

Solar System

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About **Solar System**

DeltaScienceModules, THIRD EDITION

Students explore *Solar System* through twelve hands-on activities and the Delta Science Reader. Students gain perspective on the physical relationships between objects in our Solar System. First, students become familiar with the names and positions of the planets, researching one planet and sharing information with the class. Next, combining geometry and astronomy concepts, students study ellipses and planetary orbits, then circles and planet shapes. Model planets and a classroom-size model of the Solar System dramatize the relative sizes and distances of our cosmic neighborhood. The unit introduces students to some of the satellites in our Solar System, such as asteroids, dwarf planets, meteoroids, and comets. It even extends to stars and their celestial patterns, the constellations that have intrigued sky-gazers for millennia.

In the Delta Science Reader *Solar System*, students take a tour of the Sun and the planets. Other space objects such as comets, dwarf planets, asteroids, and meteoroids are explored. Students read about the rotation and revolution of the planets and the causes of night and day, seasonal changes, and the phases of the Moon. The book describes the work of a planetary geologist. In addition, students discover how telescopes work.

Overview Chart for Hands-on Activities

| Hands-on Activity | Student Objectives |
|---|--|
| 1 Meet Our Solar System <i>page 13</i> | <ul style="list-style-type: none"> • discuss the concept of <i>system</i> • gather, record, and present data about the Sun and planets • arrange labels of the planets in order of their distance from the Sun |
| 2 Earth Orbits the Sun <i>page 21</i> | <ul style="list-style-type: none"> • explore the concept of <i>satellite</i> • build and manipulate a model satellite system • relate the concept of <i>gravity</i> to the orbits of satellites |
| 3 Planetary Orbits Are Not Circles <i>page 27</i> | <ul style="list-style-type: none"> • compare and contrast a circle with an ellipse • construct and use a setup to draw a circle • modify the setup to draw an ellipse |
| 4 Making Circles <i>page 35</i> | <ul style="list-style-type: none"> • explore the concepts of <i>radius</i> and <i>diameter</i> • practice making circles with a drawing compass • measure and draw circles of different sizes |
| 5 Scale and Relative Size <i>page 43</i> | <ul style="list-style-type: none"> • explore the relationships among metric units of measure • calculate actual heights of objects drawn to scale • determine relative size using scale drawings of familiar objects • discover that drawings of objects must be made to the same scale in order to determine their relative sizes |
| 6 Modeling Planet Sizes <i>page 51</i> | <ul style="list-style-type: none"> • calculate the radii for scale models of the planets • make a scale model of each planet • compare the relative sizes of the planets |
| 7 Scale and Relative Distance <i>page 59</i> | <ul style="list-style-type: none"> • relate the concept of <i>relative size</i> to <i>relative distance</i> • calculate distances on a map using scaled distance data • create a scale drawing from actual distance measurements |
| 8 Modeling Planet Distances <i>page 65</i> | <ul style="list-style-type: none"> • discuss which scale would be appropriate for modeling the Solar System in the classroom • make and display a model of the Solar System that shows the relative distances of the planets from the Sun • compare distances of the various planets from the Sun |
| 9 Days and Years <i>page 73</i> | <ul style="list-style-type: none"> • distinguish between rotation and revolution • construct and operate a model to demonstrate planetary rotation • role-play planets revolving around the Sun |
| 10 Asteroids, Dwarf Planets, Meteoroids, and Comets <i>page 83</i> | <ul style="list-style-type: none"> • investigate asteroids, dwarf planets, meteoroids, and comets • examine a frozen model of a comet head • draw a comet at various points on its elliptical orbit |
| 11 Star Light, Star Bright <i>page 93</i> | <ul style="list-style-type: none"> • use the term <i>light-year</i> in discussing distances from Earth to distant stars • investigate the relative brightness of light sources at various distances • explore the concepts of <i>galaxy</i> and <i>universe</i> |
| 12 Constellations: Stories in the Sky <i>page 101</i> | <ul style="list-style-type: none"> • observe seasonal changes in the position of constellations as viewed from Earth • construct constellation models and identify several constellations • write a fictional story about the origin of a constellation |
| Assessment <i>page 111</i> | <ul style="list-style-type: none"> • See page 111. |

| Process Skills | Vocabulary | Delta Science Reader |
|---|--|----------------------|
| communicate; collect, record, display, or interpret data | Earth, Jupiter, Mars, Mercury, mnemonic device, Neptune, planet, Saturn, solar system, star, Sun, system, Uranus, Venus | page 2 |
| make and use models, communicate | force, gravitational attraction, gravity, mass, moon, orbit, satellite | pages 2, 3, 6 |
| compare, make and use models | aphelion, circle, ellipse, foci, focus, perihelion | page 2 |
| communicate, make and use models, measure | circumference, diameter, drawing compass, radius | |
| use numbers, measure, make and use models, infer | centimeter, meter, millimeter, ratio, relative size, scale, scale drawing | |
| use numbers, measure, make and use models, compare | | pages 4–12 |
| use numbers, measure, make and use models, compare | map, relative distance | |
| communicate, measure, make and use models, compare | average distance | pages 4–12 |
| make and use models, observe, communicate | axis, day, revolution, revolve, rotation, year | pages 2, 6 |
| observe, make and use models | asteroid, asteroid belt, comet, crater, dwarf planet, friction, meteor, meteorite, meteoroid, Pluto | pages 12, 13, 14 |
| collect, record, display, or interpret data; compare; make and use models; infer; communicate | Alpha Centauri, galaxy, light-year, Milky Way, North Star (Polaris), relative brightness, universe | |
| observe, make and use models, communicate | Big Dipper, Cassiopeia, Cepheus, constellation, mythology, Orion | page 15 |
| | | |

See the following page for the Delta Science Reader Overview Chart.

Overview Chart for Delta Science Reader

Solar System

| Selections | Vocabulary | Related Activity |
|---|---|--------------------|
| Think About... | | |
| Our Solar System <i>page 2</i> | axis, ellipse, gravity, orbit, planet, revolution, revolve, rotate, solar system, Sun, year | Activities 1–3, 9 |
| What Is the Sun Like? <i>page 3</i> | star | Activity 2 |
| The Inner Planets <ul style="list-style-type: none"> Mercury Venus Earth Mars <i>pages 4–8</i> | atmosphere, crater, day, Earth, inner planet, Mars, Mercury, moon, Moon, phase, satellite, space probe, Venus | Activities 2, 8, 9 |
| The Outer Planets <ul style="list-style-type: none"> Jupiter Saturn Uranus Neptune Dwarf Planets <i>pages 9–12</i> | gas giant, Jupiter, Neptune, outer planet, Pluto, Saturn, Uranus | Activities 8, 10 |
| Other Objects in the Solar System <i>page 13</i> | asteroid, comet, meteor, meteorite, meteoroid | Activity 10 |
| People in Science | | |
| Adriana C. Ocampo, Planetary Geologist <i>page 14</i> | | Activity 10 |
| Did You Know? | | |
| How Telescopes Work <i>page 15</i> | astronomer, telescope | Activity 12 |

See pages 119–129 for teaching suggestions for the Delta Science Reader.

MATERIALS LIST

Solar System

| Quantity | Description | Quantity | Description |
|--------------|---|-------------------------------|---------------------------|
| 18 | balls, foam, drilled | TEACHER-PROVIDED ITEMS | |
| 16 | batteries, D-size | 1 | baseball |
| 2 | bulbs, 100-watt | 1 | basketball |
| 17 | cardboard squares, 30 cm × 30 cm | 1 | BB |
| 16 | compasses, drawing | 1 | book |
| 1 | Constellation Patterns | 1 | chalk |
| 8 | cups, paper, soufflé, 2-oz* | 8 | crayons, red |
| 8 | cups, plastic, 7-oz | 1 | map, local |
| 1 | fishing line, 100 m* | 1 | marble |
| 8 | flashlights | 17 | markers, black |
| 2 | glue, 4-oz* | - | match, safety* |
| 1 | guide, reference, Solar System | 1 | overhead projector |
| 10 | index cards, 20 cm × 20 cm* | - | paper, plain, 8.5" × 11"* |
| 1 | labels, Names of Planets | - | pebbles |
| 2 | light sources | 32 | pencils |
| 8 | metersticks† | - | rubber gloves (optional) |
| 9 | pans, aluminum | 32 | safety goggles |
| 1 | paper, butcher* | 16 | scissors |
| 17 | paper, construction, black* | - | scrap paper (optional)* |
| 15 | paper, construction, blue* | - | tape, transparent* |
| 8 | penlights with batteries | - | water* |
| 1 | poster, Goldfish and Whale scale drawing | - | water, muddy* |
| 34 | push pins | | |
| 16 | rulers, metric | | |
| 1 | steel wool pads, p/8* | | |
| 1 | string, roll* | | |
| 1 | tape, masking* | | |
| 1 | transparency, Fall Sky | | |
| 1 | transparency, Spring Sky | | |
| 1 | transparency, Summer Sky | | |
| 1 | transparency, Winter Sky | | |
| 17 | tubes, cardboard* | | |
| 17 | tubes, plastic | | |
| 1 | tweezers | | |
| 17 | washers | | |
| 1 | Teacher's Guide | | |
| 8 | Delta Science Readers | | |
| | | * = consumable item | † = in separate box |

ACTIVITY SUMMARY

ACTIVITY 1 Students begin this Delta Science Module by exploring the components of our Solar System. They become familiar with the names of the planets and then research and share information on each planet.

ACTIVITY 2 Students construct and manipulate a model satellite system to help them visualize how gravity holds a satellite in orbit around another object in space. Students relate their observations to Earth's orbit around the Sun and the Moon's orbit around the Earth.

ACTIVITY 3 Students build a setup that enables them to draw an ellipse. They discover that the shape of a planet's orbit is not a circle, but an ellipse.

ACTIVITY 4 Students are introduced to terms that identify the parts of a circle and to a tool for drawing circles—a drawing compass. With the drawing compass, they draw circles of specified sizes. Students will apply this skill in a later activity when they construct models of the planets.

ACTIVITY 5 Students develop an understanding of the concepts of scale, ratio, and relative size. They measure scale drawings of familiar objects and, using scale ratios, calculate the actual sizes of the objects represented. They also learn to determine the relative sizes of large-scale objects.

ACTIVITY 6 Students apply their experience in making circles and scale drawings to construct a scale model of each of the planets of the Solar System. The models help them visualize the enormous differences in size among the actual planets.

ACTIVITY 7 Students apply what they have learned about scale and relative size in order to explore the concept of relative distance. They measure distances from one object to several

others in the classroom, decide on a scale, and draw their own scale maps. Students use their maps to compare and discuss the relative distances of the objects from one another.

ACTIVITY 8 Students construct a 7.5-m (25-ft) classroom model of the Solar System, using their planet models from Activity 6. They place their planet models at scaled distances from an arc representing the Sun.

ACTIVITY 9 Students use satellite models and light sources to demonstrate planetary rotation and revolution. They learn that one rotation of a planet about its axis constitutes a day and that one revolution of a planet around the Sun constitutes a year. Later, they role-play planets revolving around the Sun and realize that the farther away a planet is from the Sun, the larger its orbit, and the longer its year.

ACTIVITY 10 Students are introduced to some of the other satellites that exist in our Solar System—asteroids, dwarf planets, meteoroids, and comets. Discussions involve descriptions of these minor satellites and how they differ from one another.

ACTIVITY 11 Students explore stars beyond our Solar System. They discuss distances of stars from Earth and from one another in terms of light years. They find that stars differ in size, brightness, and temperature.

ACTIVITY 12 Students investigate constellations. They discuss myths and how ancient people used them to explain in supernatural terms events on Earth. After viewing projected transparencies of the night sky in each of the four seasons, students use tubes and patterns to construct models with which they can view and identify several constellations. Then they use their imaginations to create a myth about the origin of one of the constellations.