

Carter County NGSS Science Curriculum

<p>Unit Title/Topic: Structure and Properties of Matter</p>	<p>Grade: 9th</p>	<p>Time: 6 weeks</p>
<p>Performance Expectations:</p> <p>Students who demonstrate understanding can:</p> <p>HS-PS1-1. Use the periodic table as a model to predict the relative properties of elements based on the patterns of electrons in the outermost energy level of atoms. [Clarification Statement: Examples of properties that could be predicted from patterns could include reactivity of metals, types of bonds formed, numbers of bonds formed, and reactions with oxygen.] [Assessment Boundary: Assessment is limited to main group elements. Assessment does not include quantitative understanding of ionization energy beyond relative trends.]</p> <p>HS-PS1-3. Plan and conduct an investigation to gather evidence to compare the structure of substances at the bulk scale to infer the strength of electrical forces between particles. [Clarification Statement: Emphasis is on understanding the strengths of forces between particles, and not on naming specific intermolecular forces (such as dipole-dipole). Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite). Examples of bulk properties of substances could include the melting point and boiling point, vapor pressure, and surface tension.] [Assessment Boundary: Assessment does not include Raoult’s law calculations of vapor pressure.]</p> <p>HS-PS1-8. Develop models to illustrate the changes in the composition of the nucleus of the atom and the energy released during the processes of fission, fusion, and radioactive decay. [Clarification Statement: Emphasis is on simple qualitative models, such as pictures or diagrams, and on the scale of energy released in nuclear processes relative to other kinds of transformations.] [Assessment Boundary: Assessment does not include quantitative calculation of energy released. Assessment is limited to alpha, beta, and gamma radioactive decays.]</p> <p>HS-PS2-6. Communicate scientific and technical information about why the molecular-level structure is important in the functioning of designed materials.* [Clarification Statement: Emphasis is on the attractive and repulsive forces that determine the functioning of the material. Examples could include why electrically conductive materials are often made of metal, flexible but durable materials are made up of long chained molecules, and pharmaceuticals are designed to interact with specific receptors.] [Assessment Boundary: Assessment is limited to provided molecular structures of specific designed materials.]</p>		
<p>Learning Targets/I Cans:</p> <p>I can understand subatomic particles and describe how they are arranged in atomic structures of elements.</p> <p>I can compare physical and chemical changes as related to the function of design materials.</p> <p>I can describe periodic table patterns and trends including how the element family relates to ionization.</p> <p>I can compare ionic and covalent bonds and write chemical names and formulas for both types of compounds.</p>		
<p>Science and Engineering Practices Developing and Using Models Modeling in 9–12 builds on K–8 and progresses to using, synthesizing, and developing models to predict and show relationships among variables between systems and their components in the natural and designed worlds.</p> <ul style="list-style-type: none"> Develop a model based on evidence to illustrate the relationships between systems or between components of a 	<p>Disciplinary Core Ideas PS1.A: Structure and Properties of Matter</p> <ul style="list-style-type: none"> Each atom has a charged substructure consisting of a nucleus, which is made of protons and neutrons, surrounded by electrons. (HS-PS1-1) The periodic table orders elements horizontally by the number of protons in the atom’s nucleus and places those with similar chemical properties in 	<p>Crosscutting Concepts Patterns</p> <ul style="list-style-type: none"> Different patterns may be observed at each of the scales at which a system is studied and can provide evidence for causality in explanations of phenomena. (HS-PS1-1),(HS-PS1-3) <p>Energy and Matter</p> <ul style="list-style-type: none"> In nuclear processes, atoms are not conserved, but the total number of protons plus neutrons is conserved. (HS-PS1-8) <p>Structure and Function</p> <ul style="list-style-type: none"> Investigating or designing new systems

<p>system. (HS-PS1-8)</p> <ul style="list-style-type: none"> ▪ Use a model to predict the relationships between systems or between components of a system. (HS-PS1-1) <p>Planning and Carrying Out Investigations</p> <p>Planning and carrying out investigations in 9-12 builds on K-8 experiences and progresses to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical models.</p> <ul style="list-style-type: none"> ▪ Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly. (HS-PS1-3) <p>Obtaining, Evaluating, and Communicating Information</p> <p>Obtaining, evaluating, and communicating information in 9–12 builds on K–8 and progresses to evaluating the validity and reliability of the claims, methods, and designs.</p> <ul style="list-style-type: none"> ▪ Communicate scientific and technical information (e.g. about the process of development and the design and performance of a proposed process or system) in multiple formats (including orally, graphically, textually, and mathematically). (HS-PS2-6) 	<p>columns. The repeating patterns of this table reflect patterns of outer electron states. (HS-PS1-1),(HS-PS1-2)</p> <ul style="list-style-type: none"> ▪ The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. (HS-PS1-3),(secondary to HS-PS2-6) <p>PS1.C: Nuclear Processes</p> <ul style="list-style-type: none"> ▪ Nuclear processes, including fusion, fission, and radioactive decays of unstable nuclei, involve release or absorption of energy. The total number of neutrons plus protons does not change in any nuclear process. (HSPS1-8) <p>PS2.B: Types of Interactions</p> <ul style="list-style-type: none"> ▪ Attraction and repulsion between electric charges at the atomic scale explain the structure, properties, and transformations of matter, as well as the contact forces between material objects. (HS-PS1-1),(HS-PS1-3),(HSPS2-6) 	<p>or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem. (HS-PS2-6)</p>
<p>Critical Content Vocabulary:</p> <p>Valence electrons Ionic bond Covalent bond Ionization</p>		
<p>Resources:</p>		