OVERVIEW
MATTER AND ENERGY

CONTENT GOALS

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 form 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.

FOSS EXPECTS STUDENTS TO

- Learn that light from the Sun is the source of most of the energy on Earth.
- Observe energy sources doing work and learn how energy (light, heat, motion, chemical, electric) can be converted from one form to another.
- Learn that stored energy take many forms; machines and organisms can convert energy into motion and heat.
- Describe how energy can be carried from one place to another by waves, electric current, and moving objects.
- Learn that light energy travels in straight lines from a source.
- Find out how light can reflect from the surface of a mirror.
- Learn that an object is seen only when light from that object enters an eye.
- Learn that white light is a mixture of all colors of light, that matter can absorb and reflect light, and that a shadow is the dark area behind objects that block light.
- Learn that the apparent color of an object is the result of the light it reflects; observe that the apparent color of an object is affected by the color of light striking it.
- Explore properties of the three forms of matter (solid, liquid, and gas), including change of state.
- Use metric tools to measure mass, volume, and temperature, and make multiple numerical observations to improve accuracy.
- Observe and analyze a chemical reaction.
- Collect and analyze data to develop logical conclusions.
- Predict the outcome of an event and compare the results with the prediction.

OVERVIEW CONTENTS

MATTER AND ENERGY MODULE MATRIX

SYNOPSIS	CA SCIENCE CONTENT STANDARDS	
1. ENERGY		
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.	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.
2. LIGHT		
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.	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.
	I&E5d	Predict the outcome of a simple investigation and compare the result with the prediction.
3. MATTER		
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.	PS1e	Students know matter has three forms: solid, liquid, and gas.
	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.
4. CHANGING MATTER		
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.	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.
	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&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.

CONCEPTS	READING AND WRITING	ASSESSMENT
• Energy makes things happen. • Energy takes many forms. • Most of the energy used by organisms, including humans, comes from the Sun in the form of light. • Stored energy can be converted to other forms of energy. • Machines and living things can convert energy into motion and heat. • Energy can be carried from one place to another by waves, electric current, and moving objects.	• *Energy Sources* • *Energy Conversion* • *Energy on the Move* • *Summary: Energy* • Science Notebook: Students write about their observations of energy sources and energy conversions.	**Pretest** **Embedded Assessment** • Science notebook • Response sheet **Benchmark Assessment** • I-Check 1
• Light is a form of energy that travels in straight lines from a light source. • Light can reflect off surfaces that it strikes. • An object is seen only when light from that object enters an eye. • White light is a mixture of all colors. • Light can be absorbed by matter. • The apparent color of an object is the result of the light it reflects. • The apparent color of an object is affected by the color of light striking it. • A shadow is created when objects block light.	• *Reflection* • *Throw a Little Light on Sight* • *Summary: Light* • Science Notebook: Students record the ways they worked with mirrors to solve mirror challenges and what happens to the appearance of objects when different colors of light are used to illuminate the objects.	**Embedded Assessment** • Teacher observation • Science notebook **Benchmark Assessment** • I-Check 2
• The behavior of a sample of matter in an open container indicates its state. • The gram (g) is the standard unit of measure used to quantify mass in the metric system. • Volume is a measure of the three-dimensional space occupied by matter. • The liter (L) is the standard for measuring fluid volume in the metric system. • Opinion is based on belief; scientific evidence is based on observation.	• *States of Matter* • *Opinion and Evidence* • *The Metric System* • *Summary: Matter* • Science Notebook: Students record predictions and measurements using metric tools for mass and volume.	**Embedded Assessment** • Science notebook • Teacher observation • Notebook sheet **Benchmark Assessment** • I-Check 3
• Degree Celsius (°C) is the unit used when scientists measure temperature. • Melting occurs when solids are heated. • Different substances melt at different temperatures. • Evaporation occurs when liquids are heated. • When two substances are combined, a reaction may occur, producing a new substance with unique properties. • Matter is made of small particles, atoms.	• *Change of State* • *Atoms* • *Reactions* • *Summary: Changing Matter* • Science Notebook: Students explain the results of a chemical reaction.	**Embedded Assessment** • Teacher observation • Notebook sheet **Benchmark Assessment** • I-Check 4 **Posttest**

FOSS AND CALIFORNIA STANDARDS

FOSS supports the following Physical Sciences Content Standards for grade 3.

STD	TEXT OF STANDARD	PRIMARY CITATIONS	SUPPORTING CITATIONS
1	**Energy and matter have multiple forms and can be changed from one form to another. As a basis for understanding this concept:**		
1.a	*Students know* energy comes from the Sun to Earth in the form of light.	**Grade 3 Science Resources Book** *Energy Sources* pp. 3, 7, 9 *Summary: Energy* pp. 20-21, 24 **Matter and Energy Teacher Guide** Inv. 1: pp. 68-69, 81	**Matter and Energy Teacher Guide** Inv. 1: pp. 62, 66, 70 Inv. 2: p. 112 (video: *All about Light*) Benchmark Assessment Item 24, p. 355 Notebook Sheet no. 4, p. 206
1.b	*Students know* sources of stored energy take many forms, such as food, fuel, and batteries.	**Grade 3 Science Resources Book** *Energy Sources* pp. 4-9 *Energy Conversion* pp. 13-15 *Summary: Energy* pp. 21, 22, 24 **Matter and Energy Teacher Guide** Inv. 1: pp. 56-57, 60-62, 66, 70, 81	**Matter and Energy Teacher Guide** Notebook Sheets nos. 1-3 pp. 203-205 Benchmark Assessment Items 21, 26 pp. 354-355 Inv. 1: p. 78 (video: *All about the Transfer of Energy*) Notebook Sheets nos. 4, 8 pp. 206, 210
1.c	*Students know* machines and living things convert stored energy to motion and heat.	**Grade 3 Science Resources Book** *Energy Conversion* pp. 10, 14, 15 *Summary: Energy* p. 21 **Matter and Energy Teacher Guide** Inv. 1: pp. 60-61, 66-68, 70	**Matter and Energy Teacher Guide** Inv. 1: pp. 57, 59, 78, 81 Notebook Sheets nos. 1-4, pp. 203-206 Teacher Sheet no. 6 p. 256
1.d	*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.	**Matter and Energy Teacher Guide** Inv. 1: pp. 74-75, 77-80 **Grade 3 Science Resources Book** *Energy on the Move* pp.16-19 *Summary: Energy* pp. 22-24	**Matter and Energy Teacher Guide** Notebook Sheets nos. 6-7 pp. 208-209 Teacher Sheets nos. 11-15, pp. 262-265 Benchmark Assessment Item 27, p. 355
1.e	*Students know* matter has three forms: solid, liquid, and gas.	**Matter and Energy Teacher Guide** Inv. 3: pp. 131-136, 158. Inv. 4: pp. 184-187, 195-196 (video: *All about Solids, Liquids, and Gases*) **Grade 3 Science Resources Book** *States of Matter* pp. 41-44 *Summary: Matter* pp. 51-52, 54	**Matter and Energy Teacher Guide** Notebook Sheets nos. 14-15, pp. 216-217 Benchmark Assessment Items 39, 46, pp. 360, 362 Teacher Sheet no. 20, p. 270
1.f	*Students know* evaporation and melting are changes that occur when the objects are heated.	**Matter and Energy Teacher Guide** Inv. 4: pp. 180-187, 196, 199 **Grade 3 Science Resources Book** *Change of State* pp. 56-57 *Summary: Changing Matter* pp. 68, 71	**Matter and Energy Teacher Guide** Notebook Sheet no. 23, p. 225 Benchmark Assessment Item 47, p. 363
1.g	*Students know* that when two or more substances are combined, a new substance may be form-ed with properties that are different from those of the original materials.	**Matter and Energy Teacher Guide** Inv. 4: pp. 192-195, 197-199 **Grade 3 Science Resources Book** *Reactions* pp. 65-67 *Summary: Changing Matter* pp. 69, 71	**Matter and Energy Teacher Guide** Notebook Sheet no. 22, p. 224 Benchmark Assessment Items 48-49, p. 363

MATTER AND ENERGY OVERVIEW

FOSS supports the following Physical Sciences Content Standards for grade 3.

STD	TEXT OF STANDARD	PRIMARY CITATIONS	SUPPORTING CITATIONS
1.h	*Students know* all matter is made of small particles called atoms, too small to see with the naked eye.	**Matter and Energy Teacher Guide** Inv. 4: pp. 183-184, 186, 188, 195, 199 **Grade 3 Science Resources Book** Atoms pp. 59-61, 64 *Summary: Changing Matter* pp. 69, 71	**Matter and Energy Teacher Guide** Notebook Sheet no. 23, p. 225 Benchmark Assessment Item 53, p. 364
1.i	*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.	**Grade 3 Science Resources Book** Atoms pp. 62-64 *Summary: Changing Matter* pp. 70-71 **Matter and Energy Teacher Guide** Inv. 4: pp. 188, 199	**Matter and Energy Teacher Guide** Benchmark Assessment Item 51, p. 364 Teacher Sheet no. 20, p. 270
2	**Light has a source and travels in a direction. As a basis for understanding this concept:**		
2.a	*Students know* sunlight can be blocked to create shadows.	**Sun, Moon, and Stars Teacher Guide** Inv. 1: pp. 60-66, 67-68 Inv. 2: p. 112 (video: *All about Light*) **Grade 3 Science Resources Book** *Changing Shadows* pp. 170-174 *Summary: The Sun* pp. 175-178	**Matter and Energy Teacher Guide** Benchmark Assessment Item 29, p. 357 **Sun, Moon, and Stars Teacher Guide** Benchmark Assessment Item 20, p. 233
2.b	*Students know* light is reflected from mirrors and other surfaces.	**Matter and Energy Teacher Guide** Inv. 2: pp. 97-103, 107-109 **Grade 3 Science Resources Book** *Reflection* pp. 28-30 *Summary: Light* pp. 36-37, 39	**Matter and Energy Teacher Guide** Notebook Sheets nos. 9-10 pp. 211-212 Benchmark Assessment Items 36, 38 p. 359 Teacher Sheet no. 22, p. 272
2.c	*Students know* the color of light striking an object affects the way the object is seen.	**Grade 3 Science Resources Book** *Throw a Little Light on Sight* pp. 33-35 *Summary: Light* pp. 38-39 **Matter and Energy Teacher Guide** Inv. 2: pp. 107-109, 111, 113-114 Notebook Sheet no. 13, p. 215	**Matter and Energy Teacher Guide** Notebook Sheet no. 11, p. 213 Benchmark Assessment Items 32, 34, p. 358 **CA FOSSWEB CD-ROM** Matter and Energy: *Colored Light*
2.d	*Students know an object is seen when light* traveling from the object enters the eye.	**Matter and Energy Teacher Guide** Inv. 2: pp. 97-98, 102-103, 107-108, 111, 113 **Grade 3 Science Resources Book** *Reflection* pp. 27, 28, 30 *Throw a Little Light on Sight* p. 32 *Summary: Light* p. 37	**Matter and Energy Teacher Guide** Inv. 2: pp. 109-110 Teacher Sheet no. 6, p. 266 Benchmark Assessment Items 37-38, p. 359 Notebook Sheet no. 13, p. 215