

**California State**  
**AIMS activities supporting Kindergarten Science Standards of Learning**

**PHYSICAL SCIENCE**

**1. Properties of materials can be observed, measured and predicted. As a basis for understanding this concept, students know:**

- a. objects can be described in terms of the materials they are made of (clay, cloth, paper, etc.) and their physical properties (color, size, shape, weight, texture, flexibility, attraction to magnets, floating and sinking, etc.).**

“All Sorts of Stuff,” Under Construction

*Students will sort and classify a variety of materials.*

“Bag it,” Under Construction

*Students will design a bag with a variety of materials made from cloth, paper, and plastic.*

“Texture Rough, Texture Smooth,” Sense-able Science

*Students will sort and classify objects by texture.*

“Touch and Tell,” Sense-able Science

*Students will identify and classify rough and smooth textures.*

“Let Me Count the Ways,” Primarily Bears

*Students will explore weighing various objects.*

“Sizing Up Bears,” Under Construction

*Students will understand that the descriptive size of an object depends on the size of the other objects to which it is compared*

“Color My World,” Sense-able Science

*Students will mix primary colors to produce secondary colors, recognizing that they use the sense of sight to see colors.*

“Stick to It,” Mostly Magnets

*Students will classify objects in the classroom according to whether or not they attract to magnets.*

“What Will a Magnet Attract?” Mostly Magnets

*Students will predict and then test objects for their magnetic attraction.*

“Mining With Magnets,” Mostly Magnets

*Students will use a magnet to obtain iron bits from sand and soil.*

“Floating Fruits,” Spring Into Math & Science

*Students will discover which fruits float or sink.*

“What Do You Think Will Float?” Spring Into Math and Science

*Students will discover whether an object floats or sinks.*

“Bears Afloat,” Primarily Bears

*Students will discover that physical shape can determine whether an object will sink or float.*

- b. water can be a liquid or a solid and can be made to change back and forth from one form to the other.**

“Melt a Cube,” Primarily Physics

*Students will discover the fastest way to melt ice and find the best way to prevent it from melting.*

“Room For Change,” AIMS: XIII.9

*Students will discover that water as it changes from liquid to solid also changes in appearance.*

- c. Water left in an open container evaporates (goes into the air), but water in a closed container does not.**

“A Disappearing Act,” Primarily Earth  
*Students will see the results of water evaporating into the atmosphere.*

## LIFE SCIENCE

### 2. Different types of plants and animals inhabit the Earth. As a basis for understanding this concept students should know:

- a. **how to observe and describe similarities and differences in the appearance and behavior of plants and of animals (e.g., seed-bearing plants, birds, fish, insects).**

“Lenses and Ladybugs,” AIMS: IX. 8  
*Students will observe similarities and differences in ladybugs.*

“Under Cover,” Critters  
*Students will classify animals according to various skin coverings.*

“A Seed Within,” Primarily Plants  
*Students will compare size, shape, and color of various seeds within fruits and vegetables.*

“A Plant Patch,” AIMS: XIV.1  
*Students investigate the growth of various plants.*

- b. **stories sometimes give plants and animals attributes they do not really have.**

- c. **how to identify major structures of common plants and animals (e.g., stems, leaves, roots, arms, wings, legs)**

“Wings and Webs,” Critters  
*Students will identify external differences in the bodies of insects and spiders.*

“Fishful Thinking & Fish Puzzle,” Critters  
*Students will draw what they think a goldfish looks like and after observations re-draw the goldfish and assemble their own fish models.*

“Stem Study,” Primarily Plants  
*Students will explore why stems are necessary to plants.*

## EARTH SCIENCES

### 3. The Earth is composed of land, air and water. As a basis for understanding this concept, students should know:

- a. **characteristics of mountains, rivers, oceans, valleys, deserts, and local landforms.**

“Earth's Features,” Primarily Earth  
*Students will observe and compare physical features of the earth.*

- b. **changes in weather occur from day to day and over seasons, affecting the Earth and its inhabitants.**

“Weather Wear,” Fall Into Math and Science  
*Students will learn that weather influences what we wear.*

“Watching the Weather,” Primarily Earth  
*Students will observe and record weather conditions over time.*

“A Snap of Time,” Cycles of Knowing and Growing

*Students will observe the changes of a tree over the seasons.*

**c. how to identify resources from the Earth that are used in everyday life, and that many resources can be conserved.**

“The Earth Has What We Need!” Primarily Earth

*Students will identify rocks and minerals around the school that come from the earth..*

“Drip Drop, Flip Flop,” Water, Precious Water

*Students will play a game that emphasizes the conservation of water.*

“Just a Little Drip,” AIMS: IX.9

*Students will investigate how water can be conserved by observing a leaky faucet.*

## **INVESTIGATION AND EXPERIMENTATION**

**4. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content in the other three strands, students should develop their own questions and perform investigations. Students will:**

**a. observe common objects using the five senses.**

“Touch Tells Much,” AIMS XI. 8

*Students will use the sense of touch to explore shells.*

“Paper Picnic,” Sense-able Science

*Students will make a book that encompasses their understanding of the senses.*

“The Art of Tasting,” Sense-able Science

*Students will use both the sense of taste and smell to taste foods.*

**b. describe the properties of common objects.**

“Touch Tells Much,” AIMS: XI.8

*Students will use the sense of touch to describe the properties of shells.*

“Observe a Leaf,” Primarily Plants

*Students will observe leaves using their senses.*

“Bags of Beads,” Sense-able Science

*Students will sort and describe shape beads using the sense of touch.*

**c. describe the relative position of objects using one reference (e.g., above or below)**

“The McGregors’ Garden,” AIMS: X.9

*Students will use positional and ordinal descriptions to develop a garden.*

“Bear Caves,” Primarily Bears

*Students will use logical thinking skills to solve situational problems.*

**d. compare and sort common objects based on one physical attribute (including color, shape, texture, size, weight).**

“Exploring Geometric Solids,” Math Series A

*Students will compare and contrast geometric solids. They will explore different orientations, sizes, and shapes, discovering distinguishing characteristics.*

“Describing Shapes,” Math Series A, Task Cards 13, 14

*Students will compare real world objects using geometric vocabulary.*

“Shell Sort,” Math Series A

*Students will compare and contrast shells in order to collect and graph data.*

“Gingerbread Kids Make Connections, AIMS: VI.5

*Students will observe measure, and graph gingerbread kids.*

**e. communicate observations orally and in drawings.**

“Lenses and Ladybugs,” AIMS: IX.8

*Students will use hand lenses and microscopes in order to discover and discuss the features of a ladybug.*

“Sensational Observations,” AIMS: XI.8

*Students will use math and science tools to increase their observation skills through discussion, measurement, and drawings.*

“Holiday Sense,” AIMS: XI.5

*Students will use their senses to increase their observational skills and through discussions compare their observations with those of others.*

**California State**  
**AIMS Activities supporting First Grade Science Standards of Learning**

**PHYSICAL SCIENCE**

**1. Materials come in different forms (states) including solids, liquids, and gasses. As a basis for understanding this concept, students know:**

**a. solids, liquids, and gases have different properties.**

“Room for Change,” AIMS: XIII.9

*Students will observe that water, as it changes from liquid to solid, also changes in appearance.*

“A Matter of Change,” AIMS: XII.2

*Students will use cooking experiences to investigate changes in matter when two or more substances interact.*

“Can It Matter?” AIMS: X.2

*Students will use their sense of hearing to try and determine states of matter found in four film canisters.*

“Pouring over Matter,” AIMS: XI.9

*Students will make observations of solids and liquids.*

**b. the properties of substances can change when the substances are mixed, cooled, or heated.**

“Water to Ice to Water,” Primarily Earth

*Students will discover that water expands as it freezes and that it will float.*

“Frosty Forms,” AIMS: XII.6

*Students will observe a solid (ice) as it melts and becomes a liquid.*

**LIFE SCIENCES**

**2. Plants and animals met their needs in different ways. As a basis for understanding this concept, students know:**

**a. different plants and animals inhabit different kinds of environments and have external features that help them thrive in different kinds of places.**

“Cactus,” Budding Botanist

*Students will study the adaptations of a cactus plant.*

“Noses for Nectar,” Bats Incredible

*Students make a nose and explore ways in which the bat gets food, aids in pollination, supports seed dispersal.*

**b. plants and animals both need water; animals need food, and plants need light.**

“A Seed Grows,” Primarily Plants

*Students will grow a bean seed and watch how a plant begins.*

“Two-liter Aquarium,” Primary Science Series 2

*Students will observe various animals and plants in an aquarium environment.*

“What Do Plants Need To Grow,” Primarily Plants

*Students will discover that in order to grow healthy plants soil, water, light, and air must be provided.*

**c. animals eat plants or other animals for food and may also use plants or even other animals for shelter and nesting.**

“Food Chain,” Critters

*Students explore the interdependence of life through food chains and webs.*

“Catch Me If You Can,” Critters

*Students play a tag game to simulate the relationship between predators and prey.*

- d. how to infer what animals eat from the shape of their teeth (e.g., sharp teeth: eats meat; flat teeth: eats plants).**
- e. roots are associated with the intake of water and soil nutrients, green leaves with making food from sunlight.**

“Root Study,” Primarily Plants

*Students will be able to describe the functions of the roots of a plant.*

“Show It Grow,” AIMS: XIII.10

*Students will observe bulbs roots and stems.*

## **EARTH SCIENCES**

**3. Weather can be observed, measured and described. As a basis for understanding this concept, students know:**

- a. how to use simple tools (e.g., thermometer, wind vane) to measure weather conditions and record changes from day to day and over the seasons.**

“What Is the Temperature?” Primarily Physics

*Students will learn to use a thermometer.*

“The Wind Blows,” Primarily Earth

*Students will observe and measure how the wind blows using a rating scale.*

“Which Way, (Make a Weather Vane),” Primarily Earth

*Students make a weather vane to measure wind direction.*

- b. the weather changes from day to day, but trends in temperature or of rain (or snow) tend to be predictable during a season.**
- c. the sun warms the land, air, and water.**

“You are My Sunshine,” Spring Into Math and Science

*Students will discover the effects of the sun's heat.*

## **INVESTIGATION AND EXPERIMENTATION**

**4. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, student should develop their own questions and perform investigations. Students will:**

- a. draw pictures that portray some features of the thing being described.**

“Making a Careful Observation,” AIMS: XII.8

*Students will increase their observation skills by distinguishing one object from other similar objects.*

**b. record observations and data with pictures, numbers, and /or written statements.**

“Patch Planner,” *AIMS: XIV.1*

*Students will observe plants as they change over time through pictures, numbers, and written statements.*

**c. record observations on a bar graph.**

“Gummy Bears,” Primarily Bears

*Students will use gummy bears to count, classify, and construct a graph.*

**California State**  
**AIMS Activities supporting Second Grade Science Standards of Learning**

**PHYSICAL SCIENCE**

**1. The motion of objects can be observed and measured. As a basis for understanding this concept, students know:**

**a. the position of an object can be described by locating it relative to another object or the background.**

“Look at the Moon,” Cycles of Knowing and Growing

*Students will observe the moon and its phases in relation to the earth's position.*

“Taking Turns With Triangles,” AIMS: IX.5

*Students will position triangles to create rotational symmetry in relation to other triangles.*

**b. an object's motion can be described by recording the change in its position over time.**

“Mr. Groundhog,” Cycles of Knowing and Growing

*Students will observe, trace and discuss the shadow of a paper groundhog throughout a day.*

**c. the way to change how something is moving is to give it a push or a pull. The size of the change is related to the strength, or the amount of “force,” of the push or pull.**

“Pull-It Eggs,” Under Construction

*Students will observe the reaction of a pull-string puppet when the string is pulled.*

“Huff and Puff,” Spring Into Math and Science

*Students will move objects by blowing on them.*

“Spheres on a Roll,” AIMS: XIII.7

*Students will measure and record the direction and distance a variety of spheres roll when given an equal push.*

“Hungry Hounds,” Mostly Magnets

*Students will move paper dogs along a path by pushing or pulling with magnets.*

**d. tools and machines are used to apply pushes and pulls (forces) to make things move.**

“Three Gear Circus,” AIMS: XIII.8

*Students will observe that a simple gear train can be used to change the direction of rotation and make things move.*

“Why Wheels,” AIMS: XIII.2

*Students will understand that wheels make some tasks, (movement) easier for us.*

“Push 'n Pull Puppets,” Under Construction

*Students will design puppets so they can be made to move in different ways.*

**e. objects near the Earth fall to the ground unless something holds them up.**

“Fish 'n Clips,” Mostly Magnets

*Students will observe magnet strength by the number and mass of paper clips they lift with a magnet.*

“Feather Relays,” AIMS: XIII.4

*Students will blow on various objects to keep them in the air.*

“What Goes Up Must Come Down,” AIMS: XIV.1

*Students will discover the effects of gravity on different objects.*

**f. magnets can be used to make some objects move without being touched.**

“How Close Can You Get?” Mostly Magnets

*Students will observe magnetic interaction between a magnet and a paper clip.*

“Through It All,” Mostly Magnets

*Students will investigate and measure the number of pieces of paper a magnet can maintain attraction to paper clips.*

**g. sound is made by vibrating objects and can be described by its pitch and volume.**

“Sound is Vibration,” Primarily Physics

*Students will learn that vibrating objects produce sounds and cause vibrations to whatever they touch.*

“The Beat of the Drum,” AIMS: XI.4

*Students will build drums of various sizes and materials and as they play these drums, they will hear different sounds associated with vibrations.*

“Musical Bottles Xylophone,” Primarily Physics

*Students will observe that when glass bottles are filled with different levels of water and are tapped, they will hear a difference of sound (pitch and volume).*

## **LIFE SCIENCES**

**2. Plants and animals have predictable life cycles. As a basis for understanding this concept, students know:**

**a. organisms reproduce offspring of their own kind. The offspring resemble their parents and each other.**

**b. the sequential stages of life cycles are different for different animals, for example butterflies, frogs, and mice.**

“My Mealworms,” Critters

*Students will observe the life cycle of the mealworm.*

“Time of Their Own,” Cycles of Knowing and Growing

*Students will observe the life cycle of the butterfly.*

**c. many characteristics of an organism are inherited from the parents. Some characteristics are caused by, or influenced by the environment.**

**d. there is variation among individuals of one kind within a population.**

“Gimme Five,” Jaw Breakers and Heart Thumpers

*Students will compare fingerprints to determine similarities and differences.*

“Microbat and Megabat,” Bats Incredible

*Students will compare and contrast features of megabats and microbats.*

**e. the germination, growth, and development of plants can be affected by light, gravity, touch, or environmental stress.**

“Plants and Space,” Primarily Plants

*Students explore plant growth and the need for space.*

**f. in plants flowers and fruits are associated with reproduction.**

“Flowers,” Primarily Plants

*Students will describe the parts of a flower used for reproduction.*

“Just a Little Sprout,” Cycles of Knowing and Growing

*Students will plant pumpkin seeds and observe the cycle of growth.*

## **EARTH SCIENCES**

**3. Earth is made of materials that have distance properties and provide resources for human activities. As the basis for understanding this concept, students know:**

**a. how to compare the physical properties of different kinds of rocks and that rock is composed of different combinations of minerals.**

“Rock Groups,” Primarily Earth

*Students observe physical properties of rocks and sort them by attributes.*

“Rocks and More Rocks,” Primarily Earth

*Students observe and compare and classify rocks in groups.*

**b. smaller rocks come from the breakage and weathering of larger rocks.**

“Agent Erosion,” Primarily Earth

*Students will observe the weathering of rocks into sand and soil.*

“Sand Pile,” Primary Science Series 1

*Students will observe that sand is made from larger bits of rocks.*

**c. soil is made partly from weathered rock and partly from organic materials, and that soils differ in their color, texture, capacity to retain water, and ability to support the growth of many kinds of plants.**

“Soil Samplers,” AIMS: VI.9

*Students will learn to recognize many different kinds of materials in the soil by sorting and grouping their findings.*

“That Sorted Soil,” AIMS VI.10

*Students will learn to identify living, once living and non-living soil contents.*

“Dirt Baggers,” Cycles of Knowing and Growing

*Students will observe soil to determine, if the materials are living, once living, non-living and will they support the growth of new plants.*

**d. fossils provide evidence about the plants and animals that lived long ago, and scientists learn about the past history of Earth by studying fossils.**

**e. rock, water, plants and soil provide many resources including food, fuel, and building materials that humans use.**

## **INVESTIGATION AND EXPERIMENTATION**

**4. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations. Students will:**

**a. make predictions based on patterns of observation rather than random guessing.**

“Teddy Bears and Oranges,” Primarily Bears

*Students discover similarities and differences in oranges by observing pattern of data.*

“Scouting for Patterns,” *AIMS: XII.1*

*Students collect common objects and predict common attributes.*

“Gimme Five,” Jaw Breakers and Heart Thumpers

*Students will compare fingerprints to determine likenesses and differences.*

“Who’s Not Home,” Primarily Bears

**b. measure length, weight, temperature, and liquid volume with appropriate tools and express measurements in standard and non-standard units.**

“Queen’s Bed,” *AIMS: XIII.6*

*Students construct a bed for the queen using their feet for non-standard measure.*

“Spread Your Wings,” Bats Incredible

*Students will estimate the wingspan of microbats and megabats.*

“Measure Me,” Primary Series 1

*Students use standard measures to find the length of various body parts (feet, hands, smile, etc.)*

“Bear Facts,” Hardhatting in a Geo World

*Students compare measurements between their body and their stuffed bear's body.*

“Balance Bazaar,” *AIMS: XI. 5*

*Students order, measure, and compare objects in an open-ended problem solving activity.*

“Temperature Told Hot or Cold,” *AIMS: XI.7*

*Students learn about a thermometer by building a model and using an immersion thermometer.*

“Just a Little Drip,” *AIMS: IX.9*

*Students construct a model of a leaky faucet to observe and measure how much water is wasted.*

**c. compare and sort common objects based on two or more physical attributes (including color, shape, texture, size, weight).**

“All Sorts of Stuff,” Under Construction

“Creature Feature,” (Sorting All Sorts) Math + Science, a Solution

*Students sort and resort creatures according to physical attributes.*

“A Pumpkin With Class,” *AIMS: VI.3*

*Students measure and compare the mass and size of various pumpkins.*

“A Penny for Your Thoughts,” *AIMS: XIII.3*

*Students use pennies to facilitate scientific processes and the use of tools .*

“The Remarkable Peanut,” *AIMS: XII.7*

*Students use their senses, math and science tools, and process skills to explore peanuts.*

**d. write or draw descriptions of a sequence of steps, events, and observations.**

“Tell Me When Your Birthday Comes,” Cycles of Knowing and Growing

*Students will describe the sequence of months and birthdays for a class and record these dates on a graph.*

“Materials Matter,” Under Construction

*Students will explore different materials and prepare a display board used to describe their materials' project.*

“Water Watchers,” Primary Science Series 2

*Students will observe and describe the changes in the water level of four containers with different sized openings.*

“Observing Bulbs,” Cycles of Knowing and Growing

*Students will observe and describe the physical attributes of the bulb and the steps of its growth.*

“A Time of Their Own,” Cycles of Knowing and Growing

*Students will observe and compare the metamorphosis of butterflies and moths.*

**e. construct bar graphs to record data using appropriately labeled axes.**

“Wings and Webs,” Critters

*Students will collect and record on bar graphs the external differences of spiders and insects.*

“Gone Fishing,” Critters

*Students will use a labeled bar graph to record the results of the effect of camouflage on prey populations.*

“Mini-Boxes of Raisin Fun,” AIMS: VI.2

*Students will create real graphs using small boxes of raisins.*

“Huff and Puff,” Spring Into Math and Science

*Students will move objects by blowing on them and record the distance on a bar graph.*

**f. write or draw descriptions of a sequence of steps, events and observations, and include the use of magnifiers or microscopes to extend senses.**

“Golden House,” Cycles of Knowing and Growing

*Students will observe and keep a record of what happens to a pumpkin once it has been carved.*

“Observing Bulbs,” Cycles of Knowing and Growing

*Students will describe the physical attributes of a bulb using magnifiers to extend their senses.*

“Magniviewer,” AIMS: IX.10

*Students will construct a milk carton microscope to use in investigations.*

**g. follow verbal instructions for a scientific investigation.**

“I See The Light,” Sense-able Science

*Students will construct a diorama box demonstrating the need for light.*

“Grapes to Raisins,” Fall Into Math and Science

*Students will use a step by step procedure using the sun to turn grapes into raisins.*

**California State**  
**AIMS Activities supporting Third Grade Science Standards of Learning**

**PHYSICAL SCIENCE**

- 1. Energy and matter have multiple forms and can be changed from one form to another. As a basis for understanding this concept, students know:**

Resource: “Heat Energy,” Primarily Physics

- a. energy comes from the sun to the Earth in the form of light.**

“Light Sources,” Primarily Physics

*Explore different sources of light.*

Resources:

“Energy Concept Map

“What is Energy,” (fact sheet) Primarily Physics

- b. sources of stored energy take many forms, such as food, fuel, and batteries.**

“Life in the Food Chain,” Field Detectives

*Learn about food chains and webs by observing organisms.*

“Pyramid of Choices,” Jaw Breakers and Heart Thumpers

*Classify foods according to the groups represented on the USDA Food Guide Pyramid.*

“Butter and Margarine Candles,” Off the Wall Science

*Build and burn butter and margarine candles to observe energy transformation.*

“The Burning Walnut,” Off the Wall Science

*Burn walnuts to observe the stored heat energy.*

- c. machines and living things convert stored energy to motion and heat.**

- d. energy can be carried from one place to another by waves, such as water waves and sound, by electric current, and by moving objects.**

“Wind Rollers,” Popping with Power

*Build a roller that is powered by the wind*

“Sound is Vibration,” Primarily Physics

“Traveling Sounds,” Primarily Physics

“Slinky Sounds,” Primarily Physics

*In all three activities students will demonstrate that energy can be carried from one place to another by waves*

Resource: “Sound Energy,” Primarily Physics

- e. matter has three forms: solid, liquid and gas.**

“Melt an Ice Cube,” Primarily Physics

*Observe ice as it changes from solid to liquid state*

“Room for Change,” *AIMS: 13.9*

*Observe water as it changes from liquid to solid state*

“The Inverted Tumbler,” Off the Wall Science

*Observe properties of a gas by studying air in an inverted tumbler*

“Can it Matter?” *AIMS: X.2*

*Identify states of matter hidden in film canisters using the sense of hearing*

**f. evaporation and melting are changes that occur when the objects are heated.**

“Water in Five Containers,” Off the Wall Science

*Explore evaporation of water in different sized containers.*

“Salty Water,” Off the Wall Science

*Heat salty water to observe evaporation.*

“Puddle Pushers,” AIMS: IX.6

*Observe and measure evaporation of water from a puddle.*

**g. when two or more substances are combined a new substance may be formed that can have properties that are different from those of the original materials.**

“A Matter of Change,” AIMS: XII.2

“Candied Apple,” AIMS: II.7

*Using cooking experiences to investigate changes in matter when two or more substances interact to form new substances with different observable properties.*

**h. all matter is made of small particles called atoms, too small to see with our eyes.**

“Water Molecule,” Water Precious Water

“Atoms,” Electrical Connections

*In both activities, students will construct paper models of atoms and molecules.*

**i. people once thought that earth, wind, fire, and water were the basic elements that made up all matter. Science experiments show that there are over 100 different types of atoms which are displayed on the Periodic Table of the Elements.**

**2. Light has a source and travels in a direction. As a basis for understanding this concept, students know:**

Resource: “Light Energy,” Primarily Physics

**a. sunlight can be blocked to create shadows.**

“Just Passing Through,” Primarily Physics

*Use a flashlight to discover which materials are transparent, translucent, or opaque.*

“Me and My Shadow,” Pieces and Patterns

*Measure the lengths of shadows at different times of day to determine when a shadow casts its longest and shortest image.*

“Mr. Groundhog, Mr. Groundhog,” Cycles of Knowing and Growing

*Measure lengths of shadows.*

“Shadow Shows,” AIMS: XII.1

*Measure the relationship between the length of the shadow and the time of day.*

“Sunny Side Up,” Overhead and Underfoot

*Discover information about the relationship of the earth to the sun by studying shadow patterns.*

**b. light is reflected from mirrors and other surfaces.**

“Mirrors Reflect,” Primarily Physics  
*Observe reflections using hinged mirrors.*

**c. the color of light striking an object affects how our eyes see it.**

Resources:

“Color and Light,” *AIMS*: IV.4

“Sunsets and Rainbows,” *AIMS*: IV.5

## LIFE SCIENCE

**3. Adaptations in physical structure or behavior may improve an organism’s chance for survival. As a basis for understanding this concept, students know:**

**a. plants and animals have structures that serve different functions in growth, survival, and reproduction.**

“Table Manners,” Critters

*Simulate food gathering with four different types of insect mouths.*

“Noses for Nectar,” Bats Incredible

*Simulate a mega-bat feeding process which contributes to plant pollination.*

“Stem Study,” Primarily Plants

*Experiment with celery to explore the function of plant stems.*

“Hide and Seek,” Critters

*Construct a critter to observe the effects of camouflage on animal survival.*

“Bears Feet,” *AIMS*: XI.5

*Compare and contrast different bears’ feet and describe how features of the feet contribute to survival.*

Resources:

“Plant Parts,” Primarily Plants

“Plant Structure,” Budding Botanist

**b. examples of diverse life forms in different environments, such as oceans, deserts, tundra, forests, grasslands, and wetlands.**

entire book, Exploring Environments

*In this set of explorations, students will investigate different environments as though they were taking an expedition through each. Background information backdrop scenes, sample plants and animals, and a Science Buddy have been provided to help students examine the complex interactions between living things and how they meet their survival needs. The instructional approach is very open-ended and student-centered.*

**c. living things cause changes in the environment where they live; some of these changes are detrimental to the organism or other organisms, whereas others are beneficial.**

“Fallen Leaf,” Cycles of Knowing and Growing

*Study fallen leaves to observe the process of decomposition.*

Resources: see descriptive paragraphs in Exploring Environments

**d. when the environment changes, some plants and animals survive and reproduce, and others die or move to new locations.**

“Missing Moths,” Critters

*Observe a simulated environment with moths made of paper to see the effects of camouflage.*

“Gone Fishing,” Critters

*Use paper fish cut outs to see the effect of camouflage on prey populations.*

“A Special Plot,” Field Detectives

*Closely observe a small section of the playground to study the changes that occur over time.*

- e. some kinds of organisms that once lived on Earth have completely disappeared; some of these resembled others that are alive today.**

## **EARTH SCIENCE**

- 4. Objects in the sky move in regular and predictable patterns. As a basis for understanding this concept, students know:**

- a. the patterns of stars stay the same, although they appear to move across the sky nightly, and different stars can be seen in different seasons.**

“Sky Watchers,” Cycles of Knowing and Growing

*Observe day and night skies to study patterns and changes and record observations in sky watching book.*

- b. how the moon’s appearance changes during the four-week lunar cycle.**

“Look at the Moon,” Cycles of Knowing and Growing

“Moon on a Strip,” Cycles of Knowing and Growing

*In the two activities students will observe the sky over a period of months to determine how the moon changes and construct a moon observation calendar and journal.*

- c. telescopes magnify the appearance of some distant objects in the sky, including the moon and the planets. The number of stars that can be seen through telescopes is dramatically greater than can be seen by the unaided eye.**

- d. the Earth is one of several planets that orbit the sun, and the moon orbits the Earth.**

Resource: “When the Planets go Spinning Around,” (song) AIMS: X.2

- e. the position of the sun in the sky changes during the course of the day and from season to season.**

“Me and My Shadow,” Pieces and Patterns

*Measure the lengths of shadows at different times of day to determine when a shadow casts its longest and shortest image.*

## **INVESTIGATION AND EXPERIMENTATION**

The following standards should be woven together with the previous Life, Physical and Earth Science Standards at the time these topics are taught. The Investigation and Experimentation Standards should not be viewed or taught as separate skills which are disembodied from appropriate science content. The AIMS activities listed above which incorporate any of the Investigation and Experimentation Standards are marked by an icon (IE-icon here) which contains the letter(s) of the relevant standard(s).

- 5. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to**

**address the content the other three strands, students should develop their own questions and perform investigations. Students will:**

- a. 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.**
- b. 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.**
- c. use numerical data in describing and comparing objects, events and measurements.**
- d. predict the outcome of a simple investigation, and compare the result to the prediction.**
- e. collect data in an investigation and analyze them to develop a logical conclusion.**

**California State**  
**AIMS activities supporting Fourth Grade Standards of Learning**

**PHYSICAL SCIENCE**

**1. Electricity and magnetism are related effects that have many useful applications in everyday life. As a basis for understanding this concept, students know:**

**a. how to design and build simple series and parallel circuits using components such as wires, batteries, and bulbs.**

“Sparky’s Light Kit,” Electrical Connections

*Design and build a complete circuit that lights a bulb using only a D-cell, a bulb, and a jumbo paper clip or wire.*

“Path Finders,” Electrical Connections

*Learn about complete and incomplete circuits by trying to light a bulb using various systems of bulbs, wires, and cells (batteries).*

“Electrical Circuits,” Electrical Connections

*Build and observe series and parallel circuits*

“Short Cuts,” Electrical Connections

*Build several different parallel circuits, each with a switch, and will discover the effect on each circuit when the switch is opened and closed.*

**b. how to build a simple compass and use it to detect magnetic effects, including Earth's magnetic field.**

“Make a Compass,” Mostly Magnets

*Construct a magnetic compass using a magnetized needle.*

Resource: “Science Information/Glossary” Mostly Magnets

**c. electric currents produce magnetic fields and how to build a simple electromagnet.**

“Make an Electromagnet” Mostly Magnets

*Construct an electromagnet and test variables for strength.*

“The Electromagnetic Connection,” Electrical Connections

*Discover that electromagnetic currents produce a magnetic field.*

Resource: “Electromagnetism Fact Sheets,” Electrical Connections

**d. the role of electromagnets in the construction of electric motors, electric generators, and simple devices such as doorbells and earphones.**

“How to Make an Electric Motor,” Electrical Connections

*Build a simple electric motor.*

**e. electrically charged objects attract or repel each other.**

“Static Strokes,” Electrical Connections

*Explore static electricity by testing a variety of small objects.*

“Static Magic,” Popping with Power

*Explore static electricity by testing a variety of small objects.*

Resources:

“Static Electricity,” Electrical Connections  
“St. Elmo’s Fire,” Electrical Connections

**f. magnets have two poles, labeled north and south, and like poles repel each other while unlike poles attract each other.**

“Face to Face,” Mostly Magnets

*Use pairs of magnets to discover how like and unlike poles react to one another.*

“Floating Magnets,” Mostly Magnets

*Experiment with two or more stacked ring magnets and observe how they interact.*

“Magnetic Tug-of-War,” Mostly Magnets

*Quantify magnetic interaction between two ring magnets to discover the mathematical relationship between attraction and repulsion.*

“Magnetic Lines,” Mostly Magnets

*Investigate to discover the magnetic field lines.*

**g. electrical energy can be converted to heat, light and motion.**

“Circuit Breakers,” Electrical Connections

*Build a circuit breaker and learn its function as part of a circuit.*

Sparky’s Light Kit,” Electrical Connections

*Design and build a complete circuit that lights a bulb using only a D-cell, a bulb, and a jumbo paper clip or wire.*

Resource: “Lightbulbs: The Inside Story,” Popping with Power

## LIFE SCIENCE

**2. All organisms need energy and matter to live and grow. As a basis for understanding this concept, students know:**

**a. plants are the primary source of matter and energy entering most food chains.**

“Life in the Food Chain,” Field Detectives

*Observe food webs and food chains on the playground.*

“Pizza Parts and Web Wheels,” Field Detectives

*Use a pizza’s ingredients to discover parts of the food chain.*

“Producing a Producer,” Field Detectives

*Sprout alfalfa seeds to show the beginning of the food chain.*

**b. producers and consumers (herbivores, carnivores, omnivores, and decomposers) are related in food chains and food webs, and may compete with each other for resources in an ecosystem.**

“Bean a Great Place to Live,” Field Detectives

*Determine different arrangements of animals that can live in a habitat according to space.*

“Life in the Food Chain,” Field Detectives

*Observe food webs and food chains on the playground.*

“Pyramid Pile-Up,” Field Detectives

*Build and use a model to show the structure of a food pyramid.*

Resource: “Food Chains/Food Web,” Critters

**c. decomposers, including many fungi, insects, and microorganisms, recycle matter from dead plants and animals.**

- “Dirt Dwellers,” Field Detectives  
*Locate, collect, and observe decomposer animals in the soil.*
- “From Leaf to Soil,” Field Detectives  
*Observe decomposition of leaves.*

**3. Living organisms depend on one another and on their environment for survival. As a basis for understanding this concept, students know:**

**a. ecosystems can be characterized in terms of their living and non-living components.**

- “Floor Samples,” Field Detectives  
*Observe non-living components of a habitat.*
- “A Watched Pot,” Field Detectives  
*Observe and water soil containers, recording any changes.*
- “Comfort Clues,” Field Detectives  
*Record how temperatures vary within a habitat.*
- “A Warrant for Water,” Field Detectives  
*Test water percolation in different areas of playground habitat and compare water retention in soil samples.*
- “Compacted Playground,” Field Detectives  
*Predict and observe what happens to soil and plants when people walk on them*
- “Fishing for Clues,” Field Detectives  
*Explore the basic needs that a habitat provides for organisms by making and using a model.*
- “What Makes Soil,” Overhead and Underfoot  
*Explore components of different soil samples.*
- Resource: entire book Exploring Environments

**b. for any particular environment, some kinds of plants and animals well, some survive less well, and some cannot survive at all.**

- “Hide and Seek,” Critters  
*Make a critter and see the effects of camouflage on animal visibility.*
- “Moth Maps,” Critters  
*Try to locate moths camouflaged on a coordinate grid and map their locations.*
- “Habitat Comparisons,” Our Wonderful World  
*Compare and contrast organisms in two different habitats.*
- Resource: entire book Exploring Environments

**c. many plants depend on animals for pollination and seed dispersal, while animals depend on plants for food and shelter.**

- “Seeds Travel,” Primarily Plants  
*Observe the many ways that seeds can be dispersed by a parent plant.*
- “Noses for Nectar,” Bats Incredible  
*Simulate how nectar eating bats contribute to plant pollination by building a mega-bat nose.*
- “Tree Houses,” Field Detectives  
*Observe organisms in a tree and recognize how the tree provides for their needs.*

**EARTH SCIENCE**

**4. The properties of rocks and minerals reflect the processes that formed them. As a basis for understanding this concept, students know:**

**a. how to differentiate among igneous, sedimentary, and metamorphic rocks by their properties and methods of formation (the rock cycle).**

“Rock and Rule,” Overhead and Underfoot

*Collect rock samples and classify according to certain properties.*

“Pet Rock,” Overhead and Underfoot

*Find characteristics of different rock samples.*

**b. how to identify common rock-forming minerals (including quartz, calcite, feldspar, mica, and hornblende) and ore minerals using a table of diagnostic properties.**

**5. Waves, wind, water, and ice shape and reshape the Earth's land surface. As a basis for understanding this concept, students know:**

**a. some changes in the Earth are due to slow processes, such as erosion, and some changes are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.**

“Agent Erosion,” Primarily Earth

*Use models and playground observations to observe that rocks are weathered into sand and soil.*

“Rain Away,” Water Precious Water

*Observe the effects of erosion caused by rain on a bare hillside by constructing a model.*

“Don’t Rain Away,” Water Precious Water

*Observe how vegetation helps control the erosion caused by rain by constructing a model.*

“Sand Dunes and Snow Drifts,” AIMS: IX.5

*Explore the effects of obstacles on drifting sand and/or snow by constructing a model.*

“Quaking Earth,” Primarily Earth

*Build a gelatin model to develop an idea of what happens to earth’s surface and buildings during an earthquake.*

“Volcanoes,” Primarily Earth

*Construct a model using baking soda and vinegar.*

Resource: “Erosion” (song) AIMS: IX.5

**b. natural processes, including freezing/thawing and growth of roots, cause rocks to break down into smaller pieces.**

“Ice Breakers,” Primarily Earth

*Investigate the effects of the freezing of water in simulated rock models.*

**c. moving water erodes landforms, reshaping the land by taking it away from some places and depositing it as pebbles, sand, silt, and mud in other places (weathering, transport, and deposition).**

“Quick Sand,” Down to Earth

*Study the effects of a stream slope and rate of flow on its rate of erosion by constructing a model.*

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Investigation and Experimentation Standards are marked by an icon (IE-icon here) which contains the letter(s) of the relevant standard(s).

- 6. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations. Students will:**
  - a. differentiate observation from inference (interpretation), and know that scientists' explanations come partly from what they observe and partly from how they interpret their observations.**
  - b. measure and estimate weight, length, or volume of objects.**
  - c. formulate predictions and justify predictions based on cause and effect relationships.**
  - d. conduct multiple trials to test a prediction and draw conclusions about the relationships between results and predictions.**
  - e. construct and interpret graphs from measurements.**
  - f. follow a set of written instructions for a scientific investigation.**

**California State**  
**AIMS Activities supporting Grade Five Standards of Learning**

**PHYSICAL SCIENCE**

**1. Elements and their combinations account for all the varied types of matter in the world. As a basis for understanding this concept, students know:**

**a. during chemical reactions, the atoms in the reactants rearrange to form products with different properties.**

“A Strange Change,” *AIMS: XI.10*

*Observe chemical changes by conducting experiments.*

“Another Look at a Strange Change,” *AIMS: XII.3*

*Observe and measure the effects of a chemical change using a thermometer.*

“Yeast High Risers,” Fun with Foods

*Observe and measure the chemical reaction of yeast in bread dough.*

“Homemade Fire Extinguisher,” Off the Wall Science

“Pouring Carbon Dioxide Gas,” Off the Wall Science

*Observe a chemical reaction of baking soda and vinegar and CO<sub>2</sub> gas.*

“Change Matters,” *AIMS: XI.8*

*Determine whether various changes in matter are physical or chemical by conducting experiments.*

“Money Laundering,” *AIMS: XII.9*

*Discover that the combination of vinegar and salt is a chemical reaction that can clean their pennies.*

“Riding on Air,” Soap Film and Bubbles

*Produce carbon dioxide gas in an aquarium by mixing baking soda and vinegar.*

**b. all matter is made of atoms, which may combine to form molecules.**

“Macro Molecules,” Soap Film and Bubbles

*Build models of water and soap molecules.*

“The Water Molecule,” Water Precious Water

*Construct a paper model of a water molecule.*

Resources:

“It’s a Small World,” Soap Film and Bubbles

“The Water Molecule,” Water Precious Water

**c. metals have properties in common, such as electrical and thermal conductivity. Some metals, such as aluminum (Al), iron (Fe), nickel (Ni) copper (Cu), silver (Ag), gold (Au), are pure elements while others, such as steel and brass, are composed of a combination of elemental metals.**

“Heat Energy Travels,” Primarily Physics

*Use a metal rod to comprehend heat energy transfer.*

**d. each element is made of one kind of atom. These elements are organized in the Periodic Table by their chemical properties.**

**e. scientists have developed instruments that can create images of atoms and molecules showing that they are discrete and often occur in well ordered arrays.**

**f. differences in chemical and physical properties of substances are used to separate mixtures and identify compounds.**

“Messing with Mixtures,” *AIMS: XII.7*  
*Determine how the ingredients of a mixture can be separated.*

**g. 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>).**

“Don’t Flip Your Lid,” *AIMS: XIII.1*  
*Explore various properties of gases by heating and cooling.*

“Pouring Carbon Dioxide Gas,” Off the Wall Science  
*Observe a chemical reaction of baking soda and vinegar and CO<sub>2</sub> gas.*

“Water Olympics,” Water Precious Water  
*Explore properties of water.*

“Water Activities,” Pieces and Patterns  
*Explore the properties of water and the phenomenon of surface tension.*

“Riding on Air,” Soap Film and Bubbles  
*Study the properties of gas by observing bubbles floating on a layer of carbon dioxide gas.*

“Inverted Tumbler in the Aquarium,” Off the Wall Science  
*Learn that gas occupies space by inverting a cup in a container of water.*

“The Melting Ice Cube,” Off the Wall Science  
*Explore the properties of solids and liquids by melting ice cubes.*

“Crazy Colloid,” *AIMS: IV.1*  
*Explore ways a substance shares the properties of both a solid and a liquid.*

**h. living organisms and most materials are composed of just a few elements.**

**i. common properties of salts, such as sodium chloride (NaCl).**

## LIFE SCIENCE

**2. Plants and animals have structures for respiration, digestion, waste disposal, and transport of materials. As a basis for understanding this concept, students know:**

**a. many multicellular organisms have specialized structures to support the transport of materials.**

“Herb and Woody,” Budding Botanist  
*Study and compare the specialized structures of woody and herbaceous stems.*

“Transpiration,” Budding Botanist  
*Observe the transpiration and water movement that occurs in plant leaves by conducting an experiment.*

“Stem Study,” Primarily Plants  
*Conduct an experiment to understand the function of plant stems.*

Resources:

“History of a Tree,” Budding Botanist

“Tree Cookies,” Our Wonderful World

**b. how blood circulates through the heart chambers, lungs, and body, and how carbon dioxide (CO<sub>2</sub>) and oxygen (O<sub>2</sub>) are exchanged in the lungs and tissues.**

“You Gotta Have Heart,” From Head to Toe  
*Demonstrate knowledge of heart structures by labeling a diagram of the heart.*

“Take A Breather,” From Head to Toe

*Measure lung capacity using a balloon.*

“You Take my Breath Away,” From Head to Toe

*Measure the rate of respiration while doing various exercises.*

- c. the sequential steps of digestion, and the roles of teeth and mouth, esophagus, stomach, small intestine, large intestine, and colon in the function of the digestive system.**

“Casing the System,” *AIMS: XI.1*

*Model the digestive system using sausage wrappers.*

Resource: “Food Tube,” *AIMS: XI.10*

- d. the role of the kidney in removing cellular wastes from blood and converting them into urine, which is stored in the bladder.**

- e. how sugar, water, and minerals are transported in a vascular plant.**

“Stem Study,” Primarily Plants

*Conduct an experiment to understand the function of plant stems.*

- f. plants use carbon dioxide (CO<sub>2</sub>) and energy from sunlight to build molecules of sugar and release oxygen.**

“Photosynthesis,” Budding Botanist

*Observe the production of oxygen through photosynthesis by making an experiment.*

- g. plant and animal cells break down sugar to obtain energy, forming carbon dioxide (CO<sub>2</sub>) and water (respiration).**

## **EARTH SCIENCE**

- 3. Water on Earth moves between the oceans and land through the processes of evaporation and condensation. As a basis for understanding this concept, students know:**

- a. most of the Earth’s water is present as salt water in the oceans, which cover most of the Earth’s surface.**

“Were You Aware?” Water Precious Water

*Predicting and graphing the percent of water types available on earth.*

“Surf and Sand,” Finding Your Bearings

*Do various activities to determine the ratio of water to land on the earth’s surface.*

- b. when liquid water evaporates, it turns into water vapor in the air and can reappear as a liquid when cooled, or as a solid if cooled below the freezing point of water.**

“Puddle Pushers,” *AIMS: IX.6*

*Observe and measure the evaporation of water in a puddle over a period of time.*

“Mini Water Cycle,” Water Precious Water

*Construct and observe a water cycle in a plastic bag.*

“Salty H<sub>2</sub>O,” Off the Wall Science

*Conduct an investigation evaporating salty water.*

- c. water moves in the air from one place to another in the form of clouds or fog, which are tiny droplets of water or ice, and falls to the Earth as rain, hail, sleet, or snow.**

“Moving Water,” Water Precious Water

*Make a model of the forms water will take when it is heated or cooled.*

“Moving Raindrops in the Water Cycle!” Water Precious Water

*Model the different forms water will take through the water cycle.*

Resource: “Water Cycle” (song), AIMS: IX.7

- d. the amount of fresh water, located in rivers, lakes, underground sources, and glaciers, is limited, and its availability can be extended through recycling and decreased use.**

“A Little Cup Will Do It,” Water Precious Water

*Measure the amount of water that can be saved in one week when brushing your teeth by using a cup of water instead of letting the water run.*

“Down the Drain,” Water Precious Water

*Measure the amount of water wasted while waiting for the water to get hot.*

“Drip Drop Flip Flop,” Water Precious Water

*Determine some ways to conserve water around your house by constructing a model.*

- e. the origin of water used by their local communities.**

“Water Islands,” Water Precious Water

*Model various ways communities get their water.*

“Mini Water Treatment Simulation,” Water Precious Water

*Model a water purification system.*

“Help Save the Birds,” Water Precious Water

*Plan and conduct an investigation to clean muddy water.*

- 4. Energy from the sun heats the Earth unevenly, causing air movements resulting in changing weather patterns. As a basis for understanding this concept, students know:**

- a. uneven heating of the Earth causes air movements (convection currents).**

“When Hot and Cold Meet,” Primarily Physics

*Observe convection currents in a container of water.*

“Curly Cue,” Popping with Power

*Build an air current detector as they explore convection currents in the air.*

- b. the influence of the ocean on weather, and the role of the water cycle in weather.**

- c. causes and effects of different types of severe weather.**

- d. how to use weather maps and weather forecasts to predict local weather, and that prediction depends on many changing variables.**

“World Wide Highs,” AIMS: XI.5

*Predict, record, and compare the high temperatures of various cities around the world throughout the year.*

- e. **the Earth's atmosphere exerts a pressure that decreases with distance above the Earth's surface, and is the same in all directions.**

“Seeing is Believing,” The Sky’s the Limit

*Explore discrepant events which demonstrate air pressure.*

“Look Out Below,” AIMS: X.4

*Observe the ability of air pressure to support water in an inverted cups.*

Resource: “Manometer,” AIMS: XIII.5

- 5. **The solar system consists of planets and other bodies that orbit the sun in predictable paths. As a basis for understanding this concept, students know:**

- a. **the sun, an average star, is the central and largest body in the solar system and is composed primarily of hydrogen and helium.**

- b. **the solar system includes the Earth, moon, sun, eight other planets and their satellites, and smaller objects such as asteroids and comets.**

“Planet Trivia,” Out of this World

*Participate in a card game reinforcing planetary information.*

“Planetary Facts,” Out of this World

*Generate graphs and Venn diagrams using information about the planets.*

Resources:

“When the Planets Go Spinning Around,” (song), AIMS: X.2

“Can You Planet?” Out of this World

- c. **the path of a planet around the sun is due to the gravitational attraction between the sun and the planet.**

## INVESTIGATION AND EXPERIMENTATION

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- 6. **Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations. Students will:**

- a. **classify objects (e.g., rocks, plant, leaves) based on appropriate criteria.**

- b. **develop a testable question.**

- c. **plan and conduct a simple investigation based on a student-developed question, and write instructions others can follow to carry out the procedure.**

- d. **identify the dependent and controlled variables in an investigation.**

- e. identify a single independent variable in a scientific investigation and explain what will be learned by collecting data on this variable.**
- f. select appropriate tools (e.g., thermometers, meter sticks, balances, and graduated cylinders) and make quantitative observations.**
- g. record data using appropriate graphic representation (including charts, graphs, and labeled diagrams), and make inferences based on those data.**
- h. draw conclusions based on scientific evidence and indicate whether further information is needed to support a specific conclusion.**
- i. write a report of an investigation that includes tests conducted, data collected or evidence examined, and conclusions drawn.**

**California State**  
**AIMS Activities supporting Sixth Grade Science Standards of Learning**

**FOCUS ON EARTH SCIENCE**

**PLATE TECTONICS AND EARTH'S STRUCTURE**

**1. Plate tectonics explains important features of the Earth's surface and major geologic events. As the basis for understanding this concept, students know:**

**a. the fit of the continents, location of earthquakes, volcanoes, and mid-ocean ridges, and the distribution of fossils, rock types, and ancient climatic zones provide evidence for plate tectonics.**

“Drifting Apart,” Finding Your Bearings

*Students will use a jigsaw puzzle format to determine how the continents once fit together.*

“Fossil Fill,” *AIMS: XIII.9*

*Students will learn how paleontologists use the Principle of Superposition to determine the relative age of fossils.*

Resource: “Continental Drift Theory,” Finding Your Bearings

**b. the solid Earth is layered with cold, brittle lithosphere; hot, convecting mantle; and dense, metallic core.**

“Layers of the Earth,” *AIMS: XIII.1*

*Students will construct, draw, and label the layers of the earth.*

Resource: refer to 1.a

**c. lithospheric plates that are the size of continents and oceans move at rates of centimeters per year in response to movements in the mantle.**

Resource: refer to 1.a

**d. earthquakes are sudden motions along breaks in the crust called faults, and volcanoes/fissures are locations where magma reaches the surface.**

“Peanut Butter and Jelly Geology,” Overhead and Underfoot

*Students will learn how natural forces shape the rock layers of the earth's crust.*

Resource: refer to 1.a

**e. major geologic events, such as earthquakes, volcanic eruptions, and mountain building result from plate motions.**

“Topping Off Mt. St. Helen's,” Through The Eyes of The Explorers

*Students will use contour maps to construct models of Mt. St. Helen's before and after the 1980 eruption.*

Resource: refer to 1.a

**f. how to explain major features of California geology in terms of plate tectonics (including mountains, faults, volcanoes).**

**g. how to determine the epicenter of an earthquake and that the effects of an earthquake vary with its size, distance from the epicenter, local geology, and the type of construction involved.**

**SHAPING THE EARTH'S SURFACE**

**2. Topography is reshaped by weathering of rock and soil and by the transportation and deposition of sediment. As the basis for understanding this concept, students know:**

**a. water running downhill is the dominant process in shaping the landscape, including California's landscape.**

**"Quick Sand," Down to Earth**

*Students will be able to state the relationship between a stream's slope and rate of flow and the rate of erosion.*

**b. rivers and streams are dynamic systems that erode and transport sediment, change course, and flood their banks in natural and recurring patterns.**

**"Shoot The Rapids," Down To Earth**

*Students will be able to determine the velocity of a stream and describe the relationship between slope and velocity.*

**"Flood Stage," Down To Earth**

*Students will be able to describe the relationship of the volume of water in a stream and its velocity, and determine the rate of flow in a stream.*

**c. beaches are dynamic systems in which sand is supplied by rivers and moved along the coast by wave action.**

**d. earthquakes, volcanic eruptions, landslides, and floods change human and wildlife habitats.**

## **PHYSICAL SCIENCE**

### **HEAT (THERMAL ENERGY)**

**3. Heat moves in a predictable flow from warmer objects to cooler objects until all objects are at the same temperature. As a basis for understanding this concept, students know:**

**a. energy can be carried from one place to another by heat flow, or by waves including water waves, light and sound, or by moving objects.**

**"Heat Energy Moves," Primarily Physics**

*Students will learn that metals are a good conductor of heat and plastic and wood are not.*

**"Cold Tin and Hot Hands," Primarily Physics**

*Students will be able to see that air when heated will expand.*

**b. when fuel is consumed, most of the energy released becomes heat energy.**

**"The Burning Walnut," Off the Wall Science**

*Students will observe what produces more heat energy, a burning walnut shell or a burning walnut meat.*

**"Butter and Margarine Candles," Off the Wall Science**

*Students will observe that there are oils in butter and margarine.*

**"A Nutty Experience," Pieces and Patterns**

*Students will compare the heat energy released in burning several kinds of nuts.*

- c. heat flows in solids by conduction (which involves no flow of matter) and in fluids by conduction and also by convection (which involves flow of matter).**

“Heat Energy Travels,” Primarily Physics

*Students will learn that metal can be a good conductor of heat energy.*

“When Hot and Cold Meet,” Primarily Physics

*Students will observe hot water moving by convection.*

Resource: “Mind Boggler: All Fired Up,” *AIMS*: IX.9

- d. heat energy is also transferred between objects by radiation; radiation can travel through space.**

“Tints and Temps,” Popping With Power

*Students will discover that dark cars radiate more heat than light cars and that the temperature inside a closed car can rise to unsafe levels on hot days.*

“Green Sleeves,” *AIMS*: XII.2

*Students will gather data from thermometers positioned at different angles to the sun. They will compare the effect of direct rays and indirect rays on temperature and relate the results to the seasons.*

## **ENERGY IN THE EARTH SYSTEM**

- 4. Many phenomena on the Earth’s surface are affected by the transfer of energy through radiation and convection currents. As a basis for understanding this concept, students know:**

- a. the sun is the major source of energy for phenomena on the Earth’s surface, powering winds, ocean currents, and the water cycle.**

Resources:

“Science Information: Heat Energy; Heat Energy and Temperature” Primarily Physics

“Side Talk: Weather In The Web Of Science” *AIMS*: IX.9

“Side Talk: Weather In The Web Of Science” *AIMS*: X.1

“Side Talk: Weather In The Web Of Science” *AIMS*: X.2

“Energy, Part 1” *AIMS*: VII.9

“Energy, Part 2” *AIMS*: VII.10

- b. solar energy reaches Earth through radiation, mostly in the form of visible light.**

Resources: refer to 4.a

- c. heat from Earth's interior reaches the surface primarily through convection.**

Resources: refer to 4.a

- d. convection currents distribute heat in the atmosphere and oceans.**

“When Hot and Cold Meet,” Primarily Physics

*Students will observe hot water moving by convection.*

“Curly Cue,” Popping With Power

*Students will discover that heat energy causes the air to move upward.*

“Hot Water and Cold Water,” Off The Wall Science

*Students will observe the mixing of hot water and cold water.*

Resources: refer to 4.a

**e. differences in pressure, heat, air movement, and humidity result in changes of weather.**

“Weather Watch,” *AIMS: X.2*

*Students will gather hourly weather information from a radio, television, or computer and observe weather patterns in a particular location.*

Resources: refer to 4.a

## LIFE SCIENCE

### ECOLOGY

**5. Organisms in ecosystems exchange energy and nutrients among themselves and with the environment. As a basis for understanding this concept, students know:**

**a. energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis, and then from organism to organism in food webs.**

“Photosynthesis,” Budding Botanist

*The students will observe the production of oxygen through photosynthesis.*

“Pizza Parts and Web Wheels,” Field Detectives

*The students will trace the food they eat through the levels of a food web.*

“Catch Me If You Can,” Critters

*A food chain in a game of tag.*

“Food Chains and Webs,” *AIMS: IX.9*

*The students will explore the variety of ways transfer of food energy can occur from a source in plants through a series of animals.*

“Nocturnal Hunter,” *AIMS: IV.5*

*The students will dissect an owl pellet to determine what food the owl had consumed.*

**b. over time, matter is transferred from one organism to others in the food web, and between organisms and the physical environment.**

“Worm Home,” Critters

*The students will observe earthworms in their home environments.*

“Pickle Jar Aquarium,” Magnificent Microworld Adventures

*The students will observe fresh water protozoa and plants in their own aquarium.*

“Who’s Who in the Habitat,” Field Detectives

*The students will create, maintain, and observe various habitats.*

“Teddy Bears Fight Pollution,” *AIMS: II.3*

*The students will model the affect of pollution on a food web.*

**c. populations of organisms can be categorized by the functions they serve in an ecosystem.**

“Catch Me If You Can,” Critters

*A food chain in a game of tag.*

“Life in the Food Chain,” Field Detectives

*The students will learn that all living things on the playground are part of various food chains which are links to overall food webs.*

“Producing a Producer,” Field Detectives

*The students will learn that green plants are producers.*

“Buffet Lunch,” Field Detectives

*The students will learn that some plant eating animals may eat only certain foods, while others will eat nearly anything that is available.*

“From Leaf to Soil,” Field Detectives

*The students will learn that leaves are broken down by decomposing organisms and returned to the soil.*

“Pyramid Pile-Up,” Field Detectives

*The students will construct a food pyramid structure to demonstrate the relationships within various food pyramids.*

**d. different kinds of organisms may play similar ecological roles in similar biomes.**

Exploring Environments

*The students will investigate different environments as though they were taking an expedition through each.*

“Who’s Home in the Biome?” Critters

*The students will review which plants and animals are found in each biome.*

**e. the number and types of organisms an ecosystem can support depends on the resources available and abiotic factors, such as quantity of light and water, range of temperatures, and soil composition.**

Exploring Environments

*The students will investigate different environments as though they were taking an expedition through each.*

“Design Your Own Shelter,” Field Detectives

*The students will learn that most animals need a place where they can rest, raise their young, stay warm and dry, and be safe from predators.*

“Comfort Clues,” Field Detectives

*The students will discover that temperature is one of the physical conditions influencing which plants and animals live in a particular location.*

“What Do Plants Need to Grow?” Primarily Plants

*The students will understand that in order to grow healthy plants, soil, water, light and air must be provided.*

## RESOURCES

**6. Sources of energy and materials differ in amounts, distribution, usefulness, and the time required for their formation. As a basis for understanding this concept, students know:**

**a. the utility of energy sources is determined by factors that are involved in converting these sources to useful forms and the consequences of the conversion process.**

Resources:

“Zapped,” *AIMS: XIII.1*

“Conceptual Overview,” Machine Shop

**b. different natural energy and material resources, including air, soil, rocks, minerals, petroleum, fresh water, wildlife, and forests, and classify them as renewable or nonrenewable.**

- c. natural origin of the materials used to make common objects.

## **INVESTIGATION AND EXPERIMENTATION**

- 7. **Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations. Students will:**
  - a. **develop a hypothesis.**
  - b. **select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.**
  - c. **construct appropriate graphs from data and develop qualitative statements about the relationships between variables.**
  - d. **communicate the steps and results from an investigation in written reports and verbal presentations.**
  - e. **recognize whether evidence is consistent with a proposed explanation.**
  - f. **read a topographic map and a geologic map for evidence provided on the maps, and construct and interpret a simple scale map.**
  - g. **interpret events by sequence and time from natural phenomena (e.g., relative ages of rocks and intrusions).**
  - h. **identify changes in natural phenomena over time without manipulating the phenomena (e.g., a tree limb, a grove of trees, a stream, a hillslope).**

**California State**  
**AIMS Activities supporting Seventh Grade Science Standards of Learning**

**LIFE SCIENCE**

**CELL BIOLOGY**

**1. All living organisms are composed of cells, from just one to many trillions, whose details usually are visible only through a microscope. As a basis for understanding this concept,**

**a. cells function similarly in all living organisms.**

“Model of a Cell,” The Budding Botanist

*The students will build a cell model and learn its parts.*

“The Cell as a Factory,” Magnificent Microworld Adventures

*The students will build a model of a cell to learn its structures and their function.*

Resources:

“Background Information for the Teacher: Cells: The Basis of Life,” Magnificent Microworld Adventures

“Cell Facts,” The Budding Botanist

Biographies (Leeuwenhoek, Hooke, Schwann and Schleiden), Magnificent Microworld Adventures

**b. the characteristics that distinguish plant cells from animal cells, including chloroplasts and cell walls.**

“Onion Rings,” Magnificent Microworld Adventures

*The students will observe an onion cell’s nucleus, cytoplasm, cell wall and cell membrane.*

“Cheek to Cheek,” Magnificent Microworld Adventures

*The students will prepare a wet mount slide of cheek cells and observe that animal cells are different from plant cells.*

“The Cell as a Factory,” Magnificent Microworld Adventures

*The students will build a model of a cell to learn its structures and their function.*

“Focus on Cells,” The Budding Botanist

*The students will look at an onion cell and understand that the shape of a cell is related to its job.*

**c. the nucleus is the repository for genetic information in plant and animal cells.**

**d. mitochondria liberate energy for the work that cells do, and chloroplasts capture sunlight energy for photosynthesis.**

“Photosynthesis,” The Budding Botanist

*The students will observe the production of oxygen through photosynthesis.*

**e. cells divide to increase their numbers through a process of mitosis, which results in two daughter cells with identical sets of chromosomes**

**f. as multicellular organisms develop, their cells differentiate.**

**GENETICS**

**2. A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences. As a basis for understanding this concept, students know:**

- a. the differences between the life cycles and reproduction of sexual and asexual organisms.**
- b. sexual reproduction produces offspring that inherit half their genes from each parent.**

“Picturing a Dichotomy,” *AIMS*: IX.8

*The students will compare and contrast with others the data they record about certain inherited traits.*

**c. an inherited trait can be determined by one or more genes.**

“Picturing a Dichotomy,” *AIMS*: IX.8

*The students will compare and contrast with others the data they record about certain inherited traits.*

**d. plant and animal cells contain many thousands of different genes, and typically have two copies of every gene. The two copies (or alleles) of the gene may or may not be identical, and one may be dominant in determining the phenotype while the other is recessive.**

“Teddy Bears Come In Pairs,” *AIMS*: II.5

*The students will conduct an investigation which accurately simulates the experiments of Gregor Mendel with pea plants through which he discovered the Mendelian laws of heredity.*

“Picturing a Dichotomy,” *AIMS*: IX.8

*The students will compare and contrast with others the data they record about certain inherited traits.*

Resources:

“Gregor Mendel,” *AIMS*: II.5

“The Mendelian Laws of Heredity,” *AIMS*: II.5

**e. DNA is the genetic material of living organisms, and is located in the chromosomes of each cell.**

## **EVOLUTION**

**3. Biological evolution accounts for the diversity of species developed through gradual processes over many generations. As a basis for understanding this concept, students know:**

- a. both genetic variation and environmental factors are causes of evolution and diversity of organisms.**
- b. the reasoning used by Darwin in making his conclusion that natural selection is the mechanism of evolution.**
- c. how independent lines of evidence from geology, fossils, and comparative anatomy provide a basis for the theory of evolution.**
- d. how to construct a simple branching diagram to classify living groups of organisms by shared derived characteristics, and expand the diagram to include fossil organisms.**

**e. extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival.**

“Teddy Bears Fight Pollution,” *AIMS: II.3*

*The students will model the affect of pollution on a food web.*

“Missing Moths,” Critters

*The students will observe an environment with a variety of moths to see the effects of camouflage on animal visibility and its ability to survive.*

“Hide and Seek,” Critters

*The students will make a critter and see the effects of camouflage on animal visibility and its ability to survive.*

“Gone Fishing,” Critters

*The students will use paper fish cutouts to see the effect of camouflage on prey populations.*

## **EARTH AND LIFE HISTORY (EARTH SCIENCE)**

### **4. Evidence from rocks allows us to understand the evolution of life on Earth. As the basis for understanding this concept, students know:**

**a. Earth processes today are similar to those that occurred in the past and slow geologic processes have large cumulative effects over long periods of time.**

“Drifting Apart,” Finding Your Bearing

*Students will use a jigsaw puzzle format to determine how the continents once fit together.*

“Peanut Butter and Jelly Geology,” Overhead and Underfoot

*Students will learn how natural forces shape the rock layers of the earth’s crust.*

“Topping Off Mt. St. Helen’s,” Through The Eyes of The Explorers

*Students will use contour maps to construct models of Mt. St. Helen’s before and after the 1980 eruption.*

Resource: “Continental Drift Theory,” Finding Your Bearings

**b. the history of life on Earth has been disrupted by major catastrophic events, such as major volcanic eruptions or the impact of an asteroid.**

“Topping Off Mt. St. Helen’s,” Through The Eyes of The Explorers

*Students will use contour maps to construct models of Mt. St. Helen’s before and after the 1980 eruption.*

“When Polar Ice Caps Melt,” Down To Earth

*Students will learn what effect the melting of polar ice caps would have on the coasts of countries.*

**c. the rock cycle includes the formation of new sediment and rocks. Rocks are often found in layers with the oldest generally on the bottom.**

“Sands of Time,” Down To Earth

*Students will be able to classify sand particles.*

“Peanut Butter and Jelly Geology,” Overhead and Underfoot

*Students will learn how natural forces shape the rock layers of the earth’s crust.*

Resource: “Cycle of Rock,” Down To Earth

**d. evidence from geologic layers and radioactive dating indicate the Earth is approximately 4.6 billion years old, and that life has existed for more than 3 billion years.**

“The Rate of Decay,” *AIMS: VIII.7*

*Students will become familiar with the concept of half-life through a probability investigation using coins and tapered corks.*

“Fossil Fill,” *AIMS: XIII.9*

*Students will learn how paleontologists use the Principle of Superposition to determine the relative age of fossils.*

- e. fossils provide evidence of how life and environmental conditions have changed.**

“Fossil Fill,” *AIMS: XIII.9*

*Students will learn how paleontologists use the Principle of Superposition to determine the relative age of fossils.*

- f. how movements of the Earth’s continental and oceanic plates through time, with associated changes in climate and geographical connections, have affected the past and present distribution of organisms.**

“Drifting Apart,” Finding Your Bearings

*Students will use a jigsaw puzzle format to determine how the continents once fit together.*

Resource: “Continental Drift Theory,” Finding Your Bearings

- g. how to explain significant developments and extinctions of plant and animal life on the geologic time scale.**

## **STRUCTURE AND FUNCTION IN LIVING SYSTEMS**

- 5. The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. As a basis for understanding this concept, students know:**

- a. plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism.**

“A Complete Package,” Magnificent Microworld Adventures

*The students will observe how cells work together to perform specific functions.*

- b. organ systems function because of the contributions of individual organs, tissues, and cells. The failure of any part can affect the entire system.**
- c. how bones and muscles work together to provide a structural framework for movement.**
- d. how the reproductive organs of the human female and male generate eggs and sperm, and how sexual activity may lead to fertilization and pregnancy.**
- e. the function of the umbilicus and placenta during pregnancy.**
- f. the structures and processes by which flowering plants generate pollen and ovules, seeds, and fruit.**

“A Flower Study,” The Budding Botanist

*The students will learn how flowers, seeds, and fruit develop in a plant.*

“Seeds from Fruits,” The Budding Botanist

*The students will compare seeds that are produced in the mature ovary of several representative angiosperms (flowering plants).*

“Dissect a Seed,” The Budding Botanist

*The students will dissect and compare a dicotyledon and a monocotyledon seed and identify the seed coat, the embryo, and the food for the plant.*

“Seed Scavenger Hunt,” The Budding Botanist

*The students will examine the structure of seeds that are dispersed by different methods.*

Resources:

“Seed Plants,” The Budding Botanist

“Seed Facts,” The Budding Botanist

**g. how to relate the structures of the eye and ear to their functions.**

“No Goal in Sight,” *AIMS: VIII.7*

*The students will discover their blind spot.*

Resources:

“The Eyes,” Primarily Physics

“Big Ears,” Primarily Physics

“Sound Energy,” Primarily Physics

“Isn’t It Interesting...Eye to Eye,” *AIMS: XII.10*

## **PHYSICAL PRINCIPLES IN LIVING SYSTEMS (PHYSICAL SCIENCE)**

**6. Physical principles underlie biological structures and functions. As a basis for understanding this concept, students know:**

**a. visible light is a small band within a very broad electromagnetic spectrum.**

**b. for an object to be seen, light emitted by or scattered from it must enter the eye.**

“I See The Light,” *AIMS: VI.8*

*Students will explore how increasing the amount of light increases a viewer’s ability to discriminate objects and detail.*

Resources:

“Sunsets and Rainbows,” *AIMS: IV.5*

“Seeing The Light,” *AIMS: IV.1*

**c. light travels in straight lines except when the medium it travels through changes.**

“Bent On It,” *AIMS: XIII.5*

*Students will explore how the densities of different media affect the path along which light passes.*

“Mind Boggler: Glow With The Flow,” *AIMS: X.1*

Resource: “Isn’t It Interesting...Speed Limits,” *AIMS: XIII.5*

**d. how simple lenses are used in a magnifying glass, the eye, camera, telescope, and microscope.**

“Clownin’ Around,” *AIMS: XII.1*

*Students will learn how the shape of a container (lens) will effect the image of an object.*

“Magnificent Views,” *AIMS: XII.10*

**e. white light is a mixture of many wavelengths (colors), and that retinal cells react differently with different wavelengths.**

Resources:

“Isn’t It Interesting...Eye To Eye,” *AIMS*: XII.10

“Sunsets and Rainbows,” *AIMS*: IV.5

“Color and Light,” *AIMS*: IV.4

**f. light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection).**

“Bent On It,” *AIMS*: XIII.5

*Students will explore how the densities of different media affect the path along which light passes.*

“Through The Looking Glass,” *AIMS*: IV.3

*Students will discover the position and orientation of an image in a reflected mirror.*

“Cornering Reflections,” *AIMS*: IV.3

*Students will examine multiple reflections.*

“Slides of Refraction,” *AIMS*: XIII.3

*Students will examine the refraction of light as it passes through different mediums and several layers of the same medium.*

“Mind Boggler: Glow With The Flow,” *AIMS*: X.1

Resources:

“Isn’t It Interesting...Speed Limits,” *AIMS*: XIII.5

“Light Incidents,” *AIMS*: IV.3

**g. the angle of reflection of a light beam is equal to the angle of incidence.**

“From Rays To Reason,” *AIMS*: VIII.5

*Students will discover that the path light ray follows as they look in a mirror from the angle of incidence and reflection.*

“Revealing Reflections,” *AIMS*: VII.5

*Students will learn the Law of Reflection and the relationship between mirror reflections and similar triangles.*

Resources:

“Reflection and Symmetry,” *AIMS*: IV.1

“Reflection and Symmetry,” *AIMS*: IV.2

“Reflection and Symmetry,” *AIMS*: IV.3

“Reflection and Symmetry,” *AIMS*: IV.4

“Reflection and Symmetry,” *AIMS*: IV.5

**h. how to compare joints in the body (wrist, shoulder, thigh) with structures used in machines and simple devices (hinge, ball-and-socket, and sliding joints).**

**i. how levers confer mechanical advantage and how the application of this principle applies to the musculoskeletal system.**

“M.V.P.,” Brick Layers

*The students will explore the workings of a lever.*

Resource: “Levers,” Brick Layers

**j. contractions of the heart generate blood pressure, and heart valves prevent backflow of blood in the circulatory system.**

“The Pressure’s On,” From Head To Toe

*Students will analyze information gathered to determine if physical activity will affect blood pressure.*

Resource: “Ya Gotta’ Have Heart!” From Head To Toe

## **INVESTIGATION AND EXPERIMENTATION**

- 7. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations. Students will:**
  - a. select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.**
  - b. utilize a variety of print and electronic resources (including the World Wide Web) to collect information as evidence as part of a research project.**
  - c. communicate the logical connection among hypothesis, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence.**
  - d. construct scale models, maps and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth’s plates and cell structure).**
  - e. communicate the steps and results from an investigation in written reports and verbal presentations.**

**California State**  
**AIMS Activities supporting Eighth Grade Science Standards of Learning**

**FOCUS ON PHYSICAL SCIENCE**

**MOTION**

**1. The velocity of an object is the rate of change of its position. As a basis for understanding this concept, students know:**

**a. position is defined relative to some choice of standard reference point and a set of reference directions.**

“The Race,” Gravity Rules!

*Students will collect, record, and graph, in three different ways, the distance-time data of a race between a tortoise and a hare.*

“Time Trials,” AIMS: XI.2

*Students will measure the speed of a battery-powered vehicle to develop an understanding of speed.*

**b. average speed is the total distance traveled divided by the total time elapsed. The speed of an object along the path traveled can vary.**

“The Race,” Gravity Rules!

*Students will collect, record, and graph, in three different ways, the distance-time data of a race between a tortoise and a hare.*

“How Fast Can You Walk?” Gravity Rules!

*Students will measure the time interval it takes them to walk, at their fastest rate, through a known distance.*

“How Fast Can You Run?” Gravity Rules!

*Students will measure the time interval it takes them to run, at their fastest rate, through a known distance.*

“Time Trials,” AIMS: XI. 2

*Students will measure the speed of a battery-powered vehicle to develop an understanding of speed.*

**c. how to solve problems involving distance, time, and average speed.**

“The Race,” Gravity Rules!

*Students will collect, record, and graph, in three different ways, the distance-time data of a race between a tortoise and a hare.*

“How Fast Can You Walk?” Gravity Rules!

*Students will measure the time interval it takes them to walk, at their fastest rate, through a known distance.*

“How Fast Can You Run?” Gravity Rules!

*Students will measure the time interval it takes them to run, at their fastest rate, through a known distance.*

“Time Trials,” AIMS: XI. 2

*Students will measure the speed of a battery-powered vehicle to develop an understanding of speed.*

**d. to describe the velocity of an object one must specify both direction and speed.**

“How Fast Can You Walk?” Gravity Rules!

*Students will measure the time interval it takes them to walk, at their fastest rate, through a known distance.*

“How Fast Can You Run?” Gravity Rules!

*Students will measure the time interval it takes them to run, at their fastest rate, through a known distance.*

**e. changes in velocity can be changes in speed, direction, or both.**

“Fall-Timeters,” Gravity Rules!

*Students will collect and record time and altitude data (directly from a video) and compute average velocities, including terminal velocities.*

“Terminal Velocity,” Gravity Rules!

*Students will use a graphing calculator, data collector, and motion detector to measure the terminal velocity of a paper sky diver.*

Resource: AIMS Gravity Rules! Video

**f. how to interpret graphs of position versus time and speed versus time for motion in a single direction.**

“Terminal Velocity,” Gravity Rules!

*Students will use a graphing calculator, data collector, and motion detector to measure the terminal velocity of a paper sky diver.*

“Fall-Timeters,” Gravity Rules!

*Students will collect and record time and altitude data (directly from a video) and compute average velocities, including terminal velocities.*

“Time Trials,” AIMS: XI. 2

*Students will measure the speed of a battery-powered vehicle to develop an understanding of speed.*

## **FORCES**

**2. Unbalanced forces cause changes in velocity. As a basis for understanding this concept, students know:**

**a. a force has both direction and magnitude.**

“Tinkering, Toys and Teaching: Beads in a Box,” AIMS: XIII.3

*Students will construct a device that allows them to observe and better understand Newton’s First Law of Motion.*

“Tug Teams,” AIMS: XI.7

*Students will observe how balanced and unbalanced forces affect the motion of an object.*

Resources:

“Newton’s First Law,” AIMS: VI.2

“Newton’s Second Law,” AIMS: VI.3

“Newton’s Third Law,” AIMS: VI.7

**b. when an object is subject to two or more forces at once, the effect is the cumulative effect of all the forces.**

“Tinkering, Toys and Teaching: Beads in a Box,” AIMS: XIII.3

*Students will construct a device that allows them to observe and better understand Newton’s First Law of Motion.*

“Tug Teams,” AIMS: XI.7

*Students will observe how balanced and unbalanced forces affect the motion of an object.*

Resources: see 2.a

**c. when the forces on an object are balanced, the motion of the object does not change.**

“Tinkering, Toys and Teaching: Beads in a Box,” *AIMS*: XIII.3

*Students will construct a device that allows them to observe and better understand Newton’s First Law of Motion.*

“Tug Teams,” *AIMS*: XI.7

*Students will observe how balanced and unbalanced forces affect the motion of an object.*

“Beams Over Board,” Brick Layers

*Students will discover the law of lever by determining where to place different masses on a lever to balance it.*

Resources: see 2.a

**d. how to identify separately two or more forces acting on a single static object, including gravity, elastic forces due to tension or compression in matter, and friction.**

“Tinkering, Toys and Teaching: Beads in a Box,” *AIMS*: XIII.3

*Students will construct a device that allows them to observe and better understand Newton’s First Law of Motion.*

“Skydiving In A Bottle,” Gravity Rules

*Students will construct a device that allows them to observe Newton’s First Law.*

“Slip, Sliding Away,” *AIMS*: XIII.3

*Students will compare the friction-reducing capabilities of several lubricants.*

Resources: see 2.a

**e. when the forces on an object are unbalanced the object will change its motion (that is, it will speed up, slow down, or change direction).**

“Skydiving In A Bottle,” Gravity Rules

*Students will construct a device that allows them to observe Newton’s First Law.*

“The Marbleous Rolls,” *AIMS*: VIII.1

*Students will study the effect of uniform acceleration of marbles rolled down an inclined plane on the distance they roll on a carpet.*

“Tug Teams,” *AIMS*: XI.7

*Students will observe how balanced and unbalanced forces affect the motion of an object.*

“A Shift In Lift,” Brick Layers

*Students will construct a winch and determine how the wheel size affects the force generated by the wheel.*

Resources: see 2.a

**f. the greater the mass of an object the more force is needed to achieve the same change in motion.**

Resources: see 2.a

**g. the role of gravity in forming and maintaining planets, stars and the solar system.**

Resource: “Skydiving: A Gravity Powered Sport,” Gravity Rules

## STRUCTURE OF MATTER

**3. Elements have distinct properties and atomic structure. All matter is comprised of one or more of over 100 elements. As a basis for understanding this concept, students know:**

- a. the structure of the atom and how it is composed of protons, neutrons and electrons.**

“Atoms,” Electrical Connections  
*The students will make simple models of atoms.*

Resource: “Water Wonder,” *AIMS*: III.7

- b. compounds are formed by combining two or more different elements. Compounds have properties that are different from the constituent elements.**

“The Water Molecule,” Water Precious Water  
*The students will construct a model of a water molecule.*

Resources:

“Water Wonder,” *AIMS*: III.7

“Water Wonder, Part 2,” *AIMS*: III.8

- c. atoms and molecules form solids by building up repeating patterns such as the crystal structure of NaCl or long chain polymers.**

- d. the states (solid, liquid, gas) of matter depend on molecular motion.**

Resource: “Water Wonder, Part 4,” *AIMS*: III.10

- e. in solids the atoms are closely locked in position and can only vibrate, in liquids the atoms and molecules are more loosely connected and can collide with and move past one another, while in gases the atoms or molecules are free to move independently, colliding frequently.**

“A Crazy Colloid,” *AIMS*: VI.1  
*The students will experience a substance that displays the properties of both a liquid and a solid.*

- f. how to use the Periodic Table to identify elements in simple compounds**

## **EARTH IN THE SOLAR SYSTEM (EARTH SCIENCE)**

- 4. The structure and composition of the universe can be learned from the study of stars and galaxies, and their evolution. As a basis for understanding this concept, students know:**

- a. galaxies are clusters of billions of stars, and may have different shapes.**

“Stars In The Milky Way Galaxy,” Out of This World  
*The students will discover the method by which scientists estimate the number of stars in the Milky Way Galaxy.*

- b. the sun is one of many stars in our own Milky Way galaxy. Stars may differ in size, temperature, and color.**

**c. how to use astronomical units and light years as measures of distance between the sun, stars, and Earth.**

“Spacing Out the System,” Out of This World

*The students will determine the relative distance of the planets in order to construct a model solar system.*

“It All Depends on Your Point of View,” Out of This World

*The students will construct a 3-dimensional model of a constellation.*

**d. stars are the source of light for all bright objects in outer space. The moon and planets shine by reflected sunlight, not by their own light.**

“Facing Up to the Moon,” *AIMS: X.8*

*Students will learn about the changing moon phases.*

**e. the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.**

“Spacing Out the System,” Out of This World

*Students will determine the relative distance of the planets in order to construct a model solar system.*

“Size It Up,” Out of This World

*Students will determine the relative sizes of the planets in order to construct a model solar system.*

“Can You Planet,” Out of This World

*Students will learn about various aspects of the planets and their relationships with one another.*

“Apparent Sizes,” *AIMS: XI.4*

*The student will set a situation in which different sized objects distances apart, appear to be a smaller dimension.*

## REACTIONS

**5. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept, students know:**

**a. reactant atoms and molecules interact to form products with different chemical properties.**

“Curds and Weigh,” *AIMS: IX.3*

*The students will observe that matter is conserved even when it goes through a chemical reaction.*

“Feel the Heat,” *AIMS: X.10*

*The students will observe the transformation of chemical energy into heat energy.*

“Change Matters,” *AIMS: XI.8*

*The students will determine whether various changes in matter are physical or chemical.*

“Super Sleuth,” Math + Science, a Solution

*The students will discover the varying characteristics of several substances with somewhat similar appearances.*

“A Strange Change,” *AIMS: XI.10*

*The students will observe the changes that occur when steel wool is placed in water.*

“Homemade Fire Extinguisher,” Off the Wall Science

*The students will observe the chemical reaction that occurs when baking soda and vinegar are combined. They will observe that the carbon dioxide gas that is produced does not support combustion.*

- b. the idea of atoms explains the conservation of matter: in chemical reactions the number of atoms stays the same no matter how they are arranged, so their total mass stays the same.**

“Curds and Weigh,” AIMS: IX.3

*The students will observe that matter is conserved even when it goes through a chemical reaction.*

- c. chemical reactions usually liberate heat or absorb heat.**

“Feel the Heat,” AIMS: X.10

*The students will observe the transformation of chemical energy into heat energy.*

“Another Look at ‘A Strange Change’,” AIMS: XII.3

*The students will watch the temperature change in a closed jar containing rusting steel wool.*

- d. physical processes include freezing and boiling, in which a material changes form with no chemical reaction.**

“Room For Change,” AIMS: XIII.9

*The students will discover that when a known quantity of water in the liquid state is frozen, its volume changes but its mass remains constant.*

- e. how to determine whether a solution is acidic, basic or neutral.**

“Give Me An Indication,” AIMS: VIII.2

*The students will mix different indicators with a base and an acid and note the differing pH levels.*

“Basic Indications,” AIMS: XI.5

*The students will make an indicator that can be used to test for acid or base.*

“The Red C,” Fun with Foods

*The students will use red cabbage juice as an acid-base indicator to test a variety of liquids.*

## **CHEMISTRY OF LIVING SYSTEMS (LIFE SCIENCE)**

- 6. Principles of chemistry underlie the functioning of biological systems. As a basis for understanding this concept, students know:**

- a. carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms.**
- b. living organisms are made of molecules largely consisting of carbon, hydrogen, nitrogen, oxygen, phosphorus and sulfur.**
- c. living organisms have many different kinds of molecules including small ones such as water and salt, and very large ones such as carbohydrates, fats, proteins and DNA.**

## **PERIODIC TABLE**

- 7. The organization of the Periodic Table is based on the properties of the elements and reflects the structure of atoms. As a basis for understanding this concept, students know:**

- a. **how to identify regions corresponding to metals, nonmetals and inert gases.**
- b. **elements are defined by the number of protons in the nucleus, which is called the atomic number. Different isotopes of an element have a different number of neutrons in the nucleus.**
- c. **substances can be classified by their properties, including melting temperature, density, hardness, heat, and electrical conductivity.**

## DENSITY AND BUOYANCY

**8. All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept, students know:**

**a. density is mass per unit volume.**

“Volumes of Fun,” *AIMS*: VI.5

*The students will compare the mass of equal volumes of a variety of small objects.*

Resources:

“Density Demystified,” Floaters and Sinkers

“Floating and Sinking,” Floaters and Sinkers

**b. how to calculate the density of substances (regular and irregular solids, and liquids) from measurements of mass and volume.**

“Floating Wood,” Floaters and Sinkers

*The students will compare the density of wood to the density of water.*

“See Level,” Floaters and Sinkers

*The students will calculate the density of various liquids.*

“How Much Cargo Will It Hold?” Floaters and Sinkers

*The students will compare mass, volume, and density measures to determine which should be used for making fair chargers for hauling cargo.*

“What’s in a BB?” Floaters and Sinkers

*The students will find the density of BB’s.*

**c. the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid it has displaced.**

“Aluminum Foil Boats,” Off the Wall Science

*The students will discover that if the mass of the object is less than the amount of water it displaces, it will float.*

“Weighing Objects in Water,” Off the Wall Science

*The students will observe the buoyant force (upward force) exerted on objects placed in water.*

Resources:

“Predicting Float Lines,” Historical Connections Volume 1

“Water Wonder, Part 3,” *AIMS*: III.9

**d. how to predict whether an object will float or sink.**

“Densor Sensor,” Floaters and Sinkers

*The students will find out how solids and liquids of different densities arrange themselves when combined.*

**“It Floats, It Sinks, Floaters and Sinkers**

*The students will determine if objects will float or sink by comparing the mass to volume ratio.*

## **INVESTIGATION AND EXPERIMENTATION**

- 9. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept, and to address the content the other three strands, students should develop their own questions and perform investigations. Students will:**
- a. plan and conduct a scientific investigation to test a hypothesis.**
  - b. evaluate the accuracy and reproducibility of data.**
  - c. distinguish between variable and controlled parameters in a test.**
  - d. recognize the slope of the linear graph as the constant in the relationship  $y = kx$  and apply this to interpret graphs constructed from data.**
  - e. construct appropriate graphs from data and develop quantitative statements about the relationships between variables.**
  - f. apply simple mathematical relationships to determine one quantity given the other two (including speed = distance/time, density = mass/volume, force = pressure x area, volume = area x height).**
  - g. distinguish between linear and non-linear relationships on a graph of data.**