Secondary Curriculum Maps



Cumberland Valley School District Soaring to Greatness, Committed to Excellence

Chemistry

Grade:			SUBJECT
Unit	Timeline	Topics	Priority Standards
		Scientific Method	3.2.10.A1.b Identify properties of matter.
1 Introduction to Chemistry	20 Days	Problem Solving and Conversions Significant Figures and Scientific	3.2.C.A1 Use the mole concept to determine number of particles and molar mass for elements and compounds
chemistry		Notation	
		Proper Lab Etiquette and Safety	
		Parts of the Periodic Table	3.2.10.A1.b Identify properties of matter.
		Classification and Properties of	3.2.10.A2.a Compare and contrast different bond types that result in the formation of molecules and compounds
2 Matter & Energy	20 Days	Matter Methods of Separation and Conservation of Matter	3.2.10.A3 Describe phases of matter according to the kinetic molecular theory.
		Energy and Work	3.2.C.A1 Use the mole concept to determine number of particles and molar mass for elements and compounds
		Heat, Temperature, and Phase	3.2.C.A4 Interpret and apply the laws of conservation of mass and energy.
	l	change Relationships	
		Development of the Atomic Theory of Matter	3.2.10.A1.a Predict properties of elements and their behavior using trends of the periodic table.
3. Atomic Theory & Nuclear Chemistry	18 Days	Atomic Structure	3.2.10.A1.b Identify properties of matter.
		Nuclear Chemistry	3.2.10.A3 Describe phases of matter according to the kinetic molecular theory.
			3.2.C.A1 Use the mole concept to determine number of particles and molar mass for elements and compounds
		Electron Configuration	3.2.10.A1.a Predict properties of elements and their behavior using trends of the periodic table.
4. Electron Structure &	16 Days	Development and Parts of the	3.2.10.43 Describe phases of matter according to the kinetic molecular theory
Periodic Table	10 Days	Periodic Table	S.2.10.85 Describe phases of matter according to the kinetic molecular theory.
		Periodicity	
		Parts of Ionic Compounds	3.2.10.A1.a Predict properties of elements and their behavior using trends of the periodic table.
5. Chemical	20 Days	Ionic and Molecular Nomenclature	3.2.10.A2.a Compare and contrast different bond types that result in the formation of molecules and compounds
and Stoichiometry		Formula Calculations	3.2.CA1 Use the mole concept to determine number of particles and molar mass for elements and compounds
		Mole Conversions	
		Contraction of Males Inc.	
		Using Lewis/Electron Dot Structures	3.2.10.A1.a Predict properties of elements and their benavior using trends of the periodic table.
6. Chemical Bonding	18 Days	to Show Covalent Bonding	3.2.10.A1.b Identify properties of matter.
• • • • •		Shape of Covalent Molecules and Molecular Geometry	3.2.10.A2.a Compare and contrast different bond types that result in the formation of molecules and compounds
			3.2.10.A4.a Describe chemical reactions in terms of atomic rearrangement and/or electron transfer
		Balancing and Classifying Chemical	
		Equations	5.2.10.A1.0 tuentity properties of matter.
7. Chemical	18 Davs	Identifying Physical Phases	3.2.10.A4.a Describe chemical reactions in terms of atomic rearrangement and/or electron transfer
Equations	-	Determine Mole Ratios for Conversions	3.2.10.A4.b Predict the amounts of products and reactants in a chemical reaction using mole relationships.
		Limiting Reactant Problems	3.2.C.A4 Interpret and apply the laws of conservation of mass and energy.
8. Gas Laws		Kinetic Molecular Theory of Matter	3.2.10.A1.b Identify properties of matter.
	15 Days	Relationships of Gas Variables	3.2.10.A4.b Predict the amounts of products and reactants in a chemical reaction using mole relationships.
		Dalton's Law and Graham's Law	3.2.10.A4.C identify the factors that affect the fates of reactions.
			SECAL OSC INCIDENCEDE ED UCCERTIFIC HUMBEL OF PARTICLES and motal mass for clements and compounds
		Solutions and Solubility	3.2.10.A3 Describe phases of matter according to the kinetic molecular theory.
9. Solutions, Kinetics, Thermodynamics, and Equilibrium	20 Days	Collision Theory	3.2.10.A4.a Describe chemical reactions in terms of atomic rearrangement and/or electron transfer
		Reaction Rate and Equilibrium	3.2.10.A4.b Predict the amounts of products and reactants in a chemical reaction using mole relationships.
			3.2.10.A4.c Identify the factors that affect the rates of reactions.
		<u> </u>	3.2.C.A1 Use the mole concept to determine number of particles and molar mass for elements and compounds
	I	<u> </u>	one contraction of and apply the laws of conservation of mass and energy.
		Acid and Base Theories	3.2.10.A1.b Identify properties of matter.
		Measuring and Calculating pH	3.2.10.A4.a Describe chemical reactions in terms of atomic rearrangement and/or electron transfer
10. Acids & Bases	15 Days	Neutralization Reactions	3.2.10.A4.b Predict the amounts of products and reactants in a chemical reaction using mole relationships.
			3.2.10.A4.c Identify the factors that affect the rates of reactions.
			3.2.C.A1 Use the mole concept to determine number of particles and molar mass for elements and compounds

CV Priority Standard/PA Academic Standard

3.2.10.A4.c Identify the factors that affect the rates of reactions.

Taught in Unit(s)

Unit 8: Gas Laws

Unit 9: Solutions, Kinetics, Thermodynamics and Equilibrium

Unit 10: Acids and Bases

Common Misconceptions

- 1. Students often believe that equilibrium means there are equal amounts of reactants and products.
- 2. Students struggle with applying logarithms in pH problems.
- 3. Students think that larger numbers in an exponent means that the number is larger.
- 4. Students will struggle with the power of ten differences in a pH value based on p function.

Big Idea(s)Big Idea(s)Matter can be understood by the interactions between atoms and within atoms.How can the gas laws be used to predict the behavior of gases?Matter can be understood by the interactions between atoms and within atoms.How can the gas laws be used to predict the behavior of gases?How are solutions characterized using solubility, colligative properties and concentration?How can one affect the rate and equilibrium position of a chemical reaction?How can one affect the rate and equilibrium position of a chemical reaction?What are the characteristics and properties of Acids and Bases?Unit 8 Test (common) Unit 9 Test (common)SkillsUnit 8 Test (common)(what students meed to know)Unit 8 • 7 gas laws • STPSkills• Unit 8 • Parts of a solution • Saturated, unsaturated, supersaturated • Molarity• Unit 9 • Erive factors on reaction rate • Dynamic equilibrium • LeChatelier's principle • Equilibrium constant• Unit 9 • Identify the parts of a solution • Read and interpret a simple solubility curve • Describe the five factors on reaction rates		
Matter can be understood by the interactions between atoms and within atoms.How can the gas laws be used to predict the behavior of gases?How can the gas laws be used to predict the behavior of gases?How can the gas laws be used to predict the behavior of gases?How can one affect the rate and equilibrium position of a chemical reaction?How can one affect the rate and equilibrium position of a chemical reaction?Unit 8 Test (common) Unit 9 Test (common) Unit 10 Test (common)What are the characteristics and properties of Acids and Bases?Unit 8 Test (common) Unit 10 Test (common)(what students need to know)Concepts (what students need to know)(what students must be able to do)Unit 8 • 7 gas laws • STPDescribe the relationship between pressure, temperature and volumePressure, temperature, and volumeDerive and perform calculations for the 7 different gas lawsUnit 9 • Parts of a solution • Saturated, unsaturated, supersaturated • Molarity • Five factors on reaction rate • Dynamic equilibrium • Lechatelier's principle • Equilibrium constantBescribe the five factors on reaction ratesDescribe the five factors on reaction ratesDynamic equilibrium • Lechatelier's principle • Equilibrium constantDescribe the five factors on reaction rates	Big Idea(s)	Essential Question(s)
between atoms and within atoms. between atoms and within atoms. between atoms and within atoms. between atoms and within atoms. behavior of gases? How are solutions characterized using solubility, colligative properties and concentration? How can one affect the rate and equilibrium position of a chemical reaction? What are the characteristics and properties of Acids and Bases? Assessments Unit 8 Test (common) Unit 9 Test (common) Unit 10 Test (common) Unit 10 Test (common) Unit 10 Test (common) Unit 10 Test (common) Unit 8 7 gas laws STP Pressure, temperature, and volume Drive and perform calculations for the 7 different gas laws Molarity Parts of a solution Saturated, unsaturated, supersaturated Molarity Prive factors on reaction rate Dynamic equilibrium LeChatelier's principle Equilibrium constant Molarity is calculated Describe the five factors on reaction rates Describe the five factors on reaction rates	Matter can be understood by the interactions	How can the gas laws be used to predict the
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 LeChatelier's principle Equilibrium constant Describe how molarity is calculated Describe the five factors on reaction rates 	Dynamic equilibrium	• Read and interpret a simple solubility curve
Equilibrium constant Describe the five factors on reaction rates	• LeChatelier's principle	• Describe how molarity is calculated
	• Equilibrium constant	• Describe the five factors on reaction rates
and a reaction mechanism	1	and a reaction mechanism
• Unit 10 • Draw energy diagrams for reactions and	• Unit 10	 Draw energy diagrams for reactions and
• Acids vs bases show reactants, products, change in energy,	Acids vs bases	show reactants, products, change in energy,
 Arrhenius theory activation energy, and labeled axes 	• Arrhenius theory	activation energy, and labeled axes
 Bronsted -Lowry Write equilibrium constant expressions and 	Bronsted -Lowry	• Write equilibrium constant expressions and
Neutralization reactions calculate the equilibrium constant	Neutralization reactions	calculate the equilibrium constant
pH Annly LeChatlier's Principle to determine	• nH	 Apply LeChatlier's Principle to determine
 Concentration of hydronium ion and Concentration of hydronium ion and 	 Concentration of hydronium ion and 	how equilibrium will shift

hydroxide ion	 Unit 10 List properties of acids and bases Define acids and bases according to Arrhenius and Bronsted-Lowry Identify acids and bases as strong or weak and write ionization equations Calculate [H30+] for strong and weak acids and [OH-] for strong bases
	 Identify acids and bases as strong or weak
	and write ionization equations
	 Calculate [H30⁺] for strong and weak acids
	and [OH-] for strong bases
	 Calculate pH using the log formula and
	identify a solution as acidic, basic, or neutral
	 Identify Bronsted-Lowry acids, Bronsted-
	Lowry bases, conjugate acids, conjugate
	bases, and conjugate pairs

CV Priority Standard/PA Academic Standard		
3.2.C.A4 Interpret and apply the laws of conservation of mass and energy.		
Taught in Unit(s)		
Unit 2: Matter and Energy		
Unit 7: Chemical Equations	1 .	
Unit 9: Solutions, Kinetics, Thermodynamics and Equili	brium	
Common Misconceptions	······································	
1. Students often change subscripts when balancin	ig equations with coefficients	
2. Students will often struggle with now a supersa	turated solution is formed.	
5. Students will struggle to understand that energy while endothermic reactions are a positive value		
while endother file reactions are a positive valu		
Big Idea(s)	Essential Question(s)	
Matter and energy interact in predictable ways.	What are matter and energy interactions and	
	how is matter and energy classified through	
	change (reactions)?	
	How do balanced equations describe and	
	represent chemical reactions?	
	How are solutions characterized using solubility,	
	colligative properties and concentration?	
	How can one affect the rate and equilibrium	
	position of a chemical reaction?	
Assessi	ments	
Unit 2 Test (common)		
Unit 9 Test (common)		
Concents	Skills	
(what students need to know)	(what students must be able to do)	
• Unit 2	• Unit 2	
 Substance vs mixture 	 Classify matter 	
 Homogeneous vs heterogeneous 	 Classify properties as intensive physical, 	
• 5 types of compounds	extensive physical, or chemical	
• 3 types of elements	• Classify changes as physical, chemical, or	
 Forms of energy 	nuclear	
• Exothermic vs endothermic	 Describe how the law of conservation of 	
 Energy conversions 	mass and energy relate to a chemical	
 Heat capacity 	reaction	
 Types of changes and properties 	 Differentiate between potential and kinetic 	
	energy and the 7 forms of energy	
• Unit 7	 Describe the difference between the 3 states 	
 5 types of chemical reactions 	of matter	
Activity series Solubility to black	 Describe and give examples of exothermic 	
 Solubility table Limiting vs success vssctants 	and endothermic reactions	
Limiting vs excess reactants	 Perform calculations using the specific heat 	
 Oxidation vs reduction 	capacity equation	
Init 9	● Ilnit 7	
 Parts of a solution 	 Classify and balance chemical reactions 	
 Saturated, unsaturated, supersaturated 		
- Suturateu, ansuturateu, supersuturateu		

Molarity	• Write word, sentence, and chemical
• Five factors on reaction rate	equations
 Dynamic equilibrium 	 Predict if single and double replacements
 LeChatelier's principle 	will occur
• Equilibrium constant	 Solve stoichiometry problems using the expanded mole diagram
	 Identify limiting and excess reactants
	 Determine oxidation numbers of each
	element in a formula
	 Identify the element that is oxidized and the element that is reduced and write oxidation and reduction half reactions
	• Unit 9
	 Identify the parts of a solution
	• Read and interpret a simple solubility curve
	 Describe how molarity is calculated
	 Describe the five factors on reaction rates
	and a reaction mechanism
	Draw on any diagrams for reactions and
	Draw energy utagranis for reactions and
	snow reactants, products, change in energy,
	activation energy, and labeled axes
	 Write equilibrium constant expressions and
	calculate the equilibrium constant
	 Apply LeChatlier's Principle to determine
	how equilibrium will shift

CV Priority Standard/PA Academic Standard		
3.2.C.A1 Use the mole concept to determine the number of particles and molar mass for elements and		
compounds.		
Taught i	n Unit(s)	
Unit 1: Introduction to Chemistry		
Unit 2: Matter and Energy		
Unit 3: Atomic Theory and Nuclear Chemistry		
Unit 5: Chemical Formulas, the Mole, and Stoichiometr	У	
Unit 8: Gas Laws		
Unit 9: Solutions, Kinetics, Thermodynamics and Equil	ibrium	
Unit 10: Acids and Bases		
Common Misconceptions		
1. Initially, students struggle with understanding	that the mole is a number, and understanding the	
magnitude of a mole.		
2. Students will often confuse mole and molecule		
3. Once added to stoichiometry, students often th	ink they need to place the coefficient with the mole	
when using unit analysis to convert to grams.		
4. Students think that larger numbers in an export	nent(power of ten) means that the number is larger.	
Negative powers of ten are smaller values that	cause slight confusion.	
Big Idea(s)	Essential Question(s)	
Chemists use the mole and mathematical	How does the use of the scientific process in	
relationship to relate chemicals and reactions.	chemistry allow us to describe and better	
	understand the physical world around us?	
	What are matter and energy interactions and	
	how is matter and energy classified through	
	change (reactions)?	
	How is the atomic theory of matter used to	
	describe and explain the atomic and nuclear	
	structure of atoms?	
	what are the characteristics of ionic compounds	
	and now are ionic compounds named to reflect	
	these characteristics?	
	How can the gas laws be used to predict the	
	behavior of gases?	
	How are solutions characterized using solubility,	
	colligative properties and concentration?	
	How can one offect the rate and actuilibrium	
	How can one affect the rate and equilibrium	
	position of a chemical reaction?	
	What are the characteristics as here with a	
	What are the characteristics and properties of	
· · · · · ·	ACIUS and Bases?	
Assessments		
Unit 1 Test (common)		
Unit 2 Test (common)		
Unit 3 Test (common)		

Unit 5 Test (common) Unit 8 Test (common) Unit 9 Test (common) Unit 10 Test (common)

Unit 10 Test (common)			
Concepts	Skills		
(what students need to know)	(what students must be able to do)		
• Unit 1	• Unit 1		
 Inorganic vs organic 	 Differentiate between the branches of 		
 Qualitative vs quantitative 	chemistry		
 Mass vs weight 	 Differentiate between qualitative and 		
• Accuracy vs precision	quantitative observations		
• Direct vs inverse relationships	• Graph and differentiate between inverse,		
• Density	direct, and no relationship in graphical data		
 Common lab equipment 	• Solve problems for converting units using		
• SI base units	dimensional analysis		
• Kelvin vs Celsius	 Correctly report a measurement using a 		
• Metric system	ruler, graduated cylinder, thermometer, and		
• Convert units	balance		
	 Identify and properly use lab equipment 		
• Unit 2	• Determine the number of significant figures		
• Substance vs mixture	in a measurement and apply the rules to		
 Homogeneous vs heterogeneous 	calculations		
• 5 types of compounds	 Convert standard form to scientific notation 		
• 3 types of elements	and vice versa		
• Forms of energy			
 Exothermic vs endothermic 	• Unit 2		
• Energy conversions	 Classify matter 		
• Heat capacity	• Classify properties as intensive physical.		
 Types of changes and properties 	extensive physical. or chemical		
	 Classify changes as physical, chemical, or 		
• Unit 3	nuclear		
 Subatomic particles 	 Describe how the law of conservation of 		
• Atoms vs ions	mass and energy relate to a chemical		
• 3 types of radiation	reaction		
• 6 atomic models	 Differentiate between potential and kinetic 		
• Fission vs. Fusion	energy and the 7 forms of energy		
 Molar mass vs average atomic mass 	• Describe the difference between the 3 states		
	of matter		
• Unit 5	Describe and give examples of exothermic		
Diatomic molecules	and endothermic reactions		
 Polyatomic ions 	Perform calculations using the specific heat		
• Chemical formulas	capacity equation		
• Convert between mass, mole, number of			
particles and volume	• Unit 3		
 Avogadro's number 	• Describe the six models of atom evolution		
 Monatomic vs polyatomic 	• Differentiate between protons, neutrons, and		
• Oxidation	electrons		
	• Determine the molar mass of a compound		
• Unit 8	• Calculate original and final masses for		
• 7 gas laws	radioactive isotopes using half-life equation		
• STP	• Calculate the weighted average atomic mass		
• Pressure, temperature, and volume	of an element		

• Identify which type of radiation has the most penetrating power

• Parts of a solution

• Saturated, unsaturated, supersaturated

- Molarity
- Five factors on reaction rate
- Dynamic equilibrium
- LeChatelier's principle
- Equilibrium constant
- Unit 10
- Acids vs bases
- Arrhenius theory
- Bronsted -Lowry
- Neutralization reactions
- pH
- Concentration of hydronium ion and hydroxide ion

• Unit 5

- Determine the number of atoms present in a formula
- Identify the 7 diatomic molecules and polyatomic ions
- Differentiate between and calculate empirical, molecular, and structural formulas
- Identify a compound as ionic or molecular by its formula and perform ionic, molecular, and hydrate nomenclature
- Identify cations that do not require roman numerals in nomenclature
- Describe the concept of the mole, state Avogadro's number, and use the mole to convert units

• Unit 8

- Describe the relationship between pressure, temperature and volume
- Derive and perform calculations for the 7 different gas laws
- Know and apply the concepts of standard temperature and pressure (STP)

• Unit 9

- Identify the parts of a solution
- Read and interpret a simple solubility curve
- Describe how molarity is calculated
- Describe the five factors on reaction rates and a reaction mechanism
- Draw energy diagrams for reactions and show reactants, products, change in energy, activation energy, and labeled axes
- Write equilibrium constant expressions and calculate the equilibrium constant
- Apply LeChatlier's Principle to determine how equilibrium will shift

- List properties of acids and bases
- Define acids and bases according to Arrhenius and Bronsted-Lowry
- Identify acids and bases as strong or weak and write ionization equations
- Calculate [H3O+] for strong and weak acids and [OH-] for strong bases
- Calculate pH using the log formula and identify a solution as acidic, basic, or neutral
- Identify Bronsted-Lowry acids, Bronsted-Lowry bases, conjugate acids, conjugate bases, and conjugate pairs

CV Priority Standard/PA Academic Standard 3.2.10.A4.b Predict the amounts of products and reactants in a chemical reaction using mole relationships. Taught in Unit(s) **Unit 7: Chemical Equations** Unit 8: Gas Laws Unit 9: Solutions, Kinetics, Thermodynamics and Equilibrium Unit 10: Acids and Bases **Common Misconceptions** Students will confuse the coefficients in chemical reactions representing moles, volume or particles. Students will confuse the use of subscripts for balancing charges and the use of coefficients for balancing a reaction. Students will think that dynamic equilibrium means that the quantity of reactants and products will be equal when they are remaining constant when the forward reaction and reverse reaction rates are equal. Big Idea(s) **Essential Question(s)** Chemists use the mole and mathematical How do balanced equations describe and relationship to relate chemicals and reactions. represent chemical reactions? How can the gas laws be used to predict the behavior of gases? How are solutions characterized using solubility, colligative properties and concentration? How can one affect the rate and equilibrium position of a chemical reaction? What are the characteristics and properties of Acids and Bases? Assessments Unit 7 Test (common) Unit 8 Test (common) Unit 9 Test (common) Unit 10 Test (common) Skills Concepts (what students need to know) (what students must be able to do) • Unit 7 Unit 7 • 5 types of chemical reactions • Classify and balance chemical reactions • Activity series • Write word, sentence, and chemical • Solubility table equations • Limiting vs excess reactants • Predict if single and double replacements • Oxidation vs reduction will occur • Solve stoichiometry problems using the • Unit 8 expanded mole diagram • 7 gas laws • Identify limiting and excess reactants • Determine oxidation numbers of each • STP • Pressure, temperature, and volume element in a formula Identify the element that is oxidized and the • Unit 9 element that is reduced and write oxidation • Parts of a solution and reduction half reactions • Saturated, unsaturated, supersaturated • Unit 8 Molarity

• Five factors on reaction rate

- Dynamic equilibrium
- LeChatelier's principle
- Equilibrium constant
- Unit 10
- Acids vs bases
- Arrhenius theory
- Bronsted -Lowry
- Neutralization reactions
- pH
- Concentration of hydronium ion and hydroxide ion

- Describe the relationship between pressure, temperature and volume
- Derive and perform calculations for the 7 different gas laws
- Know and apply the concepts of standard temperature and pressure (STP)

- Identify the parts of a solution
- Read and interpret a simple solubility curve
- Describe how molarity is calculated
- Describe the five factors on reaction rates and a reaction mechanism
- Draw energy diagrams for reactions and show reactants, products, change in energy, activation energy, and labeled axes
- Write equilibrium constant expressions and calculate the equilibrium constant
- Apply LeChatlier's Principle to determine how equilibrium will shift
- Unit 10
- List properties of acids and bases
- Define acids and bases according to Arrhenius and Bronsted-Lowry
- Identify acids and bases as strong or weak and write ionization equations
- Calculate [H3O+] for strong and weak acids and [OH-] for strong bases
- Calculate pH using the log formula and identify a solution as acidic, basic, or neutral
- Identify Bronsted-Lowry acids, Bronsted-Lowry bases, conjugate acids, conjugate bases, and conjugate pairs

CV Priority Standard/PA Academic Standard

3.2.10.A4.a Describe chemical reactions in terms of atomic rearrangement and/or electron transfer

Taught in Unit(s)

Unit 6: Chemical Bonding

Unit 7: Chemical Equations

Unit 9: Solutions, Kinetics, Thermodynamics and Equilibrium

Unit 10: Acids and Bases

Common Misconceptions

Students will confuse the types of acids and bases.

Students will mix up the nonpolar and polar bond types in covalent compounds.

Students will not balance equations correctly which will change the stoichiometry calculations that go along with them.

Students will mix up the effects of concentration, temperature and pressure changes in reactions using LeChatelier's principle.

Big Idea(s)	Essential Question(s)
Matter can be understood by the interactions	What are the characteristics of covalent
between atoms and within atoms.	molecules?
	How do balanced equations describe and
	represent chemical reactions?
	How are solutions characterized using solubility
	colligative properties and concentration?
	How can one affect the rate and equilibrium
	position of a chemical reaction?
	What are the characteristics and monortise of
	Acids and Bases?
Asses	sments
Unit 6 Test (common)	
Unit 7 Test (common)	
Unit 9 Test (common)	
Unit 10 Test (common)	
Concepts	Skills
(what students need to know)	(what students must be able to do)
• Unit 6	• Unit 6
 Lewis structure 	 State the reason why atoms bond and how
• VSEPR	ionic and covalent bonds form
 Ball-and-stick vs space-filling 	 Draw Lewis dot symbols and structures for
• Polarity	atoms, ions and molecules
 Single, double, and triple bonds Dipole 	 Predict the geometry of molecules using VSEPR
	 Determine the polarity of bonds and
• Unit 7	molecules
 5 types of chemical reactions 	 Describe how a hydrogen bond occurs
 Activity series 	 Describe the polarity and bonding of water
 Solubility table 	
 Limiting vs excess reactants 	• Unit 7
 Oxidation vs reduction 	 Classify and balance chemical reactions

- Parts of a solution
- Saturated, unsaturated, supersaturated
- Molarity
- Five factors on reaction rate
- Dynamic equilibrium
- LeChatelier's principle
- Equilibrium constant

• Unit 10

- Acids vs bases
- Arrhenius theory
- Bronsted -Lowry
- Neutralization reactions
- pH
- Concentration of hydronium ion and hydroxide ion

- Write word, sentence, and chemical equations
- Predict if single and double replacements will occur
- Solve stoichiometry problems using the expanded mole diagram
- Identify limiting and excess reactants
- Determine oxidation numbers of each element in a formula
- Identify the element that is oxidized and the element that is reduced and write oxidation and reduction half reactions
- Unit 9
- Identify the parts of a solution
- Read and interpret a simple solubility curve
- Describe how molarity is calculated
- Describe the five factors on reaction rates and a reaction mechanism
- Draw energy diagrams for reactions and show reactants, products, change in energy, activation energy, and labeled axes
- Write equilibrium constant expressions and calculate the equilibrium constant
- Apply LeChatlier's Principle to determine how equilibrium will shift

- List properties of acids and bases
- Define acids and bases according to Arrhenius and Bronsted-Lowry
- Identify acids and bases as strong or weak and write ionization equations
- Calculate [H3O⁺] for strong and weak acids and [OH⁻] for strong bases
- Calculate pH using the log formula and identify a solution as acidic, basic, or neutral
- Identify Bronsted-Lowry acids, Bronsted-Lowry bases, conjugate acids, conjugate bases, and conjugate pairs

CV Priority Standard/PA Academic Standard			
3.2.10.A3 Describe phases of matter according to the kinetic molecular theory.			
Taught in Unit(s)			
Unit 2: Matter and Energy			
Unit 3: Atomic Theory and Nuclear Chemistry			
Unit 4: Electron Structure and Periodic Table			
Unit 9: Solutions, Kinetics, Thermodynamics and Equili	brium		
Common Misconceptions			
Students will not recognize the difference between the	three kinetic molecular energies of translational,		
Vibrational and rotational energy.	ifferent veriables are shanged using LeChataliar's		
principle	inerent variables are changed using Lechatener s		
Students will confuse the trends on the periodic table			
Big Idea(s)	Essential Question(s)		
Scientific processes allow us to describe and better	What are matter and energy interactions and		
understand the physical world around us.	how is matter and energy classified through		
understand the physical world around as.	change (reactions)?		
	How is the atomic theory of matter used to		
	describe and explain the atomic and nuclear		
	structure of atoms?		
	How can the periodic table be used to predict the		
	properties of elements?		
	How are solutions characterized using solubility,		
	colligative properties and concentration?		
	How can one affect the rate and equilibrium		
	now call one affect the rate and equilibrium		
Assess	ments		
Unit 2 Test (common)			
Unit 3 Test (common)			
Unit 4 Test (common)			
Unit 9 Test (common)			
Concepts Skills			
(what students need to know)	(what students must be able to do)		
• Unit 2	• Unit 2		
• Substance vs mixture	Classify matter		
 Homogeneous vs heterogeneous 	 Classify properties as intensive physical, 		
 5 types of compounds 	extensive physical, or chemical		
• 3 types of elements	 Classify changes as physical, chemical, or 		
• Forms of energy	nuclear		
• Exothermic vs endothermic	 Describe how the law of conservation of 		
 Energy conversions 	mass and energy relate to a chemical		
Heat capacity	reaction		
 Types of changes and properties 	 Differentiate between potential and kinetic 		
	energy and the / forms of energy		
 UIIIL 5 Subatomic particles 	 Describe the uniference between the 3 states of matter 		
 Subatomic particles Atoms vs ions 	• Describe and give examples of evothermic		
 Atoms vs rolls Atoms of radiation 	 Describe and give examples of exothermic and endothermic reactions 		
• 5 types of radiation	מווע בוועטנוופן ווווג ובמנגוטווג		

• 6 atomic models

- Fission vs. Fusion
- Molar mass vs average atomic mass
- Unit 4
- Groups and Families on p.t.
- Electron configuration
- Electron structure
- Mendeleev vs Moseley
- Atomic radius, ionization energy, electronegativity, reactivity
- Valence electrons

• Unit 9

- Parts of a solution
- Saturated, unsaturated, supersaturated
- Molarity
- Five factors on reaction rate
- Dynamic equilibrium
- LeChatelier's principle
- Equilibrium constant

• Perform calculations using the specific heat capacity equation

• Unit 3

- Describe the six models of atom evolution
- Differentiate between protons, neutrons, and electrons
- Determine the molar mass of a compound
- Calculate original and final masses for radioactive isotopes using half-life equation
- Calculate the weighted average atomic mass of an element
- Identify which type of radiation has the most penetrating power
- Unit 4
- Describe the history of the periodic table
- Describe the electronic structure of the atom in terms of energy levels, sublevels, and orbitals
- Write the electron configuration, noble gas core notation, and orbital diagrams for elements and ions
- State the trends for atomic radius ionization energy, electronegativity, reactivity of metals and reactivity of nonmetals

- Identify the parts of a solution
- Read and interpret a simple solubility curve
- Describe how molarity is calculated
- Describe the five factors on reaction rates and a reaction mechanism
- Draw energy diagrams for reactions and show reactants, products, change in energy, activation energy, and labeled axes
- Write equilibrium constant expressions and calculate the equilibrium constant
- Apply LeChatlier's Principle to determine how equilibrium will shift

CV Priority Standard/PA Academic Standard			
3.2.10.A2.a Compare and contrast different bond types that result in the formation of molecules and			
compounds			
Taught in	n Unit(s)		
Unit 2: Matter and Energy			
Unit 5: Chemical Formulas, the Mole, and Stoichiometr	у		
Unit 6: Chemical Equations			
Common Misconceptions			
Students will struggle to differentiate ionic and covalent compounds. Students will struggle to assign charges to ions and therefore misrepresent the compounds ionic formula. Students will confuse bond polarity and calculating electronegativity differences. Students will struggle with symmetry which makes labeling molecule polarity difficult.			
Big Idea(s)	Essential Question(s)		
Matter can be understood by the interactions between atoms and within atoms.	What are matter and energy interactions and how is matter and energy classified through change (reactions)?		
	What are the characteristics of ionic compounds and how are ionic compounds named to reflect these characteristics?		
	What are the characteristics of covalent molecules?		
Assess	ments		
Unit 2 Test (common)			
Unit 5 Test (common)			
Unit 6 Test (common)			
Concepts	Skills		
(what students need to know)	(what students must be able to do)		
• Unit 2	• Unit 2 Classify matter		
Substance vs mixture	 Classify matter Classify properties as intensive physical 		
 Homogeneous vs neterogeneous 5 types of compounds 	• classify properties as intensive physical,		
 Stypes of compounds 2 types of cloments 	Classify changes as physical, chemical or		
• 5 types of elements	Classify changes as physical, chemical, of		
 Forms of chergy Evothermic vs endothermic 	 Describe how the law of conservation of 		
Fnergy conversions	mass and energy relate to a chemical		
 Heat canacity 	reaction		
 Types of changes and properties 	 Differentiate between potential and kinetic 		
	energy and the 7 forms of energy		
• Unit 5	• Describe the difference between the 3 states		
 Diatomic molecules 	of matter		
Polyatomic ions	• Describe and give examples of exothermic		
Chemical formulas	and endothermic reactions		
 Convert between mass, mole, number of particles and volume 	 Perform calculations using the specific heat capacity equation 		
• Avogadro's number	······································		
 Monatomic vs polvatomic 	• Unit 5		
• Oxidation	 Determine the number of atoms present in a formula 		
• Unit 6	101 IIIuia		

 Lewis structure 	 Identify the 7 diatomic molecules and
• VSEPR	nolvatomic ions
 Pall and stick vs space filling 	 Differentiate between and calculate
Ball-and-stick vs space-mining	Differentiate between and calculate
Polarity	empirical, molecular, and structural formulas
Single, double, and triple bonds	 Identify a compound as ionic or molecular by
• Dinole	its formula and perform ionic, molecular, and
	hudrate nomen elature
	Identify cations that do not require roman
	numerals in nomenclature
	 Describe the concept of the mole. state
	Avogadro's number and use the mole to
	nvogaaro 5 namber, and use the more to
	convert units
	● Unit 6
	State the reason why atoms hond and how
	• State the reason why atoms bond and now
	 Draw Lewis dot symbols and structures for
	atoms, ions and molecules
	Predict the geometry of molecules using
	VSFPR
	 Determine the polarity of honds and
	• Determine the polarity of bolius and
	molecules
	 Describe how a hydrogen bond occurs
	 Describe the polarity and bonding of water

CV Priority Standard/PA Academic Standard		
3.2.10.A1.b Identify properties of matter.		
Taught i	n Unit(s)	
Unit 1: Introduction to Chemistry		
Unit 2: Matter and Energy		
Unit 3: Atomic Theory and Nuclear Chemistry		
Unit 6: Chemical Bonding		
Unit 7: Chemical Equations		
Unit 8: Gas Laws		
Unit 10: Acids and Bases		
Common Misconceptions		
1. Differentiation of intensive physical and extensive p	hysical properties.	
2. Understanding the difference in polarity of bonds ve	rsus polarity of a molecule can be difficult for	
students.		
3. Differentiation between assigning liquid versus aque	eous phases of matter.	
	-	
Big Idea(s)	Essential Question(s)	
Scientific processes allow us to describe and better	How does the use of the scientific process in	
understand the physical world around us.	chemistry allow us to describe and better	
	understand the physical world around us?	
	What are matter and energy interactions and	
	how is matter and energy classified through	
	change (reactions)?	
	How is the atomic theory of matter used to	
	describe and explain the atomic and nuclear	
	structure of atoms?	
What are the characteristics of covalent		
molecules?		
	How do balanced equations describe and	
	represent chemical reactions?	
	1	
	How can the gas laws be used to predict the	
	behavior of gases?	
	~	
	What are the characteristics and properties of	
	Acids and Bases?	
Assessments		
Unit 1 Test (common)		
Unit 2 Test (common)		
Unit 3 Test (common)		
Unit 6 Test (common)		
Unit 7 Test (common)		
Unit 8 Test (common)		
Unit 10 Test (common)		
Concepts	Skills	
(what students need to know)	(what students must be able to do)	
(What statents need to know)	(what statents must be usic to do)	

- Inorganic vs organic
- Qualitative vs quantitative
- Mass vs weight
- Accuracy vs precision
- Direct vs inverse relationships
- Density
- Common lab equipment
- SI base units
- Kelvin vs Celsius
- Metric system
- Convert units

• Unit 2

- Substance vs mixture
- Homogeneous vs heterogeneous
- 5 types of compounds
- 3 types of elements
- Forms of energy
- Exothermic vs endothermic
- Energy conversions
- Heat capacity
- Types of changes and properties
- Unit 3
- Subatomic particles
- Atoms vs ions
- 3 types of radiation
- 6 atomic models
- Fission vs. Fusion
- Molar mass vs average atomic mass
- Unit 6
- Lewis structure
- VSEPR
- Ball-and-stick vs space-filling
- Polarity
- Single, double, and triple bonds
- Dipole

- 5 types of chemical reactions
- Activity series
- Solubility table
- Limiting vs excess reactants
- Oxidation vs reduction
- Unit 8
- 7 gas laws
- STP
- Pressure, temperature, and volume
- Unit 10
- Acids vs bases
- Arrhenius theory

- Unit 1
- Differentiate between the branches of chemistry
- Differentiate between qualitative and quantitative observations
- Graph and differentiate between inverse, direct, and no relationship in graphical data
- Solve problems for converting units using dimensional analysis
- Correctly report a measurement using a ruler, graduated cylinder, thermometer, and balance
- Identify and properly use lab equipment
- Determine the number of significant figures in a measurement and apply the rules to calculations
- Convert standard form to scientific notation and vice versa
- Unit 2
- Classify matter
- Classify properties as intensive physical, extensive physical, or chemical
- Classify changes as physical, chemical, or nuclear
- Describe how the law of conservation of mass and energy relate to a chemical reaction
- Differentiate between potential and kinetic energy and the 7 forms of energy
- Describe the difference between the 3 states of matter
- Describe and give examples of exothermic and endothermic reactions
- Perform calculations using the specific heat capacity equation
- Unit 3
- Describe the six models of atom evolution
- Differentiate between protons, neutrons, and electrons
- Determine the molar mass of a compound
- Calculate original and final masses for radioactive isotopes using half-life equation
- Calculate the weighted average atomic mass of an element
- Identify which type of radiation has the most penetrating power
- Unit 6
- State the reason why atoms bond and how ionic and covalent bonds form
- Draw Lewis dot symbols and structures for atoms, ions and molecules

- Bronsted -Lowry
- Neutralization reactions
- pH
- Concentration of hydronium ion and hydroxide ion
- Predict the geometry of molecules using VSEPR
- Determine the polarity of bonds and molecules
- Describe how a hydrogen bond occurs
- Describe the polarity and bonding of water

- Classify and balance chemical reactions
- Write word, sentence, and chemical equations
- Predict if single and double replacements will occur
- Solve stoichiometry problems using the expanded mole diagram
- Identify limiting and excess reactants
- Determine oxidation numbers of each element in a formula
- Identify the element that is oxidized and the element that is reduced and write oxidation and reduction half reactions
- Unit 8
- Describe the relationship between pressure, temperature and volume
- Derive and perform calculations for the 7 different gas laws
- Know and apply the concepts of standard temperature and pressure (STP)
- Unit 10
- List properties of acids and bases
- Define acids and bases according to Arrhenius and Bronsted-Lowry
- Identify acids and bases as strong or weak and write ionization equations
- Calculate [H3O+] for strong and weak acids and [OH-] for strong bases
- Calculate pH using the log formula and identify a solution as acidic, basic, or neutral
- Identify Bronsted-Lowry acids, Bronsted-Lowry bases, conjugate acids, conjugate bases, and conjugate pairs

CV Priority Standard /PA Academic Standard	
3.2.10.A1.a Predict properties of elements and their behavior using trends of the periodic table.	
Taught in Unit(s)	
Unit 3: Atomic Structure and Nuclear	
Unit 4: Electron Structure and Periodic Table	
Unit 5: Chemical Formulas, the Mole, and Stoichiometry	
Unit 6: Chemical Bonding	
Common Misconceptions	
 Students will often confuse the alkali metals and the alkaline earth metals when categorizing groups. Students will struggle with the "d" and "f" sublevel arrangements in an electron configuration. When writing a chemical formula for an ionic compound, the criss-cross method can cause confusion with empirical formula. (should be avoided unless students are confused) 	
Big Idea(s)	Essential Question(s)
Scientific processes allow us to describe and better understand the physical world around us.	How is the atomic theory of matter used to describe and explain the atomic and nuclear structure of atoms?
	How can the periodic table be used to predict the properties of elements?
	What are the characteristics of ionic compounds and how are ionic compounds named to reflect these characteristics?
	What are the characteristics of covalent molecules?
Assessments	
Unit 3 Test (common)	
Unit 4 Test (common)	
Unit 5 Test (common)	
Unit 6 Test (common)	<u>cl.'II</u> _
Concepts	SKIIIS
Init 3	Init 3
 Subatomic particles 	 Describe the six models of atom evolution
 Atoms vs ions 	 Differentiate between protons, neutrons, and
 3 types of radiation 	electrons
• 6 atomic models	 Determine the molar mass of a compound
• Fission vs. Fusion	• Calculate original and final masses for
 Molar mass vs average atomic mass 	radioactive isotopes using half-life equation
	• Calculate the weighted average atomic mass
• Unit 4	of an element
 Groups and Families on p.t. 	 Identify which type of radiation has the most
Electron configuration	penetrating power
Electron structure	
 Mendeleev vs Moseley Atomic redius invitation 	 Unit 4 Describe the history of the second list of the
 Atomic radius, ionization energy, algorithm reactivity, reactivity. 	 Describe the nistory of the periodic table Describe the electronic structure of the structure
 Valence electrons 	• Describe the electronic structure of the atom
	orbitals
• Unit 5	

- Diatomic molecules
- Polyatomic ions
- Chemical formulas
- Convert between mass, mole, number of particles and volume
- Avogadro's number
- Monatomic vs polyatomic
- Oxidation
- Unit 6
- Lewis structure
- VSEPR
- Ball-and-stick vs space-filling
- Polarity
- Single, double, and triple bonds
- Dipole

- Write the electron configuration, noble gas core notation, and orbital diagrams for elements and ions
- State the trends for atomic radius ionization energy, electronegativity, reactivity of metals and reactivity of nonmetals

- Determine the number of atoms present in a formula
- Identify the 7 diatomic molecules and polyatomic ions
- Differentiate between and calculate empirical, molecular, and structural formulas
- Identify a compound as ionic or molecular by its formula and perform ionic, molecular, and hydrate nomenclature
- Identify cations that do not require roman numerals in nomenclature
- Describe the concept of the mole, state Avogadro's number, and use the mole to convert units
- Unit 6
- State the reason why atoms bond and how ionic and covalent bonds form
- Draw Lewis dot symbols and structures for atoms, ions and molecules
- Predict the geometry of molecules using VSEPR
- Determine the polarity of bonds and molecules
- Describe how a hydrogen bond occurs
- Describe the polarity and bonding of water