

## UNIT OF STUDY

### Unit 3

<b>Title:</b> Atomic Structure and Bonding	<b>Subject/Course:</b> Physical Science	<b>Length:</b> 4 weeks
<b>Topic:</b> Subatomic particles, bond types, nomenclature	<b>Grade:</b> 9 <sup>th</sup>	<b>Designer:</b> Kathryn Melnick
<b>UNIT GOALS AND EXPECTATIONS</b>		
<p><b>IMPORTANT CONCEPTS/UNDERSTANDINGS:</b>  <b>Big Idea:</b> Atoms consist of smaller particles which follow specific patterns of arrangement.            Atoms can differ in numbers of neutron (isotopes) and electrons (ions).            Atoms are arranged in families based on their valence electrons.            Valence electrons determine atoms' properties and bonding abilities.            Atoms can form ionic, covalent, or metallic bonds.            There are specific rules for writing chemical formulas and naming chemical substances.            Chemical quantities are measured in moles.            Each element has a molar mass and an average atomic mass.</p>	<p><b>ESSENTIAL QUESTIONS:</b>            What are the subatomic particles and how are they arranged in the atom?            How were subatomic particles discovered?            How are valence numbers used to draw Lewis Dot structures?            What are the different types of chemical bonds?            What type of elements take part in each type of bond?            What are polyatomic ions?            How are chemical formulas determined?            What are the rules for naming compounds?            What is a mole?            How do we determine the molar mass and the average atomic mass?</p>	
<p><b>STUDENT LEARNING EXPECTATIONS:</b>            C.1.PS.3 Discuss and model the relative size and placement of sub-atomic particles            C.1.PS.4 Illustrate the placement of electrons in the first twenty elements using energy levels and orbitals            C.1.PS.5 Distinguish among atoms, ions, and isotopes            C.1.PS.6 Model the valence electrons using electron dot structures (Lewis electron dot structures)            C.1.PS.7 Explain the role of valence electrons in determining chemical properties            C.1.PS.8 Explain the role of valence electrons in forming chemical bonds</p>	<p>C.1.PS.9 Model bonding:                - ionic - covalent -metallic            C.1.PS.10 Identify commonly used polyatomic ions            C.1.PS.11 Write formulas for ionic and covalent compounds            C.1.PS.12 Name ionic and covalent compounds            C.1.PS.13 Identify the mole and amu (atomic mass unit) as units of measurement in chemistry            C.1.PS.14 Calculate the molar mass of compounds based on average atomic mass.            NS.11.PS.3 Summarize the development of the current atomic theory            NS.11.PS.4 Analyze the development of the periodic table            NS.11.PS.5 Research historical events in physical science</p>	
<p><b>SPECIFIC DECLARATIVE KNOWLEDGE – What I know</b>            Explain how the subatomic particles were discovered.            Show how electrons can be organized into energy levels and orbitals.            Identify atoms, ion, and isotopes.            Understand the connection between valence electrons and chemical properties.            Determine the type of bond which will form between different atoms.            Explain the difference between ionic, covalent, and metallic bonds.            Know names and formulas for polyatomic ions.            Understand the rules for naming chemical compounds.            Identify the atomic number, mass number, and atomic mass number from the periodic table.            Can predict properties of elements and bonding types based on location in the periodic table.</p>	<p><b>SPECIFIC PROCEDURAL KNOWLEDGE – What I need to do</b>            Illustrate the placement of subatomic particles in atoms, ions, and isotopes.            Draw Lewis Electron Dot structures for the elements.            Draw Lewis Electron Dot structures for simple compounds.            Write formulas and names for chemical compounds.            Calculate the molar mass of atoms and compounds.            Calculate the average atomic mass of elements.</p>	

<b>UNIT ASSESSMENTS</b> (Include tasks related to Dimensions 3 and 4 and Bloom's Taxonomy)	
<p>Students will demonstrate an understanding of Dalton's Atomic Theory using Lego Blocks.            Build a model of an isotope of an atom using paper punches (from hole punches).            Homework: Complete charts to show an understanding of subatomic particles, atomic numbers, mass numbers, ions, and isotopes.            Lab: Determine the relationship between metal ions, flame colors, and electron movement.            Draw Lewis Dot Diagrams of elements.            Virtual Lab: Determine unknown metal ions            Write formula and names for ionic and covalent compounds.            Lab: Determine which solutions are ionic or covalent by electrical conductivity.            Virtual Lab: Mix chemicals determine reactions, write formulas and names.            From a list of formulas, determine which are ionic and covalent and write correct names.</p>	
<p><b>Traditional Assessments:</b>            Test on subatomic particles            Test on bonding types            Test on writing chemical formulas and names            Element quizzes            Daily quizzes</p>	<p><b>Other Evidence of Learning:</b>            Line of learning            Lab reports</p>

<b>ACTIVITIES AND LEARNING EXPERIENCES</b>	<b>Resources</b>
<p>Models of the Atom: Discuss Democritus, Aristotle, and Dalton.</p> <p>Activity: Use Lego Blocks to demonstrate the four parts of Dalton's atomic theory. Explain what each of the parts means.</p> <p>Discuss how the subatomic particles were discovered. Use pneumonic device for memory. Complete a graphic organizer to organize the information on subatomic particles. Show how these give the atomic number and the atomic mass. Discuss basic energy levels.</p> <p>Activity: Each student in the class will be given a card with information on an element. The students will use paper discs to construct a model to show their atom. The information from the class will be used to introduce isotopes and calculate atomic mass. Complete charts which contain protons, neutrons, electrons, symbols, atomic number, atomic mass, and charge.</p> <p>Quiz on parts of the atoms.            Element quizzes on Fridays.</p> <p>Discuss evolution of the atomic model. Relate to nature of science...models change as new information is gained. Students will do drawings of Dalton's, Thomson's, Rutherford's, Bohr's, and the Quantum mechanical model. Show the relationship between energy levels and orbitals. Determine which orbital configurations are most stable. Vocabulary sheets: energy levels, orbital</p> <p>Lab: Flame testing. See the relationship between flame color and quantum leaps of electrons.</p> <p>Test on subatomic particles and atomic models.</p> <p>Use orbitals to determine Valence electrons (V-8). Draw Lewis Dot Diagrams for elements. Discuss how the Lewis Dot is related to the chemical properties and types of bonds which</p>	<p>Legos</p> <p>Smart board</p> <p>Note cards, markers, paper dots, glue sticks, calculators</p> <p>Paper, markers</p> <p>Vocabulary sheets</p> <p>Various nitrates, wood splints, Bunsen burners</p> <p>Test</p> <p>Periodic tables            Vocabulary sheets</p>

<p>can form. Vocabulary sheets: Valence electrons, Lewis Dot Structure</p> <p>Introduce electronegativity with the story of Mean Mr. Fluorine and the electron Mafia. Discuss the types of bonds, (i.e.. ionic, covalent, and metallic). Vocabulary: ionic bond, anion, cation. Use cards with the ions to write formulas and name ionic compounds. It Says sheet for properties of ionic compounds.</p> <p>Virtual lab: (Lab 15) The students will identify unknown metal ions in the virtual lab.</p> <p>Discuss covalent bonds. Introduce multiple bonds, and polar and non polar bonds. Write formulas and names for covalent compounds. Vocabulary: covalent bond, single bond, double bond, triple bond, polar covalent bond, non polar covalent bond.</p> <p>Virtual lab: (Lab 17) The students will determine if solutions are ionic or covalent based on electrical conductivity.</p> <p>It Says sheet for the properties of covalent compounds (on same sheet as ionic compounds). Compare the properties of ionic and covalent compounds. Determine similarities and differences.</p> <p>Discuss metallic bonds.</p> <p>Test on types of bonds and Lewis Dot diagrams.</p> <p>Discuss how to determine if a formula shows and ionic or covalent compound. Separate a list into ionic and covalent formulas and write the names for each based on the correct rules. Write formulas when given the names of compounds.</p> <p>Virtual lab: (Lab 16) The students will mix chemicals in the virtual lab. They will write formulas and names for the reactions given.</p> <p>Test on write formulas and naming compounds.</p>	<p>Periodic tables Vocabulary sheets It Says, I Say, and So sheets</p> <p>Lab Sheets, software, Smart board</p> <p>Vocabulary sheets</p> <p>Lab Sheets, software, Smart board</p> <p>Test</p> <p>Note cards, periodic tables Homework sheets Practice sheets</p> <p>Lab sheets, software, Smart board</p> <p>Test</p>
<b>Career Connections</b>	
<p>Food Science Technician Toxicologist Fireworks designer</p>	