

**North Carolina Chemistry Grade 9-12
Learning Objectives Mapping**

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CHEMISTRY	Boardworks High School Chemistry Presentation
Competency Goal 2: The learner will build an understanding of the structure and properties of matter.	
2.01 Analyze the historical development of the current atomic theory.	
Early contributions: Democritus and Dalton.	Introducing Atoms
The discovery of the electron: Thomson and Millikan.	Introducing Atoms
The discovery of the nucleus, proton and neutron: Rutherford and Chadwick.	Introducing Atoms
The Bohr model.	Introducing Atoms
The quantum mechanical model.	–
2.02 Examine the nature of atomic structure.	
Subatomic particles: protons, neutrons, and electrons.	Atomic Structure Electron Configuration
Mass number.	Atomic Number and Mass Number
Atomic number.	Atomic Number and Mass Number
Isotopes.	Isotopes
2.03 Apply the language and symbols of chemistry.	
Name compounds using the IUPAC conventions.	Naming Compounds
Write formulas of simple compounds from their names.	Types of Formulae
2.04 Identify substances using their physical properties:	
<i>Melting points.</i>	–
<i>Boiling points.</i>	–
<i>Density.</i>	–
<i>Solubility.</i>	–
2.05 Analyze the basic assumptions of kinetic molecular theory and its applications:	
Ideal Gas Equation.	Gases and Moles Ideal Gas Law
<i>Combined Gas Law.</i>	–
<i>Dalton's Law of Partial Pressures.</i>	–
2.06 Assess bonding in metals and ionic compounds as related to chemical and physical properties.	Ionic Bonding Ionic Compounds Metallic Bonding

2.07 Assess covalent bonding in molecular compounds as related to molecular geometry and chemical and physical properties.	
Molecular.	Covelent Bonding Giant Covalent Structures
Macromolecular.	Giant Covalent Structures
Hydrogen bonding and other intermolecular forces (dipole/dipole interaction, dispersion).	Intermolecular Forces
VSEPR theory.	–
2.08 Assess the dynamics of physical equilibria.	
Interpret phase diagrams.	
Factors that affect phase changes.	Changing State Particles in Action
Competency Goal 3: The learner will build an understanding of regularities in chemistry.	
3.01 Analyze periodic trends in chemical properties and use the periodic table to predict properties of elements.	
Groups (families).	Electron Structure and the Periodic Table Patterns of Behavior The Periodic Table
Periods.	Electron Structure and the Periodic Table Patterns of Behavior The Periodic Table
Representative elements (main group) and transition elements.	The Periodic Table
Electron configuration and energy levels.	Electron Structure and the Periodic Table
Ionization energy.	Ionization Energy
Atomic and ionic radii.	Electron Structure and the Periodic Table Patterns of Behavior
Electronegativity.	Electronegativity
3.02 Apply the mole concept, Avogadro's number and conversion factors to chemical calculations.	
Particles to moles.	What are Moles?
Mass to moles.	Molar Mass What are Moles?
Volume of a gas to moles.	Gases and Moles
Molarity of solutions.	–
Empirical and molecular formula.	Types of Formulae
Percent composition.	Percentage Composition by Mass

3.03 Calculate quantitative relationships in chemical reactions (stoichiometry).	–
Moles of each species in a reaction.	–
Mass of each species in a reaction.	–
Volumes of gaseous species in a reaction.	–
Competency Goal 4: The learner will build an understanding of energy changes in chemistry.	
4.01 Analyze the Bohr model in terms of electron energies in the hydrogen atom.	
The spectrum of electromagnetic energy.	Energy Sublevels Observing Line Spectra
Emission and absorption of electromagnetic energy as electrons change energy levels.	Energy Sublevels Observing Line Spectra
4.02 Analyze the law of conservation of energy, energy transformation, and various forms of energy involved in chemical and physical processes.	Bonds and Activation Energy Calorimetry Endothermic Reactions Enthalpy Change Exothermic Reactions Heat
Differentiate between heat and temperature.	Heat
Analyze heating and cooling curves.	
Calorimetry, heat of fusion and heat of vaporization calculations.	Calorimetry
Endothermic and exothermic processes including interpretation of potential energy.	Endothermic Reactions Exothermic Reactions
Diagrams (energy vs reaction pathway), enthalpy and activation energy.	Bonds and Activation Energy Enthalpy Change
4.03 Analyze the relationship between entropy and disorder in the universe.	–
4.04 Analyze nuclear energy.	
Radioactivity: characteristics of alpha, beta and gamma radiation.	Radioactivity Types of Radiation
Decay equations for alpha and beta emission.	Types of Radiation
Half-life.	Half-Life
Fission and fusion.	Nuclear Fission Nuclear Fusion
Competency Goal 5: The learner will develop an understanding of chemical reactions.	
5.01 Evaluate various types of chemical reactions.	

Analyze reactions by types: single replacement, double replacement (including acid-base neutralization), decomposition, synthesis, and combustion including simple hydrocarbons.	Combustion Hydrocarbons Neutralization Redox Reactions Thermal Decomposition
Predict products.	–
5.02 Evaluate the Law of Conservation of Matter.	
Write and balance formulas and equations.	Conservation of Mass Reacting Masses
Write net ionic equations.	–
5.03 Identify and predict the indicators of chemical change.	
Formation of a precipitate.	–
Evolution of a gas.	–
Color changes.	pH and Indicators
Absorption or release of heat.	Endothermic Reactions Exothermic Reactions
5.04 Identify the physical and chemical behaviors of acids and bases.	
General properties of acids and bases.	Neutralization pH and Indicators Properties of Acids and Alkalis
Concentration and dilution of acids and bases.	Neutralization pH and Indicators Properties of Acids and Alkalis
Ionization and the degree of dissociation (strengths) of acids and bases.	–
Indicators.	pH and Indicators
Acid-base titration.	Neutralization
pH and pOH.	–
5.05 Analyze oxidation/reduction reactions with regard to the transfer of electrons.	
Assign oxidation numbers to elements in REDOX reactions.	Oxidation Numbers
Identify the elements oxidized and reduced.	Redox Reactions
Write simple half reactions.	Redox Reactions
Assess the practical applications of oxidation and reduction reactions.	–
5.06 Assess the factors that affect the rates of chemical reactions.	
The nature of the reactants.	Rates of Reaction
Temperature.	Le Chatelier's Principle Temperature and Reaction Rates

Concentration.	Le Chatelier's Principle Concentration, Pressure and Reaction Rates
Surface area.	Surface Area, Catalysts and Reaction Rates
Catalyst.	Le Chatelier's Principle Surface Area, Catalysts and Reaction Rates