Featuring Chapters from:
Student Textbook
Laboratory Notebook
Teacher's Manual
Lesson Plan
Study Notebook
Quizzes
Graphics Package

Focus On Elementary Astronomy

3rd Edition

Preview Booklet

Rebecca W. Keller, PhD

Real Science 4 Kids

Introduction

Welcome to the ***Focus On Elementary Astronomy 3rd Edition Preview Booklet*** where you can take our one semester unit study program for a test run!

The materials sampled in this booklet are taken from a full semester course, with two chapters from each part of the curriculum:

- The ***Focus On Elementary Astronomy Student Textbook– 3rd Edition*** provides foundational science concepts presented in a way that makes it easy for students to read and understand. The many colorful illustrations make each chapter fun to look at and reinforce concepts presented.

- With two science experiments for each chapter, the ***Laboratory Notebook*** helps young students learn how to make good observations, an important part of doing science. Open-ended questions help students think about what they are learning, and information is provided to assist students with understanding what they observed while performing their experiments.

- The ***Teacher's Manual*** includes instructions for helping students conduct the experiments, as well as questions for guiding open inquiry. The commonly available, inexpensive materials used for all the experiments can be seen in the complete materials lists included in this booklet.

- Using the ***Lesson Plan*** makes it easy to keep track of daily teaching tasks. A page for each chapter in the ***Student Textbook*** has the objectives of the lesson and questions for further study that connect science with other areas of knowledge, such as history; philosophy; art, music, and math; technology; and language. Forms are included for students to use to do a review of material they've learned and to make up their own test for the chapter. Also included are icons that can be copied onto sticker sheets and used to help plan each day of the week.

- Different types of fun activities are presented in the ***Study Notebook***. These help reinforce the concepts students are learning and include making observations, some simple experiments, matching, fill in the blank, cut and paste, writing, following directions, and more.

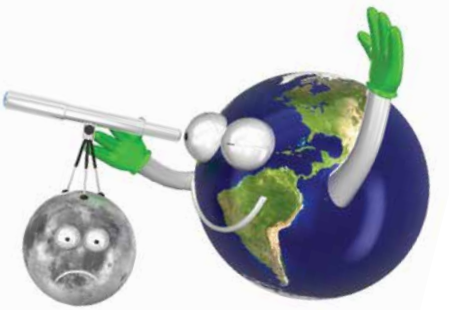
- The one final and two midterm ***Quizzes*** are self-explanatory. For those who are not fans of quizzes, students can use the self-test at the end of the ***Lesson Plan*** instead.

- Another type of teaching aid is provided in the ***Graphics Package,*** which has two full-color images from each chapter of the ***Student Textbook.*** These graphics can be used to create additional teaching aids such as flash cards, wall posters, PowerPoint lectures, or overhead projections.

Grades K-4

FOCUS ON ELEMENTARY

3rd Edition



Rebecca W. Keller, PhD

REAL SCIENCE 4 Kids

Real Science-4-Kids

Illustrations: Janet Moneymaker

Focus On Elementary Astronomy Student Textbook—3rd Edition (hardcover)
ISBN 978-1-941181-68-3

Published by Gravitas Publications Inc.
www.gravitaspublications.com
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Contents

Chapter 1 Exploring the Cosmos

1.1 Introduction

Astronomy is the study of the cosmos. The term cosmos refers to the Earth and everything that extends beyond the Earth, including other planets, stars, nebulae, comets, asteroids, and even black holes.

Astronomy is a fascinating science with many new objects and areas of space waiting to be explored.

In this chapter we will learn about some well-known astronomers and their discoveries. We will also find out what skills are used by astronomers to study objects in space.

1.2 Who Was the First Astronomer?

Because astronomers can't fly to faraway planets or ride asteroids, astronomers use various tools and techniques to find out more about the objects in the cosmos. However, before the use of modern tools, people could learn a great deal about the cosmos by studying the night sky.

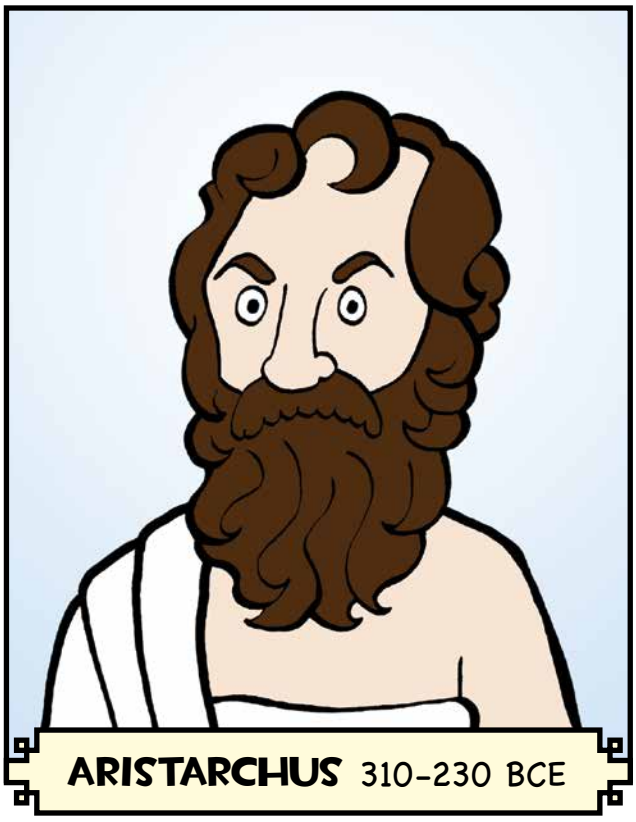
It's hard to say who was the first astronomer. Many early people studied the planets and stars, and even without modern tools they discovered a great deal about the cosmos.

Early Egyptian, Babylonian, and Mayan people observed the sky in great detail. Noting when the Moon was full

or when the Sun sank lower on the horizon, early observers were able to learn about how the planets and the Moon moved. From their observations they produced calendars and were able to predict eclipses.

One of the questions early astronomers asked was, "Does the Earth move around the Sun, or does the Sun move around the Earth?" In other words, do we live in a "Sun-centered" cosmos or an "Earth-centered" cosmos? To early astronomers it appeared from simple observation that we live in an Earth-centered cosmos. When the Sun rises and sets each day, it has the appearance of moving around the Earth. However, as we will see, sometimes how things move isn't always easy to figure out.

One of the very first astronomers to propose that the Earth moves around the Sun was Aristarchus of Samos. Aristarchus was a Greek astronomer and mathematician who lived from 310-230 BCE. He studied the planets and said that the Earth has two different movements. One movement is that Earth travels around the



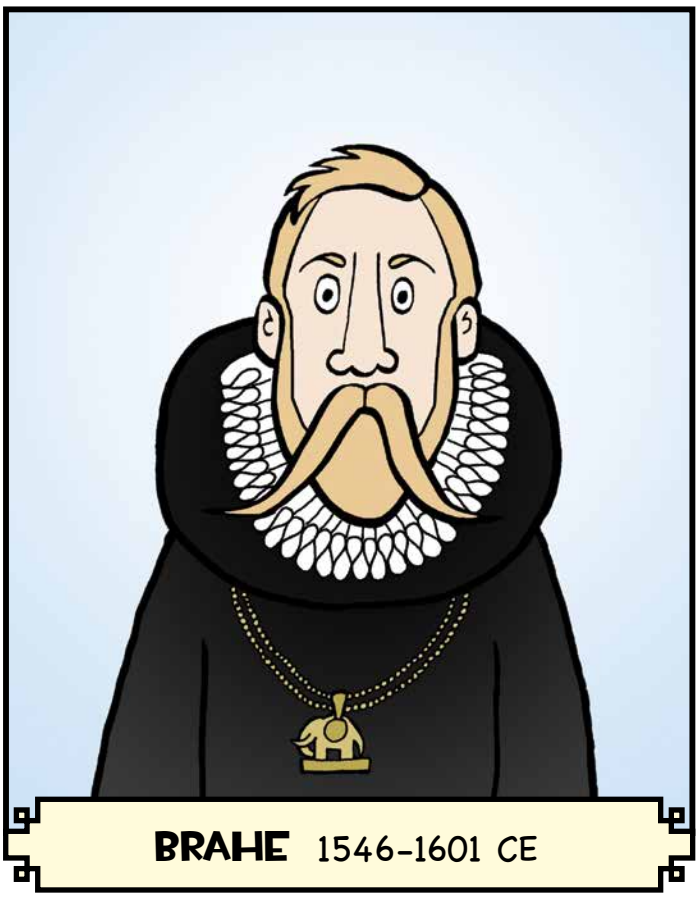
Sun, and the other movement is that Earth revolves around its own axis. We now know that he was right! But during his time no one believed him. It would be almost 2000 years before astronomers would look closely at his ideas.

1.3 Famous Early Astronomers

Nicolaus Copernicus was a famous astronomer who also thought that the Earth moved around the Sun. Copernicus was born in 1473 in the ancient Polish city of Torun. During the time Copernicus lived, most scientists believed that the Sun revolved around the Earth. They believed that the Earth was the center of the universe and everything revolved around it.

Copernicus did not agree with the scientists of his day. His ideas would eventually change the whole science of astronomy! Unlike Aristarchus, Copernicus was able to use mathematics to show that the Earth moves around the Sun and that the Sun remains fixed in one location. However,

Copernicus was not outspoken about his ideas. Because he knew his ideas might upset people, he didn't talk about them. When Copernicus did publish his work, a few people got upset, but most people just ignored his hard work. Another 100 years passed before people took his ideas seriously.



Another famous astronomer also changed the way we see the cosmos. His name was Tycho Brahe. Brahe was born in 1546 in the Danish town of Scania, and he was raised by his uncle. Like Copernicus, Brahe was curious about astronomy. His uncle wanted him to be a lawyer or a politician, but Brahe studied mathematics and slipped away at night to look at the sky. When his uncle died, Brahe was free to pursue his interests in astronomy.

Telescopes that make faraway objects look closer were not yet invented, so Brahe used sighting tubes, which are just hollow tubes with no lenses. Sighting tubes can be used to

look at one star at a time. In this way, Brahe discovered that stars do not always appear to be in the same position but are constantly changing. Based on his observations, Brahe decided to rewrite the map of the stars and spent his life working on his ideas.

Galileo Galilei was also a famous early astronomer. He was interested in trying to find out how the planets move. Galileo was born in 1564 in Pisa, Italy. He studied many different subjects, such as mathematics and physics, and he loved to look at the stars. Galileo used his knowledge of math and physics to better understand how the planets and the Moon move.

GALILEO 1564–1642 CE

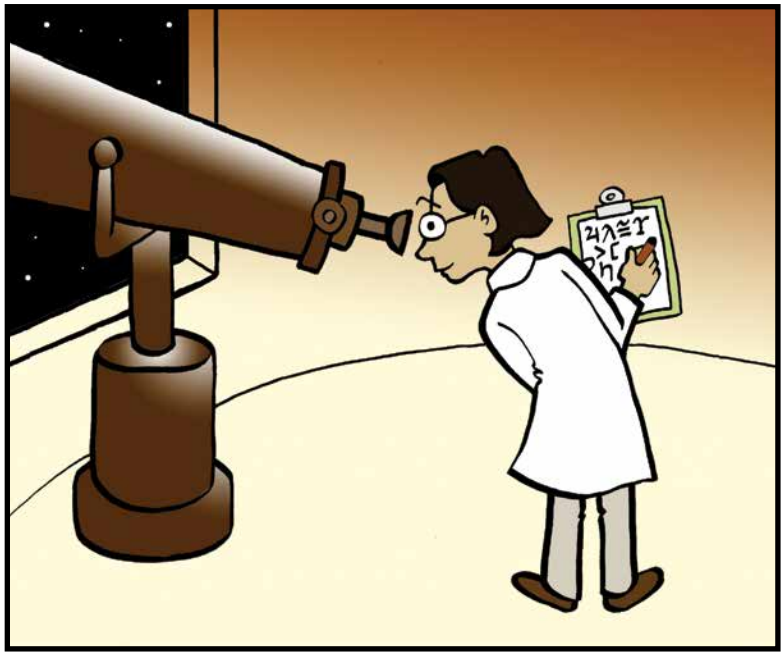
Like Copernicus, Galileo was an independent thinker, and he didn't believe in an Earth-centered universe. Galileo did experiments because he wanted to show how things moved rather than just coming up with ideas about it. By doing experiments and by using mathematics and physics, Galileo was able to prove that we live in a Sun-centered solar system that is made up of the Sun and the objects traveling

around it. Being able to prove an idea by using experiments, math, and physics was the beginning of astronomy as a science.

1.4 Astronomers Today

Today, many scientists study the stars and planets. Astronomy is a science, and modern astronomers are scientists who use a variety of scientific tools and scientific techniques to learn about the universe.

However, even with new tools, modern astronomers must use the same basic skills that Copernicus, Brahe, and Galileo used.



Today's astronomers must make good observations and must train themselves to see the details, like Copernicus did. Astronomers must also study math and physics like Brahe and Galileo did. Math and physics are essential for understanding how the stars and planets move in space. Most importantly, astronomers must always be curious and willing to argue to defend their ideas like Copernicus, Brahe, and Galileo did.

1.5 Summary

- Astronomy is the study of space and all the objects found in space.
- Early astronomers were able to discover a great deal about the stars and planets by using observation.
- Nicolaus Copernicus, Tycho Brahe, and Galileo Galilei were three early astronomers who changed the way we understand the universe.
- Modern astronomers still use observation, math, and physics to study space.

1.6 Some Things to Think About

- When it gets dark, go outside and look at the sky. What can you notice? If you have binoculars, look through them and see if you can notice more details.
- If you notice the position of the Sun at different times during the day, does it look like the Sun moves around the Earth or the Earth moves around the Sun? Do you think events can sometimes be different than how they appear to be?
- Why do you think the new ideas of Copernicus and Brahe were upsetting to people?
- Think about times when you have seen the Moon in the sky. What things would you like to find out about the Moon?

Chapter 7 Earth's Neighborhood

7.1 Introduction

In our solar system there are two different types of planets. Recall that some of our planetary neighbors are Earth-like, or terrestrial, and some are Jupiter-like, or Jovian. In this chapter we will take a look at where our planetary neighbors "live" in our solar neighborhood.

7.2 Our Solar Neighborhood

Most people live in some kind of neighborhood. A neighborhood is an area of town with houses, apartments, a few businesses, and possibly a park.

If you take a walk down the block in your neighborhood, you can see where your neighbors live. Some of your neighbors live close to you. Maybe they live next door and share the same backyard. Other neighbors live farther away, but they may all go to the local grocery store or walk their dog in the local park. We would say that all of

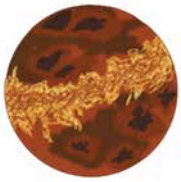
the people who live in this particular area of town are part of a neighborhood.

In the same way, planets share a particular area in space. A solar system is made up of a sun and the planets and other objects that travel around that sun.

In our solar system, there are eight planets. All of the planets share the same sun. Some planets are closer to our Sun, and some are farther away, just like the neighbors in your neighborhood.

The closest planet to the Sun and the smallest planet is Mercury. Because Mercury is so close to the Sun, its surface can be very hot. The temperature at noon on Mercury can get up to as much as 425 degrees Celsius (800 degrees Fahrenheit)! But Mercury does not have enough air to hold onto the heat from the Sun. At night the temperature on Mercury can go down to below 18 degrees Celsius (below zero degrees Fahrenheit). So Mercury does not have the right temperatures for plants and animals to be able to live.

The next closet planet to the Sun is Venus. Venus is about twice as far away from the Sun as Mercury. However, even though Venus is farther away from the Sun than Mercury is, Venus is actually hotter! Venus has lots of carbon dioxide in the air. This heats up the surface and holds the heat so



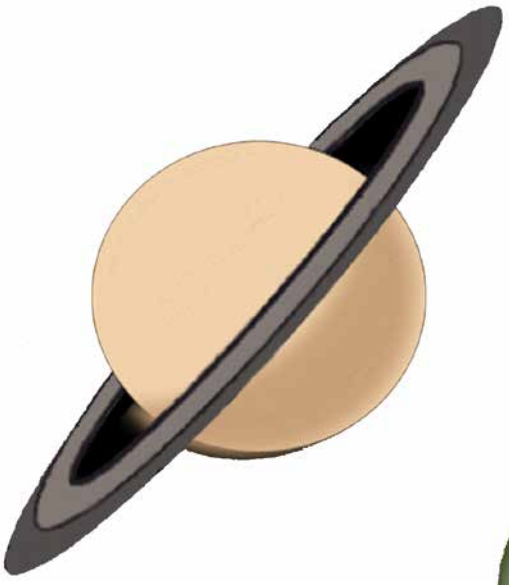
Venus is hot all the time. The surface of Venus can reach over 460 degrees Celsius (860 degrees Fahrenheit). Venus is much too hot to support plant and animal life.

The next closest planet to the Sun is Earth. Earth is close enough to the Sun to have enough heat for life to exist, but not so close that it is too hot for living things. Earth is the only planet in our solar system that supports plant and animal life.

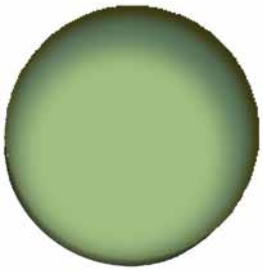
Mars sits farther away from the Sun than Earth does. Mars is much colder than Earth because it is farther away from the Sun. However, Mars is almost close enough to the Sun to support life.

Mercury, Venus, Earth, and Mars make up the inner solar system, or inner neighborhood. From an astronomer's perspective, all of these planets are relatively close to each other.

Much farther out are the four planets in the outer solar system. Jupiter is the first planet in the outer solar system. Jupiter is more than five times farther away from the Sun than Earth is.



Saturn is even farther away from the Sun than Jupiter is. Saturn is the second planet in the outer solar system.



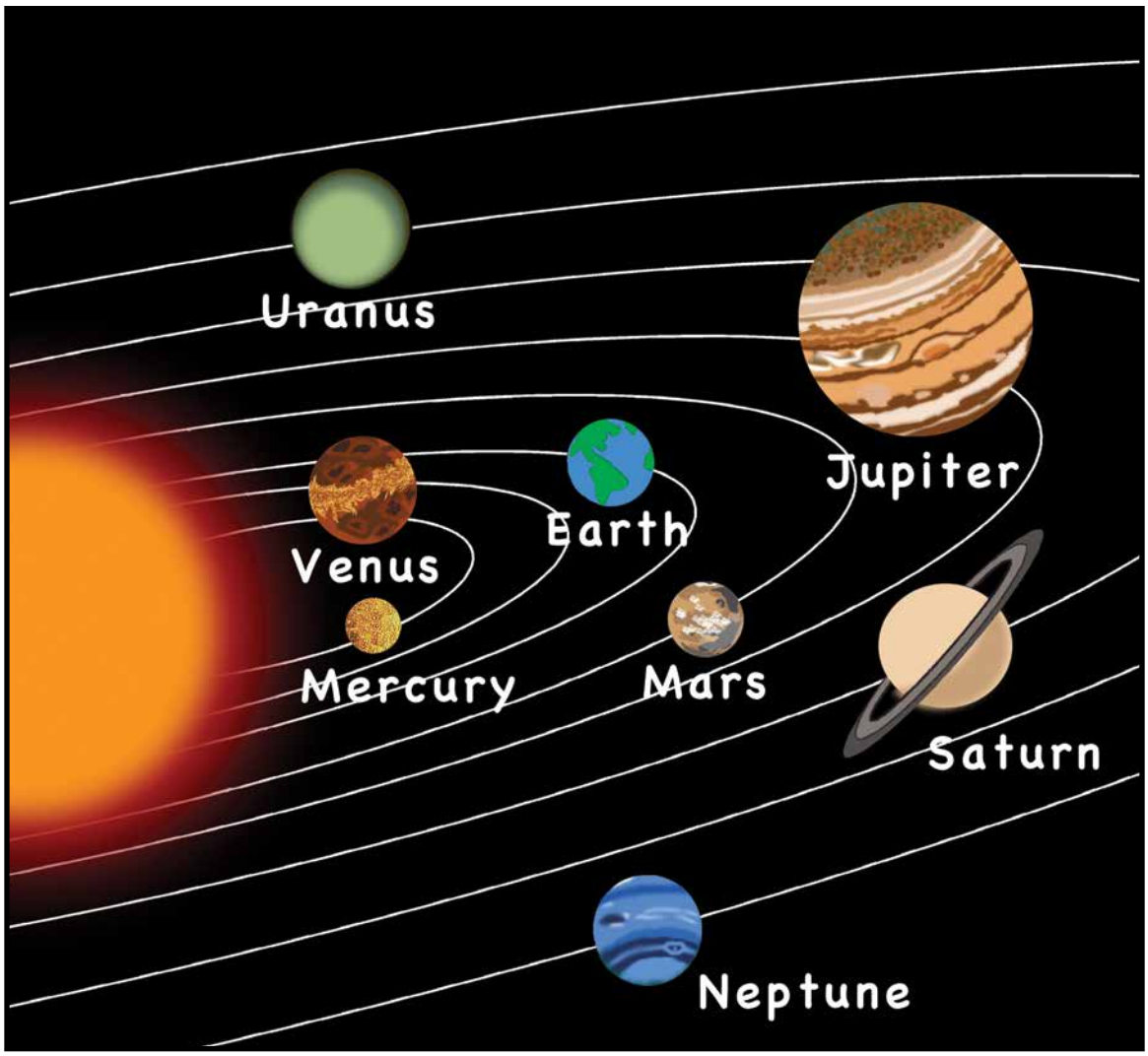
Uranus and Neptune are the last two planets in the outer solar system.

Neptune is almost 30 times as far away from the Sun as Earth is. Jupiter, Saturn, Uranus, and Neptune are all much too cold to support plant and animal life.

7.3 Orbits

The planets don't just sit in one spot, but move in a nearly circular orbit around the Sun. An orbit is a particular path, like a road, that a planet follows.

Each planet stays in its orbit at its particular distance away from the Sun. Planets don't cross other planetary orbits or ever bump into each other.



Each planet takes a certain number of days to orbit the Sun. This is called a planetary year. Mercury orbits the Sun faster than does any other planet. It only takes 88 days for Mercury to complete one orbit. So one year on Mercury is only 88 days.

It takes Venus a little longer than Mercury to orbit the Sun, but not as long as it takes Earth. Venus orbits the Sun in 225 days, and Earth orbits the Sun in 365 days. The length of our calendar year is 365 days.

It takes Mars 687 days to orbit the Sun, and it takes Jupiter almost 12 Earth years to complete one planetary year!

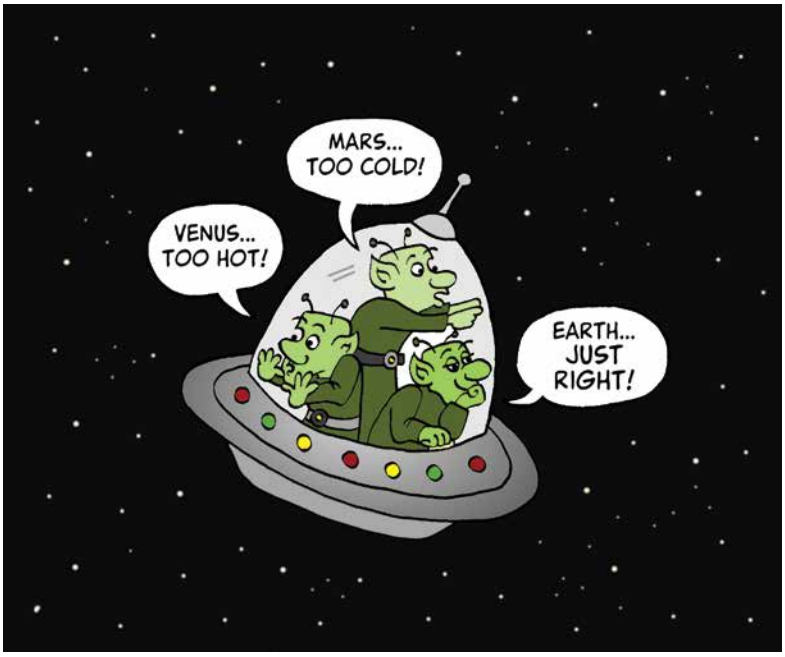
Saturn takes almost 30 Earth years to orbit the Sun, and Uranus orbits the Sun in 84 Earth years. If you lived on Neptune you would need 165 Earth years just to get around the Sun once!

Planet	Number of Days for One Orbit of the Sun
 Mercury	88
 Venus	225
 Earth	365
 Mars	687
 Jupiter	4,332
 Saturn	10,760
 Uranus	30,700
 Neptune	60,200

7.4 Why Is Earth Special?

Of all the planets in our solar system, only Earth is the right distance away from the Sun, with the right combination of water, oxygen, minerals, and soils to support plant and animal life. Earth has just the right conditions for plant and animal life to exist.

Earth has many unique features that make it just right for plant and animal life. If Earth were closer to the Sun, it would be too hot for life. If Earth were farther away from the Sun, it would be too cold for life. If Earth's atmosphere had too much gas, like Venus does, it would cause the Earth's surface to heat up and would make it too hot.



Earth is special in this way. There is no other planet in our solar system that can support plant and animal life. And so far, no other planet in the universe has been found that supports plant and animal life. Earth has just the right temperature, is just the right distance from the Sun, and is made of just the right materials for plant and animal life to exist!

7.5 Summary

- We live together with other planets in a planetary neighborhood called the solar system.
- All of the planets in our solar system share the same sun.
- Mercury is closest to the Sun, followed by Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.
- Each planet rotates around the Sun in an orbit.
- Each planet takes a different number of days to complete one orbit around the Sun. The number of days it takes a planet to orbit the Sun once is called a planetary year. Our planetary year is 365 days.

7.6 Some Things to Think About

- If you could pick any planet in the solar system to live on, which one would it be? Why?

  Mercury
  Venus
  Earth
  Mars
  Jupiter
  Saturn
  Neptune
  Uranus

- What do you think it would be like to live on a planet like Jupiter? What do you think would be different? (holidays, birthdays, seasons?)
- If you could pick any planet in the universe to live on, what requirements would be needed for plants and animals to be able to live?

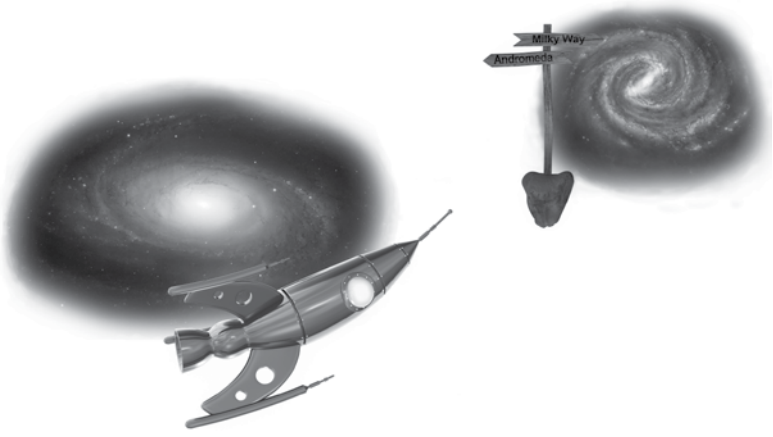
FOCUS ON

Grades K-4

ELEMENTARY

Laboratory Notebook

3rd Edition



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REAL SCIENCE 4 Kids

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Illustrations: Janet Moneymaker

Focus On Elementary Astronomy Laboratory Notebook—3rd Edition
ISBN 978-1-941181-31-7

Published by Gravitas Publications Inc.
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A Note From the Author

Hi!

In this curriculum you are going to learn how to use the scientific method to explore the world and the universe that you are part of.

In astronomy, making good observations is very important because most of the objects we can see are too far away to visit in person. We learn about them by using a variety of scientific tools and techniques.

Each experiment in this workbook is divided into several different sections. There is a section called *Observe It* where you will make observations. In the *Think About It* section you will answer questions, and in the *What Did You Discover?* section you will write down or draw what you observed in the experiment. There is a section called *Why?* where you will learn about why you may have observed certain things. And finally, there is a section called *Just For Fun* that has an extra activity for you to experiment with.

These experiments will help you learn how to use the scientific method and . . . they're lots of fun!

Enjoy!
Rebecca W. Keller, PhD

Contents

Experiment 1

Observing the Stars

I. Think About It

❶ Think about how you travel from one place to another place.

❷ How do you travel? By road? By plane? By boat? Write or draw your thoughts below.

❸ What tools do the driver, pilot, or captain use to navigate? Write or draw below.

❹ Do you think you can use the stars to navigate? Why or why not?

II. Observe It

❶ On a clear night, go outside and observe the stars and the Moon.

❷ In the space below, write down or draw where you are, the time of night, and the direction you are facing.

❸ Draw the stars you observe. Notice bright stars, big stars, and colored stars. Locate the Moon and draw what it looks like. Note stars that are near the Moon and draw them.

NIGHT 1

❹ For the next 5 days, go to the same location and face the same direction as on Night 1. Observe the stars and Moon at the same time each night. Draw what you see. Note if the location of the Moon or stars changes.

NIGHT 2

NIGHT 3

NIGHT 4

NIGHT 5

NIGHT 6

III. What Did You Discover?

❶ Did any of the stars stay in the same place each night? How do you know?

❷ Did any of the stars change places over several nights? How do you know?

❸ Did the Moon look the same each night? Why or why not?

❹ Did the stars near the Moon stay in the same place each night? Why or why not?

IV. Why?

Astronomers study the stars, planets, Moon, and Sun. Even before astronomy became a science, ancient people used the stars for navigation when they traveled. They also used the stars to plan for changes in weather and even to predict when the Sun would not shine because of a solar eclipse.

For example, the North Star, called Polaris, is above the North Pole and stays in the same place night after night. Using the North Star, travelers can know in which direction they are going. This helps them navigate their journey from one place to another.

Using the stars for navigation takes time to learn because it requires many observations over many days and nights. However, once you know how to use the stars, you can navigate a journey at night without getting lost.

V. Just For Fun

Ancient people observed that some stars look like they are in a group. Stars that appear to be in a group are called a *constellation*. The ancient people gave these constellations names like Orion the Hunter, The Little Dipper, and The Dragon.

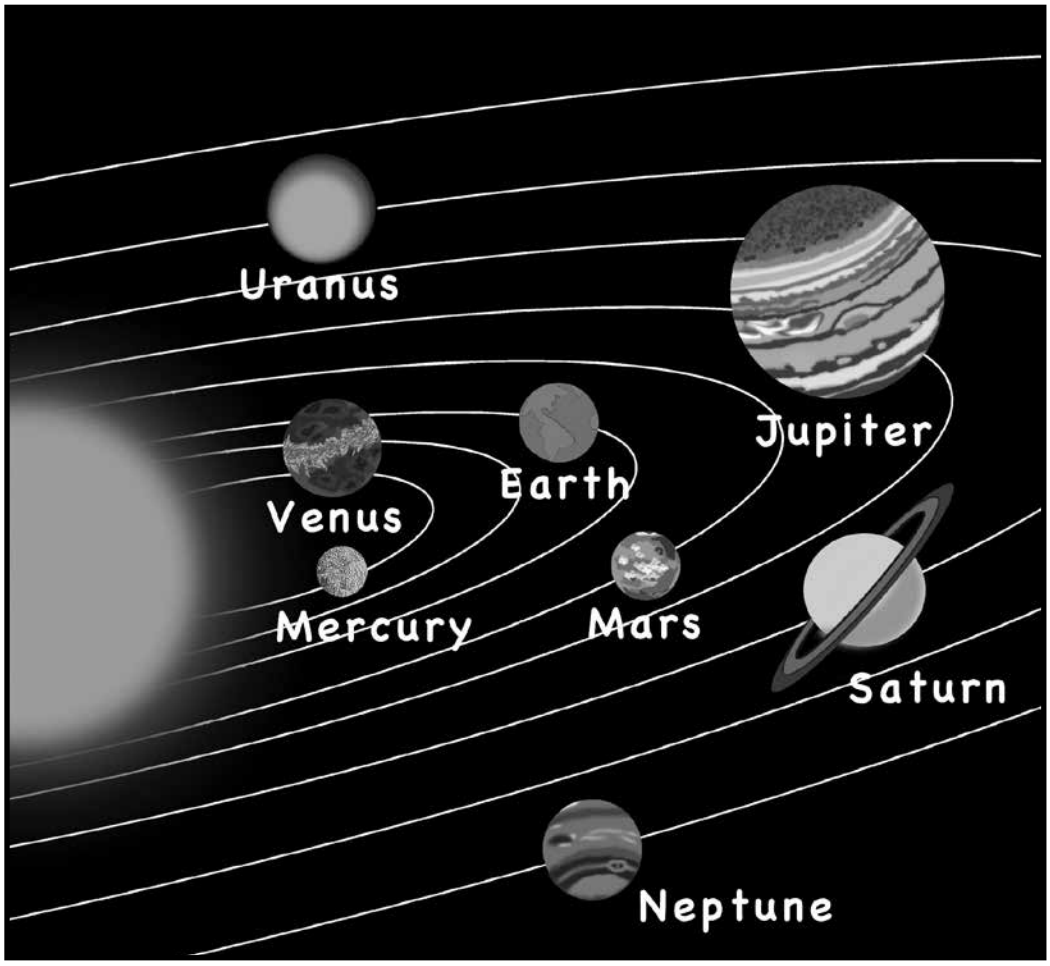
On a clear, dark night, observe the stars and find some star groups. What does each of your star groups make you think of? A person? An animal? An imaginary creature? An object? Pick one or more of your constellations and give each a name. Draw the stars in the constellation and connect the stars with lines to show the shape of your constellation.

Constellation _____

Constellation _____

Experiment 7

Modeling an Orbit



Introduction

In this experiment you will model an orbit by using a Styrofoam ball attached to a string. While holding the end of the string, you will whirl the ball around in a circle. Before you do the experiment, think about what might happen.

I. Think About It

❶ What do you think will happen when you hold the end of the string and whirl the ball?

_____

_____

❷ Do you think the ball will fall towards your hand when you whirl it? Why?

_____

_____

❸ Do you think the ball will fly off the end of the string when you whirl it? Why?

_____

_____

❹ If you shorten the string, do you think the ball will move faster or slower?

_____

_____

II. Observe It

❶ Take a Styrofoam ball, and with the help of an adult, punch a hole through the center.

❷ Next, create a large knot at one end of a piece of string. Thread the unknotted end of the string through the hole in the Styrofoam ball, and pull the string through the ball until you have just enough string to hold firmly in your hand. The end of the string that has the knot will hang down from the other side of the ball.

❸ Hold the unknotted end of the string. The ball should be near your hand. Whirl the string until the Styrofoam ball is moving in a circle with your hand at the center. Observe how the ball moves. In the space below, draw or write about what you see.

❹ Shorten the length of the string by holding it in the middle. The ball will be next to the knot. Whirl the string as in *Step 3*. Observe how the ball moves. In the space below, draw or write what you see.

❺ Shorten the length of the string again, this time holding it close to the Styrofoam ball. Whirl the string as in *Step 3*. Observe how the ball moves. In the space below, draw or write what you see.

III. What Did You Discover?

❶ How easy or difficult was it to use the string to whirl the ball in a circle?

❷ As you were whirling the ball, did it keep moving on a straight path or did it orbit around your hand?

❸ What happened when you shortened the string? Did the ball move slower or faster?

❹ Was it easier or more difficult to whirl the ball with a shorter string? Why?

IV. Why?

When you started whirling the ball, it was near your hand. The whirling motion of the string caused the ball to travel in a circle around your hand and to slide along the string. The ball moved outward away from your hand until it was stopped by the knot. At this point the string was pulling the ball inward toward your hand, and the motion of the ball was pulling it outward, away from your hand. The pulling inward and the pulling outward are different types of force. Once the ball had traveled down the string as far as it could, the inward and outward forces were balanced, and the ball kept traveling in a circular orbit at the same distance from your hand.

The planets move in their orbits around the Sun in much the same way. The Sun's gravity pulls a planet toward it. At the same time, the momentum, or force, of the planet's motion pulls it outward. Because these forces are balanced, each planet stays in a near circular orbit around the Sun.

V. Just For Fun

Place a marble in an empty cup. Now move the cup around in a circle so that the marble travels around the inner surface of the cup. Start moving the cup slowly and then gradually move it faster. What happens as you change the speed? What happens when you move the cup really slowly? What happens if you move the cup in a circle really fast?

Try repeating this experiment using different size marbles and different size cups. Does changing the sizes change your results?

Observations

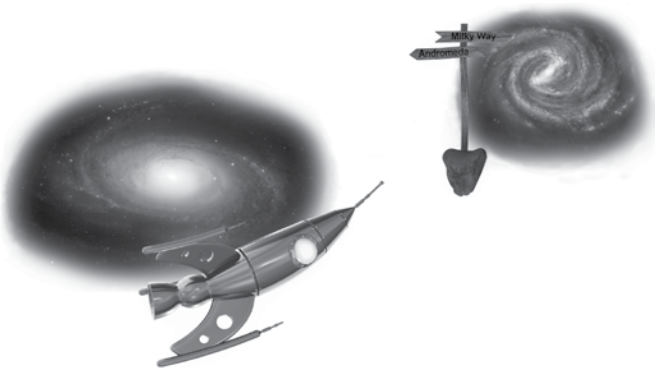
Observations

Grades K-4

FOCUS ON ELEMENTARY

Teacher's Manual

3rd Edition



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REAL SCIENCE 4 Kids

Real Science-4-Kids

Focus On Elementary Astronomy Teacher's Manual— 3rd Edition
ISBN 978-1-941181-32-4

Published by Gravitas Publications Inc.
www.gravitaspublications.com
www.realscience4kids.com

A Note From the Author

This curriculum is designed to provide an introduction to astronomy for students in the elementary level grades. *Focus On Elementary Astronomy—3rd Edition* is intended to be used as the first step in developing a framework for the study of real scientific concepts and terminology in astronomy. This *Teacher's Manual* will help you guide students through the series of experiments in the *Laboratory Notebook*. These experiments will help the students develop the skills needed for the first step in the scientific method — making good observations.

There are several sections in each chapter. The section called *Observe It* helps the students explore how to make good observations. The *Think About It* section provides questions for the students to think about and use to make further observations. In every chapter there is a *What Did You Discover?* section that gives the students an opportunity to summarize the observations they have made. A section called *Why?* provides a short explanation of what students may or may not have observed. And finally, in each chapter there is a section called *Just For Fun* that contains an additional activity.

The experiments take up to 1 hour. The materials needed for each experiment are listed on the next page and also at the beginning of each experiment.

Enjoy!

Rebecca W. Keller, PhD

Materials at a Glance

Experiment 1	Experiment 3	Experiment 5	Experiment 6	Experiment 7
clear night sky colored pencils	basketball ping-pong ball flashlight empty toilet paper tube glue or tape scissors marking pen a dark room	8 Styrofoam balls: Recommended (1) 10 cm (4 in) (1) 7.5 cm (3 in) (2) 5 cm (2 in) (2) 4 cm (1.5 in) (2) 2.5 cm (1 in) water-based craft paint: red, blue, green, orange, brown paintbrush water in a container misc. objects to represent planets (such as fruits, vegetables, candies, baking mixes) for *Just For Fun* section	colored pencils night sky daytime sky or textured surface **Optional** book or online information about constellations globe or basketball	Styrofoam ball pick, awl, or other thin, sharp object to poke a hole through the center of the ball nylon string scissors 2 or more marbles of different sizes cups that are different sizes
Experiment 2 colored pencils clear night sky basketball or other large object(s) **Telescope materials** empty cardboard paper towel tube 1-2 sheets of card stock or 1 manila file folder cut in half tape 2 lenses with different focal lengths*	**Experiment 4** colored pencils night sky			

Experiment 8	Experiment 9	Experiment 10	Experiment 11	Experiment 12
flashlight with new batteries glow sticks in assorted colors: may be found in places such as Walmart, toy stores, and online	student-selected materials to make a model of a galaxy, such as colored modeling clay, Styrofoam balls, tennis balls, marbles, sand, candies, etc. cardboard or poster board, .3-1 meter (1'-3') on each side **Optional** colored pencils or markers camera and printer	colored pencils a dark, moonless night sky far away from city lights **Optional** computer with internet access pictures of cities	2 bar magnets iron filings, purchased** or student collected shallow, flat-bottomed plastic container (or a plastic box top or large plastic jar lid) corn syrup plastic wrap Jell-O or other gelatin and items to make it assorted fruit cut in pieces and/or berries **Optional** cardboard box	small plastic pail that will fit in freezer water dirt small stones dry ice (available at most grocery stores) heavy gloves or oven mitts freezer If dry ice is in a block: safety goggles, mallet or hammer, grocery bag (cloth or paper)

* As of this writing, available from Home Science Tools: http://www.hometrainingtools.com Item# OP-LEN4x15 and Item# OP-LEN4x50
Or: Look online for a telescope kit

** As of this writing, available from Home Science Tools: http://www.hometrainingtools.com Item #CH-IRON

Materials

Quantities Needed for All Experiments

Equipment

basketball
basketball or other large object(s)
cups, several - different sizes
flashlight with new batteries
freezer
gloves, heavy, or oven mitts
lenses (2) with different focal lengths*
magnets, bar (2)
marbles, 2 or more of different sizes
pail, small plastic that will fit in freezer
paintbrush
pick, awl, or other thin, sharp object to poke a hole through the center of a Styrofoam ball
ping-pong ball
scissors

Optional

camera and printer
computer with internet access
globe
plastic container, shallow, flat-bottomed (or a plastic box top or large plastic jar lid)

Foods

corn syrup
fruit, assorted, cut in pieces, and/or berries
Jell-O or other gelatin and items to make it
objects, misc. to represent planets (such as fruits, vegetables, candies, baking mixes) for Just For Fun section

Materials

ball, Styrofoam (1)
balls, 8 Styrofoam: Recommended
(1) 10 cm (4 in)
(1) 7.5 cm (3 in)
(2) 5 cm (2 in)
(2) 4 cm (1.5 in)
(2) 2.5 cm (1 in)
card stock, 1-2 sheets or 1 manila file folder
cardboard or poster board, .3-1 meter (1'-3') on each side
dirt
dry ice (available at most grocery stores)
If dry ice is in a block: safety goggles, mallet or hammer, bag, grocery (cloth or paper)
glow sticks in assorted colors: may be found in places such as Walmart, toy stores, and online
glue or tape
iron filings, purchased** or student collected
materials, misc student-selected to make a model of a galaxy, such as colored modeling clay, Styrofoam balls, tennis balls, marbles, sand, candies, etc.

Materials (cont.)

paint, water-based craft: red, blue, green, orange, brown
paper towel cardboard tube, empty
pen, marking
pencils, colored
string, nylon
stones, small
tape
toilet paper tube, empty
water in a container

Optional

box, cardboard
markers, colored
pictures of cities
plastic wrap

Other

room, darkened
sky, dark, moonless, far away from city lights
sky, daytime. or textured surface
sky, night, clear

Optional

book or online information about constellations

* As of this writing, available from Home Science Tools: http://www.hometrainingtools.com Item# OP-LEN4x15 and Item# OP-LEN4x50
Or: Look online for a telescope kit

** As of this writing, available from Home Science Tools: http://www.hometrainingtools.com Item #CH-IRON

Contents

Experiment 1

Observing the Stars

Materials Needed

- clear night sky
- colored pencils

Note: This experiment will take 6 days to complete.

Objectives

In this experiment, students will observe the stars, Moon, and planets on several different nights to determine their movement. Students will also explore how using the stars for navigation (celestial navigation) is possible.

The objectives of this lesson are:

- To observe changes in the position of stars, planets, and the Moon.
- To understand that it is possible to use the stars for navigation.

Experiment

I. Think About It

Read this section of the *Laboratory Notebook* with your students.

❶-❷ Have the students think about different ways they travel. Have them record their answers.

❸ Explain that *to navigate* means to plan and follow a route from one place to another. Have the students think about how a driver, pilot, or captain can find out which direction to travel. Discuss possible navigation tools such as:

- *compass*
- *GPS (Global Positioning System)*
- *radio navigation*
- *maps*

Have the students think about how using these tools enables modern people to travel to their destination. Have them record their answers.

❹ Help the students imagine what it would be like not to have any modern navigation tools.

Use the following questions to have the students explore the possibility of using the stars for navigation.

- *How easy or difficult would it be to use the stars to navigate?*
- *What happens when the sky is cloudy?*
- *Would traveling during the daylight be possible?*

II. Observe It

Read this section of the *Laboratory Notebook* with your students.

❶-❹ Have the students observe the night sky for six nights. Pick a single location (the backyard or front porch, for example), and observe the sky at the same time each night.

Help the students draw what they see. They do not have to draw every star. Try to help them find prominent stars and locate the same stars each night. Have them note if any of the stars have moved.

III. What Did You Discover?

Read the questions with your students.

❶-❹ Have the students answer the questions. These can be answered orally or in writing. There are no right answers, and their answers will depend on what they actually observed.

IV. Why?

Read this section of the *Laboratory Notebook* with your students.

Discuss any questions that might come up.

V. Just For Fun

Read this section of the *Laboratory Notebook* with your students.

Encourage the students to use their imagination to make up their own constellations.

Experiment 7

Modeling an Orbit

Materials Needed

- Styrofoam ball
- pick, awl, or other thin, sharp object to poke a hole through the center of the ball
- nylon string
- scissors
- 2 or more marbles of different sizes
- cups that are different sizes

Objectives

In this unit, students will observe how two opposing forces keep a Styrofoam ball in a circular orbit.

The objectives of this lesson are for students to:

- Create a model of a planetary orbit.
- Explore opposing forces.

Experiment

I. Think About It

Read this section of the *Laboratory Notebook* with your students.

Have the students think about what happens when a string is used to whirl a ball in the air. Use questions such as the following to guide their inquiry.

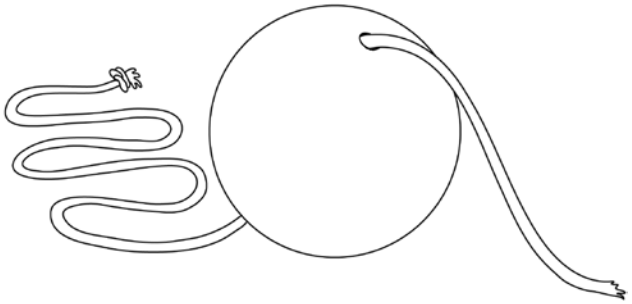
- *What do you think will happen when you hold the end of the string and whirl the ball in a circle? Will the ball stay in the same position on the string?*
- *Do you think the ball will move towards or away from your hand when you whirl it? Why?*
- *Do you think the ball will fly off the end of the string when you whirl it? Why or why not?*
  (This will happen if the knot isn't large enough.)
- *What will happen if you shorten the string? Will the ball move faster or slower with a shorter string?*

II. Observe It

Read this section of the *Laboratory Notebook* with your students.

❶ The students are to assemble the ball and string. Help them pierce the ball with a pick or sharp tool.

❷ Have the students tie a large knot at one end of the string and then thread the nylon string through the ball. When the ball and string are assembled, the ball should be near the unknotted end of the string with enough string at this end for the student to grasp firmly. The ball should be able to slide on the string, and the knot should be large enough that the ball won't come off the end of the string when it is whirled.



❸ It is useful to use the floor as a reference. Have the students whirl the ball around their hand with their hand fixed in the center of the circle. As they whirl it, the ball will slide outward along the string until it reaches the knotted end. The ball will then follow a circular path that stays at the same distance from their hand.

❹-❺ Have the students shorten and lengthen the string and observe how this changes the way the ball moves.

Encourage open inquiry with the following questions:

- *Does the ball go around faster or slower when the string is short?*
- *Is it easier or more difficult to spin the ball with a shorter string?*
- *If you slow down the speed at which you are spinning the ball, what happens to the ball?*
- *How fast can you spin the ball?*

III. What Did You Discover?

Read this section of the *Laboratory Notebook* with your students.

The questions can be answered verbally or in writing depending on the writing ability of the student. With these questions, help the students think about their observations. There are no "right" answers to these questions, and it is important for the students to write or discuss what they actually observed.

IV. Why?

Read this section of the *Laboratory Notebook* with your students.

There are two opposing forces that keep planets in a circular orbit around the Sun. One force, created by the speed and momentum of the planet, pushes the planet outward. The other force, the gravitational force of the Sun, pulls the planet inward. These two forces balance to keep the planets in circular orbits.

The balance of opposing forces is simulated in this experiment. As the ball is spun in a circle, a force causes it to travel outward. When it reaches the end of the string, the ball is pulled back towards the center, but since it is still rotating, it is also being pulled outward. The balance between the outward and inward forces keeps the ball in a circular orbit.

Planetary orbits are not quite circular, and the planets actually speed up as they near the Sun and slow down as they get farther away.

V. Just For Fun

Help the students use a marble in a cup to model an orbit. As the student moves the cup in a circular motion, the marble begins to circle the inside of the cup. In this experiment the cup creates an inward force on the marble while the outward force of the marble's momentum pushes against the cup. The two forces (inward and outward) are in balance which results in the marble circling the cup much as a planet orbits the Sun.

Have the students try using different size marbles, one at a time, in the same cup. Then they can try the marbles in different size cups. Help them notice any differences that may occur in the way the marbles move.

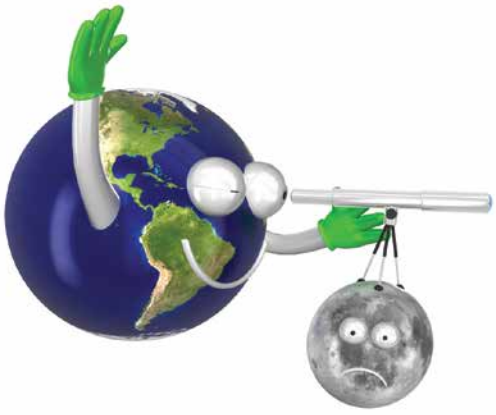
FOCUS ON

Grades K-4

ELEMENTARY

Lesson Plan

3rd Edition



Rebecca W. Keller, PhD

REAL SCIENCE 4 Kids

Real Science-4-Kids

Focus On Elementary Astronomy Lesson Plan— 3rd Edition

Published by Gravitas Publications Inc.
www.gravitaspublications.com
www.realscience4kids.com

LESSON PLAN INSTRUCTIONS

This *Lesson Plan* accompanies *Focus On Elementary Astronomy Student Textbook, Laboratory Notebook, and Teacher's Manual—3rd Edition*. It is designed to be flexible to accommodate a varying schedule as you go through the year's study. And it makes it easy to chart weekly study sessions and create a portfolio of your student's yearlong performance. The PDF format allows you to print pages as you need them.

This Lesson Plan file includes:

- Weekly Sheets
- Sticker Templates
- Self-Review Sheet
- Self-Test Sheet

Materials recommended but not included:

- 3-ring binder
- Indexing dividers (3)
- Labels—24 per sheet,1.5" x 1.5" (Avery 22805)

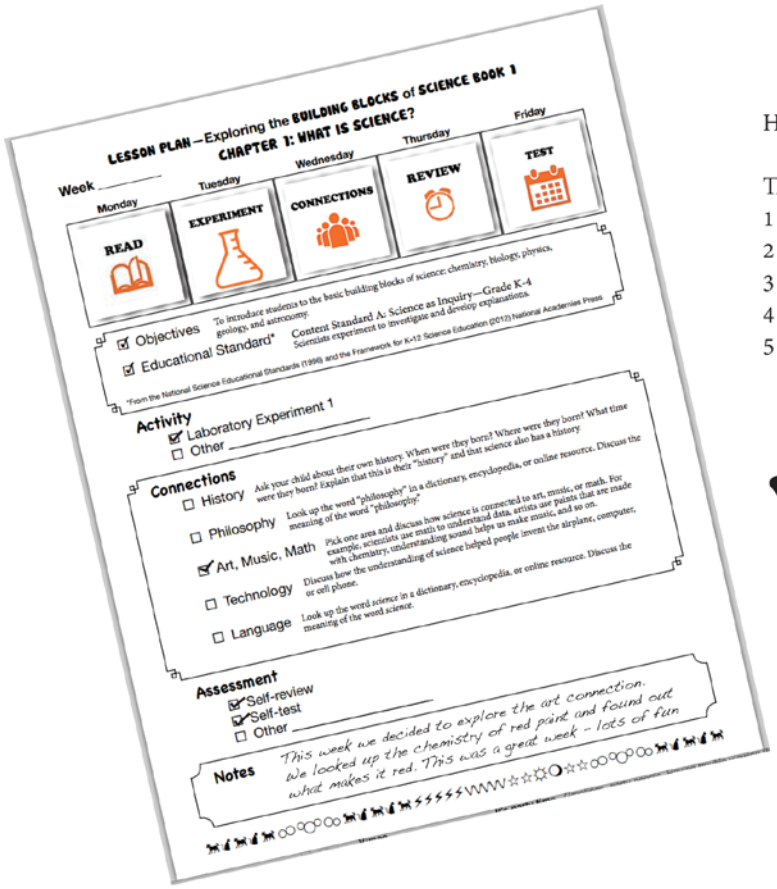
Use the Weekly Sheets to map out daily activities and keep track of student progress. For each week you decide when to read the text, do the experiment, explore the optional connections, review the text, and administer tests. For those families and schools needing to provide records of student performance and show compliance to standards, there is a section on the Weekly Sheets that shows how the content aligns to the National Science Standards.

To use this Lesson Plan:

- Print the Weekly Sheets
- Print Self-Review Sheets
- Print Self-Test Sheets
- Print the stickers on 1.5" x 1.5" labels
- Place all the printed sheets in a three-ring binder separated by index dividers

At the beginning of each week, use the squares under each weekday to plan your daily activities. You can attach printed stickers to the appropriate boxes or write in the daily activities. At the end of the week, use the Notes section to record student progress and performance for that week.

WEEKLY LESSON PLAN SAMPLES


LESSON PLAN—Exploring the BUILDING BLOCKS of SCIENCE BOOK 1
CHAPTER 1: WHAT IS SCIENCE?

Week _____

Monday	Tuesday	Wednesday	Thursday	Friday
READ	EXPERIMENT	CONNECTIONS	REVIEW	TEST

☑ Objectives — To introduce students to the basic building blocks of science: chemistry, biology, physics, geology, and astronomy.
☑ Educational Standard* — Content Standard A: Science as Inquiry—Grade K-4 Scientists experiment to investigate and develop explanations.
*From the National Science Educational Standards (1996) and the Framework for K-12 Science Education (2012) National Academies Press

Activity
☑ Laboratory Experiment 1
☐ Other _____

Connections
☐ History — Ask your child about their own history. When were they born? Where were they born? What time were they born? Explain that this is their "history" and that science also has a history.
☐ Philosophy — Look up the word "philosophy" in a dictionary, encyclopedia, or online resource. Discuss the meaning of the word "philosophy."
☑ Art, Music, Math — Pick one area and discuss how science is connected to art, music, or math. For example, scientists use math to understand data, artists use paints that are made with chemistry, understanding sound helps us make music, and so on.
☐ Technology — Discuss how the understanding of science helped people invent the airplane, computer, or cell phone.
☐ Language — Look up the word science in a dictionary, encyclopedia, or online resource. Discuss the meaning of the word science.

Assessment
☑ Self-review
☑ Self-test
☐ Other _____

Notes This week we decided to explore the art connection. We looked up the chemistry of red paint and found out what makes it red. This was a great week - lots of fun

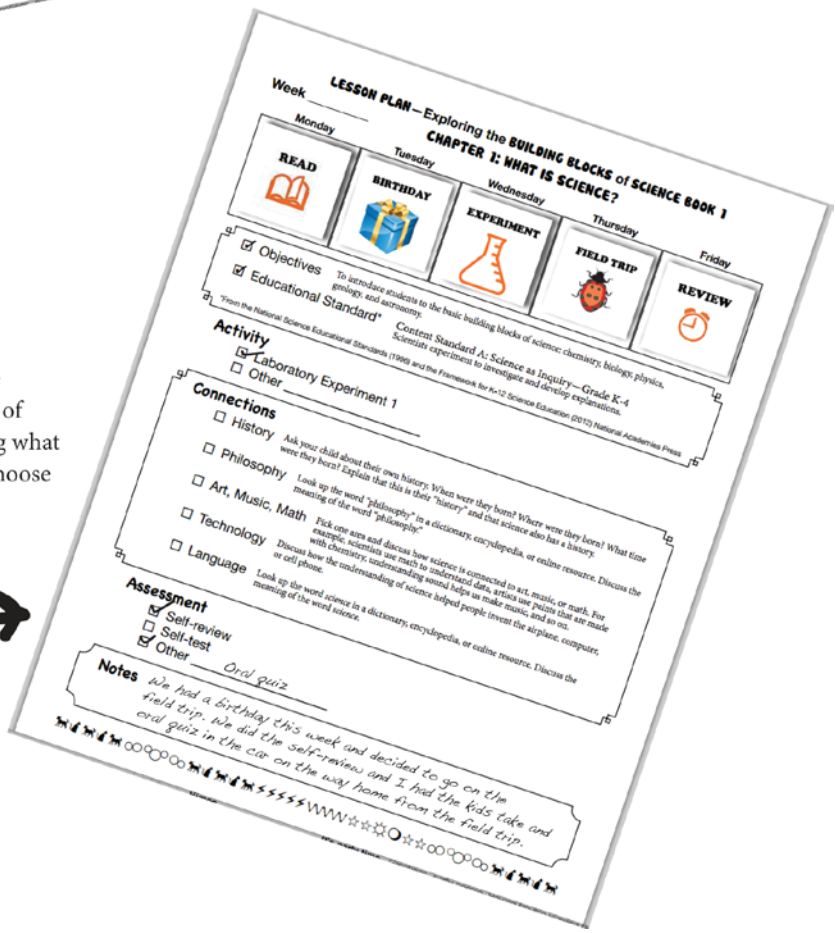
Here is a sample of a normal week.

The recommended sequence is
1 - Read the student textbook on the first day.
2 - Do the laboratory experiment on the second day.
3 - Pick one or more connections to explore on the third day.
4 - Do the self-review sheet on the fourth day.
5 - Administer the self-test or another exam on the fifth day.

Here is a sample of a week with other activities

1- Find at least one day to READ the text.
2 - Find a day to perform the EXPERIMENT.
3 - Find a day to do the REVIEW or TEST.

Any activity that is missed can be rescheduled for the following week. However, keep to the main sequence of reading the text, doing the experiment, and reviewing what has been covered. If an activity needs to be missed, choose the CONNECTIONS or SELF-TEST.


LESSON PLAN—Exploring the BUILDING BLOCKS of SCIENCE BOOK 1
CHAPTER 1: WHAT IS SCIENCE?

Week _____

Monday	Tuesday	Wednesday	Thursday	Friday
READ	BIRTHDAY	EXPERIMENT	FIELD TRIP	REVIEW

☑ Objectives — To introduce students to the basic building blocks of science: chemistry, biology, physics, geology, and astronomy.
☑ Educational Standard* — Content Standard A: Science as Inquiry—Grade K-4 Scientists experiment to investigate and develop explanations.
*From the National Science Educational Standards (1996) and the Framework for K-12 Science Education (2012) National Academies Press

Activity
☑ Laboratory Experiment 1
☐ Other _____

Connections
☐ History — Ask your child about their own history. When were they born? Where were they born? What time were they born? Explain that this is their "history" and that science also has a history.
☐ Philosophy — Look up the word "philosophy" in a dictionary, encyclopedia, or online resource. Discuss the meaning of the word "philosophy."
☐ Art, Music, Math — Pick one area and discuss how science is connected to art, music, or math. For example, scientists use math to understand data, artists use paints that are made with chemistry, understanding sound helps us make music, and so on.
☐ Technology — Discuss how the understanding of science helped people invent the airplane, computer, or cell phone.
☐ Language — Look up the word science in a dictionary, encyclopedia, or online resource. Discuss the meaning of the word science.

Assessment
☑ Self-review
☐ Self-test
☑ Other Oral quiz

Notes We had a birthday this week and decided to go on the field trip. We did the self-review and I had the kids take and oral quiz in the car on the way home from the field trip.

Week _____ **CHAPTER 1: EXPLORING THE COSMOS**

Monday	Tuesday	Wednesday	Thursday	Friday

☑ Objectives To introduce students to concept of the cosmos.

☑ Educational Standard* **Content Standard 1-ESS1.A: The Universe and Its Stars**
Patterns of the motion of the sun, moon, and stars in the sky can be observed.

*From the Next Generation Science Standards (NGSS)

Activity

- ☐ Laboratory Experiment 1
- ☐ Other _____

Connections

- ☐ History Discuss early Egyptian, Babylonian, and Chinese astronomers.
- ☐ Philosophy Look up Nicolaus Copernicus on the internet or in the library. Discuss the conflict between the theory of an Earth-centered cosmos vs. that of a Sun-centered cosmos.
- ☐ Art, Music, Math Discuss how art influences astronomy and how astronomy influences art.
- ☐ Technology Discuss how technology has helped scientists explore planets and stars.
- ☐ Language Look up the word *cosmos* in a dictionary, encyclopedia, or online resource. Discuss the meaning of the word *cosmos*.

Assessment

- ☐ Self-review
- ☐ Self-test
- ☐ Other _____

Notes

Week _____ **CHAPTER 7: EARTH'S NEIGHBORHOOD**

Monday	Tuesday	Wednesday	Thursday	Friday

☑ Objectives To introduce students to the solar system.

☑ Educational Standard* **Content Standard 1-ESS1.B (Crosscutting concepts)** Patterns in the natural world can be observed, used to describe phenomena, and used as evidence.

*From the Next Generation Science Standards (NGSS)

Activity

- ☐ Laboratory Experiment 7
- ☐ Other _____

Connections

- ☐ History Discuss the history of the discovery of the planets and the source of their names.
- ☐ Philosophy Explore how philosophy and cultural stories have played a role in the naming of the planets.
- ☐ Art, Music, Math Discuss how different planets have different orbits and different numbers of days in their year.
- ☐ Technology Discuss how modern technology allowed humans to land on the Moon and what it might take for humans to land on Mars.
- ☐ Language Look up the word *orbit* in a dictionary or encyclopedia. Discuss the meaning of the word *orbit.*

Assessment

- ☐ Self-review
- ☐ Self-test
- ☐ Other _____

Notes

SELF-REVIEW

Think about all of the ideas, concepts, and facts you read about in this chapter. In the space below, write down everything you've learned.

Date _____ **Chapter** _____

SELF-TEST

Imagine you are the teacher and you are giving your students an exam. In the space below, write 5 questions you would ask a student based on the information you learned in this chapter.

Date _____ **Chapter** _____

READ

READ

READ

READ

REVIEW

REVIEW

REVIEW

REVIEW

EXPERIMENT

EXPERIMENT

EXPERIMENT

EXPERIMENT

CONNECTIONS

CONNECTIONS

CONNECTIONS

CONNECTIONS

TEST

TEST

TEST

TEST

READ

READ

READ

READ

HOLIDAY

HOLIDAY

HOLIDAY

HOLIDAY

FIELD TRIP

FIELD TRIP

FIELD TRIP

FIELD TRIP

BIRTHDAY

BIRTHDAY

BIRTHDAY

BIRTHDAY

REST DAY

REST DAY

REST DAY

REST DAY

REST DAY

REST DAY

REST DAY

REST DAY

SICK DAY

SICK DAY

SICK DAY

SICK DAY

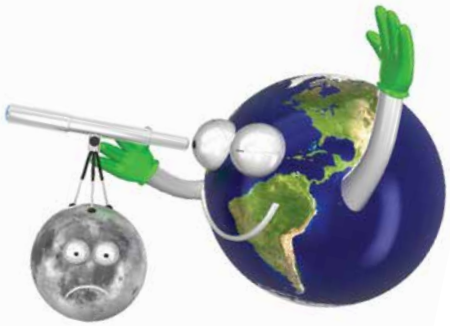
FOCUS ON

Grades K-4

ELEMENTARY

STUDY NOTEBOOK

3rd Edition



Rebecca W. Keller, PhD

REAL SCIENCE 4 Kids

(Print this page and glue to the front of your Study Notebook.)

Real Science-4-Kids

Illustrations: Janet Moneymaker

Focus On Elementary Astronomy Study Notebook— 3rd Edition

Published by Gravitas Publications Inc.
Real Science-4-Kids®
www.realscience4kids.com
www.gravitaspublications.com

FOCUS ON ELEMENTARY ASTRONOMY STUDY NOTEBOOK

This Study Notebook has activities for you to do that will help you learn the ideas presented in each chapter of the Student Textbook.

Materials you will need

- 8.5 x 11 white paper
- color printer
- scissors
- glue or clear tape
- colored pencils
- 1 manila file folder
- 3 brad paper fasteners or 3-ring binder
- 3-hole punch

STEP 1 Printing

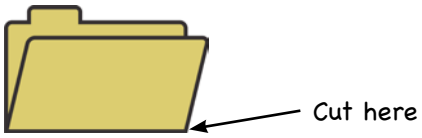
- Download the Study Notebook file for the chapter you are reading.
- Use the printer settings: portrait, letter, 8.5 x 11.
- Print the pages single sided.

STEP 2 Activities

- The little blue boxes on the left-hand side of the main pages show you which section of the Student Textbook has the information for that activity.
- For the chapter you are studying, do the activities on the two main pages (those that have page numbers at the bottom): fill in the blanks, answer questions, and follow the directions for other types of activities.
- On the **Stuff to Cut Out** pages, follow the directions for cutting out the pieces and gluing or taping them to the main pages.

STEP 3 Make the Study Notebook pages into a Book

- Cut the file folder in half along the fold.
- Use a 3-hole punch to make holes along the cut edge of the file folder pieces.



- Use the two pieces for the front and back covers.
- As you complete each chapter, punch holes in the pages and insert them between the front and back covers of your Study Notebook.

This is YOUR book! Add color to the pages along with doodles, squiggles, and notes in the margins. The backs of the pages are great for writing observations and ideas. Add your own pages with more ideas, observations, questions, science news you have heard about, and anything else you want to remember.

Punch holes on this edge.

1. Exploring the Cosmos

Astronomy

1.1 is the study of the **C _ SM _ S!**

THE C _ SM _ S includes **Ea _ _ h** and everything that extends ***beyond*** **Ea _ _ h**.

Ast _ _ nom _ _ s can travel **DEEP** into **sp _ ce** **to study objects** in the c _ s _ os.

YES! NO!

1.2

Go outside and spend some time looking at the stars. Do you think you can observe things that ancient people also observed?

Do you think that thousands of years ago the stars were exactly the same and in exactly in the same place as they are now? Why or why not?

(Make notes on the back of this page.)

1.4

Answer These Little Questions!

Because **modern astronomers** have lots of new tools to use, they no longer need to worry about details or observations.

TRUE! FALSE!

Mathematics and **physics** are essential for understanding how stars and planets move in space.

TRUE! FALSE!

1.2
1.3

Punch holes on this edge.

Glue **Astronomer TAB** Here

I am a Gr _ _ k
a _ _ ron _ _ er and
m _ the _ _ tic _ _ n.

I am one of the first to say that the E _ _ th moves around the S _ _ and that the E _ _ th r _ vol _ _ s around its own axis.

People of my time do not b _ li _ ve me!

WHO AM I?

Glue **Astronomer TAB** Here

I am a Polish
as _ _ on _ m _ r long ago.

I use ma _ _ em _ tics to prove that the Ear _ _ moves around the S _ _.

Other people think the E _ _ th is the center of the universe and some get upset by my ideas, but most people just ignore my work.

WHO AM I?

Glue **Astronomer TAB** Here

I am Danish and very interested in as _ _ ono _ y. I look at the sk _ a lot.

I discover that st _ _ s are not always in the same p _ _ it _ on in the sk _. I make new maps of the stars.

(There is a story that I have a pet moose in my house. What do you think?)

WHO AM I?

Glue **Astronomer TAB** Here

I am an Italian
ast _ _ no _ _ r.

I am interested in finding out how the pl _ _ _ ts and the M _ _ n move.

I use exp _ _ ime _ ts, ma _ _ em _ _ ics, and ph _ _ ics to prove that we live in a S _ n-cent _ _ ed solar system.

WHO AM I?

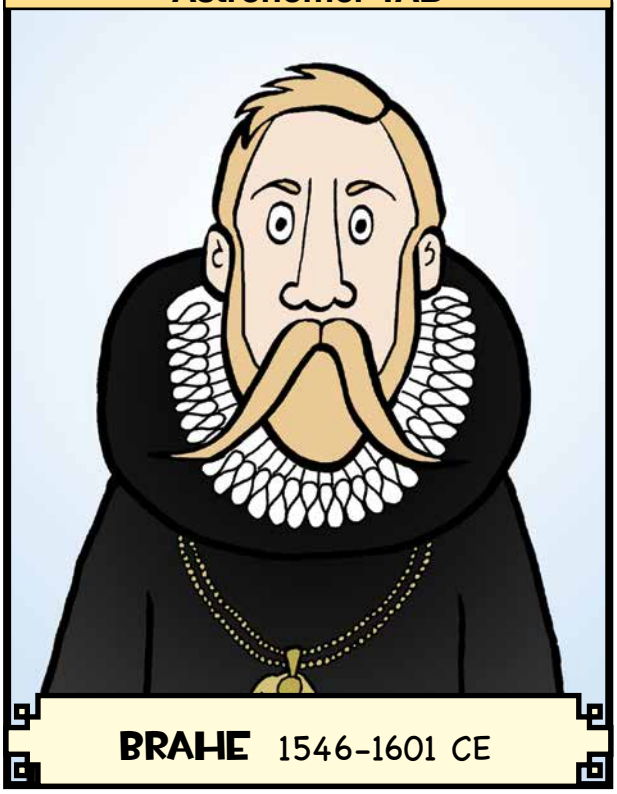
Do **YOU** think **astronomy** changes over time? Why or why not?

Do **YOU** think what we know about **astronomy** will be **different** in **50 years**? Why or why not? (Make notes on the back.)

Stuff to Cut Out for Chapter 1

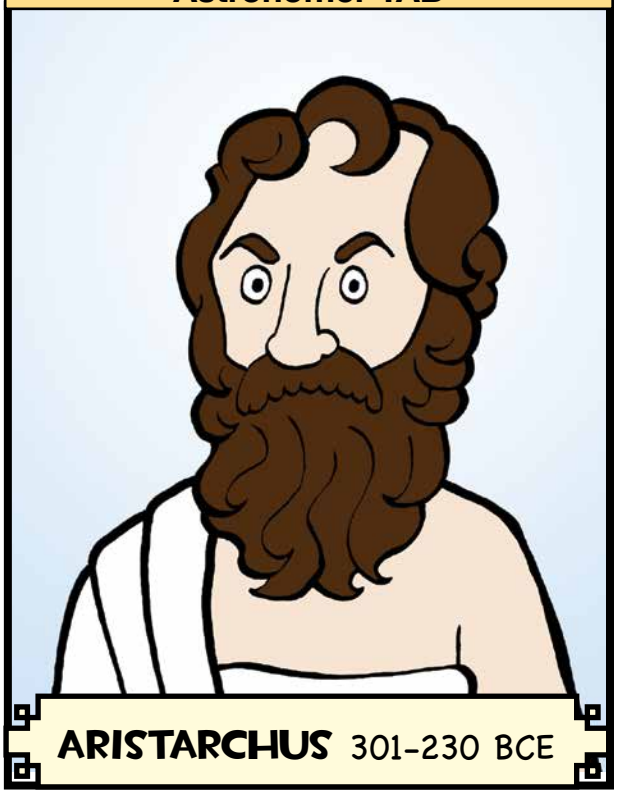
Cut out each piece on the solid outline. Match each astronomer to his description on page 2, and then glue the **yellow Astronomer TAB** to the **green GLUE Astronomer TAB HERE**.

Astronomer TAB



BRAHE 1546–1601 CE

Astronomer TAB



ARISTARCHUS 301–230 BCE

Astronomer TAB

GALILEO 1564–1642 CE

Astronomer TAB

COPERNICUS 1473–1543 CE

7. Earth's Neighborhood

7.1

Take a trip around our **SOLAR SYSTEM!**

Review

There are **2 different types** of pl _ _ _ _ _ in our **SOLAR SYSTEM**.

1. te _ _ _ _ _ _ial, or E _ _ _ _-like
2. Jo _ _ _ _, or J _ _ _ _ _ _-like

7.2

Glue **TAB 7.2** Here

M _ _ _ !

M _ _ _ is (warmer) (colder) than **EA** _ _ _ . (Circle your answer.)

Why do you think **M** _ _ _ does **not** have **plant and animal life?**

7.2

THE OUTER SOLAR SYSTEM

Draw a line from the planet to its description.

SA _ _ _ _

NE _ _ _ _ _

JU _ _ _ _ _

UR _ _ _ _

First planet in the outer solar system. More than 5 times farther from the Sun than Earth is.

Second planet in the outer solar system. Has rings.

Third planet in the outer solar system.

Fourth planet in the outer solar system. Almost 30 times farther from the Sun than Earth is.

TAB 7.2D

Punch holes on this edge.

Punch holes on this edge.

7.2 Put an **"I"** in front of the statements that are true for the **inner solar system**. Put an **"O"** in front of the statements that are true for the **outer solar system**.

7.2

____ Has 4 Jovian planets.

____ Its planets are small.

____ Its planets are made of rock.

____ Has the planets that are farthest from the Sun.

____ Its planets are far apart.

____ Its planets are very large.

____ Has the planets that are closest to the Sun.

____ Has 4 terrestrial planets.

____ Its planets are relatively close to each other.

____ Its planets are made of gas.

7.3 If we say **Earth** has a **PLANETARY YEAR** of **365 days**, what does this mean? _____

_____

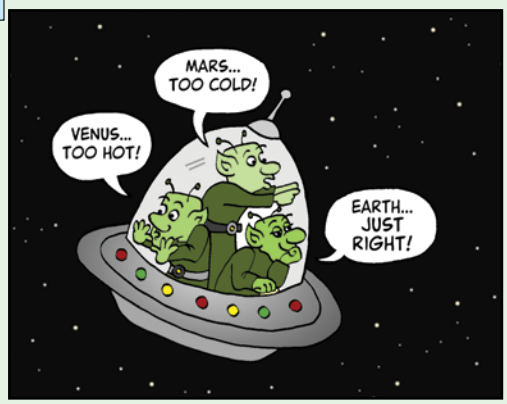
7.3

Challenge!

Each of the following planets is shown with the number of days it takes for it to make one orbit around the Sun. Use these days to number the planets according to their distance from the Sun, with **number 1** being the **closest**.

_____	**EARTH**	365
_____	**NEPTUNE**	60,200
_____	**VENUS**	225
_____	**JUPITER**	4,332
_____	**SATURN**	10,760
_____	**MARS**	687
_____	**URANUS**	30,700
_____	**MERCURY**	88

7.4



What makes **Earth** the **JUST RIGHT PLANET?**

_____

_____

_____

_____

_____

_____

_____

Stuff to Cut Out for Chapter 7

Cut out the piece below on its solid outline and match **yellow TAB 7.2** to the **green Glue TAB 7.2 Here** on page 13.

Glue **TAB 7.2A** Here

EA _ _ _ !

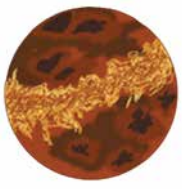
EA _ _ _ is where **we live!**

Write a little story about **EA** _ _ _ , its place in the solar system, and what makes it able to support life.

TAB 7.2

Cut out the piece below on its solid outline and match **yellow TAB 7.2A** to the **green Glue TAB 7.2A Here** on page 13.

Glue **TAB 7.2B** Here



VE _ _ _

VE _ _ _ has an atmosphere that is mostly:

(Circle one.) oxygen nitrogen carbon dioxide

VE _ _ _ is ____ (how many times) as far from the Sun as Mercury is.

(Circle one.)

3 times 10 times 5 times 2 times 50 times

Why is **VE** _ _ _ so **HOT?** _____

TAB 7.2A

More Stuff to Cut Out for Chapter 7

Cut out the piece below on its solid outline and match **yellow TAB 7.2B** to the **green Glue TAB 7.2B Here** on page 13.

Glue **TAB 7.2C** Here

TAB 7.2B

ME _ _ _ _ _

ME _ _ _ _ _ is the **closest** **pl** _ _ _ _ to the **S** _ _ .

TRUE!

FALSE!

ME _ _ _ _ _ gets both very, very hot and very, very cold.

YES!

NO!

Why? _____

_____

_____

_____

Cut out the piece below on its solid outline and match **yellow TAB 7.2C** to the **green Glue TAB 7.2C Here** on page 13.

TAB 7.2C

TE _ _ _ _ _ _ **IAL** **P**_ _ _ _ _ **S**

They're **E** _ _ _ _-like!
(See Book 1.)

This means they:
(Check ✓ your answers.)

Have volcanoes, mountains, and craters.

Are very large.

Are made mostly of gas.

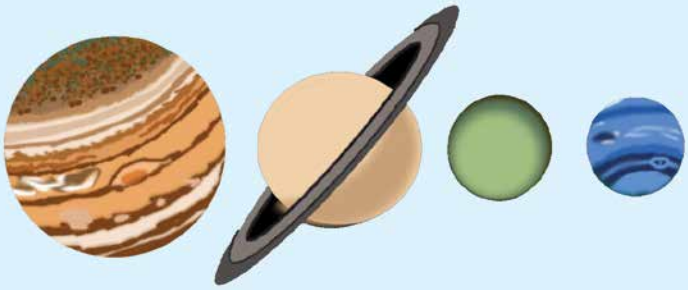
Are made of rock and minerals.

Even More Stuff to Cut Out for Chapter 7

Cut out the piece below on its solid outline and match **blue TAB 7.2D** to the **pink Glue TAB 7.2D Here** on page 13.

JO _ _ _ _ P_ _ _ _ _ S

They're **J _ _ _ _ _ _-like!**
(See Book 1.)



What are **2** things that are true for **Jo _ _ _ _** **pl _ _ _ _ _ ?**

1. _____

_____

2. _____

_____

TAB 7.2D

GRAVITAS PUBLICATIONS

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Focus On Elementary Astronomy 3rd Edition Midterm 1
Chapters 1-6, 18 questions, 10 points each

1. Because they can travel to faraway solar systems, astronomers use tools to study objects in space. (10 points)
   - ○ True
   - ○ False

2. What type of cosmos do we live in? (10 points)
   - ○ An Earth-centered cosmos.
   - ○ A Moon-centered cosmos.
   - ○ A Sun-centered cosmos.

3. Early civilizations were not able to study the stars because they did not have modern tools. (10 points)
   - ○ True
   - ○ False

Focus On Elementary Astronomy 3rd Edition Midterm 2
Chapters 7-12, 18 questions, 10 points each

1. Match the term with its description. (10 points)

_____ Outer solar system

_____ Planetary year

_____ The planet farthest from the Sun

_____ Solar system

_____ The smallest planet in our solar system

_____ Orbit

_____ Inner solar system

a. Neptune
b. Jupiter, Saturn, Uranus, Neptune
c. The number of days it takes a planet to orbit the Sun
d. Mercury, Venus, Earth, Mars
e. Mercury
f. A sun and the planets and other objects that travel around it
g. The path of a planet around a sun

2. Life could still exist if Earth were a lot closer to or farther from the Sun. (10 points)
   - ○ True
   - ○ False

3. The planets in our solar system... (Check all that apply.) (10 points)
   - [ ] All orbit the Sun.
   - [ ] Have planetary orbits that cross.
   - [ ] Are all very similar.
   - [ ] Have different planetary years.
   - [ ] Move in nearly circular orbits.

Focus On Elementary Astronomy 3rd Edition, Final Quiz
Chapters 1-12, 24 questions, 10 points each

1. Because they have modern tools, astronomers seldom need to use observation, math, and physics to study space. (10 points)
   - ○ True
   - ○ False

2. What did Copernicus use to show that Earth moves around the Sun? (10 points)
   - ○ A telescope
   - ○ A spacecraft
   - ○ A map of the stars
   - ○ Mathematics
   - ○ Chemistry

13. Check the statements that are true. (10 points)
   - [ ] Earth is the right distance from the Sun for life to exist.
   - [ ] Mars is farther from the Sun than Earth.
   - [ ] Mercury is close to the Sun, making it a hot planet.
   - [ ] Jupiter has rings.
   - [ ] Venus is too cold to support life.
   - [ ] Neptune has the longest planetary year becuse it is farthest from the Sun.
   - [ ] An orbit is the path the Sun takes around Earth.

14. Put the planets in order according to their distance from the Sun starting with the closest (10 points)

   _____ Neptune
   _____ Mars
   _____ Mercury
   _____ Jupiter
   _____ Venus
   _____ Earth
   _____ Uranus

Answer Sheet

Focus On Elementary Astronomy 3rd Edition Midterm 1
Chapters 1-6, 18 questions, 10 points each

1. False
2. A Sun-centered cosmos.
3. False

Focus On Elementary Astronomy 3rd Edition Midterm 2
Chapters 7-12, 18 questions, 10 points each

1. b, c, a, f, e, g, d
2. False
3. All orbit the Sun., Have different planetary years., Move in nearly circular orbits.

Focus On Elementary Astronomy 3rd Edition, Final Quiz
Chapters 1-12, 24 questions, 10 points each

1. False
2. Mathematics

13. Earth is the right distance from the Sun for life to exist., Mars is farther from the Sun than Earth., Mercury is close to the Sun, making it a hot planet., Neptune has the longest planetary year becuse it is farthest from the Sun.
14. 8, 4, 1, 5, 2, 3, 7, 6

FOCUS ON

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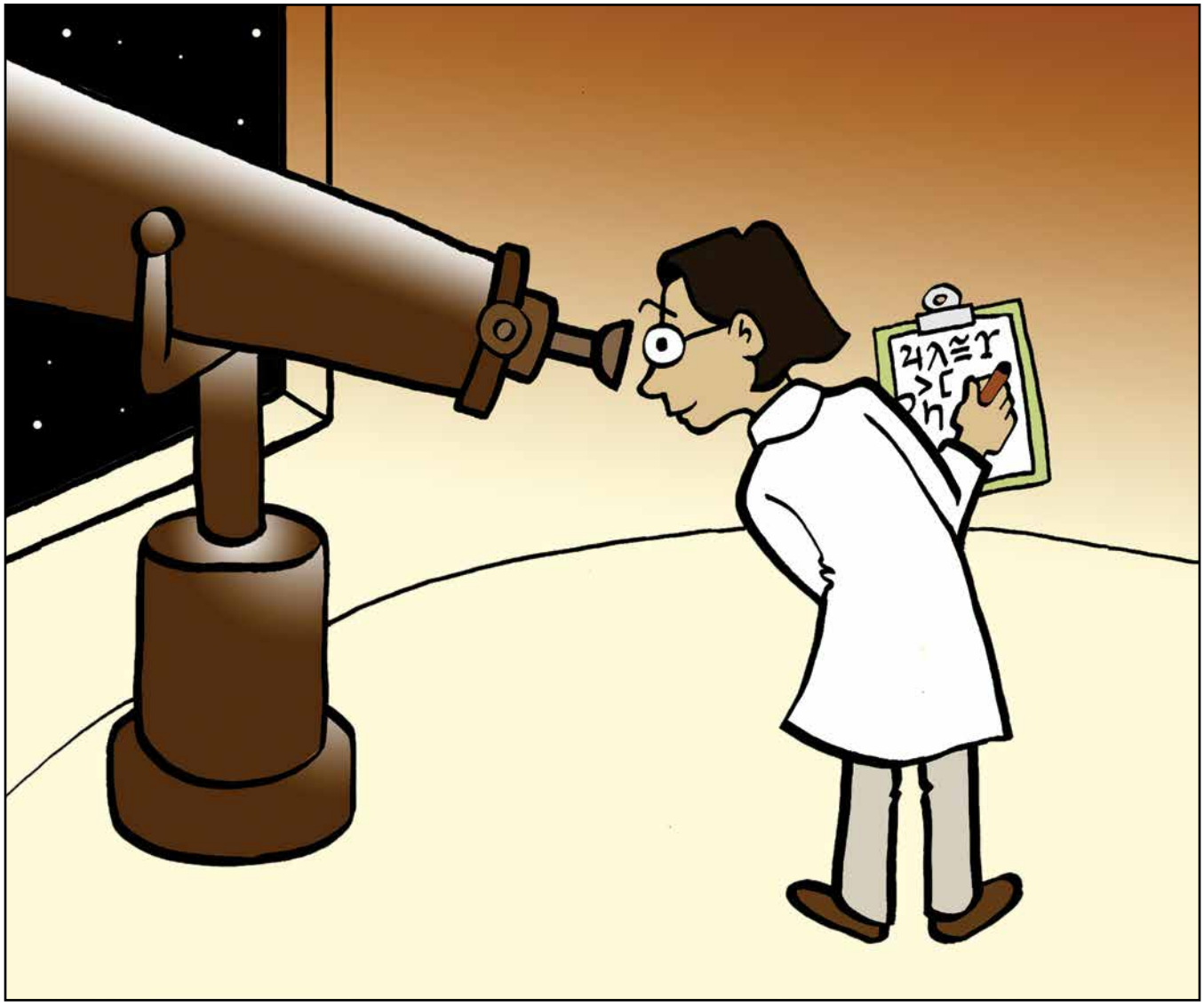

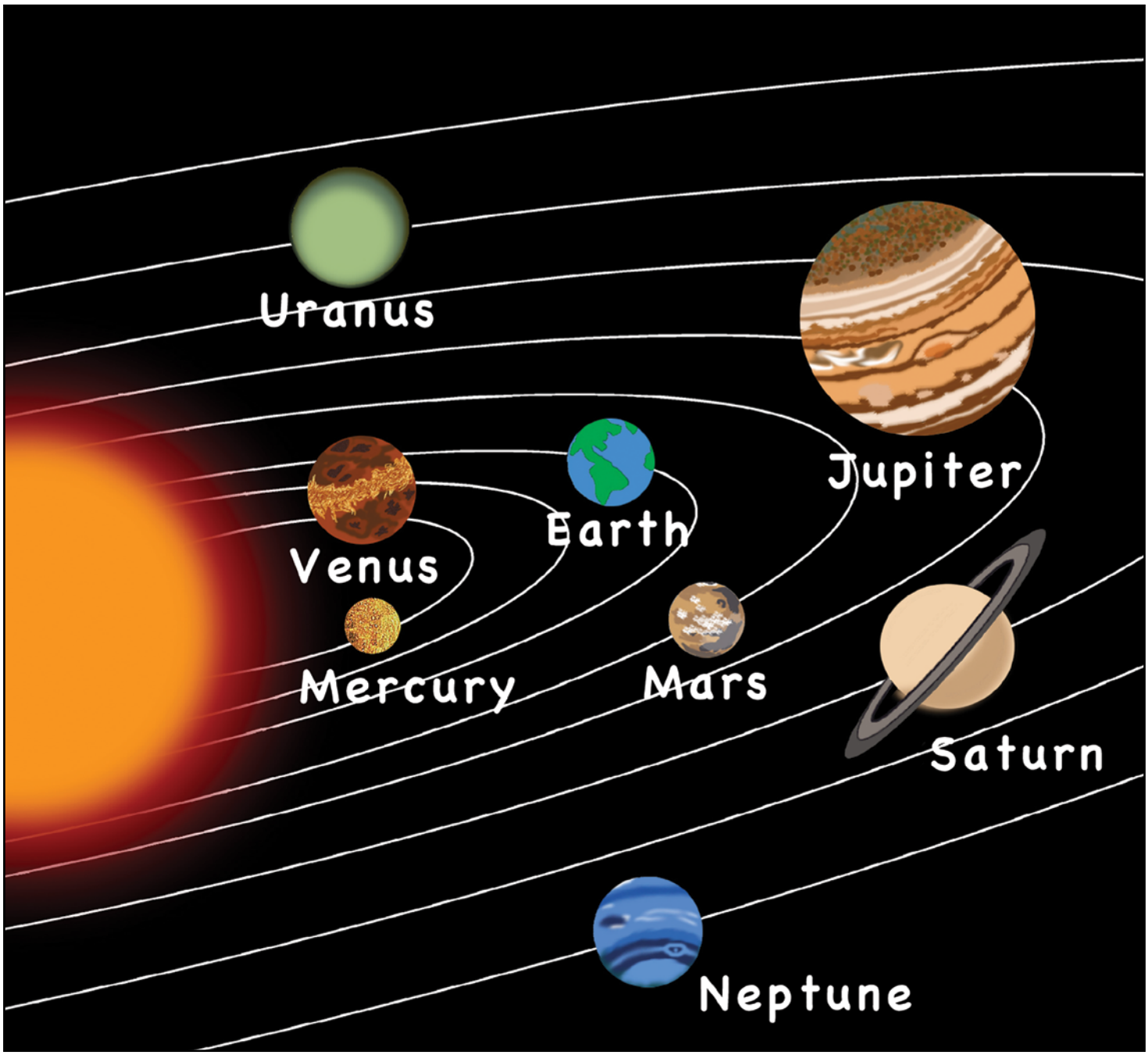
Uranus
Jupiter
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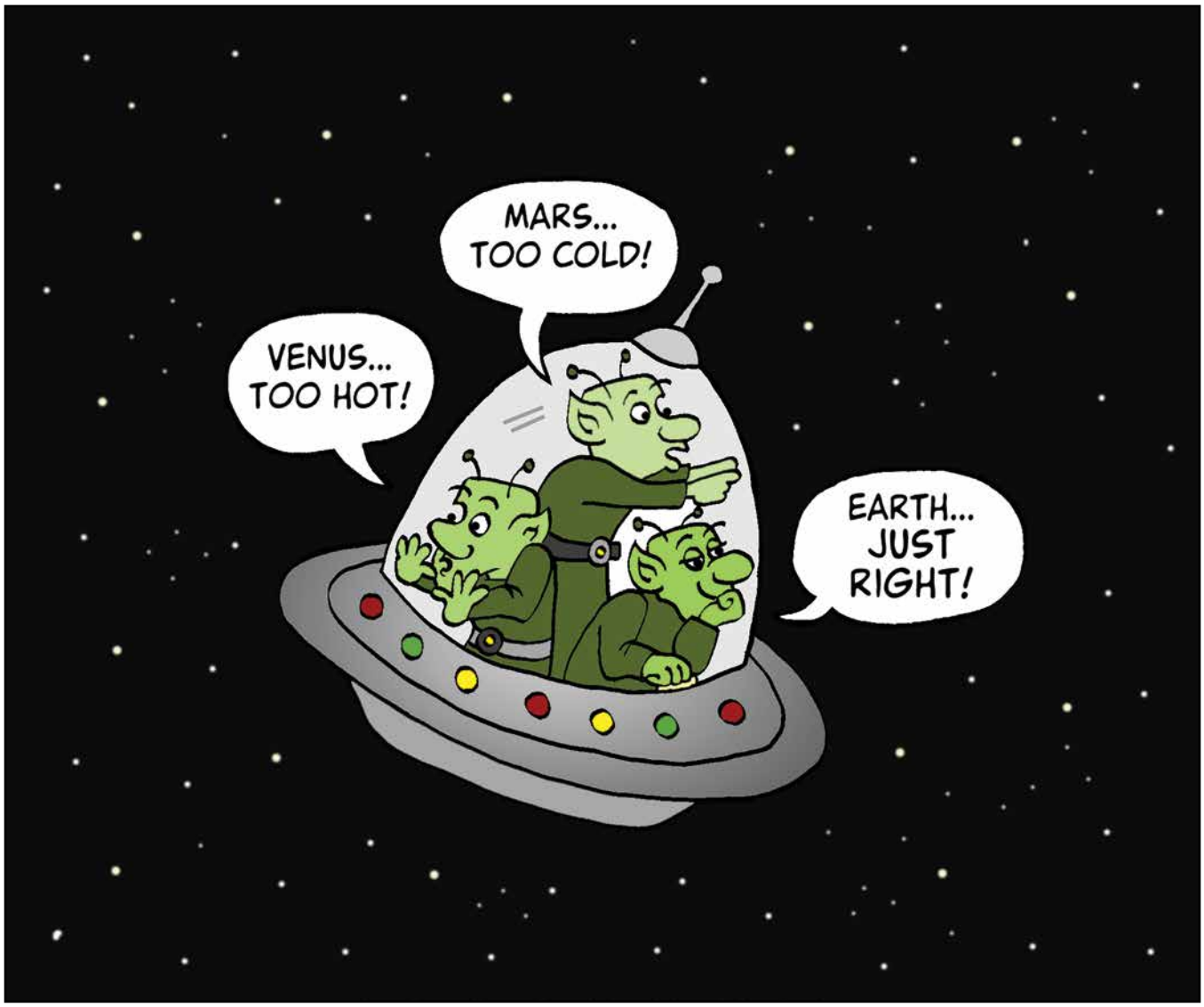
Mars
Saturn
Neptune


MARS... TOO COLD!
VENUS... TOO HOT!
EARTH... JUST RIGHT!

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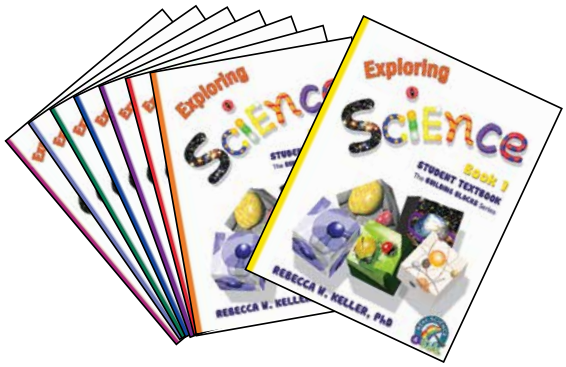

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