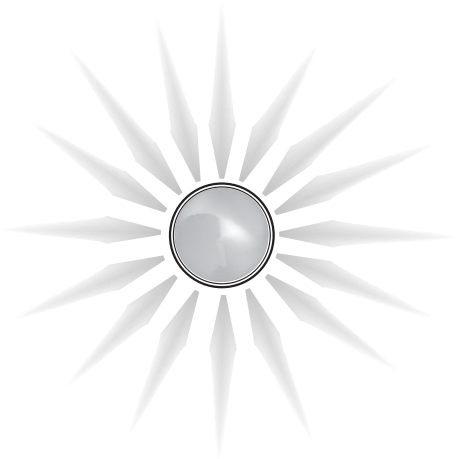


Exploring Earth, Sun, and Moon

Teacher's Guide



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National Standards Correlations

Benchmarks for Science Literacy (Project 2061 – AAAS), Grades 3–5

By the end of the fifth grade, students should know that:

The Universe (4A):

- Things on or near the earth are pulled toward it by the earth's gravity.
- Like all planets and stars, the earth is approximately spherical in shape. The rotation of the earth on its axis every 24 hours produces the night-and-day cycle. To people on Earth, this turning of the planet makes it seem as though the sun, moon, planets, and stars are orbiting the earth once a day.

National Science Education Standards (Content Standards: K–4, National Academy of Sciences) Earth and Space Science – Content Standard D:

As a result of their activities in grades K-4, all students should develop an understanding of:

- Objects in the sky have patterns of movement. The sun, for example, appears to move across the sky in the same way every day, but its path changes slowly over the seasons. The moon moves across the sky on a daily basis much like the sun. The observable shape of the moon changes from day to day in a cycle that lasts about a month.

Student Learning Objectives

Upon viewing the video and completing the enclosed student activities, students will be able to do the following:

- Cite some of the characteristics of Earth which make it unique in our solar system, including: Earth's moderate temperature, the abundance of liquid water, and the presence of oxygen in the atmosphere.
- Define gravity as the force of attraction between two objects in space. Also, state that gravity is the force which pulls objects toward the center of Earth.
- Understand that the force of gravity holds Earth and the other planets in orbit around the sun.
- State the importance of the sun, and the fact that life as we know it depends on the sun.
- Explain that the sun is made up of very hot gases with temperatures in the millions of degrees.
- State some of the characteristics of the moon including the fact that it is about $\frac{1}{4}$ the size of Earth's diameter, has a dusty surface with plains and mountains, and has great temperature fluctuations.
- Understand that the moon does not generate its own light, but instead reflects light from the sun to Earth.
- Explain why the moon appears to have different shapes throughout the course of the month.
- Identify the following phases of the moon: new moon, first quarter, full moon, and third quarter.
- Differentiate between the processes of waxing and waning.
- Create separate diagrams of a lunar eclipse and a solar eclipse. In each diagram label the sun, Earth, moon, and shadow.
- Explain that tides involve the regular rise and fall of ocean levels about every $12\frac{1}{2}$ hours.
- Understand that the gravitational interaction of the moon and Earth is responsible for the tides.

Assessment

Preliminary Test (p. 14–15):

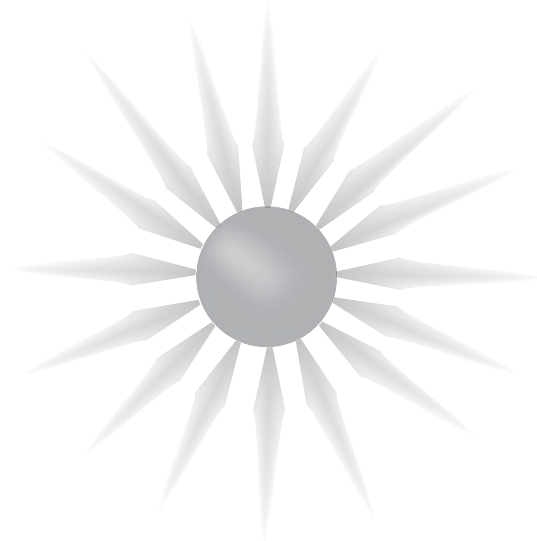
The Preliminary Test is an assessment tool designed to gain an understanding of students' preexisting knowledge. It can also be used as a benchmark upon which to assess student progress based on the objectives stated on the previous pages.

Post-Test (p. 16–17):

The Post-Test can be utilized as an assessment tool following student completion of the program and student activities. The results of the Post-Test can be compared against the results of the Preliminary Test to assess student progress.

Video Review (p. 18):

The Video Review can be used as an assessment tool or as a student activity. There are two sections. The first part contains questions displayed during the program. The second part consists of a five question video quiz to be answered at the end of the video.



Introducing the Program

Before showing the video to students, give them the following assignment: Describe the characteristics of planet Earth to an “alien” from another solar system who has never seen Earth. Tell students they need to describe Earth’s surface characteristics, atmosphere, life forms, and general appearance. Have students work in small groups to write a one page description of planet Earth.

After completing the assignment, have a member of each group read the report to the class. After each report is read, list some of Earth’s unique characteristics on the board. Tell students to pay close attention to learn more about the characteristics of Earth as well as our moon and sun. After the conclusion of the video, discuss some of the ways Earth is different from the moon and the sun.

Program Viewing Suggestions

The student master “Video Review” is provided (p. 18) for distribution to students. You may choose to have your students complete this Master while viewing the program or do so upon its conclusion.

The program is approximately 14 minutes in length and includes a five-question video quiz. Answers are not provided to the Video Quiz in the video, but are included in this guide on page 12. You may choose to grade student quizzes as an assessment tool or to review the answers in class.

The video is content-rich with numerous vocabulary words. For this reason you may want to periodically stop the video to review and discuss new terminology and concepts.

Video Script

1. As you know, we live on the third planet from the sun – planet Earth.
2. You are probably pretty familiar with the area of earth near your home and school.
3. But what about the rest of the planet? What makes Earth unique and different from the other planets in our solar system?
4. And how is Earth different from the sun and the moon?
5. You may not realize it, but both the sun and moon are very important to our existence.
6. Not only does the sun provide us with light,...
7. ...but it also plays a very important role in the force of gravity, which we will discuss later.
8. The moon, too, plays an important function, specifically in the formation of tides in the oceans.
9. During the next few minutes we are going to investigate the characteristics of Earth, our sun, and the moon.
10. And, we are going to take a look at how they interact with each other,
11. as we explore the exciting properties and movements of the Earth, sun, and moon.
- 12. Graphic Transition – Planet Earth**
13. While humans have inhabited Earth for thousands of years, we are still learning new things about our planet all the time.
14. One thing we have come to realize is that Earth is unique in our solar system.
15. What makes it unique? Unlike the other planets in our solar system, Earth has abundant liquid water.
16. In fact, 70% of Earth's surface is covered by oceans and lakes.
17. The abundance of liquid water may be the single most important factor enabling life to exist on the planet.
18. Another important factor is Earth's temperature. It is moderate, and does not wildly fluctuate as on other planets.
19. And, Earth's atmosphere contains some very important gases including carbon dioxide and oxygen.
20. Earth also experiences something called gravity. Let's take a look at this important force.
- 21. Graphic Transition – Earth in Space**
- 22. You Decide!** What holds the planets in orbit?
23. That is right, an extremely important force called gravity holds the planets, including Earth, in orbit.
24. Gravity is the force of attraction between objects such as the sun and the planets. Without gravity the planets would spin off into space.
25. The force of gravity is also at work here on Earth.
26. The force of gravity pulls objects toward the center of the Earth.
27. And when you jump off something, gravity pulls your body downward.
28. A gravitational force also exists between the Earth and our moon. We will discuss this in a few minutes.

Video Script

29. But first, let us discuss the sun.

30. Graphic Transition – The Sun

31. The sun provides us with light and heat.

32. Without the sun, life as we know it would not exist.

33. You Compare! How big is the sun compared to Earth?

34. The sun is huge. Nearly one million planets the size of Earth could fit inside the sun!

35. The sun in our solar system is actually a star. And it happens to be our nearest star.

36. Like many other stars in the galaxy, it is made up of very hot gases.

37. The gases on the sun's outer surface, called the corona, can reach a temperature of 1.7 million degrees!

38. And in the center of the sun, called the core, temperatures exceed 15 million degrees Celsius. The energy generated by the sun is so intense it can give you a sunburn even though you are 150,000,000 kilometers away, here on Earth!

39. Graphic Transition – Earth's Moon

40. Earth's moon is about 380,000 kilometers from us, which is about 100 times the distance from New York to Los Angeles.

41. On July 20, 1969 the first humans landed on the moon after traveling for three days from Earth.

42. Since that time there have been several expeditions to the moon, and we have learned a great deal about it. The moon's diameter is about $\frac{1}{4}$ the size of Earth's diameter, and has less than 2% of Earth's mass.

43. There is no water on the moon, and no life on the moon.

44. The surface is dotted with a large number of craters – mostly the result of meteorites impacting the lunar surface.

45. Plains and mountains make up the dusty landscape.

46. Due to the fact that it does not have a well developed atmosphere, the moon experiences great temperature fluctuations from very hot to very cold.

47. In short, the moon is a dry, air less, and lifeless object.

48. However, it does have a big influence on planet Earth.

49. Graphic Transition – Phases of the Moon

50. You Decide! What is the source of the moon's light?

51. The moon does not generate its own light,...

52. ...but instead reflects light from the sun.

53. So when you see the moon, it is actually reflecting light back to Earth from the sun.

54. Have you ever noticed that the moon appears to have many different shapes?

55. The moon is not changing its shape, but instead different sections of the moon are lit by the sun, and reflect these different shapes back to Earth.

56. The different shapes we see are called phases of the moon, and are a result of the moon's revolution around Earth, which takes a little less than 28 days.

57. For example, this is the position of the Earth, moon, and sun in the first phase of the roughly four week cycle in which moon orbits Earth.

Video Script

58. We cannot see the moon because the sun and the moon are lined up in the same direction. This is called a new moon.
59. As the moon revolves around Earth, sunlight begins to illuminate the side we can see. This first appears as a small crescent.
60. Each day the lighted area of the moon appears to grow bigger – this is called waxing.
61. When half of the moon appears this is called the first quarter phase.
62. The moon continues to orbit and wax until about two weeks after the new moon, and a full moon appears.
63. In a full moon Earth is between the sun and the moon.
64. In the following days, the lighted area of the moon decreases in size. This is called waning.
65. This is a third quarter moon where you can see the left half illuminated.
66. As the days go by we see less and less of the illuminated moon until a new moon once again occurs, starting the cycle all over again.
- 67. Graphic Transition - Eclipses**
68. While on vacation, a group of tourists...
69. ...observing wildlife in the Galapagos Islands of Ecuador, noticed the light darkening even though it was the middle of the afternoon.
- 70. You Decide!** What do you think was occurring?
71. The sun was becoming blocked out by the moon in an event called a solar eclipse.
72. An eclipse occurs when one object in space casts a shadow onto another object. This happens when the sun, moon, and Earth are perfectly lined up. Eclipses are not extremely common.
73. Never look at a solar eclipse without special eye protection.
74. In a solar eclipse the sun's light, is either totally or partially blocked by the moon. This casts a shadow on a portion of the Earth, and causes the day to darken.
75. This is an image of another type of eclipse, called a lunar eclipse. It occurs when Earth is directly between the moon and the sun.
76. During a lunar eclipse the Earth casts a shadow on the moon,...
77. ...causing a portion of the moon or the entire moon to darken to an eerie orangish red color.
- 78. Graphic Transition – Tides**
79. If you have ever sat at the beach for an entire day, you have probably observed the movements of the tides.
80. Tides involve the rise and fall of ocean levels about every 12 and a half hours. moon, causing a high tide.
86. A similar bulge of water also occurs directly opposite this point on the other side of the Earth, creating another high tide there.
87. On Earth, low tides are formed between these two bulges here and here.
88. This is a simple explanation of how tides are created through the interaction of Earth and moon.

Video Script

89. Depending on the time of year, and your location on Earth, tides may vary greatly.

90. Graphic Transition – Summing Up

91. During the past few minutes we have explored some of the fascinating features of the Earth, sun, and moon.

92. We began by studying some of the characteristics which make Earth unique in the solar system.

93. Then we discussed the nature of our nearest star – the sun.

94. Some of the features of the moon, which orbits our planet, were investigated.

95. And the various phases of the moon were examined.

96. We also discussed the moon's role in the formation of tides.

97. And we took a look at the formation of solar and lunar eclipses.

98. So, the next time you look up at the moon,...

99. ...notice the tide going out, or happen to see an eclipse, think about some of the things we discussed during the past few minutes.

100. You just might look at the Earth, sun, and moon a little differently.

101. Graphic Transition – Video Assessment

Fill in the correct word to complete the sentence. Good luck and let us get started.

1. The force of _____ holds us on Earth.
2. The moon _____ light from the sun.
3. Moon's different shapes are called _____ of the moon.
4. A solar _____ casts a shadow on Earth.
5. _____ involve the regular rise and fall of the oceans.



Answer Key to Student Assessments

Pre-Test (p. 14-15)

1. b - liquid water
2. c - oxygen
3. a - gravity
4. a - sun
5. c - phases
6. d - waxing
7. b - full moon
8. c - eclipse
9. a - Earth
10. c - tides
11. true
12. false
13. false
14. true
15. true
16. Earth has a moderate temperature, abundant liquid water, and a well oxygenated atmosphere. These factors enable life to thrive on Earth.
17. The moon is much smaller than Earth and has less gravity. Earth has a well oxygenated atmosphere and abundant liquid water whereas the moon does not.
18. The moon does not generate its own light, but instead reflects light from the sun to Earth. The different shapes of the moon are called phases. Over the course of about 4 weeks the phases of the moon continually change.
19. An eclipse is the formation of a shadow in space and occurs when one object blocks the light hitting another object.
20. Tides are the result of the force of gravity between Earth and the moon. The force of attraction between these bodies causes ocean water to actually be pulled resulting in a rise and fall of ocean levels.

Post-Test (p. 16-17)

1. c - eclipse
2. c - phases
3. b - full moon
4. c - tides
5. b - liquid water
6. a - Earth
7. a - gravity
8. a - sun
9. d - waxing
10. c - oxygen
11. true
12. false
13. true
14. false
15. true
16. An eclipse is the formation of a shadow in space and occurs when one object blocks the light hitting another object.
17. The moon does not generate its own light, but instead reflects light from the sun to Earth. The different shapes of the moon are called phases. Over the course of about 4 weeks the phases of the moon continually change.
18. Tides are the result of the force of gravity between Earth and the moon. The force of attraction between these bodies causes ocean water to actually be pulled resulting in a rise and fall of ocean levels.
19. Earth has a moderate temperature, abundant liquid water, and a well oxygenated atmosphere. These factors enable life to thrive on Earth.
20. The moon is much smaller than Earth and has less gravity. Earth has a well oxygenated atmosphere and abundant liquid water whereas the moon does not.

Video Review (p. 18)

1. An extremely important force called gravity holds the planets, including Earth, in orbit.
 2. Nearly one million planets the size of Earth could fit inside the sun.
 3. The moon reflects light from the sun.
 4. The sun was becoming blocked out by the moon in an event called a solar eclipse.
 5. Tidal movements are caused by the interaction of the moon and Earth.
1. The force of **gravity** holds us on Earth.
 2. The moon **reflects** light from the sun.
 3. Moon's different shapes are called **phases** of the moon.
 4. A solar **eclipse** casts a shadow on Earth.
 5. **Tides** involve the regular rise and fall of the oceans.

Answer Key to Student Activities

Vocabulary (p. 19)

1. Earth
2. sun
3. moon
4. phases
5. waxing
6. waning
7. full moon
8. solar eclipse
9. lunar eclipse
10. tides

Writing Activity (p. 20)

We live on the **third** planet from the sun - planet Earth. One of the unique characteristics of Earth is that it contains abundant liquid **water**. The force of **gravity** holds planets in orbit, and pulls objects toward the center of Earth. All the planets in our solar system revolve around the **sun**. The sun is actually Earth's nearest **star**. The **moon** orbits the Earth. When we see the moon it is **reflecting** light from the sun. The different shapes of the moon we see are called **phases** of the moon. When Earth is directly between the moon and the sun, and a shadow is cast on the moon, a lunar **eclipse** occurs. The interaction of moon and Earth is responsible for **tides**, the regular rise and fall of ocean levels.

In Your Own Words (p. 20)

1. Earth, unlike other planets in the solar system, contains abundant liquid water, a well oxygenated atmosphere, and moderate temperatures. These factors enable life to thrive on Earth.
2. Earth is much larger than the moon and has a gravitational force that is much stronger. The moon's atmosphere does not contain important gases such as oxygen as found on Earth. The moon does not contain life.
3. The different shapes of the moon which appear to us over the course of a month are referred to as phases of the moon.

Mission to the Moon (p. 21)

1. The Apollo Project was the United States' mission to the moon program with the goal of putting a person on the moon by 1970.
2. The purpose of the Apollo Missions was to put a person on the moon by 1970. One of the setbacks was the fire on January 27, 1967 which occurred on Apollo 1 killing three astronauts.
3. The first person to land on the moon was Neil Armstrong in July of 1969.
4. Neil Armstrong meant that landing on the moon was a huge accomplishment in the history of civilization. Landing on the moon was a tremendous achievement representing hundreds of years of scientific advances.

Shadows in Space (p. 22–23)

1. In a lunar eclipse, Earth comes directly between the sun and the moon, creating a shadow on the moon.
2. In a solar eclipse, the moon comes directly between the sun and Earth, creating a shadow on the earth.
3. The entire illuminated side of Earth is not covered by a shadow because the moon is much smaller than the Earth, and this creates a relatively small shadow on Earth's surface.

Lunar eclipse:

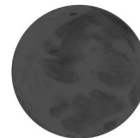
1. sun
2. earth
3. moon
4. shadow

Solar eclipse:

5. sun
6. moon
7. earth
8. shadow

Phases of the Moon (p. 24–25)

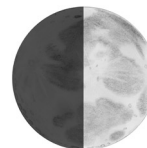
New moon



waxing



First quarter moon



waxing



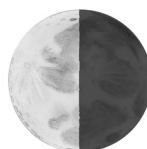
Full moon



waning



Third quarter moon



waning



Pre-Test

Circle the best answer for each of the following questions.

1. Earth is the only planet in the solar system that has the following abundant substance:
a. propane *b. liquid water* *c. helium* *d. acid*
2. Earth's atmosphere contains carbon dioxide and which of the following gases in abundance?
a. lead *b. ammonia* *c. oxygen* *d. plutonium*
3. The force of attraction between two objects in space is referred to as:
a. gravity *b. repulsion* *c. photosynthetic* *d. interaction*
4. The following object provides Earth with light and heat:
a. sun *b. Mars* *c. quasar* *d. Mercury*
5. The different shapes of the moon we see are called:
a. pieces *b. silhouettes* *c. phases* *d. options*
6. The process of the lighted areas of the moon appearing larger night after night is called:
a. widening *b. waning* *c. narrowing* *d. waxing*
7. When the entire moon appears lit, what type of moon is this called?
a. crescent moon *b. full moon* *c. new moon* *d. 2nd quarter moon*
8. What event occurs when one object in space casts a shadow onto another object?
a. lunar event *b. meteor* *c. eclipse* *d. solar event*
9. In a solar eclipse a shadow is cast on a portion of:
a. Earth *b. sun* *c. Venus* *d. moon*
10. The regular rise and fall of ocean levels is referred to as:
a. tsunami *b. typhoon* *c. tides* *d. wave*

Pre-Test

Name _____

Write true or false next to each statement.

- 11. _____ The temperature on Earth is relatively moderate.
- 12. _____ Without the sun life as we know it could easily thrive.
- 13. _____ The moon produces its own light.
- 14. _____ During a lunar eclipse the Earth casts a shadow on the moon.
- 15. _____ The interaction of the moon and Earth are responsible for tidal movement.

Write a short answer for each of the following.

16. List two ways which makes Earth unique in our solar system.

17. State two ways the moon is different from Earth.

18. Describe where the moon's light comes from, and explain what is meant by the "phase of the moon."

19. Describe what occurs in an eclipse.

20. Briefly explain the forces responsible for creating the tides.

Post-Test

Name _____

Circle the best answer for each of the following questions.

1. What event occurs when one object in space casts a shadow onto another object?
a. lunar event *b. meteor* *c. eclipse* *d. solar event*
2. The different shapes of the moon we see are called:
a. pieces *b. silhouettes* *c. phases* *d. options*
3. When the entire moon appears lit, what type of moon is this called?
a. crescent moon *b. full moon* *c. new moon* *d. 2nd quarter moon*
4. The regular rise and fall of ocean levels is referred to as:
a. tsunami *b. typhoon* *c. tides* *d. wave*
5. Earth is the only planet in the solar system that has the following abundant substance:
a. propane *b. liquid water* *c. helium* *d. acid*
6. In a solar eclipse a shadow is cast on a portion of:
a. Earth *b. sun* *c. Venus* *d. moon*
7. The force of attraction between two objects in space is referred to as:
a. gravity *b. repulsion* *c. photosynthetic* *d. interaction*
8. The following object provides Earth with light and heat:
a. sun *b. Mars* *c. quasar* *d. Mercury*
9. The process of the lighted areas of the moon appearing larger night after night is called:
a. widening *b. waning* *c. narrowing* *d. waxing*
10. Earth's atmosphere contains carbon dioxide and which of the following gases in abundance?
a. lead *b. ammonia* *c. oxygen* *d. plutonium*

Post-Test

Name _____

Write true or false next to each statement.

- 11. _____ The interaction of the moon and Earth are responsible for tidal movement.
- 12. _____ The moon produces its own light.
- 13. _____ The temperature on Earth is relatively moderate.
- 14. _____ Without the sun, life as we know it could easily thrive.
- 15. _____ During a lunar eclipse the Earth casts a shadow on the moon.

Write a short answer for each of the following.

- 16. Describe what occurs in an eclipse.

- 17. Describe where the moon's light comes from, and explain what is meant by the "phase of the moon."

- 18. Briefly explain the forces responsible for creating the tides.

- 19. List two ways which makes Earth unique in our solar system.

- 20. State two ways the moon is different from Earth.

Video Review

Name _____

While you watch the video, answer these questions:

You Decide!

1. What holds the planets in orbit?

You Compare!

2. How big is the sun compared to Earth?

You Decide!

3. What is the source of the moon's light?

You Decide!

4. What do you think was occurring?

You Decide!

5. What causes these tidal movements?

After you watch the video, test your knowledge with these questions.

1. The force of _____ holds us on Earth.
2. The moon _____ light from the sun.
3. Moon's different shapes are called _____ of the moon.
4. A solar _____ casts a shadow on Earth.
5. _____ involve the regular rise and fall of the oceans.

Vocabulary

Name _____

Use these words to fill in the blanks next to the sentences below.

Words	solar eclipse	phases	waxing	Earth	waning
	moon	lunar eclipse	sun	tides	full moon

- _____ Planet which contains abundant liquid water.
- _____ The only star in our solar system.
- _____ Object which orbits Earth and reflects light of the sun.
- _____ Different shapes of moon which appear to us on Earth.
- _____ The process of the moon appearing bigger over time.
- _____ The process of less and less of the moon appearing to us over several days.
- _____ The phase of the moon in which the entire moon appears illuminated.
- _____ Occurs when the sun's light is totally or partially blocked by the moon, and casts a shadow on a portion of Earth.
- _____ Occurs when the Earth, moon, and sun are directly aligned, and a shadow is cast on the moon.
- _____ The rise and fall of ocean levels about every 12½ hours.

Writing Activity

Name _____

reflecting sun water tides third moon eclipse gravity phases star

Use the correct word from above to complete the sentences in the following paragraph.

We live on the _____ planet from the sun - planet Earth. One of the unique characteristics of Earth is that it contains abundant liquid _____. The force of _____ holds planets in orbit, and pulls objects toward the center of Earth. All the planets in our solar system revolve around the _____. The sun is actually Earth's nearest _____. The _____ orbits the Earth. When we see the moon it is _____ light from the sun. The different shapes of the moon we see are called _____ of the moon. When Earth is directly between the moon and the sun and a shadow is cast on the moon, a lunar _____ occurs. The interaction of moon and Earth is responsible for _____, the regular rise and fall of ocean levels.

In Your Own Words

1. Describe two characteristics which make Earth unique compared to other planets in the solar system.

2. In a few sentences compare the moon to Earth.

3. Briefly explain the phrase - "phases of the moon".

Mission to The Moon

Name _____

Directions: Read the following information and answer the questions below.

Have you ever looked up at the moon and wondered what it would be like to walk on its surface? While it may be hard to believe, several people have actually explored the moon. On July 20, 1969, Neil Armstrong was the first human to set foot on the moon. This represented one of the greatest scientific accomplishments in the history of mankind. Let us take a quick look at how this amazing scientific accomplishment was achieved.

In 1959, the Soviet spacecraft Luna 3 took the first picture of the far side of the moon. Up to this point no one had ever seen the moon's far side. Motivated by the success of the Soviet Union, the United States set a course for a mission to the moon. In 1961, the Apollo project began with its goal to put people on the moon by 1970. The distance to the moon is 300,000 meters, 100 times the distance from New York to Los Angeles. The Soviets had a similar goal, and the race was on to see who could land on the moon first.

In the 1960's there were a number of Apollo missions leading up to landing on the moon. The numerous Apollo missions were designed to get the people and technology prepared for landing on the moon. There were many successful launches and experiments. There were also setbacks. On January 27, 1967 a terrible tragedy on Apollo 1 occurred during a routine training exercise when a fire ripped through the command module killing three astronauts.

In December of 1968, astronauts first orbited the moon on Apollo 8 for over 20 hours. Finally, in July of 1969, Neil Armstrong and Edwin "Buzz" Aldrin made the first footprints in the lunar soil. After Armstrong made the first step from the lunar module he said, "That's one small step for man, one giant leap for mankind." Over the next several years, five more United States missions landed on the moon. From these explorations a great deal of information was obtained about the moon's surface, seismology, atmosphere, and geology.

Questions:

1. What was the Apollo Project?
2. What was the purpose of the Apollo Missions and what was one of the setbacks?
3. Who was the first person to land on the moon and when did this occur?
4. What do you think Neil Armstrong meant when he stepped on the moon and said, "One small step for man, and one giant leap for mankind"?

Shadows in Space

Name _____

Background: Everyday when you go to school you take it for granted that the sun is illuminating Earth. But, on rare occasions the sun's light is entirely or partially blocked by the moon in a remarkable event called a solar eclipse. In a solar eclipse, the moon comes directly between Earth and sun, casting a shadow on part of Earth's surface. In a solar eclipse, the sun appears to darken because the moon's shadow falls onto part of Earth. In a total solar eclipse the entire sun is blocked out by the moon, creating near total darkness on Earth. In a partial solar eclipse the moon covers just part of the sun, which creates diminished light on Earth. Never look directly at the sun during a solar eclipse because the sun's light could badly damage your eyes.

In a lunar eclipse the moon becomes dark because Earth is casting a shadow on it. A total lunar eclipse occurs when the moon is entirely covered by Earth's shadow. In a partial lunar eclipse only a part of the moon is covered by the shadow of Earth. Witnessing a lunar eclipse or a solar eclipse is a very exciting experience.

Directions:

1. On the following page are diagrams of a solar eclipse and a lunar eclipse. Take a minute to study each diagram.
2. In each diagram label the sun, Earth, and moon.
3. Next, label the part of each diagram where the shadow is occurring - this is called the umbra.
4. Turn off the lights, and using a flashlight (sun), golf ball (moon), and a baseball or softball (Earth), create your own solar and lunar eclipses.
5. Answer the questions below on a separate piece of paper.

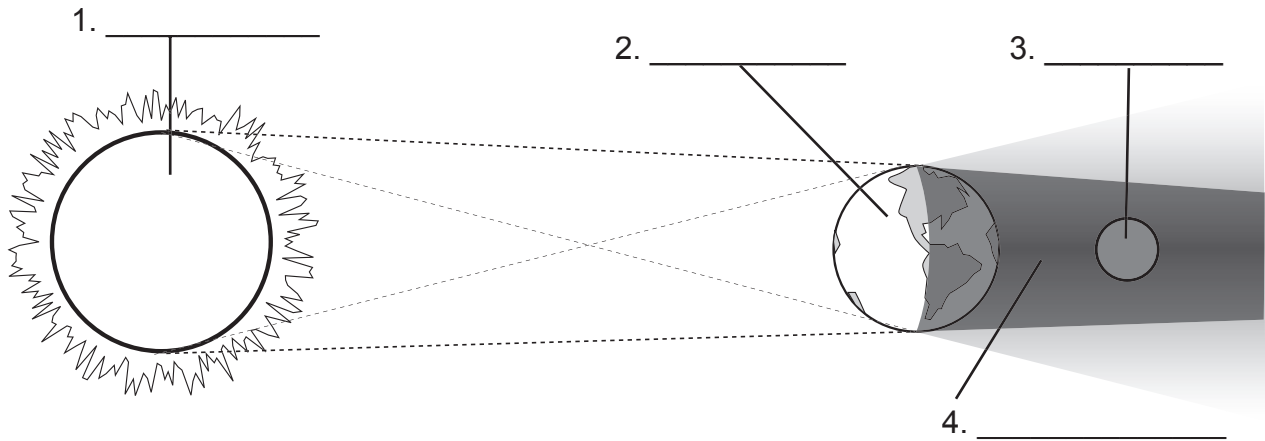
Questions:

1. Describe what occurs in a lunar eclipse.
2. Describe what occurs in a solar eclipse.
3. Explain why the shadow in a solar eclipse covers just a portion of the illuminated side of Earth.

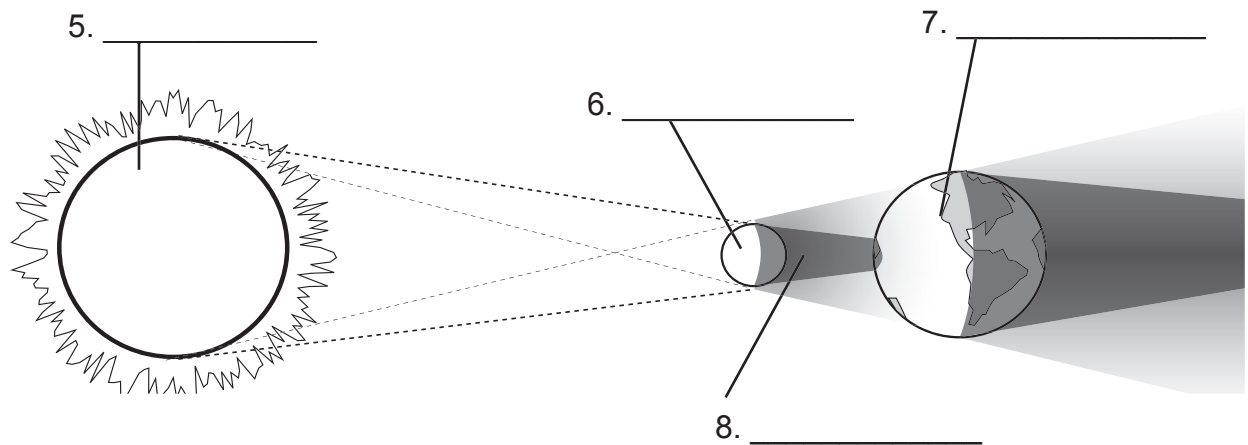
Shadows in Space

Name _____

Lunar eclipse



Solar eclipse



Phases of the Moon

Name _____

Background: Perhaps you have been lucky enough to take a walk at night when the full moon is shining. On a clear moonlit night it can be so bright you can read a book by the moonlight. Maybe you have noticed that a few days after a full moon, less of the moon is visible. In fact, each night less and less of the moon is visible until it reaches a new moon. This process is called waning. Waxing is the process of more and more of the moon becoming visible as it approaches a full moon.

The different shapes of the moon we see, called phases of the moon, are a result of the moon's revolution around Earth. It takes a little less than 28 days for the moon to orbit Earth. In the phase called a new moon, we cannot see the moon. After approximately seven days, the right half of the moon is visible in the first quarter moon. About seven days later all of the moon is visible as a full moon. After about another week, just the left half of the moon is visible as a third quarter moon. During the following week less and less of the moon is visible until none is visible in the new moon, starting the lunar cycle all over again.

Materials:

Phases of the Moon Worksheet

pair of scissors

gluestick

piece of paper

calendar or newspaper which illustrates the lunar phases for current month

Directions:

1. Read the background to become familiar with the four main phases of the moon.
2. On your blank piece of paper write the following terms on the left side in a column and space them out evenly: new moon, first quarter moon, full moon, third quarter moon.
3. Carefully cut out each of the moon images.
4. Using the gluestick, carefully position the correct moon image next to its name.
5. To the right of the images state whether the moon is waxing or waning.
6. Compare your phases of the moon diagram to those of your classmates.
7. Your teacher will provide you with a calendar or newspaper that has the lunar phases for the current month. Take a minute to study this.
8. Next to each phase on your worksheet write the date when this particular phase occurs.

Phases of The Moon Worksheet

Name _____

