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EASTERN LEBANON COUNTY SCHOOL DISTRICT
STUDENT LEARNING MAP

Course/Subject: **Chemistry I** Days: **10**
Topic: **Matter (U1)** Grade Level: **10th**

Key Learning Chemistry is the study of matter, its structure, properties, and the changes that it undergoes. It is essential to classify and organize types of matter and types of change in order to further understand and study chemistry.

Unit Essential Question Why is it important to classify matter and its changes?

Concept Nature of Science	**Concept** Matter Classification	**Concept** Properties & Change in Matter
Standards: CHEM.A.1.1.2; 3.2.10.A; 3.2.10.B	**Standards:** CHEM.A.1.1.4; CHEM.A.1.2.2	**Standards:** CHEM.A.1.1.1;
LEQ What methods do scientists use to study the world?	**LEQ** What is chemistry? What is matter & how is it classified?	**LEQ** How does matter change?
Vocabulary Hypothesis, Theory, Law, Experiment, Control, Independent Variable, Dependent Variable, Quantitative, Qualitative	**Vocabulary** Matter, Mass, Element, Compound, Atom, Particle, Mixture, Pure Substance, Heterogeneous, Homogeneous, Separation, Filtration, Distillation	**Vocabulary** Chemical Property, Chemical Change, Physical Property, Physical Change, Solid, Liquid, Gas, Intensive, Extensive

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Course/Subject: **Chemistry I** Days: **10**
Topic: **Measurement (U2)** Grade Level: **10th**

Key Learning In order to learn chemistry, it is essential to have basic knowledge of conceptual and mathematical tools and techniques used by chemists. These tools and techniques will be important when making observations in the lab and discussing chemical concepts.

Unit Essential Question How are math and measurement skills incorporated into the science of chemistry?

Concept Measurement & Metric System	**Concept** Scientific Notation	**Concept** Derived Units
Standards: 3.1.10.D; 3.7.10.D	**Standards:** 3.1.10.D.	**Standards:** 3.2.10.D.; 3.7.10.B.
LEQ What importance do measurements and units have?	**LEQ** How can very large or small numbers be managed easily?	**LEQ** How can base units be manipulated to create new units for measuring various quantities?
Vocabulary Mass, Volume, Unit, Measurement, SI, Metric	**Vocabulary** Coefficient, Exponent	**Vocabulary** Density, Direct & Inverse Proportions, Graph, Regression Line, Chart, Table, Extrapolation

Concept Dimensional Analysis	**Concept** Accuracy & Precision	**Concept** Significant Figures
Standards: 3.1.10.D.	**Standards:** 3.7.10.B	**Standards:** CHEM.A.1.1.3
LEQ How can we convert one unit to another?	**LEQ** How can measurements be described in the lab?	**LEQ** How can we be sure that other scientists' measurements are accurate and precise?
Vocabulary Dimensional Analysis, Conversion Factor	**Vocabulary** Accurate, Precise, Percent Error	**Vocabulary** Significant Figures

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Course/Subject: **Chemistry I**
Topic: **The Atom (U3)**
Days: **8**
Grade Level: **10th**

Key Learning In order to understand chemical reactions and changes in matter, it is essential to understand the building blocks of matter. An atom is the smallest unit of an element, but is comprised of smaller subatomic particles. The characteristics of these subatomic particles dictate the elemental properties and interactions.

Unit Essential Question How are the characteristics of subatomic particles in an atom important in determining elemental properties and interactions?

Concept Atomic Laws	**Concept** Atomic Structure	**Concept** History of the Atomic Theory
Standards: 3.4.10.A.	**Standards:** CHEM.A.1.1.4; 3.4.10.A	**Standards:** CHEM.A.2.1.1
LEQ What did scientists discover about matter?	**LEQ** How are atoms structured?	**LEQ** How has the Atomic Theory evolved over time?
Vocabulary Law of Conservation of Mass, Law of Definite Proportions, Law of Multiple Proportions	**Vocabulary** Proton, Neutron, Electron, Nucleus	**Vocabulary** Atom, Democritus, Rutherford, Dalton, Bohr, Gold Foil Experiment, Cathode Ray Tube, Plum Pudding Model, Quantum Mechanical Model

Concept Atomic Properties	**Concept** Relating Mass to Number of Particles & Moles	**Concept**
Standards: CHEM.A.1.1.4; CHEM.A.2.1.2	**Standards:** CHEM.B.1.1.1	**Standards:**
LEQ What can the periodic table tell us about the atom?	**LEQ** How are particles related to mass?	**LEQ**
Vocabulary Isotope, Mass	**Vocabulary** Avogadro's	**Vocabulary**

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Number, Atomic Number, Atomic Mass, Ion	Number, Mole, Molar Mass	

Course/Subject: **Chemistry I**
Topic: **The Electron (U4)**
Days: **8**
Grade Level: **10th**

Key Learning Atoms contain areas that have a high probability of housing electrons. The locations of the electrons and their transitions define the properties of an atom and affect atomic interaction.

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Unit Essential Question How does electron arrangement in an atom affect the atom's behavior and properties?

Concept Electron Levels, Sublevels & Orbitals	**Concept** Electron Configurations & Lewis Dot Structures	**Concept** Electron Transitions
Standards: CHEM.A.2.2.3	**Standards:** CHEM.A.2.2.1	**Standards:** CHEM.A.2.2.1, CHEM.A.2.2.3
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LEQ What space in an atom do electrons occupy?	**LEQ** How is an electron's location in the atom described?	**LEQ** How do electrons behave in an atom?
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Vocabulary Energy Levels, Sublevels, Orbitals, Pauli Exclusion Principle, Hund's Rule, Aufbau Principle, Heisenberg Uncertainty Principle, Quantum Numbers	**Vocabulary** Electron Configuration, Valence Electrons, Lewis Dot Structure	**Vocabulary** Ground State, Excited State, Electron Transition, Emission, Absorption

Concept Electromagnetic Radiation & Energy	**Concept**	**Concept**
Standards: 3.1.10.B.	**Standards:**	**Standards:**
⇩	⇩	⇩
LEQ How is energy related to the electron?	**LEQ**	**LEQ**
⇩	⇩	⇩

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Vocabulary Electromagnetic Radiation, Frequency, Wave, Wavelength, Speed of EMR, Photon	**Vocabulary**	**Vocabulary**

Course/Subject: **Chemistry I**
Topic: **Periodic Table (U5)**
Days: **10**
Grade Level: **10th**

Key Learning The organization of the periodic table is intentionally arranged to reveal atomic properties. Families and periods align elements with similar characteristics. The characteristics of a family repeat periodically as you move down the periods of the periodic table.

Unit Essential Question How does the specific organization of the periodic table help in identifying the key properties of elements?

Concept History of the Periodic Table	**Concept** Classifying the Elements	**Concept** Periodic Trends
Standards: CHEM.A.2.3.1	**Standards:** 3.4.10.A	**Standards:** CHEM.A.2.2.2; CHEM.A.2.3.2; 3.4.10.A; 3.1.10. C
		
LEQ How were the elements originally organized on the periodic table?	**LEQ** Why do different categories of elements exist?	**LEQ** How are atomic properties predicted based on an element's placement on the periodic table?
		
Vocabulary Periodic Law, Periodic Table, Periodic, Mendeleev	**Vocabulary** Alkali Metals, Alkaline Earth Metals, Transition Metals, Main Group Elements, Halogens, Noble Gases, Lanthanides, Actinides	**Vocabulary** Atomic Radius, Ionization Energy, Electron Affinity, Ionic Radius, Electronegativity

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Course/Subject: **Chemistry I**
Topic: **Chemical Bonding (U6)**
Days: **11**
Grade Level: **10th**

Key Learning The focus of chemical interactions is based on an element's ability to share or transfer valence electrons. The nature and three-dimensional spacing of these electron interactions dictate properties such as molecular geometry and intermolecular forces.

Unit Essential Question How do electron configurations of individual atoms dictate the type of bonds, shapes and interactions that molecules can have?

Concept Types of Bonding	**Concept** Molecular Geometry	**Concept** Intermolecular Forces
Standards: CHEM.A.1.1.4; CHEM.B.1.3.1; CHEM.B.1.3.2; CHEM.B.1.3.3; 3.4.10.A	**Standards:** CHEM.B.1.3.3; CHEM.B.1.4.1; CHEM.B.1.4.2; 3.4.10.A	**Standards:** CHEM.B.1.3.3; 3.4.10.A
LEQ How are chemical bonds classified based on electron interactions?	**LEQ** How do valence electrons affect the three-dimensional orientation of molecules?	**LEQ** Why does the polarity of one molecule have an affect on another molecule?
Vocabulary Chemical Bond, Ionic, Covalent, Nonpolar, Polar, Molecule, Compound, Chemical Formula, Oxidation Number, Formula Unit, Lattice Energy	**Vocabulary** Lewis Dot Structure, VSEPR, Single Bond, Multiple Bond, Resonance, Bond Angle, Dipole	**Vocabulary** Dipole-Dipole, London Dispersion Force, Hydrogen Bonding, Induced

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Course/Subject: **Chemistry I**
Topic: **Nomenclature & Formulas (U7)**
Days: **9**
Grade Level: **10th**

Key Learning Atoms combine in whole number ratios that can be represented with formulas. There is a systematic naming method for these chemical formulas. These chemical formulas can be utilized or solved for with calculations deriving from percent composition (by mass) of the substance.

Unit Essential Question How are chemical substances represented, both in terms of formulas and names?

Concept Nomenclature	**Concept** Formula Writing	**Concept** Calculating Chemical Formulas
Standards: CHEM.A.1.1.5; CHEM.B.1.2.2	**Standards:** CHEM.A.1.1.5; CHEM.B.1.2.2	**Standards:** CHEM.B.1.2.1; CHEM.B.1.2.2; CHEM.B.1.2.3
LEQ How are ionic and molecular compounds named?	**LEQ** How do oxidation numbers assist in writing formulas that support the Law of Definite Proportions?	**LEQ** How can we use lab data to calculate the ratio of elements in a particular substance?
Vocabulary Monatomic, Polyatomic, Ion, Stock, Classical, Cation, Anion	**Vocabulary** Oxidation Number, Subscript, Superscript, Salt	**Vocabulary** Percent Composition, Empirical Formula, Molecular Formula, Formula Mass

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Course/Subject: **Chemistry I** Days: **8**
Topic: **Chemical Reactions (8)** Grade Level: **10th**

Key Learning Chemicals interact through various classifications of reactions. The reactions depend on the starting materials and their characteristics. Products of certain reactions and their characteristics can be predicted using chemical formulas.

Unit Essential Question How can we make predictions as to how certain chemicals will interact with other chemicals?

Concept Basics of Chemical Reactions	**Concept** Types of Chemical Reaction	**Concept** Balancing Chemical Equations
Standards: CHEM.B.2.1.3; CHEM.B.2.1.4	**Standards:** CHEM.B.2.1.3; CHEM.B.2.1.4	**Standards:** CHEM.B.2.1.5; 3.4.10.A
LEQ How is a chemical reaction represented with an equation?	**LEQ** How are different chemical reactions classified?	**LEQ** How does the Law of Conservation of Matter affect chemical equations?
Vocabulary Reactants, Products, Aqueous, Irreversible Reaction, Reversible Reaction	**Vocabulary** Synthesis, Decomposition, Single Displacement, Double Displacement, Combustion	**Vocabulary** Law of Conservation of Matter, Coefficient

Concept Reactions in Aqueous Solution	**Concept**	**Concept**
Standards: CHEM.A.1.2.1; CHEM.A.1.2.5	**Standards:**	**Standards:**

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LEQ How are we able to predict when reaction products will be conductive?	**LEQ**	**LEQ**
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Vocabulary Electrolyte, Dissolve, Dissociate, Solubility	**Vocabulary**	**Vocabulary**

Course/Subject: **Chemistry I**
Topic: **Stoichiometry (9)**

Days: **8**
Grade Level: **10th**

Key Learning In the laboratory setting it is important to use balanced chemical equations to determine the amount of substances to be used or produced. An amount of product can be theoretically predicted based on the starting amounts of each reactant and reaction equation coefficients.

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Unit Essential Question What can balanced chemical equations and amounts of reactants indicate about a chemical reaction's products?

Concept Stoichiometric Relationships	**Concept** Limiting Reagents	**Concept** Percent Yield
Standards: CHEM.B.1.1.1., CHEM.B.2.1.2.	**Standards:** CHEM.B.2.1.1.	**Standards:** CHEM.B.2.1.2.
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LEQ How can values of reactants and products be determined in a chemical reaction?	**LEQ** How can calculations indicate the maximum amount of product based on a limiting reactant?	**LEQ** How can yields in the lab be compared to calculated yields?
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Vocabulary Stoichiometry, Mole Ratio, Molar Mass	**Vocabulary** Excess Reagent, Limiting Reagent	**Vocabulary** Theoretical Yield, Actual Yield, Percent Yield

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Course/Subject: **Chemistry I**
Topic: **Gas Laws (10)**

Days: **8**
Grade Level: **10th**

Key Learning The kinetic molecular theory accounts for gas properties and particle interaction, which relate in ways that can be explained through algebraic expressions.

Unit Essential Question What factors affect the way gases behave?

Concept Gases and the Kinetic Molecular Theory	**Concept** The Gas Laws	**Concept** Ideal Gases
Standards: 3.4.10.A	**Standards:** CHEM.B.2.2.1, CHEM.B.2.2.2., 3.4.10.A	**Standards:** CHEM.B.2.2.1, CHEM.B.2.2.2., 3.4.10.A
		
LEQ How does the kinetic molecular explain observations we can make about gases?	**LEQ** How are pressure, volume, and temperature related in a gas?	**LEQ** How does an ideal gas behave compared to real gases?
		
Vocabulary Kinetic Molecular Theory, Elastic Collision, Compressibility, Diffusion, Effusion, Pressure	**Vocabulary** Boyle's Law, Charles's Law, Gay-Lussac's Law, Combined Gas Law	**Vocabulary** Ideal Gas Law, Dalton's Law of Partial Pressures

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