Chemistry

State Standard Number	State Standard Area / Description	Unit Name	Course Topic Description
1	Apply inquiry-based and problem-solving processes and skills to scientific investigations.		
1.a	Use current technologies such as CD-ROM, DVD, Internet, and on-line data search to explore current research related to a specific topic.	The Scientific Method, Significant Figures and Energy	Discovery Writing
1.b	Clarify research questions and design laboratory investigations.	The Scientific Method, Significant Figures and Energy	Measurement Lab
1.c	Demonstrate the use of scientific inquiry and methods to formulate, conduct, and evaluate laboratory investigations (e.g., hypotheses, experimental design, observations, data analyses, interpretations, theory development).	The Scientific Method, Significant Figures and Energy	Measurement Lab
1.d	Organize data to construct graphs (e.g., plotting points, labeling x-and y-axis, creating appropriate titles and legends for circle, bar, and line graphs), draw conclusions, and make inferences.		
1.e	Evaluate procedures, data, and conclusions to critique the scientific validity of research.		
1.f	Formulate and revise scientific explanations and models using logic and evidence (data analysis).	Mole/Chemical Composition	Empirical Lab
1.g	Collect, analyze, and draw conclusions from data to create a formal presentation using available technology (e.g., computers, calculators, SmartBoard, CBL's, etc.)	Mole/Chemical Composition	Empirical Lab
2	Demonstrate an understanding of the atomic model of matter by explaining atomic structure and chemical bonding.		

Chemistry

2.a	Describe and classify matter based on physical and chemical properties and interactions between molecules or atoms.		
2.a.1	Physical properties (e.g., melting points, densities, boiling points) of a variety of substances	Chemistry Fundamentals	Chemical versus Physical Properties
2.a.2	Substances and mixtures	Chemistry Fundamentals	Classification of Matter
2.a.3	Three states of matter in terms of internal energy, molecular motion, and the phase transitions between them	Chemistry Fundamentals	Sates and Changes of Matter
2.b	Research and explain crucial contributions and critical experiments of Dalton, Thomson, Rutherford, Bohr, de Broglie, and Schrõdinger and describe how each discovery contributed to the current model of atomic and nuclear structure.	Chemistry Fundamentals	Atom
2.c	Develop a model of atomic and nuclear structure based on theory and knowledge of fundamental particles.		
2.c.1	Properties and interactions of the three fundamental particles of the atom	Chemistry Fundamentals	Atom

Chemistry

2.c.2	Laws of conservation of mass, constant composition, definite proportions, and multiple proportions	Chemistry Fundamentals	Atom
2.d	Write appropriate equations for nuclear decay reactions, describe how the nucleus changes during these reactions, and compare the resulting radiation with regard to penetrating ability.		
2.d.1	Three major types of radioactive decay (e.g., alpha, beta, gamma) and the properties of the emissions (e.g., composition, mass, charge, penetrating power)	Nuclear Chemistry	Alpha Decay Beta Decay Gamma Decay
2.d.2	The concept of half-life for a radioactive isotope (e.g., carbon-14 dating) based on the principle that the decay of any individual atom is a random process	Nuclear Chemistry	Half-life
2.e	Compare the properties of compounds according to their type of bonding.		
2.e.1	Covalent, ionic, and metallic bonding	Ionic Compounds	Ionic and Covalent Bonding Metallic Bonds
2.e.2	Polar and non-polar covalent bonding	Ionic Compounds	Nonpolar and Polar Covalent Bonds
2.e.3	Valence electrons and bonding atoms	Ionic Compounds	Ionic and Covalent Compounds

Chemistry

2.f	Compare different types of intermolecular forces and explain the relationship between intermolecular forces, boiling points, and vapor pressure when comparing differences in properties of pure substances.	Ionic Compounds Solids, Liquids and Gases	Ionic and Covalent Bonding Metallic Bonds Changes of State
2.g	Develop a three-dimensional model of molecular structure.		
2.g.1	Lewis dot structures for simple molecules and ionic compounds	Ionic Compounds	Lewis Dot Structures
2.g.2	Valence shell electron pair repulsion theory (VSEPR)		
3	Develop an understanding of the periodic table.		
3.a	Calculate the number of protons, neutrons, and electrons in individual isotopes using atomic numbers and mass numbers, write electron configurations of elements and ions following the Aufbau principle, and balance equations representing nuclear reactions.	Atoms/Periodic Table Chemical Reactions	Atomic Number, Mass Number and Isotopes Writing Electron Configurations Balancing Chemical Equations
3.b	Analyze patterns and trends in the organization of elements in the periodic table and compare their relationship to position in the periodic table.		

Chemistry

3.b.1	Atomic number, atomic mass, mass number, and number of protons, electrons, and neutrons in isotopes of elements	Atoms/Periodic Table	Atomic Number, Mass Number and Isotopes
3.b.2	Average atomic mass calculations	Atoms/Periodic Table	Atomic Number, Mass Number and Isotopes
3.b.3	Chemical characteristics of each region	Atoms/Periodic Table	History of the Periodic Table
3.b.4	Periodic properties (e.g., metal/nonmetal/metalloid behavior, electrical/heat conductivity, electronegativity, electron affinity, ionization energy, atomic/covalent/ionic radius)	Atoms/Periodic Table	History of the Periodic Table
3.c	Classify chemical reactions by type.		
3.c.1	Single displacement, double displacement, synthesis (combination), decomposition, disproportionation, combustion, or precipitation.	Chemical Reactions	Types of Chemical Reactions
3.c.2	Products (given reactants) or reactants (given products) for each reaction type	Chemical Reactions	Types of Chemical Reactions
3.c.3	Solubility rules for precipitation reactions and the activity series for single and double displacement reactions		
3.d	Use stoichiometry to calculate the amount of reactants consumed and products formed.		

Chemistry

3.d.1	Difference between chemical reactions and chemical equations	Chemical Reactions	Types of Chemical Reactions
3.d.2	Formulas and calculations of the molecular (molar) masses	Chemical Reactions	Stoichiometry
3.d.3	Empirical formula given the percent composition of elements	Chemical Reactions	Stoichiometry
3.d.4	Molecular formula given the empirical formula and molar mass	Chemical Reactions	Stoichiometry
4	Analyze the relationship between microscopic and macroscopic models of matter.		
4.a	Analyze the nature and behavior of gaseous, liquid, and solid substances using the kinetic molecular theory.	Solids, Liquids and Gases	Kinetic Molecular Theory
4.b	Use the ideal gas laws to explain the relationships between volume, temperature, pressure, and quantity in moles.		
4.b.1	Difference between ideal and real gas	Solids, Liquids and Gases	Kinetic Molecular Theory
4.b.2	Assumptions made about an ideal gas	Solids, Liquids and Gases	Kinetic Molecular Theory
4.b.3	Conditions that favor an ideal gas	Solids, Liquids and Gases	Kinetic Molecular Theory

Chemistry

4.c	Use the gas laws of Boyles, Charles, Gay-Lussac, and Dalton to solve problems based on the laws.	Solids, Liquids and Gases	Understanding Gas Laws
4.d	Explain the thermodynamics associated with physical and chemical concepts related to temperature, entropy, enthalpy, and heat energy.		
4.d.1	Specific heat as it relates to the conservation of energy	Thermodynamics	Specific Heat
4.d.2	Amount of heat absorbed or released in a process, given mass, specific heat, and temperature change	Thermodynamics	Specific Heat
4.d.3	Energy (in calories and joules) required to change the state of a sample of a given substance, using its mass and its heat of vaporization or heat of fusion	Thermodynamics	Specific Heat
4.d.4	Endothermic or exothermic changes	Thermodynamics	Energy Transfer
4.e	Describe and identify factors affecting the solution process, rates of reaction, and equilibrium.		
4.e.1	Concentration of a solution in terms of its molarity, using stoichiometry to perform specified dilutions	Water, Solutions, Acids and Bases	Concentration
4.e.2	Chemical reaction rates affected by temperature, concentration, surface area, pressure, mixing, and the presence of a catalyst	Reaction Rates and Equilibrium	Reaction Rates and Collision Theory
4.e.3	Relationship of solute character		

Chemistry

4.e.4	LeChatelier's Principle		
5	Compare factors associated with acid/base and oxidation/reduction reactions.		
5.a	Analyze and explain acid/base reactions.		
5.a.1	Properties of acids and bases, including how they affect indicators and the relative pH of the solution	Water, Solutions, Acids and Bases	Properties of Acids and Bases
5.a.2	Formation of acidic and basic solutions	Water, Solutions, Acids and Bases	Properties of Acids and Bases
5.a.3	Definition of pH in terms of the hydronium ion concentration and the hydroxide ion concentration	Water, Solutions, Acids and Bases	Properties of Acids and Bases
5.a.4	The pH or pOH from the hydrogen ion or hydroxide ion concentrations of solution	Water, Solutions, Acids and Bases	Properties of Acids and Bases
5.a.5	How a buffer works and examples of buffer solutions		
5.b	Classify species in aqueous solutions according to the Arrhenius and Bronsted-Lowry definitions, respectively and predict products for aqueous neutralization reactions.	Water, Solutions, Acids and Bases	Properties of Acids and Bases
5.c	Analyze a reduction/oxidation reaction (REDOX) to assign oxidation numbers (states) to reaction species and identify the		

Chemistry

	species oxidized and reduced, the oxidizing agent, and reducing agent.		