

Unit 1

Lab Safety

Duration	1 week			Assessed
Priority Standard(s)	N/A	There are no applicable state standards for Laboratory safety, it must be taught for legal purposes.		
Supporting Standard(s)				

Unit 2

Properties of Materials

Duration	3 weeks		Assessed
Priority Standard(s)	2. PS1.A.1	Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties. [Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.]	
	9-12.PS1.A.4	Apply the concepts of bonding and crystalline/molecular structure to explain the macroscopic properties of various categories of structural materials, i.e. metals, ionic (ceramics), and polymers. [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.]	
Supporting Standard(s)		I can classify materials as metal, ceramic, polymer, or composite based on its physical and chemical properties	
		I can identify properties of different types of materials	
		I can identify types of chemical bonds as ionic, covalent, or molecular	
		I can explain how types of bonds lead to different types of materials	

Unit 3

Crystals Part 1

Duration	4 weeks	Assessed	
Priority Standard(s)	PS1.A.1	Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.]	
	9-12.PS1.A.4	Apply the concepts of bonding and crystalline/molecular structure to explain the macroscopic properties of various categories of structural materials, i.e. metals, ionic (ceramics), and polymers. [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.]	
Supporting Standard(s)		Correctly define vocabulary words such as nucleation site, allotrope, amorphous, crystalline, and dendritic	
		Describe the three methods for crystal formation	
		I can explain the difference between solutions that are unsaturated, saturated, and supersaturated.	
		Identify and define the components of a solution	
		Identify and define allotropes	
		Explain the difference between crystalline and amorphous solids	

Unit 4

Crystals Part 2

Duration	4 weeks		Assessed
Priority Standard(s)	PS1.A.1	Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence supporting a model could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.]	
	9-12.PS1.A.4	Apply the concepts of bonding and crystalline/molecular structure to explain the macroscopic properties of various categories of structural materials, i.e. metals, ionic (ceramics), and polymers. [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.]	
Supporting Standard(s)		I can identify the 4 basic crystal structures found in metals	
		I can explain how different heat treatments of a metal can affect the properties of a metal.	
		I can explain how the crystal structure of a metal affects the overall properties of that metal	
		I can explain how defects in a crystal structure can affect the properties of a metal	

Unit 5
Metals

Duration	4 weeks			Assessed
Priority Standard(s)	PS1.B.2	Conduct an investigation to determine whether the combining of two or more substances results in new substances.		
	9-12.PS1.A.1	Use the organization of the periodic table 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.]		
Supporting Standard(s)		I can explain the basics of oxidation and reduction chemistry		
		I can explain the difference between casting and forging and how each affects the crystal structure of a metals		
		I understand that metals interact with other chemicals based on their placement in the activity series		
		I can explain melting point depression		
		I can predict the product of a single displacement reaction		
		I can name ionic compounds		

Unit 6

Lewis Dot Structures

Duration	4 weeks	Assessed
Priority Standard(s)	9-12.PS1.A.1	Use the organization of the periodic table 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.]
Supporting Standard(s)		I can predict the number of valence electrons in an element based on its placement in the periodic table
		I can draw the lewis dot structure of basic inorganic compounds
		I can draw the lewis dot structure, condensed structural formula, and bond-line formulas for basic organic compounds

Unit 7

Polymers

Duration	5 weeks	Assessed	
Priority Standard(s)	PS1.B.2	Conduct an investigation to determine whether the combining of two or more substances results in new substances.	
	9-12.PS1.A.3	Plan and conduct an investigation to gather evidence to compare physical and chemical properties of substances such as melting point, boiling point, vapor pressure, surface tension, and chemical reactivity to infer the relative strength of attractive forces between particles. [Clarification Statement: Emphasis is on understanding the relative strength of forces between particles. Examples of particles could include ions, atoms, molecules, and networked materials (such as graphite).	
Supporting Standard(s)		I can explain the difference between addition polymerization, condensation polymerization, and cross-linking	
		I can predict the products of a polymerization reaction	
		I can explain the difference between a thermoset and a thermoplastic polymer	
		I can describe the challenges involved in recycling plastics	
		I can classify polymers as natural or synthetic	

Unit 8

Ceramics and Glass

Duration	4 weeks		Assessed
Priority Standard(s)	9-12.PS1.A.4	Apply the concepts of bonding and crystalline/molecular structure to explain the macroscopic properties of various categories of structural materials, i.e. metals, ionic (ceramics), and polymers. [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.]	
Supporting Standard(s)		I can identify types of glass based on their properties	
		I can describe the chemical changes that occur during clay firing (both traditional and raku)	
		I can explain how to prevent thermal shock	
		I can explain the chemical difference between a metal and a ceramic	

Unit 9

Composites

Duration	4 weeks		Assessed
Priority Standard(s)	2.PS1.A.2	Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. [Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.]	
	9-12.PS1.A.4	Apply the concepts of bonding and crystalline/molecular structure to explain the macroscopic properties of various categories of structural materials, i.e. metals, ionic (ceramics), and polymers. [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.]	
Supporting Standard(s)		I can identify the matrix and reinforcement in a composite and describe their functions	
		I can design and create a composite material	
		I can describe stressed-skin composites vs. sandwich-type composites	