

## Illustrations of Materials Science alignment with Ohio Science Content Standards, Benchmarks and Indicators

### ASM Materials Education Foundation

Excerpts from “Materials Science and Technology” Teachers Handbook

Battelle Memorial Institute

Pacific Northwest National Laboratory/ US Department of Energy

Richland, Washington

### Ohio Math and Science Coalition, authors

<b>Materials Science and Technology Teachers Handbook Activity Title</b>	<b>Alignment with Ohio Science Content Standards Grades 9-10 Benchmarks and Indicators</b>	<b>Alignment with Ohio Science Content Standards Grades 11-12 Benchmarks and Indicators</b>	<b>Lesson Description</b>
<b>Water Lock</b> (Demonstration) <b>Time</b> One class period	Physical Sciences <ul style="list-style-type: none"> <li>▶ Benchmark B                             <ul style="list-style-type: none"> <li>• Nature of Matter Grade 9 Indicator 9</li> </ul> </li> </ul> Science and Technology <ul style="list-style-type: none"> <li>▶ Benchmark A                             <ul style="list-style-type: none"> <li>• Technological Design Grade 9 Indicator 2 Grade 9 Indicator 3 Grade 10 Indicator 3</li> </ul> </li> <li>▶ Benchmark B                             <ul style="list-style-type: none"> <li>• Understanding Technology Grade 10 Indicator 1 Grade 10 Indicator 2</li> </ul> </li> </ul>	Physical Sciences <ul style="list-style-type: none"> <li>▶ Benchmark A                             <ul style="list-style-type: none"> <li>• Nature of Matter Grade 12 Indicator 1</li> </ul> </li> </ul> Science and Technology <ul style="list-style-type: none"> <li>▶ Benchmark A                             <ul style="list-style-type: none"> <li>• Understanding Technology Grade 10 Indicator 2 Grade 10 Indicator 3</li> </ul> </li> </ul>	<i>Introductory</i>  Students observe chemical bonding of water with sodium polyacrylate.
<b>Classification of Materials</b> (Activity) <b>Time</b> One class period	Physical Sciences <ul style="list-style-type: none"> <li>▶ Benchmark C                             <ul style="list-style-type: none"> <li>• Nature of Matter Grade 9 Indicator 9</li> </ul> </li> </ul>	Physical Sciences <ul style="list-style-type: none"> <li>▶ Benchmark A                             <ul style="list-style-type: none"> <li>• Nature of Matter Grade 12 Indicator 1</li> </ul> </li> </ul>	<i>Introductory</i>  Students investigate properties of matter

	Grade 9 Indicator 10		that can be used to organize and group similar materials.
<b>Property Testing</b> (Activity) <b>Time</b> One class period	Physical Sciences ▶ Benchmark C <ul style="list-style-type: none"> <li>• Nature of Matter</li> </ul> Grade 9 Indicator 9 Grade 9 Indicator 10	Physical Sciences ▶ Benchmark A <ul style="list-style-type: none"> <li>• Nature of Matter</li> </ul> Grade 12 Indicator 1	<i>Introductory</i>  Students investigate materials (metals, ceramics, polymers) through their physical properties
<b>Crystal Study</b> (Lab) <b>Time</b> One class period	Scientific Inquiry ▶ Benchmark A <ul style="list-style-type: none"> <li>• Doing Scientific Inquiry</li> </ul> Grade 9 Indicator 2 Grade 9 Indicator 3 Grade 10 Indicator 1	Physical Sciences ▶ Benchmark A <ul style="list-style-type: none"> <li>• Nature of Matter</li> </ul> Grade 12 Indicator 1  Physical Sciences ▶ Benchmark E <ul style="list-style-type: none"> <li>• Nature of Matter</li> </ul> Grade 11 Indicator 2  Science and Technology ▶ Benchmark A <ul style="list-style-type: none"> <li>• Understanding Technology</li> </ul> Grade 12 Indicator 1 Grade 12 Indicator 2  Scientific Inquiry ▶ Benchmark A <ul style="list-style-type: none"> <li>• Doing Scientific Inquiry</li> </ul> Grade 12 Indicator 3	<i>Introductory</i>  Students investigate growth of crystals under different chemical, electromagnetic and thermal conditions
<b>Paper Clip Destruction</b> (Investigation)	Physical Sciences ▶ Benchmark C		<i>Introductory</i>

<p><b>Time</b> One class period</p>	<ul style="list-style-type: none"> <li>• Nature of Matter Grade 9 Indicator 9 Grade 9 Indicator 10</li> </ul> <p>Science and Technology</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Technological Design Grade 9 Indicator 2 Grade 9 Indicator 3</li> </ul> </li> </ul>		<p>Students investigate structural integrity of paper clips. Real World Connections: Quality Control Destructive testing Plot a distribution chart Describe results using scientific terms</p>
<p><b>Properties of Metals</b> (Lab) <b>Time</b> One class period</p>	<p>Physical Sciences</p> <ul style="list-style-type: none"> <li>▶ Benchmark C <ul style="list-style-type: none"> <li>• Nature of Matter Grade 9 Indicator 9 Grade 9 Indicator 10</li> </ul> </li> </ul> <p>Scientific Inquiry</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Doing Scientific Inquiry Grade 9 Indicator 2 Grade 9 Indicator 3 Grade 10 Indicator 1</li> </ul> </li> </ul>	<p>Physical Sciences</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Nature of Matter Grade 12 Indicator 1</li> </ul> </li> </ul> <p>Scientific Inquiry</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Doing Scientific Inquiry Grade 12 Indicator 3</li> </ul> </li> </ul>	<p><i>Metals</i></p> <p>Students investigate metals and their electrical, magnetic, and physical properties. Compare and contrast characteristics of metals and non metals Develop reference chart</p>
<p><b>Aluminum-Zinc Phase Change in Metals</b> (Lab) <b>Time</b> One class period</p>	<p>Physical Sciences</p> <ul style="list-style-type: none"> <li>▶ Benchmark C <ul style="list-style-type: none"> <li>• Nature of Matter Grade 9 Indicator 9 Grade 9 Indicator 10</li> </ul> </li> </ul> <p>Scientific Inquiry</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Doing Scientific Inquiry</li> </ul> </li> </ul>	<p>Physical Sciences</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Nature of Matter Grade 12 Indicator 1 Grade 12 Indicator 2</li> </ul> </li> </ul> <p>Physical Sciences</p> <ul style="list-style-type: none"> <li>▶ Benchmark E <ul style="list-style-type: none"> <li>• Nature of Matter</li> </ul> </li> </ul>	<p><i>Metals</i></p> <p>Students begin investigating annealing, miscible and alloying properties as metals change state from solid to liquid, then cooled to</p>

	Grade 9 Indicator 2 Grade 9 Indicator 3	Grade 12 Indicator 2 Scientific Inquiry ▶ Benchmark A • Doing Scientific Inquiry Grade 12 Indicator 3	solid state again. Students make a useful alloy. Use phase diagrams to describe observations and data collected
--	--	---	---

<p><b>Alloying Sterling Silver</b> (Lab) <b>Time</b> One class period</p>	<p>Physical Sciences</p> <ul style="list-style-type: none"> <li>▶ Benchmark B <ul style="list-style-type: none"> <li>• Nature of Matter Grade 9 Indicator 6 Grade 9 Indicator 7</li> </ul> </li> <li>▶ Benchmark C <ul style="list-style-type: none"> <li>• Nature of Matter Grade 9 Indicator 9 Grade 9 Indicator 10</li> </ul> </li> </ul> <p>Scientific Inquiry</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Doing Scientific Inquiry Grade 9 Indicator 2 Grade 9 Indicator 3 Grade 10 Indicator 1</li> </ul> </li> </ul>	<p>Physical Sciences</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Nature of Matter Grade 12 Indicator 1</li> </ul> </li> <li>▶ Benchmark E <ul style="list-style-type: none"> <li>• Nature of Matter Grade 11 Indicator 2</li> </ul> </li> </ul> <p>Scientific Inquiry</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Doing Scientific Inquiry Grade 12 Indicator 3</li> </ul> </li> </ul>	<p><i>Metals</i></p> <p>Students learn about the molecular structure and bonding properties of alloys. Students calculate the amount of copper and silver needed to make sterling silver. Observe changes that take place as the alloy is being made Explain why sterling silver alloy is used rather than other alloys Students describe thru writing and discussion the process and results when an alloy is made</p>
<p><b>Making a Light Bulb</b> (Activity) <b>Time</b> One class period</p>	<p>Physical Sciences</p> <ul style="list-style-type: none"> <li>▶ Benchmark F <ul style="list-style-type: none"> <li>• Nature of Energy Grade 9 Indicator 15</li> </ul> </li> <li>▶ Benchmark G <ul style="list-style-type: none"> <li>• Nature of Energy Grade 9 Indicator 18</li> </ul> </li> </ul> <p>Scientific Ways of Knowing</p> <ul style="list-style-type: none"> <li>▶ Benchmark B <ul style="list-style-type: none"> <li>• Scientific Theories Grade 9 Indicator 5 Grade 9 Indicator 7</li> </ul> </li> </ul>		<p><i>Metals</i></p> <p>Students construct a battery-powered, low-voltage incandescent light bulb. Students can explain how a light bulb works</p>

<p><b>Batching Glass</b> (Lab) <b>Time</b> One class period</p>	<p>Physical Sciences  ▶ Benchmark B  • Nature of Matter  Grade 9 Indicator 7  ▶ Benchmark C  • Nature of Matter  Grade 9 Indicator 9  Grade 9 Indicator 10</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 9 Indicator 2  Grade 9 Indicator 3</p>	<p>Physical Sciences  ▶ Benchmark A  • Nature of Matter  Grade 12 Indicator 1</p> <p>Science and Technology  ▶ Benchmark A  • Understanding Technology  Grade 12 Indicator 1</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 12 Indicator 3</p>	<p><i>Ceramics</i></p> <p>Students develop the concept of molarity and how an understanding of moles is important in creating chemical reactions.  Apply a mole concept in determining molar masses  Use the mole concept in problem solving  Use equations</p>
<p><b>Glass Melting</b> (Lab) <b>Time</b> At least two class periods</p>	<p>Physical Sciences  ▶ Benchmark B  • Nature of Matter  Grade 9 Indicator 7  ▶ Benchmark C  • Nature of Matter  Grade 9 Indicator 9  Grade 9 Indicator 10</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 9 Indicator 2  Grade 9 Indicator 3</p>	<p>Physical Sciences  ▶ Benchmark A  • Nature of Matter  Grade 12 Indicator 1</p> <p>Science and Technology  ▶ Benchmark A  • Understanding Technology  Grade 12 Indicator 1</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 12 Indicator 3</p>	<p><i>Ceramics</i></p> <p>Students investigate how various metal oxides, melted with glass, produce glasses of varying color.  Students melt, pour, air quench and anneal glass  Practice safe procedures for glass making</p>

<p><b>Thermal Shock</b> (Activity) <b>Time</b> One class period</p>	<p>Physical Sciences  ▶ Benchmark B  • Nature of Matter  Grade 9 Indicator 7  ▶ Benchmark C  • Nature of Matter  Grade 9 Indicator 9  Grade 9 Indicator 10</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 9 Indicator 2  Grade 9 Indicator 3</p>	<p>Physical Sciences  ▶ Benchmark A  • Nature of Matter  Grade 12 Indicator 1</p> <p>Science and Technology  ▶ Benchmark A  • Understanding Technology  Grade 12 Indicator 1</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 12 Indicator 3</p>	<p><i>Ceramics</i></p> <p>Students investigate properties of thermal conductivity, strength, coefficient of expansion and compare stress/strain, Young's Modulus. Students explain in writing the effect of varying rates of expansion and TSI on different kinds on materials</p>
<p><b>Making Glass from Soil</b> (Lab) <b>Time</b> Two class periods</p>	<p>Physical Sciences  ▶ Benchmark C  • Nature of Matter  Grade 9 Indicator 9</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 9 Indicator 2  Grade 9 Indicator 3  Grade 9 Indicator 5  Grade 9 Indicator 6</p>	<p>Physical Sciences  ▶ Benchmark A  • Nature of Matter  Grade 12 Indicator 1</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 12 Indicator 1  Grade 12 Indicator 2  Grade 12 Indicator 3  Grade 12 Indicator 4</p>	<p><i>Ceramics</i></p> <p>Students investigate the presence of Silicon Dioxide in soil samples. They graph the melt behavior and observe physical changes as Silicon Dioxide and Anhydrous Borax are mixed in different proportions.</p>

<p><b>Making and Testing Superconductors</b> (Lab) <b>Time</b> Two class periods</p>		<p>Physical Sciences  ▶ Benchmark A  • Nature of Matter  Grade 12 Indicator 1  Grade 12 Indicator 4</p> <p>Science and Technology  ▶ Benchmark A  • Understanding Technology  Grade 12 Indicator 1  Grade 12 Indicator 2  Grade 12 Indicator 3</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 12 Indicator 2  Grade 12 Indicator 3  Grade 12 Indicator 4</p>	<p><i>Ceramics</i></p> <p>Students make superconducting materials using chemical batching, mixing, grinding, heating, pressing and tempering and investigate the Meissner Effect.</p>
<p><b>Making Slime</b> (Lab) <b>Time</b> One class period</p>	<p>Physical Sciences  ▶ Benchmark B  • Nature of Matter  Grade 9 Indicator 7</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 9 Indicator 2  Grade 9 Indicator 3</p>	<p>Physical Sciences  ▶ Benchmark A  • Nature of Matter  Grade 12 Indicator 1  Grade 12 Indicator 2</p>	<p><i>Polymers</i></p> <p>Students learn about the construction of polymers by combining Polyvinyl Alcohol and Sodium Borate  Students can observe and describe the properties of a prepared substance., observe the nature of a polymer; describe how cross linking affects a polymer</p>

			using models, drawings, discussion
--	--	--	---------------------------------------

<p><b>Making Polymer Foams</b> (Lab) <b>Time</b> One class period</p>	<p>Scientific Inquiry  <ul style="list-style-type: none"> <li>▶ Benchmark B <ul style="list-style-type: none"> <li>• Understanding Technology Grade 10 Indicator 1 Grade 10 Indicator 2</li> </ul> </li> </ul> </p>	<p>Physical Sciences  <ul style="list-style-type: none"> <li>▶ Benchmark E <ul style="list-style-type: none"> <li>• Nature of Matter Grade 11 Indicator 2</li> </ul> </li> </ul>   Physical Sciences  <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Nature of Matter Grade 12 Indicator 1 Grade 12 Indicator 2</li> </ul> </li> </ul> </p>	<p><i>Polymers</i></p> <p>Students learn how two-part polyurethane foam solutions are mixed and how foam can be used for molding and insulation. Mix 2 organic compounds together to observe the reaction and resulting polymeric materials that are produced. Evaluate the similarities and differences</p>
<p><b>Making Nylon Thread</b> (Activity) <b>Time</b> One class period</p>	<p>Physical Sciences  <ul style="list-style-type: none"> <li>▶ Benchmark B <ul style="list-style-type: none"> <li>• Nature of Matter Grade 9 Indicator 7</li> </ul> </li> </ul>   Scientific Inquiry  <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Doing Scientific Inquiry Grade 9 Indicator 2 Grade 9 Indicator 3 Grade 9 Indicator 5</li> </ul> </li> </ul> </p>	<p>Physical Sciences  <ul style="list-style-type: none"> <li>▶ Benchmark E <ul style="list-style-type: none"> <li>• Nature of Matter Grade 11 Indicator 2</li> </ul> </li> </ul>   Physical Sciences  <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Nature of Matter Grade 12 Indicator 1 Grade 12 Indicator 2</li> </ul> </li> </ul>   Science and Technology  <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Understanding Technology Grade 12 Indicator 2 Grade 12 Indicator 3</li> </ul> </li> </ul> </p>	<p><i>Polymers</i></p> <p>Students learn how a polymer (nylon) is made and extract nylon threads from a polymer solution. Create a thermoplastic resin synthesized through step polymerization</p>

<p><b>Casting a Silicone Rubber Mold</b> (Lab) <b>Time</b> Two class periods</p>	<p>Physical Sciences  ▶ Benchmark B  • Nature of Matter  Grade 9 Indicator 7</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 9 Indicator 2  Grade 9 Indicator 3  Grade 9 Indicator 5</p> <p>Science and Technology  ▶ Benchmark A  • Abilities to Do Design  Grade 10 Indicator 3  Grade 9 Indicator 3  Grade 9 Indicator 5  ▶ Benchmark B  • Understanding Technology  Grade 10 Indicator 2</p>	<p>Physical Sciences  ▶ Benchmark E  • Nature of Matter  Grade 11 Indicator 2</p> <p>Physical Sciences  ▶ Benchmark A  • Nature of Matter  Grade 12 Indicator 1  Grade 12 Indicator 2</p> <p>Science and Technology  ▶ Benchmark A  • Understanding Technology  Grade 12 Indicator 2  Grade 12 Indicator 3</p>	<p><i>Polymers</i></p> <p>Students learn how to cast a silicone rubber mold from silicone rubber, using room temperature vulcanizing</p>
--	--	--	--

<p><b>Epoxy Resin Casting</b> (Activity) <b>Time</b> One class period</p>	<p>Physical Sciences ▶ Benchmark B • Nature of Matter Grade 9 Indicator 7</p> <p>Scientific Inquiry ▶ Benchmark A • Doing Scientific Inquiry Grade 9 Indicator 2 Grade 9 Indicator 3 Grade 9 Indicator 5</p> <p>Science and Technology ▶ Benchmark A • Abilities to Do Design Grade 10 Indicator 3 Grade 9 Indicator 3 Grade 9 Indicator 5 ▶ Benchmark B • Understanding Technology Grade 10 Indicator 2 •</p>	<p>Physical Sciences ▶ Benchmark E • Nature of Matter Grade 11 Indicator 2</p> <p>Physical Sciences ▶ Benchmark A • Nature of Matter Grade 12 Indicator 1 Grade 12 Indicator 2</p>	<p><i>Polymers</i></p> <p>Students demonstrate the ability to follow directions and learn how use rubber molds to cast products made from epoxy resin. Students describe the effect of adding a catalyst to initiate a chemical reaction thereby changing the characteristics of the material</p>
<p><b>Identifying Polymers</b> (Lab) <b>Time</b> One class period</p>	<p>Physical Sciences ▶ Benchmark C • Nature of Matter Grade 9 Indicator 9 Grade 9 Indicator 10</p> <p>Scientific Inquiry ▶ Benchmark A • Doing Scientific Inquiry Grade 9 Indicator 2 Grade 9 Indicator 3 Grade 9 Indicator 6</p>	<p>Physical Sciences ▶ Benchmark A • Nature of Matter Grade 12 Indicator 1 Grade 12 Indicator 2</p> <p>Scientific Inquiry ▶ Benchmark A • Doing Scientific Inquiry Grade 12 Indicator 3 Grade 12 Indicator 5</p>	<p><i>Polymers</i></p> <p>Students learn to identify and sort several different plastics based on observation and categorization of thermoforming or thermosetting properties. Identify a plastic using simple test procedures of odor and</p>

		flammability
--	--	--------------

<p><b>Making Concrete</b> (Lab) <b>Time</b> Two class periods</p>	<p>Physical Sciences  ▶ Benchmark B  • Nature of Matter  Grade 9 Indicator 7  ▶ Benchmark C  • Nature of Matter  Grade 9 Indicator 9</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 9 Indicator 2  Grade 9 Indicator 3  Grade 9 Indicator 5  Grade 9 Indicator 6</p> <p>Science and Technology  ▶ Benchmark A  • Abilities to Do Design  Grade 9 Indicator 2  Grade 9 Indicator 3</p>	<p>Physical Sciences  ▶ Benchmark A  • Nature of Matter  Grade 12 Indicator 1</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 12 Indicator 1  Grade 12 Indicator 2  Grade 12 Indicator 3  Grade 12 Indicator 4  Grade 12 Indicator 5</p>	<p><i>Composites</i></p> <p>Students can describe a composite material, investigate the properties of different concrete mixtures and determine the role that different components contribute to the final concrete properties. Identify several composite materials used commonly in our lives.  Students will actively participate in making concrete materials.</p>
<p><b>Testing New Materials</b> (Lab) <b>Time</b> One class period</p>	<p>Physical Sciences  ▶ Benchmark B  • Nature of Matter  Grade 9 Indicator 7  ▶ Benchmark C  • Nature of Matter  Grade 9 Indicator 9</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 9 Indicator 2  Grade 9 Indicator 3  Grade 9 Indicator 5  Grade 9 Indicator 6</p>	<p>Physical Sciences  ▶ Benchmark A  • Nature of Matter  Grade 12 Indicator 1</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 12 Indicator 1  Grade 12 Indicator 2  Grade 12 Indicator 3  Grade 12 Indicator 4  Grade 12 Indicator 5</p>	<p><i>Composites</i></p> <p>Students perform quality control tests to measure the strength of different concrete mixtures.</p>

	<p>Science and Technology</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Abilities to Do Design Grade 9 Indicator 2 Grade 9 Indicator 3</li> </ul> </li> </ul>		
<p><b>Composite Experiments</b> (Lab) <b>Time</b> One class period</p>	<p>Physical Sciences</p> <ul style="list-style-type: none"> <li>▶ Benchmark B <ul style="list-style-type: none"> <li>• Nature of Matter Grade 9 Indicator 7</li> </ul> </li> <li>▶ Benchmark C <ul style="list-style-type: none"> <li>• Nature of Matter Grade 9 Indicator 9</li> </ul> </li> </ul> <p>Scientific Inquiry</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Doing Scientific Inquiry Grade 9 Indicator 2 Grade 9 Indicator 3 Grade 9 Indicator 5 Grade 9 Indicator 6</li> </ul> </li> </ul> <p>Science and Technology</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Abilities to Do Design Grade 9 Indicator 2 Grade 9 Indicator 3</li> </ul> </li> </ul>	<p>Physical Sciences</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Nature of Matter Grade 12 Indicator 1</li> </ul> </li> </ul> <p>Scientific Inquiry</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Doing Scientific Inquiry Grade 12 Indicator 1 Grade 12 Indicator 2 Grade 12 Indicator 3 Grade 12 Indicator 4 Grade 12 Indicator 5</li> </ul> </li> </ul>	<p><i>Composites</i></p> <p>Students perform quality control tests to measure the strength of different laminates and laminating/honeycomb processes (Fiberglass and Kevlar). Students make a composite to apply testing procedures to obtain a new material</p>
<p><b>Simple Stressed-Skin Composite</b> (Demonstration) <b>Time</b> Two class periods</p>	<p>Science and Technology</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Abilities to Do Design Grade 9 Indicator 2 Grade 9 Indicator 3</li> </ul> </li> </ul>	<p>Science and Technology</p> <ul style="list-style-type: none"> <li>▶ Benchmark A <ul style="list-style-type: none"> <li>• Understanding Technology Grade 12 Indicator 1 Grade 12 Indicator 2 Grade 12 Indicator 3</li> </ul> </li> </ul>	<p><i>Composites</i></p> <p>Students learn about Young's Modulus, the strength testing of beams, tensile and compressive forces.</p>

<p><b>Testing Stressed-Skin Composite</b> (Lab) <b>Time</b> One class period</p>	<p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 9 Indicator 2  Grade 9 Indicator 3  Grade 9 Indicator 5  Grade 9 Indicator 6</p> <p>Science and Technology  ▶ Benchmark A  • Abilities to Do Design  Grade 9 Indicator 2  Grade 9 Indicator 3</p>	<p>Science and Technology  ▶ Benchmark A  • Understanding Technology  Grade 12 Indicator 1  Grade 12 Indicator 2  Grade 12 Indicator 3</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 12 Indicator 1  Grade 12 Indicator 2  Grade 12 Indicator 3  Grade 12 Indicator 4  Grade 12 Indicator 5</p>	<p><i>Composites</i></p> <p>Students investigate the strength of beams reinforced with composite materials; demonstrate the consequences of certain defects in structures, quantify gains made by engineered composite construction using a simple measurement of Young's modulus of elasticity</p>
<p><b>Making Paper</b> (Activity) <b>Time</b> One class period</p>	<p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 9 Indicator 2  Grade 9 Indicator 3  Grade 9 Indicator 5</p> <p>Science and Technology  ▶ Benchmark A  • Abilities to Do Design  Grade 9 Indicator 2  Grade 9 Indicator 3</p>	<p>Science and Technology  ▶ Benchmark A  • Understanding Technology  Grade 12 Indicator 1  Grade 12 Indicator 2  Grade 12 Indicator 3</p> <p>Scientific Inquiry  ▶ Benchmark A  • Doing Scientific Inquiry  Grade 12 Indicator 1  Grade 12 Indicator 2  Grade 12 Indicator 3  Grade 12 Indicator 4  Grade 12 Indicator 5</p>	<p><i>Composites</i></p> <p>Students learn to make different pulps from plant materials and investigate how pulps are used to create different kinds of paper.</p>