Course: Honors Chemistry **Grade: 10-12** **Designer(s): M. Rush**	**Overview of Course** (Briefly describe what students should understand and be able to do as a result of engaging in this course)**:** This course is designed to help students understand the following fundamental scientific principles: matter and energy, atomic structure, bonding, writing chemical formulas and chemical equations, the mole concept, kinetic theory, gas laws, volume-volume relationships in chemical equations, and solution chemistry. These topics will be supplemented with laboratory experiments and computer technology. **Math skills are required**.

Overarching Big Ideas, Enduring Understandings, and Essential Questions
(These "spiral" throughout the entire curriculum.)

Big Idea (A Big Idea is typically a noun and always transferable within and among content areas.)	**Standard(s) Addressed** (What Common Core Standard(s) and/or PA Standard(s) address this Big Idea?)	**Enduring Understanding(s)** (SAS refers to Enduring Understandings as "Big Ideas." EUs are the understandings we want students to carry with them after they graduate. EUs will link Big Ideas together. Consider having only one or two EUs per Big Idea.)	**Essential Question(s)** (Essential Questions are broad and open ended. Sometimes, EQs can be debated. A student's answer to an EQ will help teachers determine if he/she truly understands. Consider having only one or two EQs per Enduring Understanding.)
CONNECTIONS	**3.1.C.A9** **3.1.C.C4** **3.1.C.B6** **3.2.C.A6** **3.2.C.B7** **3.3.C.A8** **3.3.C.B3B1** **3.3.10.**	**Chemistry connects with other subject areas, and with life.**	**Why is Chemistry important in all areas of life?** **How does the study of Chemistry connect to other subject areas?**
INTERACTIONS	**3.3.10.B1** **3.2.C.A2**	**Everything on earth is a result of an interaction.**	**What types of interactions result in the makeup of the universe? Give examples.**
PATTERNS	**3.2.10.B6** **3.2.10.A1** **3.3.12.B2**	**Trends/patterns can be used to explain many aspects of the universe.**	**How might trends/patterns be used to explain changes in the universe? Give an example.**

ENERGY	**3.2.10.B6** **3.3.10.A4**	**Changes in matter are accompanied by changes in energy.**	**Explain how energy affects the transition from one phase of matter to another.**
SYSTEMS	**S11.A.3.1**	**Systems are made of smaller parts that work together to form the whole (system).**	**How do these smaller "parts" work together to form matter?** **How might a system be impacted if part of the system changes? Give an example.**

Big Ideas, Enduring Understandings, and Essential Questions Per Unit of Study
(These do NOT "spiral" throughout the entire curriculum, but are specific to each unit.)

Month of Instruction (In what month(s) will you teach this unit?)	**Title of Unit**	**Big Idea(s)** (A Big Idea is typically a noun and always transferable within and among content areas.)	**Standard(s) Addressed** (What Common Core Standard(s) and/or PA Standard(s) address this Big Idea?)	**Enduring Understanding(s)** (SAS refers to Enduring Understandings as "Big Ideas." EUs are the understandings we want students to carry with them after they graduate. EUs will link Big Ideas together. Consider having only one or two EUs per Big Idea.)	**Essential Question(s)** (Essential Questions are broad and open ended. Sometimes, EQs can be debated. A student's answer to an EQ will help teachers determine if he/she truly understands. Consider having only one or two EQs per Enduring Understanding.)	**Common Assessment(s)*** (What assessments will all teachers of this unit use to determine if students have answered the Essential Questions?)	**Common Resource(s)* Used** (What resources will all teachers of this unit use to help students understand the Big Ideas?)
August-September	**MATTER AND CHANGE**	**CONNECTIONS** **ENERGY** PROPERTIES OF MATTER	**3.1.C.A9** **3.1.C.B6** **3.1.C.C4** **3.2.C.A6** **3.2.C.B7** **3.2.C.A1** **3.3.C.A8** **3.3.C.B3**	**Chemistry is the study of matter and the changes it undergoes.** **Chemistry as the central science.**	**Why is it important to study Chemistry?** **What properties are used to describe matter?** **How can matter change its form?**	**Chapter Test**	
September	**MEASUREMENTS AND CALCULATIONS**	QUANTIFYING MATTER	**3.2.C.A5** **3.2.C.A2** **3.2.C.A3** **3.2.C.A4**	**Observations of matter can be qualitative, quantitative, direct, or indirect.**	**How do chemists solve problems?** **How do scientists express the degree**	**Chapter Test** **Lab – Density**	

				The use of significant figures assures that quantitative observations are both accurate and precise.	**of uncertainty in their measurements? How is dimensional analysis used to solve problems?**	**Lab – Scientific Method** **Lab – Specific Heat**	
October	**ATOMS: THE BUILDING BLOCKS OF MATTER**	**SYSTEMS** STRUCTURE OF MATTER	**3.2.C.A5** **3.2.C.A2** **3.2.C.A1** **3.2.10.A1** **3.2.10.A4** **3.2.10.A5**	**The atomic theory is the foundation for the study of chemistry.**	**What components make up an atom?** **How are atoms of one element different from atoms of another element?** **In what ways has the theory of the atom changed over time due to technological improvements?**	**Chapter Test** **Lab – Law of Conservation of Mass** **Lab – Law of Constant Composition** **Lab – Mole Relationships**	
October - November	**ARRANGEMENT OF ELECTRONS IN ATOMS**	**SYSTEMS** STRUCTURE OF ATOMS	**3.2.10.A5** **3.2.C.A1** **3.2.C.A2** **3.2.12.A2** **3.2.C.A5**	**Electrons are found in quantized energy levels within the atom.** **Atoms strive to be most stable.**	**How does the quantum mechanical model describe the arrangement of electrons in atoms?** **What happens when electrons in atoms absorb or release energy?** **How are the Aufbau Principle, the Pauli Exclusion Principle, and Hund's Rule used to predict the most stable arrangement/structure of an atom?**	**Chapter Test** **Lab – Flame Test** **Lab – Electron Configurations**	
November	**THE PERIODIC**	**PATTERNS**	**3.2.C.A2** **3.2.C.A1**	**Chemical periodicity is the basis for the**	**What information does the periodic**	**Chapter Test**	

	LAW	STRUCTURE OF ATOMS		**arrangement of the periodic table.** **Trends in the periodic table can predict the properties and behaviors of elements.**	**table provide?** **How can periodic trends be explained?**	**Lab – Activity of Groups 1, 2, & 17** **Lab – Periodic Law**	
November - December	**CHEMICAL BONDING**	**INTERACTIONS**	**3.2.10.A3** **3.2.C.A1** **3.2.C.A2** **3.2.10.A1** **3.2.10.A2** **3.2.12.A2**	**Chemical bonding occurs as a result of attractive forces between particles.** **Chemical bonding can be covalent, ionic or metallic.**	**How does the distribution of electrons in atoms affect the formation and shape of a compound?** **How does bonding in molecular (covalent) compounds differ from the bonding in ionic compounds?** **How does metallic bonding affect the properties of metals?** **What factors affect molecular properties/shape?**	**Chapter Test** **Lab – Properties of Bond Types**	
December - January	**CHEMICAL FORMULAS & CHEMICAL COMPOUNDS**	**INTERACTIONS** STRUCTURE OF ATOMS THE MOLE QUANTIFYING MATTER	**3.2.C.A2**	**Chemical bonding and periodic trends are used to write chemical names and formulas for chemical compounds.** **Dimensional analysis is a mathematical technique that can be used to express stoichiometric relationships.**	**How does the periodic table help you determine the names and formulas of ions and compounds?** **What is the difference between an ionic and molecular compound?** **Why is the mole an important**	**Chapter Test** **Lab – Formulas and Oxidation Numbers** **Lab – Formula of a Hydrate** **Lab – Empirical Formula**	

					measurement in Chemistry? **How can the molecular formula of a compound be determined experimentally?**		
January - February	**CHEMICAL EQUATIONS AND REACTIONS**	**INTERACTIONS** REACTIONS	**3.2.C.A2** **3.2.C.A4** **3.2.10.A5** **3.2.10.A4**	**Chemical reactions are predictable.**	**How do chemical reactions obey the law of conservation of mass?** **How can you predict the products of a chemical reaction?** **What factors identify the types of chemical reactions?**	**Chapter Test** **Lab – Chemical Changes and Equations** **Lab – Chemical Reactions** **Lab – Activity Series**	
February	**STOICHIOMETRY**	**INTERACTIONS** **CONNECTIONS** THE MOLE REACTIONS	**3.2.C.A4** **3.2.C.A2** **3.2.C.A1** **3.2.10.A5**	**The amounts of reactants and products involved in a chemical reaction can be predicted using mole relationships.** **Dimensional analysis is a mathematical technique that can be used to express stoichiometric relationships.**	**How are balanced chemical equations used in stoichiometric calculations?** **How can you calculate amounts of reactants and products in chemical reactions?**	**Chapter Test** **Lab – Stoichiometry** **Lab - % Yield** **Lab – Sodium Chloride Experiment**	
March – April	**STATES OF MATTER**	**ENERGY** KINETIC THEORY	**3.2.C.A1** **3.2.C.A3**	**Changes in matter are accompanied by changes in energy.**	**What factors determine the physical state of a substance?** **What are**	**Chapter Test** **Lab – Heating Curve for Water** **Lab – Heat of**	

					characteristics that distinguish gases, liquids, and solids? **How do substances change from one state to another?** **How do the interactions between water molecules account for the unique properties of water?**	**Fusion of Ice**	
March	**GASES**	KINETIC THEORY	**3.2.C.A3** **3.2.10.A3**	**Changes in matter are accompanied by changes in energy.**	**How do gases respond to changes in pressure, volume, and temperature?** **Why is the ideal gas law useful even though ideal gases do not exist?**	**Chapter Test** **Lab – Hydrogen and Oxygen** **Lab – Charles' Law**	
April	**SOLUTIONS**	**INTERACTIONS** QUANTIFYING MATTER	**3.2.C.A1** **3.2.10.A4** **3.2.C.A2** **3.2.C.A4** **3.2.10.A5** **3.2.12.A1** **3.2.10.A2** **3.2.C.B2** **3.2.C.B3**	**Bond types and properties are used to describe the nature of a solution.**	**What properties are used to describe the nature of solutions?** **In what ways can you quantify the concentration of a solution?**	**Chapter Test** **Lab – Le Chatelier's Principle** **Lab – Effect of Temperature on Solubility** **Lab – Chromatography** **Lab - Conductivity**	
April - May	**IONS IN AQUEOUS**	**INTERACTIONS**	**3.2.C.A1** **3.2.10.A4**	**Bond types and properties are used to**	**How do aqueous solutions form?**	**Chapter Test**	

	SOLUTIONS AND COLLIGATIVE PROPERTIES		**3.2.C.A2** **3.2.C.A4** **3.2.10.A5** **3.2.12.A1** **3.2.10.A2**	**describe the nature of a solution.**		**Lab – Solubility** **Lab – Qualitative Analysis** **Lab – Molecular Mass Determination**	
May	**ACIDS AND BASES**	REACTIONS		**Acids and bases are defined according to their chemical makeup.**	**What are the different ways chemists define acids and bases?** **What does the pH of a solution mean?** **How do chemists use acid-base reactions?**	**Chapter Test** **Lab – Acid/Base Indicator** **Lab – Reactions of Acids** **Lab – Rainbow (pH)** **Lab - Titration**	

***** Some teachers may need to think about the assessments and resources used in order to determine the Big Ideas, Enduring Understandings, and Essential Questions embedded in their courses. At this point in your curriculum mapping, you might want to ignore the "Common Assessments" and "Common Resources Used" columns. However, you may use them if you wish.