity difference and the distance between the atoms (bond length)

D. Polar covalent bonds are introduced as an intermediary between ionic and pure covalent bonds

1. Metallic bonding is introduced to explain many of the properties of metals (e.g., conductivity)
2. A substance may contain more than one type of bond

E. Compounds containing carbon are an important example of bonding

1. Carbon atoms can bond together and with other atoms, especially hydrogen, oxygen, nitrogen, and sulfur to form chains, rings, and branching networks that are present in a variety of compounds, including synthetic polymers, fossil fuels, and the large molecules essential to life
2. Given the name of an ionic or covalent substance, formulas can be written

F. Many different models may be used to represent compounds including chemical formulas, Lewis structures, and ball and stick structures

1. These models may be used to visualize atoms and molecules and to predict the properties of substances
2. Each type of representation provides unique information about the compound
3. Different representations are better suited for particular substances

G. Lewis structures and VSEPR theory can be used to predict the three-dimensional electron pair and molecular geometry of compounds

1. Lewis structures and molecular geometries will only be constructed for the following combinations of elements: hydrogen, carbon, nitrogen, oxygen, phosphorus, sulfur, and the halogens.
2. Organic nomenclature is reserved for more advanced courses

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RST.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.

RST.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

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YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: CHEMISTRY 2013-2014	
Unit Title: UNIT #5: "CLASSIFYING AND BALANCING EQUATIONS"	**Timeframe: Quarter 2 4 weeks**
Cluster of Standards	**Literacy Standards**
V. CLASSIFYING AND BALANCING EQUATIONS A. Complex reactions will be studied, classified, and represented with chemical equations and three-dimensional models B. Recognize patterns of what may happen two substances are mixed 1. Identify oxidation/reduction, synthesis, decomposition, single-replacement, double-replacement (including precipitation reactions and acid-base neutralizations) and combustion reactions 2. Some reactions may fit into more than one category (e.g., single-replacement may also be oxidation-reduction 3. In oxidation-reduction reactions, identify which substance is oxidized and which substance is reduced C. Coefficients are used to balance equations D. Balancing equations and modeling are used to demonstrate the law of conservation of matter 1. Write balanced chemical equations 2. Predict products in a chemical equation	**RST.4** Determine the meaning of symbols, key terms, and other domain specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics. **WHST.6** Use technology, including the internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information. **WHST.8** Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively, assess the strengths and limitations of each source in terms of the specific task, purpose, and audience; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and overreliance on any one source and following a standard format for citation.

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: CHEMISTRY 2013-2014	
Unit Title: UNIT #6: "STOICHIOMETRY"	**Timeframe: Quarter 2-3 4 weeks**
Cluster of Standards	**Literacy Standards**

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: CHEMISTRY 2013-2014

Unit Title: UNIT #6: "STOICHIOMETRY"	Timeframe: Quarter 2-3 4 weeks
Cluster of Standards	**Literacy Standards**
VI MOLES AND STOICHIOMETRY A. Matter can be quantified in a way that macroscopic properties such as mass can reflect the number of particles present B. Elemental samples are a mixture of several isotopes with different masses C. Atomic mass of an element is calculated given the mass and relative abundance of each isotope of the element as it exists in nature D. The mole is used to translate between the atomic and the macroscopic levels 1. The mole is used as a counting number, like a dozen. It is equal to the number of particles in exactly 12 grams of carbon (i.e. 12 atoms) 2. The mass of one mole of a substance is equal to its formula mass in grams E. The formula mass of a substance can be used in conjunction with Avogadro's number and the density of a substance to convert between mass, moles, volume, and number of particles of a sample. F. A stoichiometric involves the conversion from the amount of one substance in a chemical reaction to the amount of another substance. G. The coefficients of the balanced equation indicate the ratios of the substances involved in the reaction in terms of both particles and moles. H. Once the number of moles of a substance is known, amounts can be changed to mass, volume of a gas, volume of solutions, and/or number of particles. I. Molarity is the measure of the concentration of a solution that can be used in stoichiometric calculations. J. The experimental yield can be compared to the theoretical yield to calculate percent yield	**WHST.7** Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: CHEMISTRY 2013-2014

Unit Title: UNIT #7: "STATES OF MATTER"	Timeframe: Quarter 3, 7 weeks
Cluster of Standards	**Literacy Standards**

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: CHEMISTRY 2013-2014

Unit Title: UNIT #7: "STATES OF MATTER"	Timeframe: Quarter 3, 7 weeks
Cluster of Standards	**Literacy Standards**
VII INTERMOLECULAR FORCES, ENERGY, THERMODYNAMICS, AND GAS LAWS A. Plasmas occur when gases have so much energy that the electrons are stripped away; therefore, they are electrically charged 1. In Bose-Einstein condensation the atoms, when subjected to temperatures a few billionths of a degree above absolute zero, all coalesce to lose individual identity and become a super atom. 2. Bose-Einstein condensates are opposites of plasmas. B. intermolecular attractions are generally weak when compared to intramolecular bonds, but span a wide range of strengths. 1. The composition of a substance and the shape and polarity of a molecule are particularly important in determining the type and strength of bonding and intermolecular interactions 2. Types of intermolecular reactions include London dispersion forces (present between all molecules), dipole-dipole forces (present between polar molecules), and hydrogen bonding (a special case of dipole-dipole where hydrogen is bonded to a highly electronegative atom such as fluorine, oxygen, or nitrogen) each with its own characteristic relative strengths C. The configuration of atoms in a molecule determines the strength of the forces (bonds or intermolecular forces) between the particles and therefore the physical properties (e.g., melting point, boiling point, solubility, and vapor pressure) of a material D. For a given substance the average kinetic energy (temperature) needed for a change of state to occur depends upon the strength of the intermolecular forces between the particles E. Melting point and boiling point depend upon the amount of energy needed to overcome the attractions between the particles. F. Substances that have strong intermolecular forces or are made up of three-dimensional networks of ionic or covalent bonds tend to be solids at room temperature and have high melting and boiling points G. Non-polar organic molecules are held together by weak London dispersion forces H. Substances with longer chains provide more opportunities for attraction and tend to have higher melting and boiling points. Increased branching of organic molecules interferes with the intermolecular attractions that leads to lower boiling and melting points. I. For chemical systems, potential energy is in the form of chemical energy and kinetic energy is in the form of thermal energy 1. The total amount of chemical or thermal energy in a system is impossible to measure 2. The energy change in a system can be calculated from measurements (mass and change in temperature) from calorimetry experiments in the laboratory J. Conservation of energy is an important component of calorimetry equations K. Thermal energy is the energy of a system due to the movement of its particles 1. Thermal energy of an object depends on the amount of matter present, temperature, and chemical composition 2. Some materials require little energy to change their temperature and other require a great deal to change their temperature by the same amount 3. Chemical equations involve valence electrons forming bonds to yield more stable products with lower energies L. Energy is required to break interactions and bonds between the reactant atoms and energy is released when an interaction or bond is	**RST.8** Evaluate the hypothesis, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information. **WHST.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose and audience. **WHST.5** Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Unit Title: UNIT #7: "STATES OF MATTER"	Timeframe: Quarter 3, 7 weeks
Cluster of Standards	**Literacy Standards**
formed between the atoms in the products M. Molecules with weak bonds are less stable and tend to react to produce more stable products, releasing energy in the process N. Generally energy is transferred out of the system (exothermic) when the products have stronger bonds than the reactants and is transferred into the system (endothermic) when the reactants have stronger bonds than the products. Predictions of the energy requirements of a reaction can be made given a table of bond energies O. graphic representations can be drawn and interpreted to represent the energy changes during a reaction, including the activation energy P. Specific heat is a measure of how much energy is needed to change the temperature of a specific mass of material a specific amount 1. Specific heat values can be used to calculate the thermal energy change, the temperature (initial, final, or change in) or mass of a material in calorimetry. 2. Water has a particularity high specific heat capacity, which is important in regulating Earth's temperature Q. The kinetic-molecular theory can be used to explain the macroscopic properties of gases (pressure, temperature, and volume) through the motions and interactions of its particles. 1. When one of these properties is kept constant, the relationship between the other two properties can be quantified, described and explained. 2. Real world phenomena (why tire pressure increases in hot weather, why a hot air balloon rises) can be explained using this theory R. Problems can also be solved involving the changes in temperature, pressure, and volume of a gas 1. When solving gas problems, the Kelvin temperature scale must be used 2. The Kelvin scale uses absolute zero as its minimum temperature S. Problems can be solved using the ideal gas law (PV=nRT) 1. Use the gas law to study the effects of temperature, pressure, and concentration on the volume of different substances in the gaseous state 2. Gas laws include: Boyle's' law, Charles's law, Dalton's law of partial pressure, combined gas law, ideal gas law, molecular gas law, Graham's law T. Explore the relationship between the volume, temperature, and pressure in the laboratory or through computer simulations or virtual experiments	

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: CHEMISTRY 2013-2014

Unit Title: UNIT #8: "ACIDS AND BASES"	Timeframe: Quarter 4, 4 weeks
Cluster of Standards	**Literacy Standards**
VIII. ACIDS AND BASES A. Structural features of molecules are explored to further understand acids and bases B. Acids often result when hydrogen is covalently bonded to an electronegative element and is easily dissociated from the rest of the molecule to bind with water to form a hydronium ion (H_3O^+) C. The acidity of an aqueous solution can be expressed as pH, where pH can be calculated from the concentration of the hydronium ion D. Bases are likely to dissociate in water to form a hydroxide ion E. Acids can react with bases to form a salt and water F. Neutralization reactions can be studied quantitatively by performing titration experiments 1. Experimentally determine the concentration of an acid or base through titration 2. Use indicators to determine the identity of an unknown substance G. Equilibrium of acids and bases and the concept of Brønsted-Lowry and Lewis acids and bases are studied	**RST.1** Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account. **WHST.9** Draw evidence from informational texts to support analysis, reflection, and research.

YOUNGSTOWN CITY SCHOOLS CURRICULUM MAP: CHEMISTRY 2013-2014	
Unit Title: UNIT #9: "ORGANIC CHEMISTRY/NUCLEAR CHEMISTRY"	**Timeframe: Quarter 4, 2 Weeks**
Cluster of Standards	**Literacy Standards**
IX. ORGANIC AND NUCLEAR CHEMISTRY A. Organic molecules release energy when undergoing combustion reactions and are used to meet the energy needs of society (e.g., oil, gasoline, natural gas) and to provide the energy needs of biological organisms (e.g., cellular respiration) B. When a reaction between two ionic compounds in aqueous solution results in the formation of a precipitate or molecular compound, the reaction often occurs because the new ionic or covalent bonds are stronger than the original ion-dipole interactions of the ions in solution C. Laboratory experiences (3-D or virtual) with different types of chemical reactions must be provided D. Specific types of radioactive decay and using nuclear reactions as a source of energy are discussed 1. Radioactive decay can result in the release of different types of radiation (alpha, beta, gamma, and positron) each with a characteristic mass, charge, and potential to ionize and penetrate the material it strikes 2. Beta decay results from the decay of a neutron 3. Positron decay results from the decay of a proton 4. When a radioisotope undergoes alpha, beta, or positron decay, the resulting nucleus can be predicted and a balanced nuclear equation can be written E. Nuclear reactions, such as fission and fusion, are accompanied by large energy changes that are much greater than those that accompany chemical reactions 1. Nuclear reactions can theoretically be used as a controlled source of energy in a nuclear power plant 2. There are advantages and disadvantages of generating electricity from fission and fusion	**RST.10** By the end of grade twelve, read and comprehend science/technical texts in the grades 11-CCR text complexity band independently and proficiently. **WHST.2** Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes. **a**. Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension. **b.** Develop the topic thoroughly by selecting the most significant and relevant facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic. **c**. Use varied transitions and sentence structures to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts. **d**. Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stand in a style that responds to the discipline and context as well as to the expertise of likely readers. **e**. Provide a concluding statement or section that follows from and supports the information or explanation provided (e.g., articulating implication of the significance of the topic).