Chemistry CP Curriculum Maps

Grade: 10 - 12 **Subject:** Chemistry CP	**Unit 1: The Science of Chemistry**
Big Idea/Rationale	• Three States Matter • Evidence of a Chemical Change • Comparison of Physical and Chemical Properties • Using Conversion Factors • Pure Substances vs. Mixtures • Classifying Matter
Enduring Understanding (Mastery Objective)	• To understand the chemistry behind states of matter • To distinguish what is physical and what is chemical • To distinguish and separate pure substances from mixtures
Essential Questions (Instructional Objective)	• What are the characteristics of the states of matter? • How can one tell the difference between physical and chemical properties? • What are the different characteristics of matter? Mass, volume, weight • What are physical properties, including density? • What are chemical properties? • What are pure substances? Heterogeneous and homogenous mixtures?
Content (Subject Matter)	• States of Matter • Chemical and Physical Properties • Density • Mixtures and Pure Substances
Skills/ Benchmarks (CCSS Standards)	• 5.2.12.C.1: Use the kinetic molecular theory to describe and explain the properties of solids, liquids, and gases. • 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.
Materials and Resources	• Holt – Chemistry textbook, Chapter 1.
Notes	

Grade: 10 - 12 **Subject:** Chemistry CP	**Unit 2: Matter and Energy**
Big Idea/Rationale	• Energy in Chemical Reactions • Scientific Method • Accuracy and Precision
Enduring Understanding (Mastery Objective)	• Changes in matter require transfer of energy • Energy is never destroyed or created. • There is a difference between heat and temperature • Troubleshoot a problem using the scientific method • Distinguish between accuracy and precision • Write very large numbers and very small numbers in scientific notation
Essential Questions (Instructional Objective)	• How do substances change from state to state of matter? • How do we know that matter and energy is never destroyed or created. • Is there a difference between heat and temperature? • How does one logically solve a problem? • When do we use accuracy vs. precision? There's a difference? • What is the concise way to write and calculate very large and very small numbers?
Content (Subject Matter)	• States of Matter • Chemical and Physical Properties • Density • Mixtures and Pure Substances
Skills/ Benchmarks (CCSS Standards)	• 5.1.12.A.3: Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence. • 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.
Materials and Resources	• Holt – Chemistry Textbook • Scientific Calculator • Projector • Periodic Table
Notes	

Grade: 10 - 12 **Subject:** Chemistry CP	**Unit 3: Atoms and Electrons**
Big Idea/Rationale	• Law of Conservation of Mass • History of the Atomic Model • Discovery of the Subatomic particles • Electron Configuration • Electromagnetic Spectrum
Enduring Understanding (Mastery Objective)	• Law of Conservation of Mass • History of the Atomic Model • Discovery of the Subatomic particles • Electron Configuration • Electromagnetic Spectrum
Essential Questions (Instructional Objective)	• What is the law of conservation of mass? Does this apply all the time? • How has the atomic model changed over time? • How do electrons behave?
Content (Subject Matter)	• Law of Conservation of Mass • History of the Atomic Model • Discovery of the Subatomic particles • Electron Configuration • Electromagnetic Spectrum
Skills/ Benchmarks (CCSS Standards)	• 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.
Materials and Resources	• Holt – Chemistry Textbook • Scientific Calculator • Projector • Periodic Table
Notes	

Grade: 10 - 12 **Subject:** Chemistry CP	**Unit 4: The Periodic Table**
Big Idea/Rationale	• To understand how the periodic table is arranged. • To understand and identify the various families/groups of elements. • To identify the various trends within the periodic table.
Enduring Understanding (Mastery Objective)	• Describe the organization of the modern periodic table according to the periodic law. • Locate the different families of the representative elements and describe their characteristic properties. • Locate metals, nonmetals and metalloids on the periodic table. • Describe the periodic trends in ionization energy, atomic radius, electro negativity, ionic size, and electron affinity.
Essential Questions (Instructional Objective)	• What patterns did the historical figures in chemistry notice in regards to elemental properties? • How did they organize the elements? • What are the different families of the representative elements (main group elements) on the periodic table? • What are the characteristic properties of the metals? How do they relate to their electron configurations? • What is ionization energy and its periodic trend? How does it relate to atomic structures of the elements? • What are the periodic trends of atomic radii? How do they relate to the atomic structures of the elements? • What are the periodic trends in electro negativity? How do they relate to the atomic structures of the elements?
Content (Subject Matter)	• John Newland, Dmitri Mendeleev, and Henry Moseley contributed to the development of the periodic table. • The periodic law states that the properties of elements are periodic tunctions of the elements' atomic numbers. • In the periodic table, elements are ordered by atomic number. They are placed in to groups and periods. • Elements in the same period have the same number of occupied energy levels and valence electrons. • The main-group elements are Group 1 (alkali metals), Group 2 (alkaline-earth metals), Group 13-16, Group 17 (Halogens), Group 18 (Noble Gases). • Hydrogen is in a class by itself. • Most elements are metals. • Transition metals, including the lanthanides and actinides, occupy the center of the periodic table. • Periodic trends are related to the atomic structure of the elements.

	• Ionization energy, electro negativity, and electron affinity generally increase across the period and increase as you move down a group.
Skills/ Benchmarks (CCSS Standards)	• 5.1.12.B.4: Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations. • 5.1.12.C.3: Consider alternative theories to interpret and evaluate evidence-based arguments. • 5.1.12.D.1: Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • 5.2.12.A.3: Predict the placement of unknown elements on the Periodic Table based on their physical and chemical properties. • 5.2.12.B.1: Model how the outermost electrons determine the reactivity of elements and the nature of the chemical bonds they tend to form.
Materials and Resources	• Holt – Chemistry Textbook • Scientific Calculator • Projector • Periodic Table
Notes	

Grade: 10 - 12 **Subject:** Chemistry CP	**Unit 5: Ions and Ionic Compounds**
Big Idea/Rationale	• To understand simple ions. • To understand and identify ionic bonding and salts. • To name ionic compounds, and write their chemical formulas.
Enduring Understanding (Mastery Objective)	• Relate the electron configuration of an atom to its chemical reactivity. • Determine an atom's number and valence electrons. Use the octet rule to predict what stable ions are like to form. • Explain why the properties of ions differ from those of their parent atoms • Describe the process of forming an ionic bond • Explain how the properties of ionic compounds depend on the nature of ionic bonds. • Names of cations, anions, and ionic compounds. • Write the chemical formulas for ionic compounds.
Essential Questions (Instructional Objective)	• How does electron configuration relate to the atom's chemical reactivity? • How does one determine the valence electrons and draw their electron dot structure? • How would one describe the formation of cations from metals and the anions from nonmetals? • What are the characteristics of an ionic bond and an ionic compound?
Content (Subject Matter)	• Atoms may gain or lose electrons to achieve an electron configuration identical to that of a noble gas. • Alkali metals and halogens are very reactive when donating and accepting electrons from one another. • Electrons in the outermost energy level are known as valence electrons. • Ions are electrically charged particles that have different chemical properties than their parent atoms. • The opposite charges of cations and anions attract to form a tightly packed substance of bonded ions call a crystal lattice. • Salts have high melting points and do not conduct electric current in the solid state, but they do conduct electric current when metlted or when dissolved in water. • Ionic compounds are named by joining the cation and anion names. • Formulas for ionic compounds are written to show their balance of overall charge. • A polyatomic ion is a group of two or more atoms bonded together that functions as a single unit. • Parentheses are used to group polyatomic ions in a chemical formula with a subscript.

Skills/ Benchmarks (CCSS Standards)	• 5.1.12.D.1: Engage in multiple forms of discussion n order to process, make sense of, and learn from others' ideas, observations, and experiences. • 5.1.12.D.2: Represent ideas using literal representations, such as graphs, tables, journals, concept maps, and diagrams. • 5.2.12.A.1: Use atomic models to predict the behaviors of atoms in interactions. • 5.2.12.B.1: Model how the outermost electrons determine the reactivity of elements and the nature of they tend to form • 5.2.12.C.2: Account for any trends in the melting points of various compounds
Materials and Resources	• Holt – Chemistry Textbook • Projector • Periodic Table
Notes	

Grade: 10 - 12 **Subject:** Chemistry CP	**Unit 6: Covalent Compounds**
Big Idea/Rationale	• Students will learn about covalent compounds. They will learn how covalent bonds form, how ionic and covalent substances differ, how to draw and name covalent compounds, and how the shape of a molecule affects its properties.
Enduring Understanding (Mastery Objective)	• Compare and contrast: ionic and covalent bonding. • Write the chemical formulas and names for ionic and covalent compounds. • Draw ionic and covalent structures based upon current theory. • Apply bonding theory to determine properties of molecules and compounds.
Essential Questions (Instructional Objective)	• Explain the role and location of electrons in covalent bonds. • Explain differences in bond energies and lengths • Describe the change in energy and stability that takes place as a covalent bond forms. • Distinguish between nonpolar and polar covalent bonds based on electronegativity • Compare the physical properties of substances that have different bond types, and relate bond types to electronegativity differences. • Draw Lewis structures to show the arrangement of valence electrons among atoms in molecules and polyatomic ions. • Explain the differences between single, double, and triple covalent bonds. • Draw resonance structures for simple molecules and polyatomic ions, and recognize when they are required. • Name binary inorganic covalent compounds by using prefixes, roots, and suffixes. • Predict the shape of a molecule using VSEPR theory. • Associate the polarity of molecules with the shapes of molecules, and relate the polarity and shape of molecules to the properties of a substance.
Content (Subject Matter)	• Covalent bonds • Potential energy of bonds • Electronegativity differences • Lewis structures • Multiple bonds • Resonance structures • Nomenclature • VSEPR

	• Polarity
Skills/ Benchmarks (CCSS Standards)	• **5.1.12.A.1:** Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations. • **5.1.12.A.2:** Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories. • **5.1.12.A.3** Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence. • **5.1.12.B.1:** Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data. • **5.1.12.B.2:** Build, refine, and represent evidence-based models using mathematical, physical, and computational tools. • **5.1.12.B.3:** Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories. • **5.1.12.B.4:** Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations. • **5.1.12.C.1:** Reflect on and revise understandings as new evidence emerges. • **5.1.12.C.2:** Use data representations and new models to revise predictions and explanations. • **5.1.12.C.3:** Consider alternative theories to interpret and evaluate evidence-based arguments. • **5.1.12.D.1:** Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • **5.1.12.D.3:** Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare. • **5.2.12.A.1:** Use atomic models to predict the behaviors of atoms in interactions. • **5.2.12.A.4:** Explain how the properties of isotopes, including half-lives, decay modes, and nuclear resonances, lead to useful applications of isotopes.

Materials and Resources	**Lab: Chemical Bonds**
	• **Equipment**:
	  ○ Well plates
	  ○ Conductivity tester
	  ○ Foil
	  ○ Hot plates
	  ○ Pipettes
	• **Materials**
	  ○ CaCl2

	○ Citric Acid ○ Ethanol ○ Phenyl Salicylate ○ KI ○ NaCl ○ Distilled water ○ Sucrose • Holt – Chemistry Textbook • Scientific Calculator • Projector • Periodic Table
Notes	

Grade: 10 - 12 **Subject:** Chemistry CP	**Unit 7: The Mole and Chemical Composition**
Big Idea/Rationale	Students will learn about the Mole and Avogadro's number and how to convert between the amount in moles and the number of particles. They will solve problems using moles, particles, and molar mass. They will relate moles to chemical formulas and determining molar mass. Empirical and molecular formulas are also determined from percentage composition and formula mass, and percentage composition is derived from empirical and molecular formulas.
Enduring Understanding (Mastery Objective)	• Calculate chemical formulas from experimental data. • Mathematically convert moles to other equivalent units
Essential Questions (Instructional Objective)	• Identify the mole as the unit used to count particles, whether atoms, ions, or molecules. • Use Avogadro's number to convert between amount in moles and number of particles. • Solve problems converting between mass, amount in moles, and number of particles using Avogadro's number and molar mass. • Use molar volume to convert between moles of a substance and volume. • Use a periodic table or isotopic composition data to determine the average atomic masses of elements. • Infer information about a compound from its chemical formula • Determine the molar mass of a compound from its formula. • Determine a compound's empirical formula from its percentage composition. • Determine the molecular formula or formula unit of a compound from its empirical formula and its formula mass. • Calculate percentage composition of a compound from its molecular formula or formula unit.
Content (Subject Matter)	• Avogadro's number • Molar conversions • Percentage composition • Empirical and molecular formulas
Skills/ Benchmarks (CCSS Standards)	• **5.1.12.A.1:** Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations. • **5.1.12.A.2:** Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories. • **5.1.12.A.3** Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence. • **5.1.12.B.1:** Design investigations, collect evidence, analyze data, and

	evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data. • **5.1.12.B.2:** Build, refine, and represent evidence-based models using mathematical, physical, and computational tools. • **5.1.12.B.3:** Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories. • **5.1.12.B.4:** Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations. • **5.1.12.C.1:** Reflect on and revise understandings as new evidence emerges. • **5.1.12.C.2:** Use data representations and new models to revise predictions and explanations. • **5.1.12.C.3:** Consider alternative theories to interpret and evaluate evidence-based arguments. • **5.1.12.D.1:** Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • **5.1.12.D.3:** Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare. • **5.2.12.A.1:** Use atomic models to predict the behaviors of atoms in interactions. • **5.2.12.A.4:** Explain how the properties of isotopes, including half-lives, decay modes, and nuclear resonances, lead to useful applications of isotopes.

Materials and Resources	**Lab: Hydrates**
	• **Equipment**:
	  ○ Bunsen burner
	  ○ Ring stand/ring
	  ○ Evaporating dish
	  ○ Stirring rod
	  ○ Balance
	• **Materials**
	  ○ CuSO4
	
	Lab: Synthesis of MgO
	• **Equipment**:
	  ○ Crucible/lid
	  ○ Bunsen burner
	  ○ Ring stand
	  ○ Triangle/ring
	  ○ Balance
	• **Materials**

	○ Mg Strips • Holt – Chemistry Textbook • Scientific Calculator • Projector • Periodic Table
Notes	

Grade: 10 - 12 **Subject:** Chemistry CP	**Unit 8: Chemical Equations and Reactions**
Big Idea/Rationale	Students will learn about the different types of evidence of chemical reactions. They will describe chemical reactions by using word equations and unbalanced and balanced formula equations. They will learn how mass is conserved in chemical reactions and how to relate conservation of mass to a balanced equation. Different types of chemical reactions are described, and students learn to predict products for each type. They will also learn to distinguish between and write total and net ionic equations.
Enduring Understanding (Mastery Objective)	• Predict products from in chemical reactions. • Apply the concept of conservation of mass to chemical reactions.
Essential Questions (Instructional Objective)	• List evidence that suggests that a chemical reaction has occurred and evidence that proves that a chemical reaction has occurred. • Describe a chemical reaction by using a word equation and formula equation. • Interpret notations in formula equations, such as those relating to states of matter or reaction conditions. • Relate the conservation of mass to the rearrangement of atoms in a chemical reaction. • Write and interpret a balanced chemical equation for a reaction, and relate conservation of mass to the balanced equation. • Identify combustion reactions, and write chemical equations that predict the products. • Identify synthesis reactions, and write chemical equations that predict the products. • Identify decomposition reactions, and write chemical equations that predict the products. • Identify displacement reactions, and use the activity series to write chemical equations that predict the products. • Identify double-displacement reactions, and write chemical equations that predict the products. • Write total ionic equations for reactions in aqueous solutions. • Identify spectator ions and write net ionic equations for reactions in aqueous solutions. • Explain how concentration, pressure, and temperature may affect the rate of a reaction. • Explain why, for surface reactions, the surface area is an important factor.

Content (Subject Matter)	• Chemical reactions • States of matter • Balancing equations • Classifying reactions • Predicting products • Net ionic equations
Skills/ Benchmarks (CCSS Standards)	• **5.1.12.A.1:** Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations. • **5.1.12.A.2:** Develop and use mathematical, physical, and computational tools to build evidence-based models and to pose theories. • **5.1.12.A.3** Use scientific principles and theories to build and refine standards for data collection, posing controls, and presenting evidence. • **5.1.12.B.1:** Design investigations, collect evidence, analyze data, and evaluate evidence to determine measures of central tendencies, causal/correlational relationships, and anomalous data. • **5.1.12.B.2:** Build, refine, and represent evidence-based models using mathematical, physical, and computational tools. • **5.1.12.B.3:** Revise predictions and explanations using evidence, and connect explanations/arguments to established scientific knowledge, models, and theories. • **5.1.12.B.4:** Develop quality controls to examine data sets and to examine evidence as a means of generating and reviewing explanations. • **5.1.12.C.1:** Reflect on and revise understandings as new evidence emerges. • **5.1.12.C.2:** Use data representations and new models to revise predictions and explanations. • **5.1.12.C.3:** Consider alternative theories to interpret and evaluate evidence-based arguments. • **5.1.12.D.1:** Engage in multiple forms of discussion in order to process, make sense of, and learn from others' ideas, observations, and experiences. • **5.1.12.D.3:** Demonstrate how to use scientific tools and instruments and knowledge of how to handle animals with respect for their safety and welfare. • **5.2.12.A.1:** Use atomic models to predict the behaviors of atoms in interactions. • **5.2.12.A.4:** Explain how the properties of isotopes, including half-lives, decay modes, and nuclear resonances, lead to useful applications of isotopes.

Materials and Resources	**Lab: Evidence of a Chemical Change**
	• **Equipment**:
	  ○ Beaker 100mL
	  ○ Bunsen burner

	- Stirring rod - Gloves - Ring stand/ring/mesh - Marker - Ruler - Test tubes/rack - Materials - Aluminum Wire - Cu(NO3)2, 1M - HCl, 1M - NaOH, ~3M - copper wire - note: double the amt of HCl Lab: Progressive Precipitation - Equipment: - Test tubes - Beaker - Stirring rod - Stoppers - Materials: - silver nitrate sol’n - sodium sulfate sol’n - potassium dichromate sol’n - distilled water - Sodium chloride sol’n - Sodium sulfide sol’n Lab: Simple Qualitative Analysis - Equipment: - Beakers, 50 mL - Bunsen burner - Wood stirrers - Filter paper strips - Well Plates - Red litmus paper - Materials: - Na2CO3 1M HCl 0.1M KMnO4 1M NaOH - Na2SO3 - NH4Cl - Holt – Chemistry Textbook - Scientific Calculator

	• Projector • Periodic Table
Notes	

Grade: 10 - 12 **Subject:** Chemistry CP	**Unit 9: Stoichiometry**
Big Idea/Rationale	• Convert between amounts in moles • Solve mass-mass problems • Limiting and excess reagents • Percent yield
Enduring Understanding (Mastery Objective)	• Like a recipe, you need a certain amount of reactants to obtain a certain amount of products • Predict theoretical yield • Determine the percent yield
Essential Questions (Instructional Objective)	• What is a mole ratio, and why should I care? • How do chemists predict how much a reaction will yield? • How do I organize my data so that I can solve a molar problem?
Content (Subject Matter)	• Use proportional reasoning to determine mole ratios from a balanced chemical equation • Solve stoichiometry problems involving mass by using molar mass. • Determine the limiting and excess reagents • Perform calculations involving percentage yield.
Skills/ Benchmarks (CCSS Standards)	• 5.1.12.C.2: Use data representations and new models to revise predictions and explanations. • 5.1.12.A.1: Refine interrelationships among concepts and patterns of evidence found in different central scientific explanations.
Materials and Resources	• Holt – Chemistry Textbook • Scientific Calculator • Projector • Periodic Table
Notes	