Chemistry

Unit 0 - Introduction

Essential	**Front Loading** · Scientific Method · Lab procedures, skills, safety · Measurements: how to make a scientific measurement for volume, mass, density, temperature · Data Analysis: gathering data, making the graph (when appropriate), interpreting the data, writing a conclusion
Extension	● Unit conversions ● Scientific notation ● Precision and accuracy ● Lab report Formatting ● Graphing 101 ● recognize that elements have different properties than the compounds they form.
Eliminate	n/a

Unit 1

Essential	**Matter** · What it is (definition) · Classifications: pure (element and compounds)vs. mixtures (homo vs. hetero); · States of matter (particle arrangement at molecular level and compare volume and shape) · Properties: chemical and physical · Changes: physical and chemical **Atoms:** · Atomic Theory/History: ○ Dalton, Thompson, Rutherford, Bohr and Schrodinger: Experimental evidence (Thompson & Rutherford)models and biggest contributions · Atomic Structure and Isotopes: ○ Subatomic particles (p+, no, e-): relative size, charge, mass, and location w/in atom ○ Determining # of protons, neutrons and electrons in an average/neutral atom from info on Periodic table ○ Atomic number, mass number ○ Isotopes: definition; isotope notation (2 ways); determining # of protons and neutrons; atomic mass (what it means); determining most common isotope

	from atomic mass. **Nuclear:** ● Radioactivity and Decay: ○ Unstable nuclei: imbalance between EMF and SNF; will decay over time by emitting particles and/or energy ○ Decay types: Alpha, beta, and gamma-penetrating power; mass and charge of particles; changing of identity of atom (alpha and beta) ○ Half-life: defining; interpreting a half-life graph ● Fission and Fusion: ○ Fission reactions vs. Fusion (what are they, in general?) ○ Energy of fission/fusion vs. chemical reactions ● Effects of nuclear radiation on life ● Common Origin of the Naturally Occurring Elements: nuclear process (fusion) to form elements; location of formation (stars); relative abundances of elements;
Extension	● Other scientists and their contributions to atomic theory ● Calculating atomic mass from abundance data ● Band of stability ● Recognize and/or write nuclear equations ● Calculations involving half-life
Eliminate	

Unit 2

Essential	**Light: waves, energy and photons** ● Relationship between wavelength, frequency and energy ● Bohr Model: How light is emitting from an atom: electrons absorb energy, energy level transitions result in light emission. ○ energy absorbed and released is in “discrete” units (quanta) ● Lab evidence to make connections between absorbing energy and releasing light; and using results to identify elements (flame tests and/or spectrum tubes) ● Relate color of light to energy of that light ● Particle vs. wave nature of light **Quantum Mechanical Model**: ● what is it: electrons are located in regions based on probability (orbits vs. orbitals) ● Energy levels, sublevels and orbitals: s,p,d and f sublevels/orbitals; shapes; # of electrons in each sublevel/orbital ● Electron configuration (up to argon) **Periodic Table:** ● determining # of valence electrons

	● organization: families (groups); periods; order of increasing atomic number ● types of elements: metals, non-metals, metalloids; properties and location on periodic table ● generalized trends : atomic radius; electronegativity and ionization energy ● reactivity and properities of elements (in a family): valence electrons
Extension	● calculating wavelength, frequency and energy ● photoelectric effect ● Heisenberg uncertainty principle ● electron configuration with d and f; orbital notation and noble gas configuration ● Lewis dot diagram for an element ● history of periodic table development ● electron affinity
Eliminate	

Unit 3

Essential	**Ionic Bonding and Ions** ● ion formation and why; cations and anions; charges; ● what it is and why atoms bond this way. ● naming (IUPAC) and formula writing for ionic compounds, including transition metals and polyatomic ions ● properties of ionic compounds ● recognize that elements have different properties than the compounds they form. **Covalent** ● what it is and why atoms bond this way. ● Lewis dot structures ● polar and nonpolar bonds ● naming (IUPAC) and formula writing for binary covalent compounds ● properties of covalent compounds ● recognize that elements have different properties than the compounds they form. **Metallic** ● what it is and why atoms bond this way. ● properties of metallic compounds **Comparing all three types of compounds:** bond strength and electron behavior **Intermolecular Forces and Kinetic Molecular Theory:** ● VSEPR theory ● molecular polarity

	● IMFs: Dispersion Forces; Dipole-Dipole and Hydrogen bonding: ○ define and types of molecules involved ○ relate the relative strength to properties (melting point, surface tension; boiling point) ● Water and its amazing and special properties (hydrogen bonding)
Extension	● memorization of polyatomic ions ● alloys
Eliminate	● hybridization