



San Diego Unified School District  
Science Department

**Grade 5 – Mixtures and Solutions**  
Physical Science  
**Unit of Study**



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**Science Vision for  
San Diego Unified School District**  
Science is an integral part of the intellectual development of a child. Interest in science begins with attitudes and values established in the earliest years through daily experiences. Students graduating from high school must have a foundation in scientific knowledge and evidence based reasoning.

Updated versions of this unit of study can be found online at [www.sandi.net/science](http://www.sandi.net/science).



## Grade 5 – Mixtures and Solutions Module Overview



### Overview of the Unit

The Mixtures and Solutions Module has four investigations that introduce students to fundamental ideas in chemistry. Chemistry is the study of the structure of matter and the changes or transformations that take place in it. Learning about the makeup of substances gives us knowledge about how things go together and how they can be taken apart. Learning about changes in substances is important for several reasons: changes can be controlled to produce new materials; changes can be controlled to produce new materials; changes can give off energy to run machines.

### Grade 5 Physical Science Conceptual Flow

#### Concept #1

Elements and their combinations account for all the varied types of matter in the world. (PS1a, PS1b, PS1c, PS1d, PS1e, PS1f, PS1g, PS1h)

<b>Subconcepts</b> <b>Investigation #1: Separating Mixtures</b>	<b>Subconcepts:</b> <b>Investigation #2: Reaching Saturation</b>	<b>Subconcepts</b> <b>Investigation #3: Fizz Quiz</b>	<b>Subconcepts</b> <b>Investigation #4: Elements</b>
A mixture combines two or more materials that retain their own properties.	Solubility is the property that substances have of dissolving in solvents. Solubility is different for different material and can change with temperature and solvent.	When a change results from mixing two or more materials, that change is a chemical reaction, which can be represented with chemical formulas and chemical equations.	Earth has 90 naturally occurring elements, each defined by a unique atom.
A solution forms when a material dissolves in a liquid (solvent) and cannot be retrieved with a filter.	Solubility can be used to differentiate and identify substances.	Atoms are the fundamental building blocks of matter; all substances are composed of atoms.	Most matter on Earth is made from only a few elements.
All mixtures can be separated based on the properties of the constituent substances.	A solution is saturated when a solvent has dissolved as much solute as possible.	Atoms in reactants rearrange during reactions to form new substances.	Most elements on Earth are metals; metals share properties of malleability and conduction of heat and electricity.
Evaporation can separate a liquid from a solid in a solution.	Decompression sickness is caused by supersaturation of the gas nitrogen in blood.	Atoms combine to form molecules. Molecules are the fundamental units of substances.	The periodic table provides information about the composition of an element's atom and the element's chemical properties.
Crystal form can be used to identify substances.			Atoms and molecules can be imaged with scanning tunneling microscopes.

### 5th Grade Science Content Standards Addressed in this Module

## Physical Sciences

- PS1 Elements and their combinations account for all varied types of matter in the world. As a basis for understanding this concept:
- PS1a Students know that during chemical reactions the atoms in the reactants rearrange to form products with different properties.
  - PS1b Students know all matter is made of atoms, which may combine to form molecules.
  - PS1c Students know metals have properties in common, such as high electrical and thermal conductivity. Some metals, such as aluminum (Al), iron (Fe), nickel (Ni), copper (Cu), silver (Ag), and gold (Au), are pure elements; others, such as steel and brass, are composed of a combination of elemental metals.
  - PS1d Students know that each element is made of one kind of atom and that the elements are organized in the periodic table by their chemical properties.
  - PS1e Students know scientists have developed instruments that can create discrete images of atoms and molecules that show that the atoms and molecules often occur in well-ordered arrays.
  - PS1f Students know differences in chemical and physical properties of substances are used to separate mixtures and identify compounds.
  - PS1g Students know properties of solid, liquid, and gaseous substances, such as sugar (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>), water (H<sub>2</sub>O), helium (He), oxygen (O<sub>2</sub>), nitrogen (N<sub>2</sub>), and carbon dioxide (CO<sub>2</sub>).
  - PS1h Students know living organisms and most materials are composed of just a few elements.
  - PS1i Students know the common properties of salts, such as sodium chloride (NaCl).

## Investigation and Experimentation

- I&E6 Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:
- I&E6a Classify objects (e.g., rocks, plants, leaves) in accordance with appropriate criteria.
  - I&E6c Plan and conduct a simple investigation based on a student-developed question and write instructions others can follow to carry out the procedure.
  - I&E6f Select appropriate tools (e.g., thermometers, meter sticks, balances, and graduated cylinders) and make quantitative observations.
  - I&E6g Record data by using appropriate graphic representations (including charts, graphs, and labeled diagrams) and make inferences based on those data.
  - I&E6h Draw conclusions from scientific evidence and indicate whether further information is needed to support a specific conclusion.
  - I&E6i Write a report of an investigation that includes conducting tests, collecting data or examining evidence, and drawing conclusions.

## Pacing the Unit as a Whole

Pre-Test				
<b>Day 1</b> Start Inv. 1 Part 1 A	<b>Day 2</b> A/W	<b>Day 3</b> R	<b>Day 4</b> Start Inv. 1 Part 2 A	<b>Day 5</b> A
<b>Day 6</b> A/W	<b>Day 7</b> R	<b>Day 8</b> Start Inv. 1 Part 3 A	<b>Day 9</b> R	<b>Day 10</b> I-Check 1
<b>Day 11</b> Review	<b>Day 12</b> Start Inv. 2 Part 1 A	<b>Day 13</b> W/R	<b>Day 14</b> Start Inv. 2 Part 2 A	<b>Day 15</b> A/W
<b>Day 16</b> R	<b>Day 17</b> Start Inv. 2 Part 3 A	<b>Day 18</b> R I-Check 2	<b>Day 19</b> Review	<b>Day 20</b> Start Inv. 3 Part 1 A
<b>Day 21</b> A/W	<b>Day 22</b> R	<b>Day 23</b> Start Inv. 3 Part 2 A	<b>Day 24</b> A	<b>Day 25</b> A/W
<b>Day 26</b> R	<b>Day 27</b> Start Inv. 3 Part 3 A	<b>Day 28</b> A/W	<b>Day 29</b> R	<b>Day 30</b> Start Inv. 3 Part 4 A
<b>Day 31</b> I-Check 3	<b>Day 32</b> Review	<b>Day 33</b> Start Inv. 4 Part 1 A	<b>Day 34</b> A/W	<b>Day 35</b> R
<b>Day 36</b> Start Inv. 4 Part 2 A/W	<b>Day 37</b> A/W	<b>Day 38</b> R	<b>Day 39</b> Start Inv. 4 Part 3 A	<b>Day 40</b> R
<b>Day 41</b> R I-Check 4	<b>Day 42</b> Review	<b>Day 43</b> Benchmark Assessment		

**A – Active Investigation** sessions include hands-on work with mixtures, solutions, and chemical reactions, active thinking about the concrete experiences, small-group discussion, writing in science notebooks, learning new vocabulary in context, and completing written embedded assessments to inform instruction. (Approximately 60 minutes)

**W – Wrap-up** sessions are teacher-directed vocabulary reinforcement and science content review. (Approximately 30 minutes)

**R – Reading** sessions (*Science Resources* book) include individual and interactive reading, answering review questions, and discussing the reading to ensure that students integrate the information. (Approximately 30 minutes)

**I-Checks** are short summative assessments. Students respond to written prompts. (Approximately 30 minutes)



**Grade 5 – Mixtures and Solutions**  
**Pacing Guide – Investigation 1: Separating Mixtures**



**Investigation Overview**

<p><b>Investigation 1: Separating Mixtures</b>  <b>Concept: Elements and their combinations account for all the varied types of matter in the world.</b>          Students learn that solids, liquids, and gases can be combined to make mixtures and they make mixtures with solid materials and water. They compare the mass of a mixture to the mass of its parts, separate mixtures by particle size using screens and filters, and separate solutions, using evaporation. Students identify substances by crystal shape and become familiar with physical properties of common solid and liquid substances. They measure and weigh solids and liquids, using appropriate tools to make quantitative observations. Students write a plan for separating a mixture of three solid materials and test the plan for effectiveness.</p>		
<b>Part 1: Separating Mixtures</b>	<b>Part 2: Separating a Salt Solution</b>	<b>Part 3: Separating a Dry Mixture</b>
<p><u>Summary</u>          Students make mixtures of water and solid materials (gravel, diatomaceous earth, and salt) and separate the mixtures with screens and filters. They discover that water and salt make a special kind of mixture, a solution, which cannot be separated with a filter. Students read an article that reinforces and extends the concept of mixture.</p>	<p><u>Summary</u>          Students separate salt from water in a solution. They compare the total mass of a salt solution to the masses of its parts, the solvent and solute. Students separate the salt solution using evaporation and use the shape of the crystal to identify the salt. Students read about methods for separating various mixtures, using the properties of the constituents.</p>	<p><u>Summary</u>          Students make a dry mixture (gravel, powder, and salt). They develop a plan for separating the mixture and write it up as a sequential procedure. They use the procedure to complete a separation. They assess the separation methods developed by other students and use other procedures to separate the mixture. Students read an article that summarizes the skills and concepts developed in this investigation.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ A mixture is an intermingling of two or more materials.</li> <li>▪ When one substance (solute) dissolves in a second substance (solvent), the mixture is a solution.</li> <li>▪ Mixtures can be made with matter in any of its three common states, solid, liquid, and gas.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ All mixtures can be separated based on the properties of the constituent substances.</li> <li>▪ Evaporation can be used to separate solutions.</li> <li>▪ Crystal form can be used to identify substances.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ All mixtures can be separated based on the properties of the constituent substances.</li> <li>▪ Evaporation can be used to separate solutions.</li> </ul>
<p><u>Time Allocation</u>          Active Investigation: 2 days          Reading: 1 day</p>	<p><u>Time Allocation</u>          Active Investigation/Wrap-Up: 3 days          Reading: 1 day</p>	<p><u>Time Allocation</u>          Active Investigation: 1 day          Reading: 1 day          Assessment: 2 days</p>
<p><u>CA Science Standards</u>          PS1f, PS1g</p>	<p><u>CA Science Standards</u>          PS1f, PS1g, I&amp;E6f</p>	<p><u>CA Science Standards</u>          PS1f, PS1g, I&amp;E6f, I&amp;E6g</p>



**Grade 5 – Mixtures and Solutions**  
**Pacing Guide – Investigation 1: Separating Mixtures**

**Pacing Guide – Investigation 1: Separating Mixtures**

Day 1		Day 2		Day 3	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Read “Overview” <i>TG p. 1-31</i> <input type="checkbox"/> Read “At a Glance” <i>TG p. 46-47</i> <input type="checkbox"/> Read “Background for the Teacher” <i>TG p. 48-51</i> <input type="checkbox"/> Read “Teaching Children About Separating Mixtures” <i>TG p. 52-53</i> <input type="checkbox"/> Watch Video demo of Inv. 1, Pt 1 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 54-55</i> <input type="checkbox"/> Administer FOSS pre-test <i>TG. P.333-339</i>	Guiding the Investigation <input type="checkbox"/> “Investigation 1 Separating Mixtures, Part 1: Separating Mixtures” Steps 1-18 <i>TG p. 58-61</i> <input type="checkbox"/> <b>Body of Evidence Prompt #1</b> <i>TG p. 204</i>		Guiding the Investigation <input type="checkbox"/> “Part 1: Separating Mixtures; Wrapping up Part 1” Steps 19-20 <i>TG p. 62</i>		Reading in Science Resources <input type="checkbox"/> Steps 21-22 <i>TG p. 63</i>  Student Reading: Science Resources p. 3-7

**Pacing Guide – Investigation 1: Separating Mixtures (continued)**

Day 4		Day 5		Day 6	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Watch Video demo of Inv. 1, Pt 2 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 64-65</i>	Guiding the Investigation <input type="checkbox"/> “Part 2: Separating a Salt Solution” Steps 1-9 <i>TG p. 66-68</i>		Guiding the Investigation <input type="checkbox"/> “Part 2: Separating a Salt Solution” Steps 10-15 <i>TG p. 68-69</i> <input type="checkbox"/> <b>Body of Evidence Prompt #2</b> <i>TG p. 207</i>		<input type="checkbox"/> “Part 2: Separating Mixtures; Wrapping up Part 2” Step 16-17 <i>TG p. 70</i>
Day 7		Day 8		Day 9	
Prep	Instruction	Prep	Instruction	Prep	Instruction
	Reading in Science Resources <input type="checkbox"/> Step 18-19 <i>TG p. 71</i>  Student Reading: Science Resources p. 8-11	<input type="checkbox"/> Watch Video demo of Inv. 1, Pt 3 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 72-73</i>	Guiding the Investigation <input type="checkbox"/> “Part 3: Separating a Dry Mixture” Steps 1-9 <i>TG p. 74-75</i> <input type="checkbox"/> <b>Body of Evidence Prompt #3</b> <i>TG p. 74</i>		Concluding Investigation 1  Reading in Science Resources <input type="checkbox"/> Step 10-11 <i>TG p. 76</i>  Student Reading: Science Resources p. 12-14
Day 10		Day 11			
Prep	Instruction	Prep	Instruction		
<input type="checkbox"/>	Concluding Investigation 1 <input type="checkbox"/> I-Check 1 Step 12 <i>TG p. 77, 308-311, 340-341</i>		Guiding the Investigation <input type="checkbox"/> Review <input type="checkbox"/> Interdisciplinary Extensions <i>TG p. 78-80</i>  Student Reading: Science Resources p. 15		



**Grade 5 – Mixtures and Solutions**  
**Pacing Guide – Investigation 2: Reaching Saturation**

**Investigation Overview**

**Investigation 2: Reaching Saturation**

**Concept: Elements and their combinations account for all the varied types of matter in the world.**

Students experience saturated solutions. They understand dissolving as a process that takes place at the invisible particle level. Students compare the solubility of salts in water as a property of the salts. They measure the volume and mass of solids and liquids and compare the quantities of three solid materials required to saturate 50 ml of water. Students learn how decompression sickness is caused by dissolved gas (nitrogen) in body tissues. They identify an unknown substance based on its solubility in water. Students measure and weigh solids and liquids, using appropriate tools to make quantitative observations.

<b>Part 1: Salt Saturation</b>	<b>Part 2: Epsom-salts saturation</b>	<b>Part 3: The Saturation Puzzle</b>
<p><u>Summary</u> Students make a saturated solution by adding salt to water until no more salt will dissolve. Using a balance, they find the mass of the solution to determine the amount of salt that dissolved in the solution. Students read an article that introduces atomic theory by providing a model for dissolving at the fundamental particle level.</p>	<p><u>Summary</u> Students make a saturated Epsom-salts solution. Using a balance, they compare the solubility of salt and Epsom salts by comparing the mass of the solid materials dissolved in the saturated solutions. Students read about the bends, a medical condition caused by nitrogen gas saturation of blood and experienced by deep-sea divers and others who breathe pressurized air.</p>	<p><u>Summary</u> Students get an unknown material (citric acid), determine the mass of it required to saturate 50 ml of water, and compare the mass to other solids. They use solubility as a property to identify the unknown substance. Students read a review article that summarizes the skills and concepts developed in this investigation.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Solids dissolve in liquids at the atomic level.</li> <li>▪ A solution is saturated when a solvent has dissolved as much solute as possible.</li> <li>▪ Solubility is a property of solid substances.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ The mass of a solution is equal to the masses of its component parts.</li> <li>▪ Different salts have different solubilities.</li> <li>▪ Solubility can be used to differentiate and identify substances.</li> <li>▪ Decompression sickness is caused by supersaturation of the gas nitrogen in blood.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Solubility can be used to differentiate and identify substances.</li> </ul>
<p><u>Time Allocation</u> Active Investigation: 1 day Reading/Wrap-Up: 1 day</p>	<p><u>Time Allocation</u> Active Investigation: 2 days Reading: 1 day</p>	<p><u>Time Allocation</u> Active Investigation: 1 day Reading/Assessment: 2 days</p>
<p><u>CA Science Standards</u> PS1b, PS1f, PS1i</p>	<p><u>CA Science Standards</u> PS1b, PS1f, PS1g, PS1i I&amp;E6f</p>	<p><u>CA Science Standards</u> PS1f, Ps1i, I&amp;E6f, I&amp;E6h, I&amp;E6i</p>



**Grade 5 – Mixtures and Solutions**  
**Pacing Guide – Investigation 2: Reaching Saturation**



**Pacing Guide – Investigation 2: Reaching Saturation**

Day 12		Day 13		Day 14	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Read “At a Glance” <i>TG p. 82-83</i> <input type="checkbox"/> Read “Background for the Teacher” <i>TG p. 84-88</i> <input type="checkbox"/> Read “Teaching Children About Saturation” <i>TG p. 89</i> <input type="checkbox"/> Watch Video demo of Inv. 2, Pt 1 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 90-91</i>	Guiding the Investigation <input type="checkbox"/> “Investigation 2: Reaching Saturation, Part 1: Salt Saturation” Steps 1-17 <i>TG p. 92-96</i>		Guiding the Investigation <input type="checkbox"/> “Part 1: Salt Saturation Wrapping up Part 1” Steps 18-19 <i>TG p. 97</i>  <input type="checkbox"/> Reading in Science Resources Steps 20-21 <i>TG p. 98</i> Student Reading: Science Resources p. 16-19	<input type="checkbox"/> Watch Video demo of Inv. 1, Pt. 2 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 100-101</i>	Guiding the Investigation <input type="checkbox"/> “Part 2: Epsom-salts Saturation” Steps 1-14 <i>TG p. 102-104</i> <input type="checkbox"/> <b>Body of Evidence Prompt #4</b> <i>TG p. 210</i>
Day 15		Day 16		Day 17	
Prep	Instruction	Prep	Instruction	Prep	Instruction
	Guiding the Investigation <input type="checkbox"/> “Part 2: Epsom-salts Saturation; Wrapping up Part 2” Steps 16-18 <i>TG p. 104-105</i>		Reading in Science Resources <input type="checkbox"/> Steps 19-20 <i>TG p. 106</i>  Student Reading: Science Resources p. 20-24	<input type="checkbox"/> Watch Video demo of Inv. 2, Pt 3 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 107-108</i>	Guiding the Investigation <input type="checkbox"/> “Part 3: The Saturation Puzzle;” Steps 1-10 <i>TG p. 109-110</i> <input type="checkbox"/> <b>Body of Evidence Prompt #5</b> <i>TG p. 110</i>

**Pacing Guide – Investigation 2: Reaching Saturation (continued)**

Day 18		Day 19	
Prep		Prep	Instruction
	Guiding the Investigation <input type="checkbox"/> Reading in Science Resources Steps 12-13 Student Reading: Science Resources p. 25-26  <input type="checkbox"/> I-Check 2 Step 14 <i>TG p. 111, 312-317, 340-344</i>		<input type="checkbox"/> Review <input type="checkbox"/> Interdisciplinary Extensions <i>TG p. 112-114</i>  Student Reading: Science Resources p. 27



**Grade 5 – Mixtures and Solutions**  
**Pacing Guide – Investigation 3: Fizz Quiz**



**Investigation Overview**

<p><b>Investigation 3: Fizz Quiz</b>  <b>Concept: Elements and their combinations account for all the varied types of matter in the world.</b>          Students compare reactants and products before and after a chemical reaction. They observe, separate, and identify the products of chemical reactions. Students learn that atoms are the fundamental building blocks of matter and that all substances are composed of atoms. They learn that atoms rearrange during chemical reactions to form new substances. Students use atom models and chemical formulas to represent atoms and molecules. They represent chemical reactions with chemical equations. They measure volumes of solids and liquids.</p>	
<p><b>Part 1: Chemical Reactions</b></p>	<p><b>Part 2: Reaction Products</b></p>
<p><u>Summary</u>          Students mix combinations of substances (calcium chloride, baking soda, and citric acid) with water and observe changes. The changes (formation of a gas and a white precipitate) are identified as evidence of a chemical reaction. Students read an introductory article about atomic theory.</p>	<p><u>Summary</u>          Students use techniques from earlier investigations (filtering and evaporating) to separate and study the products of the reactions. Students read an article about using atom models and chemical formulas to represent molecules in chemical reactions.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ When a change results from mixing two or more materials, that change is a chemical reaction. A reaction results in new materials</li> <li>▪ Atoms are the fundamental building blocks of matter; all substances are composed of atoms.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Atoms combine to form molecules. Molecules are the fundamental units of substances.</li> <li>▪ Atoms in reactants rearrange during chemical reactions to form new substances called products.</li> </ul>
<p><u>Time Allocation</u>          Active Investigation/Wrap-Up: 2 days          Reading: 1 day</p>	<p><u>Time Allocation</u>          Active Investigation/Wrap-Up: 3 days          Reading: 1 day</p>
<p><u>CA Science Standards</u>          PS1a, PS1b, I&amp;E6f</p>	<p><u>CA Science Standards</u>          PS1a, PS1b, PS1d</p>

## Investigation Overview (continued)

<p><b>Investigation 3: Fizz Quiz</b>  <b>Concept: Matter is made of atoms that may combine to form molecules; in chemical reactions new substances with new properties form.</b>          Students compare reactants and products before and after a chemical reaction. They observe, separate, and identify the products of chemical reactions. Students learn that atoms are the fundamental building blocks of matter and that all substances are composed of atoms. They learn that atoms rearrange during chemical reactions to form new substances. Students use atom models and chemical formulas to represent atoms and molecules. They represent chemical reactions with chemical equations. They measure volumes of solids and liquids.</p>	
<p><b>Part 3: Equations</b></p>	<p><b>Part 4: Reaction In A Zip Bag</b></p>
<p>Students learn to manipulate models and chemical equations to communicate the numbers and associations of atoms before and after reactions. The reading supports technical aspects of using equations and emphasizes the conservation of atoms during reactions.</p>	<p><u>Summary</u>          Students conduct chemical reactions in a zip bag to confirm the presence and quantity of gas produced by various combinations of substances. They read a summary article that reinforces the concepts associated with chemical reactions and the conventions for representing them.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Chemical reactions can be represented with chemical formulas and chemical equations..</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>▪ Atoms in reactants rearrange during chemical reactions to form new substances called products.</li> </ul>
<p><u>Time Allocation</u>          Active Investigation/Wrap-Up: 2 days          Reading: 1 day</p>	<p><u>Time Allocation</u>          Active Investigation: 1 day          Reading/Assessment: 2 days</p>
<p><u>CA Science Standards</u>          PS1a, PS1b</p>	<p><u>CA Science Standards</u>          PS1a, PS1f, I&amp;E6f, I&amp;E6g I&amp;E6h, I&amp;E6i</p>



**Grade 5 – Mixtures and Solutions**  
**Pacing Guide – Investigation 3: Fizz Quiz**



**Pacing Guide – Investigation 3: Fizz Quiz**

Day 20		Day 21		Day 22	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Read “At a Glance” <i>TG p. 116-117</i> <input type="checkbox"/> Read “Background for the Teacher” <i>TG p. 118-121</i> <input type="checkbox"/> Read “Teaching Children About Chemical Reactions” <i>TG p. 122-123</i> <input type="checkbox"/> Watch Video demo of Inv. 3, Pt 1 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 124-126</i>	Guiding the Investigation <input type="checkbox"/> “Investigation 3: Fizz Quiz, Part 1: Chemical Reactions” Steps 1-20 <i>TG p. 127-131</i>  <input type="checkbox"/> <b>Body of Evidence Prompt #6</b> <i>TG p. 212</i>		Guiding the Investigation <input type="checkbox"/> Wrapping up Part 1 Steps 21-22 <i>TG p. 132</i>	<input type="checkbox"/>	Reading in Science Resources <input type="checkbox"/> Steps 23-24 <i>TG p. 133</i>  Student Reading: Science Resources p. 28-31
Day 23		Day 24		Day 25	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Watch Video demo of Inv. 3, Pt 2 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 134-135</i>	Guiding the Investigation <input type="checkbox"/> “Part 2: Reaction Products; Step 1-5” <i>TG p. 136</i>		Guiding the Investigation <input type="checkbox"/> “Part 2: Reaction Products; Step 6-13” <i>TG p. 137-139</i> <input type="checkbox"/> <b>Body of Evidence Prompt #7</b> <i>TG p. 213</i>		Guiding the Investigation <input type="checkbox"/> Wrapping up Part 2 Steps 14-15 <i>TG p. 140</i>

**Pacing Guide – Investigation 3: Fizz Quiz (continued)**

Day 26		Day 27		Day 28	
Prep	Instruction	Prep	Instruction	Prep	Instruction
	Reading in Science Resources <input type="checkbox"/> “Part 2: Reaction Products; Step 16-17 <i>TG p. 141</i>  Student Reading: Science Resources p. 32-33	<input type="checkbox"/> Watch Video demo of Inv. 3., Pt. 3 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 142-143</i>	Guiding the Investigation <input type="checkbox"/> “Part 3: Equations” Steps 1-11 <i>TG p. 144-148</i> <input type="checkbox"/> <b>Body of Evidence Prompt #8</b> <i>TG p. 215</i>		Guiding the Investigation <input type="checkbox"/> Review Step 11 <i>TG p. 148</i> <input type="checkbox"/> Wrapping up Part 3 Steps 12-13 <i>TG p. 149</i>
Day 29		Day 30		Day 31	
Prep	Instruction	Prep	Instruction	Prep	Instruction
	Reading in Science Resources <input type="checkbox"/> Steps 14-15 <i>TG p. 150</i>  Student Reading: Science Resources p. 34-35	<input type="checkbox"/> Watch Video demo of Inv. 3 Pt 4 “Reaction in a Zip Bag” <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 151-152</i>	Guiding the Investigation <input type="checkbox"/> Part 4: “Reaction in a Zip Bag” Steps 1-13 <i>TG p. 153-155</i>		Concluding Investigation 3  Reading in Science Resources <input type="checkbox"/> Steps 14-15 <i>TG p. 156</i> <input type="checkbox"/> I-Check 3 Step 16 <i>TG p. 156, 318-323, 345-348</i>
Day 32					
Prep	Instruction				
	<input type="checkbox"/> Review <input type="checkbox"/> Interdisciplinary Extensions <i>TG p. 157-159</i>				



**Grade 5 – Mixtures and Solutions**  
**Pacing Guide – Investigation 4: Elements**



**Investigation Overview**

<b>Investigation 4: Elements</b>		
<p><b>Concept: Elements and their combinations account for all the varied types of matter in the world.</b></p> <p>Students know that Earth has 90 naturally occurring elements, each defined by a unique atom. They learn that all atoms are made of three basic parts in varying numbers: protons, neutrons, and electrons. Students recognize the periodic table of the elements as a graphic display of the elements showing increasing atomic number in rows and similar chemical properties in columns. They learn that most elements are metals and that elemental metals and metal alloys have common properties. Students understand that most matter on Earth, including organisms, is made from a small number of elements. They know that the scanning tunneling microscope (STM) can produce discrete images of atoms and molecules in ordered arrays.</p>		
<b>Part 1: Elements and Atoms</b>	<b>Part 2: Metals</b>	<b>Part 3: Consumer Elements</b>
<p><u>Summary</u> Students review the chemical formulas for several familiar substances, including (H<sub>2</sub>O, O<sub>2</sub>, N<sub>2</sub>, C, CO<sub>2</sub>, Al, and Cu). They organize them into two groups: those with one kind of atom and those with more than one kind. The groups are identified as elements and compounds. Students are introduced to the periodic table of the elements and use their atom disks to locate the familiar elements on the periodic table. Students read an article about the periodic table.</p>	<p><u>Summary</u> Students learn that most elements are metals. They peruse the periodic table for familiar metals and review the properties common to all metals. They observe two demonstrations to learn that metals (both elemental and alloys) are good conductors of electricity and heat. Students read an article about metals and their properties.</p>	<p>Students scrutinize product packages to determine the elements they contain. Vitamins, fortified cereals, pet foods, and baked goods are rich sources of elements. Students read about the percentage of elements in Earth and organisms. They read of the methods scientists use to extend the periodic table beyond uranium, and how instrumentation has made it possible to see atoms. The last two articles include an interview with a chemist and a summary.</p>
<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>Earth has 90 naturally occurring elements, each defined by a unique atom.</li> <li>Atoms are composed of protons, neutrons, and electrons.</li> <li>The periodic table provides information about the composition of an element's atom and the element's chemical properties.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>Earth has 90 naturally occurring elements, each defined by a unique atoms.</li> <li>Most elements on Earth are metals.</li> <li>Metals share the properties of malleability and conduction of heat and electricity.</li> </ul>	<p><u>Subconcepts</u></p> <ul style="list-style-type: none"> <li>Most matter on Earth is made from only a few of the 90 naturally occurring elements.</li> <li>Atoms and molecules can be imaged with scanning tunneling microscopes.</li> </ul>
<p><u>Time Allocation</u> Active Investigation/Wrap-Up: 3 days Reading: 1 day</p>	<p><u>Time Allocation</u> Active Investigation/Wrap-Up: 2 days Reading: 1 day</p>	<p><u>Time Allocation</u> Active Investigation/Wrap-Up: 1 day Reading: 1 day Assessment: 2 days</p>
<p><u>CA Science Standards</u> PS1d</p>	<p><u>CA Science Standards</u> PS1c, PS1d</p>	<p><u>CA Science Standards</u> PS1d, PS1e, PS1h</p>



**Grade 5 – Mixtures and Solutions**  
**Pacing Guide – Investigation 4: Elements**



**Pacing Guide – Investigation 4: Elements**

Day 33		Day 34		Day 35	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Read “At a Glance” <i>TG p. 162-163</i> <input type="checkbox"/> Read “Background for the Teacher” <i>TG p. 164-172</i> <input type="checkbox"/> Read “Teaching Children About Elements and Atoms” <i>TG p. 173-175</i> <input type="checkbox"/> Watch Video demo of Inv. 4, Pt 1 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 176-177</i>	Guiding the Investigation <input type="checkbox"/> “Part 1: Elements and Atoms” Steps 1-11 <i>TG p. 178-183</i>		Guiding the Investigation <input type="checkbox"/> Wrapping up Part 1 Steps 12-13 <i>TG p. 184</i>	<input type="checkbox"/>	Reading in Science Resources <input type="checkbox"/> Steps 14-15 <i>TG p. 185</i>  Student Reading: Science Resources p. 42-47
Day 36		Day 37		Day 38	
Prep	Instruction	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Watch Video demo of Inv. 4, Pt 2 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 186-188</i>	Guiding the Investigation <input type="checkbox"/> “Part 2: Metals” Steps 1-10 <i>TG p. 189-191</i> <input type="checkbox"/> <b>Body of Evidence Prompt #9</b> <i>TG p. 217</i>		Guiding the Investigation <input type="checkbox"/> Wrapping up Part 2 Steps 11-12 <i>TG p. 192</i>	<input type="checkbox"/>	Reading in Science Resources <input type="checkbox"/> Steps 13-14 <i>TG p. 193</i>  Student Reading: Science Resources p. 52-58

Day 39		Day 40		Day 41	
Prep	Prep	Prep	Instruction	Prep	Instruction
<input type="checkbox"/> Watch Video demo of Inv. 4, Pt 3 <input type="checkbox"/> Review “Materials” and “Getting Ready” <i>TG p. 194-195</i>	Guiding the Investigation <input type="checkbox"/> “Part 3: Consumer Elements” Steps 1-4 <i>TG p. 196-197</i> <input type="checkbox"/> Wrapping up Part 3 Steps 5 <i>TG p. 198</i>		Reading in Science Resources <input type="checkbox"/> Steps 6-8 <i>TG p. 199-200</i>  Student Reading: Science Resources p. 59-63	<input type="checkbox"/>	Concluding Investigation 4  Reading in Science Resources <input type="checkbox"/> Steps 9-10 <i>TG p. 201</i> Student Reading: Science Resources p. 68-75  <input type="checkbox"/> I-Check 4 Step 11 <i>TG p. 201, 324-331, 349-353</i>
Day 42		Day 43			
Prep	Prep	Prep	Instruction		
	Concluding Investigation 4  Review <input type="checkbox"/> I-Check 4 Step 11 <i>TG p. 201, 324-331, 349-353</i>		Administer DISTRICT Grade 5 Physical Science Benchmark Assessment		



## Grade 5 – Mixtures and Solutions Recommended Body of Evidence



### Overview

This guide is intended to support the collection of a Body of Evidence. A student's Body of Evidence should, at a minimum, include work from the listed prompts and in-class investigations that demonstrate a student's level of proficiency. The FOSS pre-assessment given at the beginning of the unit, the I-checks given after each investigation, and Grade 5 DISTRICT Physical Science Benchmark Assessment given at the end of the unit (post-assessment) may also be included in the body of evidence.

Download samples of proficient work at <https://eteams.sandi.net/sites/sbrc>

### Recommended Body of Evidence – Grade 5 Physical Science

#### Concept #1

Elements and their combinations account for all the varied types of matter in the world. (PS1a, PS1b, PS1c, PS1d, PS1e, PS1f, PS1g, PS1h)

**Prompt 1:** FOSS: Mixtures and Solutions: Investigation 1: Separating Mixtures – Part 1: Separating Mixtures  
(TG p. 204 - Thinking about Mixtures – No. 2 – Science Notebook)

1. What is a mixture? An example of a mixture is.... 2. What is a solution? An example of a solution is ... 3. Is salt and water a mixture, a solution, or both? Explain. 4. How do you know when a solid and a liquid form a solution? 5. How can mixtures be separated? 6. How are screens and paper filters alike? How are they different?

**Prompt 2:** FOSS: Mixtures and Solutions: Investigation 1: Separating Mixtures – Part 2: Separating a Salt Solution (I&E6F)  
(TG p. 207 - Separating Mixtures – No. 5 – Science Notebook)

Martin wrote in his science notebook: "Water and salt make a solution. I know that because when you mix them, you can't see them, you can't see the salt anymore. It can't be a mixture because mixtures are always made of two or more solids." Is Martin confused? Rewrite his paragraph as you think it should be written.

**Prompt 3:** FOSS: Mixtures and Solutions: Investigation 1: Separating Mixtures – Part 3: Separating a Dry Mixture (I&E6C, I&E6F)  
(TG p. 74 Step 5 Assess Progress: Teacher Observation)

While students work on their plans, visit the groups to check their ability to develop a systematic plan for separation. Without influencing their plans, see if they proposed adding water at the start, have a sequential plan for using screens and filters, and recognize the need for evaporation.

**Prompt 4:** FOSS: Mixtures and Solutions: Investigation 2: Reaching Saturation – Part 2: Epsom-Salts Saturation (I&E6F)  
(TG p. 210 - Reaching Saturation – No. 8 – Science Notebook)

Karin wrote in her notebook: "I made three solutions of water and sugar. I put the same amount of water in each bottle. Then I put 2 spoonfuls of sugar in bottle 1, 4 spoonfuls in bottle 2, and 6 spoonfuls in bottle 3. I shook each bottle for 1 minute. When I was done I knew I had a saturated solution in bottle 3." Karin's three bottles are shown below. In bottle 2 she drew the liquid level and her idea of where the sugar was in the solution. Draw the liquid level in bottle 1 and in bottle 3. Draw dots in bottle 1 and bottle 3 to show where you think the sugar is. Karin knew she had a saturated solution in bottle 3. Why do you think she was sure the solution was saturated?

## **Recommended Body of Evidence – Grade 5 Physical Science (continued)**

### **Prompt 5: FOSS: Mixtures and Solutions: Investigation 2: Reaching Saturation – Part 3: The Saturation Puzzle (TG p. 110 Step 7 Assess Progress: Teacher Observation)**

Visit students as they work. Check to see if they are conducting a systematic procedure for determining saturation and using data to identify the mystery substance.

### **Prompt 6: FOSS: Mixtures and Solutions: Investigation 3: Fizz Quiz – Part 1: Chemical Reactions (TG p. 212 – Fizz Quiz Observations No. 10– Science Notebook)**

Follow the Fizz-Quiz Place Mat directions to make the mixtures. Record the results. Draw and describe what you observed. Cup 1: 1 spoon of calcium chloride, 1 spoon of baking soda, and 50 ml of water; Cup 2: 1 spoon of calcium chloride, 1 spoon of citric acid, and 50 ml of water; Cup 3: 1 spoon of baking soda, 1 spoon of citric acid, and 50 ml of water. 1. Which substances reacted to form a gas?; 2. Which substances reacted to form a precipitate?

### **Prompt 7: FOSS: Mixtures and Solutions: Investigation 3: Fizz Quiz – Part 2: Reaction Products (TG p. 213 – Reaction Analysis No. 11 – Science Notebook)**

1. You mixed two substances in cup 1. What were they? 2. A reaction occurred when you added water to cup 1. What was the evidence? 3. What were the reactants in the reaction? 4. What were the products of the reaction? 5. What properties of the products allowed you to identify the products?

### **Prompt 8: FOSS: Mixtures and Solutions: Investigation 3: Fizz Quiz – Part 3: Equations (TG p. 215 – Fizz Quiz No. 13– Science Notebook)**

Marc wanted to make a model volcano. His aunt told him that a mixture of vinegar and baking soda, and soap would make good “lava.” He made the mixture to see what would happen. Here are his observations. “First I mixed the soap and baking soda. Nothing happened. Then I added vinegar. The mixture bubbled and spilled over the edge of the cup! After the bubbling stopped, the liquid was clear. There was no precipitate.” Marc said, “I think I made a mixture, a solution, and a reaction.” Do you think Marc made a mixture? Explain your answer. Do you think Marc made a solution? Explain your answer. Do you think Mark made a reaction? Explain your answer.

### **Prompt 9: FOSS: Mixtures and Solutions: Investigation 4: Elements – Part 2: Metals (TG p. 217– Properties of Materials; No. – 15 -- Science Notebook)**

Part 1. Record data for the six materials you observed (aluminum, brass, copper, plastic, steel, wood), Part 2. Write your ideas about materials and conduction; 1. Which materials conducted both heat and electricity? 2. What is the same about those materials? 3. Which metal conducted heat best and which one conducted heat worst? What is your evidence? 4. Check the elements you think are good conductors of heat and electricity and explain why (zirconium, iodine, vanadium, sulfur, krypton, silver, cesium, nitrogen).



## Grade 5 – Mixtures and Solutions Module Materials and Equipment



### Materials Provided

The FOSS kit comes with most of the supplies that are needed to teach the unit. The kits will be delivered to the school site prior to the start of the 12-week unit of instruction. At the end of the 12-weeks, the kit will be returned to the Science Resource Center where it will be refurbished and prepared for its next use. Please review the refurbishment calendar for kit drop-off and return dates. Kits must be returned according to the refurbishment calendar to ensure that all kits are checked and restocked with consumable materials.

### Materials Supplied by the Teacher or School Site

Be aware that the classroom teacher or school site must supply a few items. These are indicated in the materials list for each part of the investigation with an asterisk (\*). Here is a summary of those items.

<b>Investigation 1: Separating Mixtures</b>	<b>Investigation 2: Reaching Saturation</b>	<b>Investigation 3: Fizz Quiz</b>	<b>Investigation 4: Elements</b>
<ul style="list-style-type: none"><li>▪ 1 Bucket (optional)</li><li>▪ 1 Flip Chart</li><li>▪ Paper Towels</li><li>▪ 32 Safety Goggles</li><li>▪ Scratch Paper</li></ul>	<ul style="list-style-type: none"><li>▪ 1 Bucket (optional)</li><li>▪ Paper Towels</li><li>▪ 32 Safety Goggles</li><li>▪ Scratch Paper</li><li>▪ Transparent Tape</li></ul>	<ul style="list-style-type: none"><li>▪ 1 Bucket (optional)</li><li>▪ 1 Small piece of Chalk</li><li>▪ Paper Towels</li><li>▪ 32 Safety Goggles</li><li>▪ Scratch Paper</li><li>▪ Transparent Tape</li><li>▪ White Vinegar-1 quart</li></ul>	<ul style="list-style-type: none"><li>▪ Hot Water</li><li>▪ Margarine</li><li>▪ 1 Paper Plate (optional)</li><li>▪ 1 Lead Pencil</li><li>▪ 30-40 Product packages (empty)</li><li>▪ Scratch Paper</li><li>▪ Thermos Bottle</li></ul>