

Phoenixville Area School District Understanding by Design (UbD) Science Template

Grade Level &/or HS Subject: 11/Chemistry

Unit Name: Bonding

Stage 1 Desired Results		
Overarching NGSS & PA Standards: PA-SPM1: 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. PA-CR2: Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in	Transfer	
	<i>Students will be able to independently use their learning to...</i> Ask questions and/or define problems Develop and/or use models Analyze and interpret data using computational thinking Construct explanations and design solutions	
	Meaning-Making	
	<i>Students will understand that...</i> <ul style="list-style-type: none"> • <i>The driving force behind creation of compounds is stability of an atom.</i> • <i>The types of bonds and behavior of atoms determine how atoms and compounds are named.</i> • <i>Forces between molecules vary depending on type of bond and bond energy.</i> • <i>Angles of bonds can be used to predict and model molecular geometry.</i> 	ESSENTIAL QUESTIONS <i>Students will keep considering...</i> <ul style="list-style-type: none"> • How do particles combine to form the variety of matter one observes? • How are energy and bonding related? • How do compounds get their names? • Can the properties of a substance be attributed to the bonds within it?

<p>total bond energy.</p> <p>PA-SPM2: 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.</p>		<ul style="list-style-type: none"> How are molecular geometry and bonding related?
<p>Which branch(es) of science apply:</p> <p>PS E&SS</p>	<p><i>Knowledge and Skills Acquisition</i></p>	
	<p style="text-align: center;">UNDERSTANDINGS</p> <p><i>Students will know...</i></p> <ul style="list-style-type: none"> Bonding in its most basic form is due to the octet rule. Ionic bonding involves transfer of electrons while covalent bonds share electrons. Bonds within metals form a sea of electrons. The structure and interactions of matter at the bulk scale are determined by electrical forces within and between atoms. Nomenclature for ionic and covalent compounds including acids. How to draw Lewis structures for ionic and covalent bonds keeping in mind dipoles and polarity. How bond energy relates to stability of a compound. Compounds have 3D shapes determined by VSEPR. 	<p><i>Students will be skilled at...</i></p> <ul style="list-style-type: none"> Use a model to predict the relationships between systems or between components of a system Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources. Apply scientific principles and evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest. Reason abstractly and quantitatively.
<p style="text-align: center;">KEY VOCABULARY</p> <p>Octet rule Ionic bond Covalent bond Metallic bond Dipole Polarity Bond angle Double bond Triple bond Electronegativity Formal charge Lone pair VSEPR Tetrahedral Trigonal planar Trigonal bipyramidal Octahedral</p>		

Stage 2 – Evidence

Evaluative Criteria	Assessment Evidence	
<p>Lab reports</p> <p>Accuracy of models</p> <p>Written and verbal observations</p> <p>Formative checks for understanding</p>	<p style="text-align: center;">PERFORMANCE TASK(S):</p> <ul style="list-style-type: none"> Students will use the periodic table to predict the patterns of behavior of the elements based on the attraction and repulsion between electrically charged particles and the patterns of outermost electrons that determine the typical reactivity of an atom. Students will use paper or digital models to predict charge of ions and types and numbers of bonds between elements. Students will construct foam models of molecular compounds. Their observations including bond angles will serve as evidence for their chosen geometry. Students will use data concerning inter and intra molecular forces to present solutions concerning applications of bulk materials in everyday life. 	<p>Differentiation Considerations:</p> <ul style="list-style-type: none"> Assignments can be scaffolded to a variety of difficulties. Example models can be made for students who struggle to start. Some data can be given at the start of activities. Teacher prompts to get students talking.
<p>Classroom data sets</p> <p>Group presentations</p> <p>Vocabulary concept maps</p> <p>Written and multiple-choice responses</p>		<p>Differentiation Considerations:</p> <ul style="list-style-type: none"> Multiple-choice assessments can be shortened. Assignments can be made vocabulary based for EL's Larger assignments can be chunked with multiple student check ins.