San Diego Unified School District
Science Department

# Grade 3 – Matter and Energy

## 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 in the *Curriculum Resources for Teachers* section of **www.sandi.net**

San Diego Unified School District
Instructional Support Services - Science

# Grade 3 – Matter and Energy
## Module Overview

**Overview of the Unit**

The Matter and Energy module consists of four sequential investigations to introduce the multiple forms that matter and energy can take and to give students experience with the transfer of energy from one from to another. Light absorption and reflection is the focus of an entire investigation. Students also conduct and observe chemical reactions and are introduced to atoms and elements.

**Grade 3 Physical Science Conceptual Flow**

**Concept #1**
Energy and matter have multiple forms and can be changed from one form to another.

| Subconcepts<br>Investigation #1: Energy | Subconcepts<br>Investigation #3: Matter | Subconcepts<br>Investigation #4: Changing Matter |
|---|---|---|
| Energy makes things happen. | Common matter on Earth has three forms (states); solid, liquid, and gas. | Melting occurs when solids are heated. |
| Energy takes many forms. | The behavior of a sample of matter in an open container indicates its state. | Different substances melt at different temperatures. |
| Energy can be stored. | | Evaporation occurs when liquids are heated. |
| Most energy used by organisms, including humans, comes from the Sun in the form of light. | | All matter on Earth is made of tiny particles called atoms. |
| | | Ninety different elements occur naturally on Earth; 26 elements have been created in laboratories. |
| | | When two substances are combined, a reaction may occur, producing a new substance with unique properties. |

## Grade 3 Physical Science Conceptual Flow – continued

| **Concept #2** |
| --- |
| Light has a source and travels in a direction. |

| **Subconcepts**<br>**Investigation #2: Light** |
| --- |
| Light is a form of energy that travels in a straight line from a light source. |
| Light can reflect (bounce off) surfaces it strikes. |
| A mirror is a smooth, reflective surface. |
| An object is seen only when light from that object enters an eye. |

# Grade 3 – Matter and Energy
## California Science Standards

### 3rd Grade Science Content Standards Addressed in this Module

Physical Sciences

PS1 Energy and matter have multiple forms and can be changed from one form to another. As a basis for understanding this concept:

- PS1a Students know energy comes from the Sun to Earth in the form of light.
- PS1b Students know sources of stored energy take many forms, such as food, fuel, and batteries.
- PS1c Students know machines and living things convert stored energy to motion and heat.
- PS1d Students know energy can be carried from one place to another by waves, such as water waves and sound waves, by electric current, and by moving objects.
- PS1e Students know matter has three forms: solid, liquid, and gas.
- PS1f Students know evaporation and melting are changes that occur when the objects are heated.
- PS1g Students know that when two or more substances are combined, a new substance may be formed with properties that are different from those of the original materials.
- PS1h Students know all matter is made of small particles called atoms, too small to see with the naked eye.
- PS1i Students know people once thought that earth, wind, fire, and water were the basic elements that made up all matter. Science experiments show that there are more than 100 different types of atoms, which are presented on the periodic table of the elements.

PS2 Light has a source and travels in a direction. As a basis for understanding this concept:

- PS2a Students know sunlight can be blocked to create shadows.
- PS2b Students know light is reflected from mirrors and other surfaces.
- PS2c Students know the color of light striking an object affects the way the object is seen.
- PS2d Students know an object is seen when light traveling from the object enters the eye.

**3rd Grade Science Content Standards Addressed in this Module (continued)**

Investigation and Experimentation

I&E5 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&E5a Repeat observations to improve accuracy and know that the results of similar scientific investigations seldom turn out exactly the same because of differences in the things being investigated, methods being used, or uncertainty in the observation.

I&E5b Differentiate evidence from opinion and know that scientists do not rely on claims or conclusions unless they are backed by observations that can be confirmed.

I&E5c Use numerical data in describing and comparing objects, events, and measurements.

I&E5d Predict the outcome of a simple investigation and compare the result with the prediction.

I&E5e Collect data in an investigation and analyze those data to develop a logical conclusion.

# Grade 3 – Matter and Energy
## Pacing the Unit as a Whole

**Recommended Pacing for FOSS California *Matter and Energy* - Pacing the Unit as a Whole**

***Essential = lessons that cover Content and/or Investigation & Experimentation standards; are tested on SDUSD Earth Science Benchmark and CST***
***Foundational = lessons that build concepts for future learning; may or may not be tested***
***Optional = lessons cover Investigation & Experimentation standards only and are not tested on SDUSD Earth Science Benchmark***

| | | | | |
|---|---|---|---|---|
| Pre-Test | | | | |
| ***Essential*** **Day 1** Start Inv. 1 Part 1 A | ***Essential*** **Day 2** A/W | ***Essential*** **Day 3** R | ***Essential*** **Day 4** Start Inv. 1 Part 2 A/W | ***Essential*** **Day 5** R |
| ***Essential*** **Day 6** Assessment | ***Essential*** **Day 7** Start Inv. 1 Part 3 A | ***Essential*** **Day 8** A/W | ***Essential*** **Day 9** R | ***Essential*** **Day 10** I-Check 1 |
| ***Optional*** **Day 11** Review | ***Essential*** **Day 12** Start Inv. 2 Part 1 A | ***Essential*** **Day 13** A/W | ***Essential*** **Day 14** R | ***Essential*** **Day 15** Start Inv. 2 Part 2 A |
| ***Foundational*** **Day 16** A/W | ***Foundational*** **Day 17** R | ***Foundational*** **Day 18** R | ***Essential*** **Day 19** I-Check 2 | ***Optional*** **Day 20** Review |
| ***Essential*** **Day 21** Start Inv. 3 Part 1 A | ***Essential*** **Day 22** A/W | ***Essential*** **Day 23** R | ***Foundational*** **Day 24** Start Inv 3. Part 2 A | ***Foundational*** **Day 25** A |
| ***Essential*** **Day 26** A/W | ***Essential*** **Day 27** R | ***Essential*** **Day 28** Start Inv. 3 Part 3 A | ***Foundational*** **Day 29** A/W | ***Foundational*** **Day 30** R |
| ***Foundational*** **Day 31** R | ***Essential*** **Day 32** I-Check 3 | ***Optional*** **Day 33** Review | ***Foundational*** **Day 34** Start Inv. 4 Part 1 A | **Day 35 No Science Day** |

**A – Active Investigation** sessions include firsthand observations about energy and matter, active thinking about the experiences, small group discussion, simulations, writing in science notebooks, learning new vocabulary in context, viewing a video, 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)

## Recommended Pacing for FOSS California *Matter and Energy* - Pacing the Unit as a Whole (continued)

| | | | | |
|---|---|---|---|---|
| ***Essential*** **Day 36** Start Inv. 4 Part 2 A | ***Essential*** **Day 37** A/W | ***Essential*** **Day 38** R | ***Essential*** **Day 39** R | ***Essential*** **Day 40** Start Inv 4. Part 3 A |
| ***Essential*** **Day 41** A/W | ***Essential*** **Day 42** R | ***Essential*** **Day 43** I-Check 4 | ***Essential*** **Day 44** Review | ***Essential*** **Day 45** Benchmark Assessment |

# Grade 3 – Matter and Energy
## Pacing Guide – Investigation 1: Energy

## Investigation Overview

**Investigation 1: Energy**
**Concept: Energy and matter have multiple forms and can be changed from one form to another.**
Students investigate different forms of energy (light, heat, sound, and motion) and determine ways that energy is converted to make things happen. They explore ways that energy forms are carried from one place to another. Students explore energy working with materials (batteries, bulbs, candle, solar cells, spring toys, rolling balls), through readings, and through video.

| Part 1: Energy Sources | Part 2: Converting Energy | Part 3: Energy on the Move |
|---|---|---|
| Summary<br>Students investigate different sources of energy. They use batteries to turn on a flashlight, run a motor, and create sound; a candle to create flame; a solar cell to convert light into movement; and rubbing their hands to generate heat. They develop a definition of energy: It makes things happen. Students read about other sources of energy, including food and fuels such as gasoline and natural gas. | Summary<br>Students determine the various ways that energy is converted to make different things happen. They use cards to match different stored energy sources with what the sources can make happen. | Summary<br>Students investigate different ways that energy can be carried from one place another. They visit stations that demonstrate energy carried in wires by electric current, in air by sound waves, by rolling objects, and by a spring toy. In a class demonstration, students observe waves carrying energy in water. Students read about the various ways energy moves from one place to another and watch a video about energy and how it is transferred. |
| Subconcepts<br>▪ Energy makes things happen.<br>▪ Energy takes many forms.<br>▪ Energy can be stored.<br>▪ Most of the energy used by organisms, including humans, comes from the Sun in the form of light. | Subconcepts<br>▪ Stored energy can be converted to other forms of energy.<br>▪ Machines and living things can convert energy into motion and heat. | Subconcepts<br>▪ Energy can be carried from one place to another by waves, electric current, and moving objects. |
| Time Allocation<br>Active Investigation/Wrap-up: 2 days<br>Reading: 1 day | Time Allocation<br>Active Investigation/Wrap-up: 1 day<br>Reading: 1 day<br>Assessment/Review: 1 day | Time Allocation<br>Active Investigation/Wrap-up: 1 day<br>Video: 1 day<br>Reading: 1 day<br>Assessment/Review: 2 days |
| CA Science Standards<br>PS1a, PS1b | CA Science Standards<br>PS1a, PS1b, PS1c | CA Science Standards<br>PS1d |

# Grade 3 – Matter and Energy
## Pacing Guide – Investigation 1: Energy

**Pacing Guide – Investigation 1: Energy**

| Day 1 | | Day 2 | | Day 3 | |
|---|---|---|---|---|---|
| Prep | Instruction | Prep | Instruction | Prep | Instruction |
| ❑ Read "At a Glance" *TG p. 44-45*<br>❑ Read "Science Background" *TG p. 46-50*<br>❑ Read "Teaching Children About Energy" *TG p. 51*<br>❑ Watch Video demo of Inv. 1, Pt 1<br>❑ Review "Materials" and "Getting Ready" *TG p. 52-55*<br>❑ Administer Grade 3 Physical Science Benchmark | Guiding the Investigation<br>❑ "Part 1: Energy Sources" Steps 1-9 *TG p. 56-59* | | Guiding the Investigation<br>❑ "Part 1: Energy Sources; Wrapping up Part 1" Steps 10-15 *TG p. 59-61* | | Reading in Science Resources<br>❑ Steps 16-18 *TG p. 62, 294-295*<br><br>Student Reading: Science Resources p. 3-9<br><br>❑ **Body of Evidence Prompt #1** *TG p. 205* |
| **Day 4** | | **Day 5** | | **Day 6** | |
| Prep | Instruction | Prep | Instruction | Prep | Instruction |
| ❑ Watch Video demo of Inv. 1, Pt 2<br>❑ Review "Materials" and "Getting Ready" *TG p. 63-65* | Guiding the Investigation<br>❑ "Part 2: Converting Energy; Wrapping up Part 2" Steps 1-10 *TG p. 66-69* | | Reading in Science Resources<br>❑ Steps 11-12 *TG p. 70*<br><br>Student Reading: Science Resources p. 10-15 | | Reading in Science Resources<br>❑ Step 13 *TG p. 70, 296-297*<br>❑ **Body of Evidence Prompt #2** *TG p. 207* |

**Pacing Guide – Investigation 1: Energy (continued)**

| Day 7 | | Day 8 | | Day 9 | |
|---|---|---|---|---|---|
| Prep | Instruction | Prep | Instruction | Prep | Instruction |
| ❑ Watch Video demo of Inv. 1, Pt 3<br>❑ Review "Materials" and "Getting Ready"<br>*TG p. 71-73* | Guiding the Investigation<br>❑ "Part 3: Energy on the Move"<br>Steps 1-8<br>*TG p. 74-76*<br>❑ **Body of Evidence Prompt #3**<br>*TG p. 208&209* | | Guiding the Investigation<br>❑ "Part 3: Energy on the Move; Wrapping up Part 3"<br>Steps 9-15<br>*TG p. 77-79*<br>❑ **Body of Evidence Prompt #4**<br>*TG p. 210* | | Reading in Science Resources; Concluding Investigation 1<br>❑ Steps 16-19<br>*TG p. 80-81*<br><br>Student Reading: Science Resources p. 16-24 |

| Day 10 | | Day 11 | |
|---|---|---|---|
| Prep | Instruction | Prep | Instruction |
| | Concluding Investigation 1<br>❑ I-Check 1<br>Step 20<br>*TG p. 81, 324-329, 354-356* | | ❑ Review<br>❑ Interdisciplinary Extensions<br>*TG p. 82-83*<br><br>Student Reading: Science Resources p. 25 |

# Grade 3 – Matter and Energy
## Pacing Guide – Investigation 2: Light

## Investigation Overview

**Investigation 2: Light**
**Concept: Light has a source and travels in a direction.**
Students use mirrors to reflect light and learn that light travels in straight lines. They are introduced to blocked light (shadows), light absorption, and to white light as a mixture of all colors of light. They investigate firsthand and through simulations, video, and readings how the appearance of an object is affected by the color of light striking it.

| Part 1: Reflected Light | Part 2: Colored Light | |
|---|---|---|
| Summary<br>Students use mirrors to experience the reflections of light. They start by using mirrors outside to discover how to see objects behind them and to reflect a bright spot onto walls. In the classroom, they determine that a mirror can be used to reflect light, that is, to change its direction of travel. Students then use flashlights and mirrors to reflect light in numerous ways, reinforcing the idea that light can reflect from surfaces. Students read an article about reflection and its role in vision. | Students are introduced to the idea of light absorption and the definition of white light as a mixture of all the colors of light. They use gels and tubes to create colored-light environments into which they can place small colored plastic cubes. Students observe that the apparent color of the cubes is affected by the color of light striking them inside the tubes. Students see a video about light and shadows and read an expository article about color and vision. Students are introduced to a multimedia simulation of colored light shining on colored paint. They are able to predict the colors of the paint based on their appearance under colored light. | |
| Subconcepts<br>▪ Light is a form of energy that travels in straight lines from a light source.<br>▪ Light can reflect (bounce off) surfaces it strikes.<br>▪ A mirror is a smooth, reflective surface.<br>▪ An object is seen only when light from that object enters an eye. | Subconcepts<br>▪ White light is a mixture of all the colors of light.<br>▪ Light can be absorbed by matter.<br>▪ The apparent color of an object is the result of the light it reflects.<br>▪ The apparent color of an object is affected by the color of light striking it.<br>▪ A shadow is created when an opaque object blocks light. | |
| Time Allocation<br>Active Investigation/Wrap-up: 2 days<br>Reading: 1 day | Time Allocation<br>Active Investigation/Wrap-up: 1 day<br>Video: 1 day<br>Reading: 2 days<br>Assessment/Review: 2 days | |
| CA Science Standards<br>PS2b, PS2d | CA Science Standards<br>PS2a, PS2c, PS2d, I&E5d | |

# Grade 3 – Matter and Energy
## Pacing Guide – Investigation 2: Light

### Pacing Guide – Investigation 2: Light

| Day 12 | | Day 13 | | Day 14 | |
|---|---|---|---|---|---|
| Prep | Instruction | Prep | Instruction | Prep | Instruction |
| ❑ Read "At a Glance" *TG p. 86-87*<br>❑ Read "Science Background" *TG p. 88-92*<br>❑ Read "Teaching Children About Light" *TG p. 93*<br>❑ Watch Video demo of Inv. 2, Pt 1<br>❑ Review "Materials" and "Getting Ready" *TG p. 94-96* | Guiding the Investigation<br>❑ "Part 1: Reflected Light" Steps 1-9 *TG p. 97-99* | | Guiding the Investigation<br>❑ "Part 1: Reflected Light; Wrapping up Part 1" Steps 10-16 *TG p. 100-102*<br>❑ **Body of Evidence Prompt #5** *TG p.211-212* | | Reading in Science Resources<br>❑ Steps 17-18 *TG p. 103, 298*<br>Student Reading: Science Resources p. 26-30<br>❑ **Body of Evidence Prompt #6** *TG p. 103* |
| **Day 15** | | **Day 16** | | **Day 17** | |
| Prep | Instruction | Prep | Instruction | Prep | Instruction |
| ❑ Watch Video demo of Inv. 2, Pt 2<br>❑ Review "Materials" and "Getting Ready" *TG p. 104-106* | Guiding the Investigation<br>❑ "Part 2: Colored Light" Steps 1-10 *TG p. 107-111* | | Guiding the Investigation<br>❑ "Part 2: Colored Light; Wrapping up Part 2" Steps 11-15 *TG p. 112-113* | | Reading in Science Resources<br>❑ Steps 16-18 *TG p. 114, 299-300*<br>Student Reading: Science Resources p. 31-35<br>❑ **Body of Evidence Prompt #7** *TG p. 285* |

**Pacing Guide – Investigation 2: Light (continued)**

| Day 18 | | Day 19 | | Day 20 | |
|---|---|---|---|---|---|
| Prep | Instruction | Prep | Instruction | Prep | Instruction |
| | Concluding Investigation 2<br>❑ Steps 19-20<br>*TG p. 115*<br><br>Student Reading:<br>Science Resources<br>p. 36-39 | | Concluding Investigation 2<br>❑ I-Check 2<br>Step 21<br>*TG p. 115, 330-335, 357-359* | | ❑ Review<br>❑ Interdisciplinary Extensions<br>*TG p. 116-118*<br><br>Student Reading:<br>Science Resources<br>p. 40 |

# Grade 3 – Matter and Energy
## Pacing Guide – Investigation 3: Matter

## Investigation Overview

**Investigation 3: Matter**
**Concept: Energy and matter have multiple forms and can be changed from one form to another.**
Students work with different states of matter, measure mass and volume using metric standards and tools, and solve problems using their knowledge of metric measurement. They develop a set of defining characteristics for states of matter. They read about the difference between opinion and evidence.

| Part 1: Fact of the Matter | Part 2: Weighty Matters | Part 3: A Matter of Volume |
|---|---|---|
| Summary<br>Students sort a variety of materials based on state: solid, liquid, and gas. They summarize the properties of the different forms of matter and develop a set of defining characteristics for each. Students read an article that reinforces the ideas developed in the active investigations. | Summary<br>Students learn the concept of mass – the stuff of the world – and how to measure mass by weighing. They weigh a metal disk in paper-clip units. After reporting the mass of the metal disks in paper clips, which are different sizes, students recognize the need for a standard unit of measure. The gram is introduced. After determining the mass of water a sponge can soak up, students read a related article about the difference between opinion and evidence. Students discuss the importance of observation and evidence in the scientific process. | Summary<br>Students learn the conventions associated with measuring fluid volume. Different-size vials, used as units to measure the capacity of a plastic cup filled with water, help establish the need for a standard unit of volume. The liter and milliliter are introduced. Students read about the metric system and read a summary on matter. |
| Subconcepts<br>▪ Common matter on Earth has three forms (states): solid, liquid, and gas.<br>▪ The behavior of a sample of matter in an open container indicates its state. | Subconcepts<br>▪ Measurement is used to quantify observations.<br>▪ A measurement standard is a unit agreed upon and used by a large number of people.<br>▪ The gram (g) is the standard unit of measure used to quantify mass in the metric system.<br>▪ Volume is the measure of the three-dimensional space occupied by matter.<br>▪ Opinion is based on belief; scientific evidence is based on observation. | Subconcepts<br>▪ A measurement standard is a unit agreed upon and used by a large number of people.<br>▪ The liter (L) is the standard for measuring fluid volume in the metric system.<br>▪ Common matter on Earth has three forms (states): solid, liquid, and gas. |
| Time Allocation<br>Active Investigation/Wrap-up: 2 days<br>Reading: 1 day | Time Allocation<br>Active Investigation/Wrap-up: 3 days<br>Reading: 1 day | Time Allocation<br>Active Investigation/Wrap-up: 2 days<br>Reading: 1 day<br>Assessment/Review: 2 days |
| CA Science Standards<br>PS1e | CA Science Standards<br>PS1e, I&E5a, I&E5b, I&E5c, I&E5d, I&E5e | CA Science Standards<br>PS1e, I&E5c, I&E5d |

# Grade 3 – Matter and Energy

## Pacing Guide – Investigation 3: Matter

### Pacing Guide – Investigation 3: Matter

| Day 21 | | Day 22 | | Day 23 | |
|---|---|---|---|---|---|
| Prep | Instruction | Prep | Instruction | Prep | Instruction |
| ❑ Read "At a Glance" *TG p. 120-121*<br>❑ Read "Science Background" *TG p. 122-125*<br>❑ Read "Teaching Children About Matter" *TG p. 126*<br>❑ Watch Video demo of Inv. 3, Pt 1<br>❑ Review "Materials" and "Getting Ready" *TG p. 127-129* | Guiding the Investigation<br>❑ "Part 1: Fact of the Matter" Steps 1-7 *TG p. 130-132* | | Guiding the Investigation<br>❑ "Part 1: Fact of the Matter; Wrapping up Part 1" Steps 8-16 *TG p. 132-135*<br>❑ **Body of Evidence Prompt #*8*** *TG p. 217* | | Reading in Science Resources<br>❑ Steps 17-18 *TG p. 136, 301*<br><br>Student Reading: Science Resources p. 41-44 |
| **Day 24** | | **Day 25** | | **Day 26** | |
| Prep | Instruction | Prep | Instruction | Prep | Instruction |
| ❑ Watch Video demo of Inv. 3, Pt 2<br>❑ Review "Materials" and "Getting Ready" *TG p. 137-139* | Guiding the Investigation<br>❑ "Part 2: Weighty Matters" Steps 1-15 *TG p. 140-144* | | Guiding the Investigation<br>❑ "Part 2: Weighty Matters" Steps 16-20 *TG p. 144-145* | | Guiding the Investigation<br>❑ "Part 2: Weighty Matters; Wrapping up Part 2" Steps 21-26 *TG p. 145-147* |

**Pacing Guide – Investigation 3: Matter (continued)**

| Day 27 | | Day 28 | | Day 29 | |
|---|---|---|---|---|---|
| Prep | Instruction | Prep | Instruction | Prep | Instruction |
| | Reading in Science Resources<br>❑ Steps 27-29<br>*TG p. 148, 302-303*<br><br>Student Reading: Science Resources p. 45-48 | ❑ Watch Video demo of Inv. 3, Pt 3<br>❑ Review "Materials" and "Getting Ready"<br>*TG p. 149-151* | Guiding the Investigation<br>❑ "Part 3: A Matter of Volume"<br>Steps 1-8<br>*TG p. 152-153* | | Guiding the Investigation<br>❑ "Part 3: A Matter of Volume; Wrapping up Part 3"<br>Steps 9-18<br>*TG p. 154-156* |
| **Day 30** | | **Day 31** | | **Day 32** | |
| Prep | Instruction | Prep | Instruction | Prep | Instruction |
| | Reading in Science Resources<br>❑ Steps 19-20<br>*TG p. 157, 304*<br><br>Student Reading: Science Resources p. 49-50 | | Concluding Investigation 3<br>❑ Steps 21-22<br>*TG p. 158*<br><br>Student Reading: Science Resources p. 51-54 | | Concluding Investigation 3<br>❑ I-Check 3<br>Step 23<br>*TG p. 158, 336-341, 360-362* |
| **Day 33** | | | | | |
| Prep | Instruction | | | | |
| | ❑ Review<br>❑ Interdisciplinary Extensions<br>*TG p. 159-160*<br><br>Student Reading: Science Resources p. 55 | | | | |

# Grade 3 – Matter and Energy

## Pacing Guide – Investigation 4: Changing Matter

## Investigation Overview

**Investigation 4: Changing Matter**
**Concept: Energy and matter have multiple forms and can be changed from one form to another.**
Students use a thermometer to measure and record temperatures as they explore melting of common substances. The class conducts an evaporation investigation, and students use the data to draw conclusions. Students combine substances and observe the results of a chemical reaction. They read about atoms and elements.

| Part 1: Measuring Temperature | Part 2: Melting and Evaporation | Part 3: Reactions |
|---|---|---|
| Summary<br>Students are introduced to the concept of temperature and to the tool for measuring temperature, the thermometer. Students compare the temperature of three cups of water using their fingers as gauges. They realize that a standard is needed as well as a more accurate devise to measure temperature. | Summary<br>Students put samples of chocolate, margarine, wax, and a pebble in a cup. They place the cup in hot water and observe what happens to the samples. This is followed by a demonstration of transferring heat to liquid water and comparing the amount of evaporation to a similar cup that was not heated. Students read about atoms as the building blocks of matter and learn that the motion of atoms is related to state of matter. | Summary<br>Students conduct the vinegar and baking soda reaction. They determine the mass of the starting products, predict what will happen to the mass when the two are mixed, and then determine the mass of the products. They learn that new substances form when baking soda and vinegar are mixed, and the loss of gas to the atmosphere accounts for the observed loss of mass. Students watch a video about solids, liquids, and gases, and read about reactions. |
| Subconcepts<br>▪ A measurement standard is a unit agreed upon by a large number of people.<br>▪ Degree Celsius (°C) is the unit used when scientists measure temperature. | Subconcepts<br>▪ Melting occurs when solids are heated.<br>▪ Different substances melt at different temperatures.<br>▪ Evaporation occurs when liquids are heated.<br>▪ All matter on Earth is made of tiny particles called atoms.<br>▪ Ninety different elements occur naturally on Earth; 26 elements have been created in laboratories. | Subconcepts<br>When two substances are combined, a reaction may occur, producing a new substance with unique properties. |
| Time Allocation<br>Active Investigation/Wrap-up: 1 day | Time Allocation<br>Active Investigation/Wrap-up: 2 days<br>Reading: 2 days | Time Allocation<br>Active Investigation/Wrap-up: 1 day<br>Video: 1 day<br>Reading: 1 day<br>Assessment/Review: 2 days |
| CA Science Standards<br>I&E5a, I&E5c | CA Science Standards<br>PS1f, PS1h, PS1i, I&E5c, I&E5d | CA Science Standards<br>PS1g, I&E5a, I&E5c, I&E5d |

# Grade 3 – Matter and Energy

## Pacing Guide – Investigation 4: Changing Matter

### Pacing Guide – Investigation 4: Changing Matter

| Day 34 | | Day 35 | | Day 36 | |
|---|---|---|---|---|---|
| Prep | Instruction | Prep | Instruction | Prep | Instruction |
| ❑ Read "At a Glance" *TG p. 162-163*<br>❑ Read "Science Background" *TG p. 164-168*<br>❑ Read "Teaching Children About Changing Matter" *TG p. 169*<br>❑ Watch Video demo of Inv. 4, Pt 1<br>❑ Review "Materials" and "Getting Ready" *TG p. 170-172* | Guiding the Investigation<br>❑ "Part 1: Measuring Temperature; Wrapping up Part 1"<br>Steps 1-13<br>*TG p. 173-176, 305* | | No Science Day | ❑ Watch Video demo of Inv. 4, Pt 2<br>❑ Review "Materials" and "Getting Ready" *TG p. 177-179* | Guiding the Investigation<br>❑ "Part 2: Melting and Evaporation"<br>Steps 1-9<br>*TG p. 180-182* |
| **Day 37** | | **Day 38** | | **Day 39** | |
| Prep | Instruction | Prep | Instruction | Prep | Instruction |
| | Guiding the Investigation<br>❑ "Part 2: Melting and Evaporation; Wrapping up Part 2"<br>Steps 10-16<br>*TG p. 182-186* | | Reading in Science Resources<br>❑ Steps 17-18 *TG p. 187, 306*<br><br>Student Reading: Science Resources p. 56-58<br><br>❑ **Body of Evidence Prompt #9** *TG p. 187* | | Reading in Science Resources<br>❑ Steps 19-20 *TG p. 188*<br><br>Student Reading: Science Resources p. 59-64<br><br>❑ **Body of Evidence Prompt #10** *TG p. 188* |

**Pacing Guide – Investigation 4: Changing Matter (continued)**

| Day 40 | | Day 41 | | Day 42 | |
|---|---|---|---|---|---|
| Prep | Instruction | Prep | Instruction | Prep | Instruction |
| ❑ Watch Video demo of Inv. 4, Pt 3<br>❑ Review "Materials" and "Getting Ready"<br>*TG p. 189-191* | Guiding the Investigation<br>❑ "Part 3: Reactions" Steps 1-12<br>*TG p. 192-195* | | Guiding the Investigation<br>❑ "Part 3: Reactions; Wrapping up Part 3" Steps 13-16<br>*TG p. 195-197*<br>❑ **Body of Evidence Prompt #11**<br>*TG p. 225* | | Reading in Science Resources; Concluding Investigation 4<br>❑ Steps 17-20<br>*TG p. 198-199*<br>Student Reading: Science Resources p. 65-71<br>❑ **Body of Evidence Prompt #12**<br>*TG p. 198* |
| **Day 43** | | **Day 44** | | **Day 45** | |
| Prep | Instruction | Prep | Instruction | Prep | Instruction |
| | Concluding Investigation 4<br>❑ I-Check 4 Step 21<br>*TG p. 199, 342-347, 363-365* | | ❑ Review<br>❑ Interdisciplinary Extensions<br>*TG p. 200-201*<br><br>Student Reading: Science Resources p. 72-75 | | ❑ Administer Grade 3 Physical Science Benchmark Assessment |

# Grade 3 – Matter and Energy
## 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 form the listed prompts and in-class investigations. Other class work and assessments that demonstrate a student's level of proficiency may be included. Download samples of proficient work at https://eteams.sandi.net/sites/sbrc

**Recommended Body of Evidence – Grade 3 Physical Science**

Note: Administer Grade 3 Physical Science Benchmark Assessment at the beginning of the unit (pre-assessment) and at the end of the unit (post-assessment).

| **Concept #1**<br><br>Energy and matter have multiple forms and can be changed from one form to another. |
|---|
| ***Prompt 1:*** **FOSS: Matter and Energy: Investigation 1: Energy - Part 1: Energy Sources**<br>**(*TG p. 205* - Energy Sources Questions - No. 3 – Science Notebook *or* Science Resources Book P. 9 Review Questions)**<br>1. What is energy? 2. What are some of the different kinds of energy? 3. What are some of the sources of stored energy that people use? 4. How are food, fuel, and batteries alike? 5. What is the source of most of the energy used by people? Explain.<br>***Prompt 2:*** **FOSS: Matter and Energy: Investigation 1: Energy - Part 2: Converting Energy**<br>**(*TG p. 207* - Response Sheet – Energy - No. 5 – Science Notebook)**<br>Brad told his friend, "See that truck driving by? It is powered by sunlight." Brad's friend said, "No it isn't, it's powered by gasoline." Explain why Brad said the truck was powered by sunlight.<br>***Prompt 3:*** **FOSS: Matter and Energy: Investigation 1: Energy - Part 3: Energy on the Move**<br>**(*TG p. 208-209* – How Does Energy Travel? A and B – No. 6&7 – Science Notebook)**<br>What action did you observe? Where did the energy come from? Where did the energy go? What carried the energy? The energy in _____ moved through _____ and ended up _____<br>***Prompt 4:*** **FOSS: Matter and Energy: Investigation 1: Energy - Part 3: Energy on the Move** (I&E5a, I&E5c)<br>**(*TG p. 210* - All About the Transfer of Energy - No.8 – Science Notebook)**<br>1. Where do people get energy? 2. Why does a car need gasoline to run? 3. What kinds of things have moving energy? 4. What are some examples of stored energy? 5. How can stored energy change into active, moving energy? 6. What is fuel used for? 7. How does energy from the Sun get converted into energy that can be used by humans and other animals? |

## Recommended Body of Evidence – Grade 3 Physical Science (continued)

***Prompt 8:*** **FOSS: Matter and Energy: Investigation 3: Matter – Part 1: Fact of the Matter**
**(*TG p. 217* Properties of Solid, Liquid, and Gas – No. 15 – Science Notebook)**
1. Solid. How can you tell if a sample of matter is solid? 2. Liquid. How can you tell if a sample of matter is liquid? Gas. How can you tell if a sample of matter is gas?

***Prompt 9:*** **FOSS: Matter and Energy: Investigation 4: Changing Matter – Part 2: Melting and Evaporation (**I&E5c, I&E5d)
**(*TG p. 187*; Science Resources Book SE P. 58 Review Questions)**
1. What is melting? 2. What cause matter to melt? 3. What is evaporation? 4. What causes evaporation?

***Prompt 10:*** **FOSS: Matter and Energy: Investigation 4: Changing Matter – Part 2: Melting and Evaporation**
**(*TG p. 188*; Science Resources Book SE P. 64 Review Questions)**
1. What is all matter made of? 2. What is the periodic table of the elements? 3. What did people think matter was made of 2,000 years ago?

***Prompt 11:*** **FOSS: Matter and Energy: Investigation 4: Changing Matter – Part 3: Reactions (**I&E5a, I&E5c, I&E5d)
**(*TG p. 225* All About Solids, Liquids, and Gases – No. 23 – Science Notebook)**
1. What is all matter made of? 2. How are atoms organized in solids and liquids? 3. If you transfer heat energy to a solid, what happens to the atoms? 4. If you transfer heat energy to a liquid, what happens to the atoms? 5. Do all solids have the same melting point? Explain.

***Prompt 12:*** **FOSS: Matter and Energy: Investigation 4: Changing Matter – Part 3: Reactions**
**(*TG p. 198*; Science Resources Book SE P. 67 Review Questions)**
1. What caused the bubbling and fizzing when Carlo combined baking soda and vinegar? 2. Why did Carlo's reaction cup have less mass after the fizzing stopped? 3. How do new substances form?

### Concept #2
Light has a source and travels in a direction.

***Prompt 5:*** **FOSS: Matter and Energy: Investigation 2: Light – Part 1: Reflected Light**
**(*TG p. 211-212* – Mirror Challenges A & B - No. 9&10 – Science Notebook)**
Make up your own challenge and show how to solve it.

***Prompt 6:*** **FOSS: Matter and Energy: Investigation 2: Light – Part 1: Reflected Light**
**(*TG p. 103*; Science Resources Book SE P. 30 Review Questions)**
1. What must happen for you to see an object? 2. What is a light source? Give three examples. 3. What happens when light reflects? 4. What kinds of surfaces reflect light? 5. What can you use a mirror for?

***Prompt 7:*** **FOSS: Matter and Energy: Investigation 2: Light – Part 2: Colored Light (**I&E5d)
**(*TG p. 285* – All About Light Questions – No. 12 –Science Notebook *or* Science Resources Book SE P. 35 Review Questions)**
1. Why couldn't Sara see anything when she first went into the exhibit at the Lawrence Hall of Science? 2. Why did Sara's orange appear black in blue light? 3. Why did Sara's lime appear green in white light? 4. How will Sara's lime look in red light? Explain why.

# Grade 3 – Matter and Energy
## 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.

| **Investigation 1: Energy** | **Investigation 2: Light** | **Investigation 3: Matter** | **Investigation 4: Changing Matter** |
|---|---|---|---|
| ▪ 2-tennis balls or softballs<br>▪ 12 cans or water bottle, empty<br>▪ 1 piece of cardboard, about 12 cm square<br>▪ Computers with CD-ROM capability (optional)<br>▪ 1 Flip Chart or sheets of chart paper<br>▪ Marking Pens<br>▪ Masking Tape<br>▪ Matches<br>▪ Overhead Projector<br>▪ 16 Pieces of paper two colors<br>▪ 8 Clear plastic sheet protectors<br>▪ 2 transparencies (optional)<br>▪ 1 VCR and Monitor | ▪ Computers with CD-ROM Capability<br>▪ Index cards or scratch paper<br>▪ Overhead projector<br>▪ Colored pens and pencils (optional)<br>▪ Lamp, additional (optional)<br>▪ VCR and Monitor | ▪ Apple or Orange (optional)<br>▪ Book<br>▪ Cans or water bottle, empty<br>▪ Chocolate chips<br>▪ Corn syrup (light or dark)<br>▪ Liquid dishwashing detergent<br>▪ Food Coloring<br>▪ Scratch Paper<br>▪ Paper towels<br>▪ Pencils<br>▪ Rock<br>▪ Scissors<br>▪ Transparent Tape | ▪ Sheet of Chart Paper (optional)<br>▪ 8 Chocolate Chips<br>▪ 1 Tray of Ice Cubes<br>▪ 1 Stick of Margarine<br>▪ Paper towels<br>▪ Pen or pencil<br>▪ 32 - Safety Goggles<br>▪ Thermos or coffee pot<br>▪ Transparent tape<br>▪ VCR or Monitor<br>▪ White Vinegar 1 quart |