LIFEPAC®

SCIENCE

STUDENT BOOK

7th Grade | Unit 3

Alpha Omega PUBLICATIONS

SCIENCE 703

Earth In Space: Part 1

LIFEPAC Test is located in the center of the booklet. Please remove before starting the unit.

Author:
Betty Buzitis

Editor-In-Chief:
Richard W. Wheeler, M.A.Ed
Editor:
Lee H. Dunning, M.S.T., M.S.Ed.
Consulting Editor:
Harold Wengert, Ed.D
Revision Editor:
Alan Christopherson, M.S

Westover Studios Design Team:
Phillip Pettet, Creative Lead
Teresa Davis, DTP Lead
Nick Castro
Andi Graham
Jerry Wingo
Don Lechner

804 N. 2nd Ave. E.
Rock Rapids, IA 51246-1759

Earth In Space: Part 1

Introduction

"In the beginning God created the heaven and the earth...And God said, Let there be light: and there was light. And God saw the light, that it was good: and God divided the light from the darkness. And God called the light Day, and the darkness he called Night....And God said, Let there be lights in the firmament of the heaven to divide the day from the night; and let them be for signs, and for seasons, and for days, and years: And let them be for lights in the firmament of the heaven to give light upon the earth: and it was so. And God made two great lights; the greater light to rule the day, and the lesser light to rule the night: he made the stars also. And God set them in the firmament of the heaven to give light upon the earth, and to rule over the day and over the night, and to divide the light from the darkness: and God saw that it was good. And the evening and the morning were the fourth day." (Genesis 1:1, 3-5, 14-19)

God created the earth and the moon and the sun and all the stars in the heavens. God put each one in its place and set it in motion. God created the universe and established the rules and laws by which it moves. As man has observed and studied the movements in the heavens, he has discovered the wonders of God's creation and the laws which keep them functioning smoothly.

In this LIFEPAC® you will learn about the earth in space, about the ancients whose observations laid the groundwork for astronomy, about the men who discovered God's laws for the universe, and about the heavenly bodies God created.

Objectives

Read these objectives. The objectives tell you what you will be able to do when you have successfully completed this LIFEPAC. When you have finished this LIFEPAC, you should be able to:

1. Describe the motions seen in the heavens.
2. Describe and illustrate the geocentric theory.
3. Name some of the constellations.
4. Explain why the "wanderers" created problems in the geocentric theory.
5. Define *meteor*, *meteoroid*, and *meteorite*.
6. Identify and describe refracting and reflecting telescopes.
7. List the major contributions of early astronomers.
8. Identify flaws in the geocentric (transparent-globe) theory.
9. Describe and illustrate the heliocentric theory.
10. Construct and describe the characteristics of an ellipse.
11. Name Kepler's Laws of Planetary Motion.
12. Write an illustration of Newton's Law of Universal Gravitation.
13. Identify the tools of the astronomer and name their uses.
14. Define celestial terms.
15. Construct and use an astrolabe.

1. STARGAZING

To a great extent, the way we interpret our observations depends on our point of view. Because modern communications media provide us with many points of view, we have a better understanding of the natural world than our ancestors had. We no longer rely on legends to explain the movements of sun, moon, and stars. We know instead that they are part of a vast system that is far more wonderful than any legend.

We as Christians do not seek direction for our lives and predictions of the future in the stars, as the astrologers of old did. The stars hold a different kind of mystery today—the mystery of blazing nuclear furnaces scattered in the vastness of space. We are not frightened by eclipses and comets. Scientists have discovered the physical laws that govern such dramatic **celestial** events, and we have access to their explanations.

As you study this section you will learn that the ancient peoples thought of the earth as the center of the universe. You will look at the patterns of the stars. You will think about the "wanderers"—those "stars" that do not behave normally—and you will read what the Bible has to say about the stars.

SECTION OBJECTIVES

Review these objectives. When you have completed this section, you should be able to:

1. Describe the motions seen in the heavens.
2. Describe and illustrate the geocentric theory.
3. Name some of the constellations.
4. Explain why the "wanderers" created problems in the geocentric theory.
5. Define *meteor*, *meteoroid*, and *meteorite*.

VOCABULARY

Study these words to enhance your learning success in this section.

apparent (u par' unt). According to appearances; that which appears to be.

axis (ak' sis). A straight line about which an object turns or seems to turn.

celestial (su les' chul). Of the sky.

constellation (kon' stu' lā shun). A group of stars having a certain pattern or shape.

cosmology (koz mol' u jē). The science or theory of the whole universe.

meteor (mē' te ôr). A mass of rock or metal that enters earth's atmosphere from space.

meteoric (mē' tē ôr' ik). Having to do with meteors.

meteorite (mē' tē u rīt). A mass of rock or metal that has reached earth from space.

meteoritic (mē' tē u rit' ik). Having to do with meteorites.

meteoroid (mē' tē u roid). Body of rock or metal traveling through space.

Milky Way (mil′ kē wā). A broad band of faint light that stretches across the sky at night. Our solar system is part of the Milky Way Galaxy. The Milky Way is made up of billions of stars.

myth (mith). Legend or story that usually attempts to account for something in nature.

mythology (mi thol′ u jē). A body of myths relating to a particular country.

North Star (nôrth stär). The bright star directly above the North Pole.

planet (plan′ it). One of the heavenly bodies (except comets and meteors) that move around the sun in elliptical orbits.

retrograde (ret′ ru grād). Moving backward.

solar system (so′ lur sis′ tum). The sun and all its planets, satellites, comets, and other heavenly bodies that revolve around it.

summer triangle (sum′ ur trī′ ang gul). A group of three bright stars: Vega, Deneb, and Altair, especially prominent in the summer sky.

wanderer (won′ dur ur). The name given to the planets by the ancients because they appeared to wander among the stars.

zenith (zē′ nith). Point in heavens directly overhead. The opposite of nadir.

zodiac (zō′ dē ak). An imaginary belt in the heavens extending about 8 degrees on both sides of the path of the sun and including the paths of major planets and the moon.

Note: *All vocabulary words in this LIFEPAC appear in* **boldface** *print the first time they are used. If you are not sure of the meaning when you are reading, study the definitions given.*

Pronunciation Key: h**a**t, **ā**ge, c**ã**re, f**ä**r; l**e**t, **ē**qual, t**ė**rm; **i**t, **ī**ce; h**o**t, **ō**pen, **ô**rder; **oi**l; **ou**t; c**u**p, p**u̇**t, r**ü**le; **ch**ild; lo**ng**; **th**in; /ŦH/ for **th**en; /zh/ for mea**s**ure; /u/ represents /a/ in **a**bout, /e/ in tak**e**n, /i/ in penc**i**l, /o/ in lem**o**n, and /u/ in circ**u**s.

THE ANCIENTS

Before electric lights, people could easily see the night sky. In ancient times, man would gaze at the magnificent sky. In his mind he imagined the outlines of people and animals. The early Greeks gave names to these star-shaped figures from their religious and cultural stories. These stories are known today as **myths**.

For centuries some men have looked up at the night sky and have wondered whether those numberless specks could affect their lives. People who studied the stars were called astrologers. Astrology was part of the Babylonian religion. To them the **zodiac** was a sacred pathway for the sun and the planets. Others have continued to see in the myriads of stars the mighty hand of God in creation and in preservation of design and order in the universe. The Psalmist wrote (Psalm 19:1) "The heavens declare the glory of God; and the firmament sheweth his handywork."

Stars became familiar signposts in the sky to sailors and travelers. Some of the first inventions were used by sailors to find their way in the vast oceans.

Ancient peoples told time by the sky. The sun and stars marked the time of day and night. The moon measured the month. Stars marked the year and its seasons. Observers noticed that stars set about four minutes earlier each night and concluded that the star day is four minutes shorter than the sun day.

As people studied the sky they observed at least four different motions:

1. Most stars rise in the east and set in the west,
2. Both the sun and moon rise in the east and set in the west,
3. The sun rises farther north in summer and farther south in winter, and
4. The moon does not always rise at the same time.

Complete these exercises.

1.1 Write at least four different motions that can be observed in the sky.

a. ________________ b. ________________

c. ________________ d. ________________

1.2 List three ways the ancients told time by the sky.

a. ________________ b. ________________

c. ________________

1.3 Name two ways that the stars aided ancient man.

a. ________________

b. ________________

1.4 How did the Psalmist react to his stargazing?

____

____

____

1.5 Locate an identifiable group of stars that you will recognize each time you look for it. On the first line of the table, record the data and the time the stars are directly over some feature such as a church spire, a flagpole, or one wall of a building. Go to the same observation post about ten days later and note the time the same group is in the same position. Record the date and time of your second observation on the second line. Make the same observation ten days later and again ten days after that. Record the dates and times on the table.

Observation	Date	Observation Time
First observation		
Ten days later		
Ten days later		
Ten days later		

1.6 What do you conclude from this thirty-day observation?

____

____

____

____

TEACHER CHECK __________ initials __________ date

CONSTELLATIONS

The imaginary figures that the ancients observed are star groups that seem to travel together in space.

Do you think you are sitting still in your chair right now? If you could look at yourself from outer space, you would see that you are turning a giant somersault once every twenty-four hours as the earth turns on its **axis** at about sixteen hundred kilometers per hour. You are also making a circle around the sun at the speed of 107,200 kilometers per hour. Also, our **solar system** revolves around the center of our galaxy, the **Milky Way**, at the rate of 69,200 kilometers an hour. The whole galaxy is traveling toward the star Vega at about twenty kilometers per second. So you see, you are definitely not sitting still in your chair.

The Milky Way is the home of our solar system. On an early summer evening you can see the cloud of stars stretching across the sky. You can see a great number of stars. With a telescope you can see many more stars. People in ancient times thought that all stars were part of the Milky Way. Today we know of many other galaxies similar to the Milky Way.

To study the Milky Way as a whole is difficult for scientists on the earth because we are located within it. We cannot look at the Milky Way galaxy from the outside to observe its size and shape. It is so large that light travels about one hundred thousand years from one side to the other. Outer space is so staggering that a unit of measurement was invented to express the great distances. A *light year* represents the distance that light travels in one year. One light year is almost 6 trillion miles. The nearest star, other than the sun, is Proxima Centauri, which is one of 3 stars in the Alpha Centauri system. It is 4.3 light years away.

Calculate a light year.

1.7 Light travels at a speed of 186,000 miles a second. Calculate the distance light travels in a year.

Complete these activities.

1.8 Suppose a star is 300 light years away. The number tells you the distance to the star. It also tells you that the light you are seeing started on its journey from the star 300 years ago. If a star that is nine light years away blew up today, when would we know about it?

____

1.9 Explain your answer in 1.8. ____

____

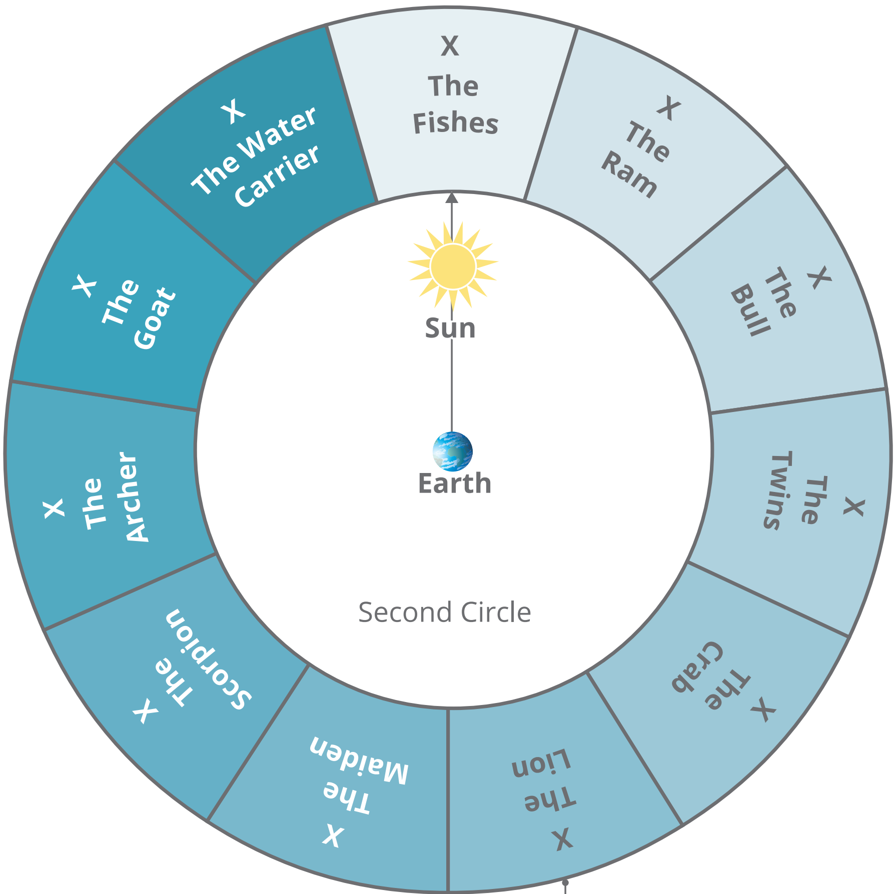
____

A set of twelve **constellations** in the sky is called the zodiac. The zodiac constellations can be seen in the part of the sky traveled by the sun and the moon. Different ones are visible at different seasons of the year. The following activity model will help you understand why.

View 703 Constellations, from the Grade 7 SCIENCE EXPERIMENTS Video

Complete these activities.

1.10 Cut a cardboard circle about twenty-five centimeters in diameter (twice the diameter of the one shown here). Mark an X at each point where an hour would be on a clock face. At each X write the name of a zodiac constellation as shown in the figure.



Draw and cut out another circle about twenty centimeters in diameter. At the edge of this circle draw a small picture of the sun. Fasten the two circles together with a paper fastener through their centers. The paper fastener will represent the earth. Draw a line from the earth through the sun.

1.11 Complete the following chart by writing in Column 1 the name of the constellation that is in the line with the earth and sun. In Column 2 write the name of the constellation that would set just after the sun sets. Turn the constellation circle *counterclockwise* one constellation. Each time note which constellation is in line with the earth and the sun and which one would set just after sunset each time.

Constellations Experiment

	Column 1 Constellation in Line with Earth and Sun	Column 2 Next Constellation to Set
a.		
b.		
c.		
d.		
e.		
f.		
g.		
h.		
i.		
j.		
k.		
l.		

Star charts have been developed to help follow the ever-changing picture formed by the heavenly bodies. Each season and hemisphere has its own pattern of stars. Once you learn to recognize the principal constellations of each season, you can use them as a guide along with your star chart to find other stars. The charts in this unit are for the northern hemisphere.

Early evening darkness is the best time for stargazing. Hold the star chart over your head. Make sure that north on your chart is lined up with true north. Use a flashlight covered with red cellophane to read your chart and compass. White light deadens the ability of your eyes to see the stars.

The winter sky. Of all the months of the year, February is best for stargazing. It has an exciting parade of stars.

Orion, the hunter, is one of the best- known constellations in the sky. Three stars make up Orion's belt. Betelgeuse, a giant red star, marks his right shoulder. Betelgeuse is one of the largest stars man has found. Its diameter is 400 million miles. Rigel, a brilliant blue star, is positioned at Orion's left knee. He appears to be holding his right arm over his head. If you imagine a line drawn along Orion's belt toward the southeast, you will find the star, Sirius, the dog star. Sirius is the second brightest star in the sky. Sirius is the nose of one of Orion's hunting dogs, Canis Major.

The imaginary line made by Orion's belt toward the northwest passes just under the horn of Taurus, the bull. The horns of Taurus form a V-shape in the sky and contain the star, Aldebaran. Pleiades, the seven sisters, are located on the shoulder of Taurus. Usually only six stars can readily be seen; but when viewed with a telescope, many more stars can be seen.

The horns of Taurus point toward two stars located above Orion's second dog, Canis Minor. These stars are the Gemini twins, Pollux and Castor.[1]

[1] This LIFEPAC has an appendix of constellation names and descriptions.

SELF TEST 1

Complete the statements (each answer, 3 points).

1.01 The star day is shorter than the sun day by ________________ minutes.

1.02 If you were standing at the ________________ , all the stars you see would rise and set.

1.03 Early astronomers believed that the ________________ was the center of the universe.

1.04 The Greek scientist who first theorized that the sun and planets revolved around the earth was ________________ .

1.05 Ptolemy's "improvement" of Aristotle's cosmology attempted to explain the odd movements of the ________________ .

1.06 The ancients nicknamed those celestial objects with the odd movements " ________________ ."

1.07 Pieces of rock or metal moving through space are called ________________________ .

1.08 Pieces of rock or metal that enter the earth's atmosphere are called ________________ .

1.09 Pieces of rock and metal that have struck the earth's surface are called ________________ .

Complete the activities (each answer, 3 points).

1.010 List three ways the ancients told time by the sky.

a. ____

b. ____

c. ____

1.011 List three apparent motions of the celestial objects.

a. ____

b. ____

c. ____

1.012 List three of the motions we make as we ride the earth through space.

a. ____

b. ____

c. ____

Complete these activities (each answer, 5 points).

1.013 Make a drawing of the geocentric theory proposed by Aristotle.

1.014 Make a drawing to show how Ptolemy modified Aristotle's cosmology (geocentric theory).

Match the terms (each answer, 2 points).

1.015	________	light year	a.	measure of distance
1.016	________	Milky Way	b.	of the sky
1.017	________	constellation	c.	winter constellation
1.018	________	Orion	d.	summer constellation
1.019	________	Polaris	e.	home of the solar system
1.020	________	Cygnus	f.	circumpolar constellation
1.021	________	Cassiopeia	g.	path of Polaris
1.022	________	cosmology	h.	star pattern
1.023	________	celestial	i.	theory of the whole universe
1.024	________	wanderers	j.	planets
1.025	________	zodiac	k.	twelve constellations in the sky
			l.	North Star
			m.	measure of time

Complete these activities (each numbered answer, 5 points).

1.026 Explain why the "wanderers" created a problem for those who believed the geocentric theory.

____

____

1.027 Name the three stars in the summer triangle.

a. ______________________ b. ______________________

c. ______________________

77/96 **SCORE** ____________ **TEACHER** ____________ ____________
initials date

SCI0703 – May ‘14 Printing

ISBN 978-0-86717-763-3

9 780867 177633

Alpha Omega
PUBLICATIONS

804 N. 2nd Ave. E.
Rock Rapids, IA 51246-1759

800-622-3070
www.aop.com