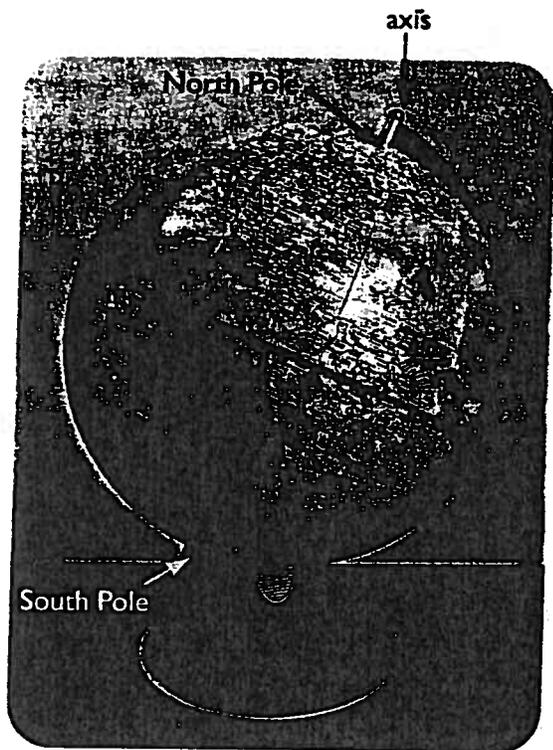


The Earth Spins on its Axis



Imagine that the Earth has a rod that passes through its centre. The rod comes out of the top of the Earth at the North Pole, and it comes out of the bottom at the South Pole. If you connected the Earth and its rod to a stand, and shrank it all down to a much more manageable size, you would have a model of the Earth that you probably know as a globe.

The top and bottom of the rod in a globe are supported on a stand. This enables the globe to spin. The real Earth also spins, even though there's no rod to spin around and no stand to support it in space. Scientists usually call the imaginary rod an axis. They describe Earth's spinning in space as "rotating on its axis." This simply means that the Earth spins (rotates) *as if* it had a rod running through it between the North and South Poles.

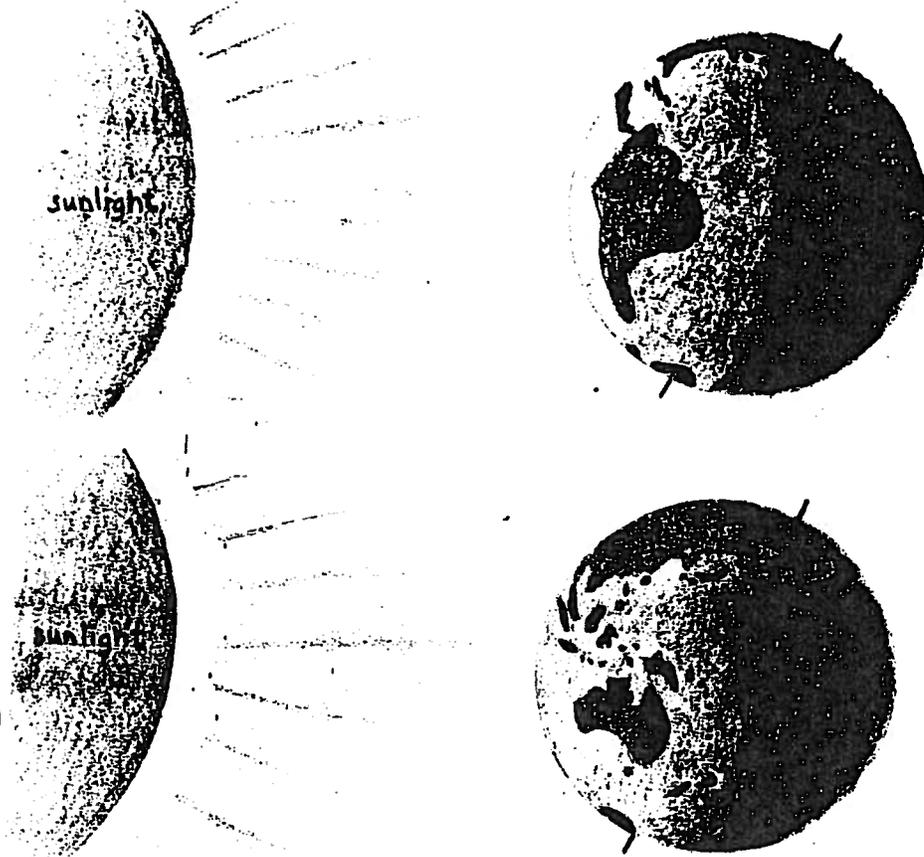


Earth's Axis Is Tilted

Notice that the axis rod of a globe is tilted to one side. This is because the Earth's axis is tilted at an angle of 23.5° from an upright position.

A circle is made up of 360° . Use a protractor to measure the angle that the Earth's imaginary axis is tilted in this diagram. What measurement does the protractor show?

The Cycle of Daytime and Nighttime

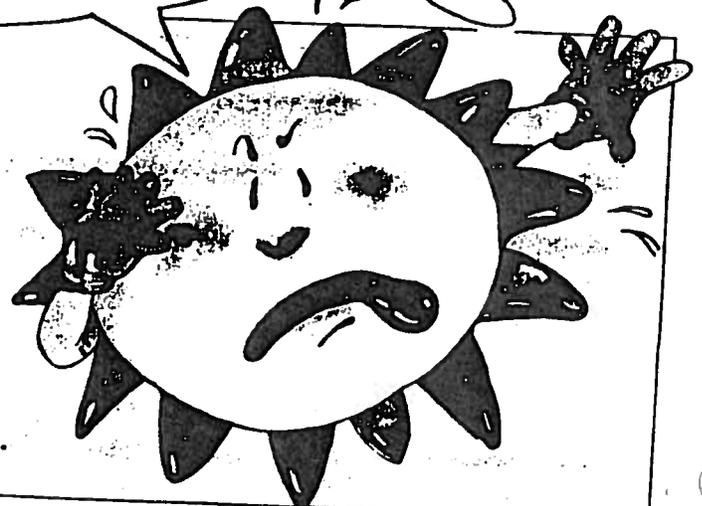


The Earth rotates in a counterclockwise direction. We experience daytime light when the Earth's rotation spins us so we face toward the Sun. We experience nighttime darkness when the Earth's rotation spins us so we face away from the Sun. The time it takes for the Earth to go through one cycle of daytime and nighttime is 23 h, 56 min, 4 s. We usually round this number off to 24 h. Each cycle of 24 h is one full rotation.

DO YOU KNOW?

Many early cultures explained daytime and nighttime by saying that the Sun moves in a circular path around a motionless Earth. To do this, the Sun would have to travel at speeds of over 25 million kilometres per hour in order to make the trip around Earth in 24 hours. That's extremely fast. When the Space Shuttle is moving at top speed, it is only travelling about 28 thousand kilometres per hour. To create daytime and nighttime by orbiting Earth, the Sun would have to move a thousand times faster than the space shuttle.

I DON'T CARE IF ROTATING MAKES YOU DIZZY. I PREFER IT THIS WAY !!





The Earth, Sun Relationship

The Day / Night Cycle

- 1) The Earth is tilted on an imaginary line called an _____
- 2) It is tilted _____ degrees.
- 3) Draw a line that is tilted approximately that many degrees from the line below.



- 4) What causes Day and Night? _____

- 5) Define Rotation: _____

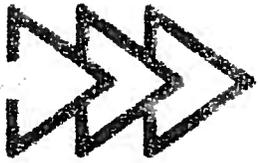
- 6) One complete rotation of the Earth takes _____.

- 7) Identify and draw a picture of something else that rotates:

8) When the Earth spins us to face toward the Sun, we experience _____ . When the Earth spins us to face away from the Sun, we experience _____ .

9) When it is Daytime in some parts of the world, it is Nighttime in other parts of the world. Draw a diagram of the Sun and Earth showing which parts are in day and which parts are in night. Label and explain your diagram.





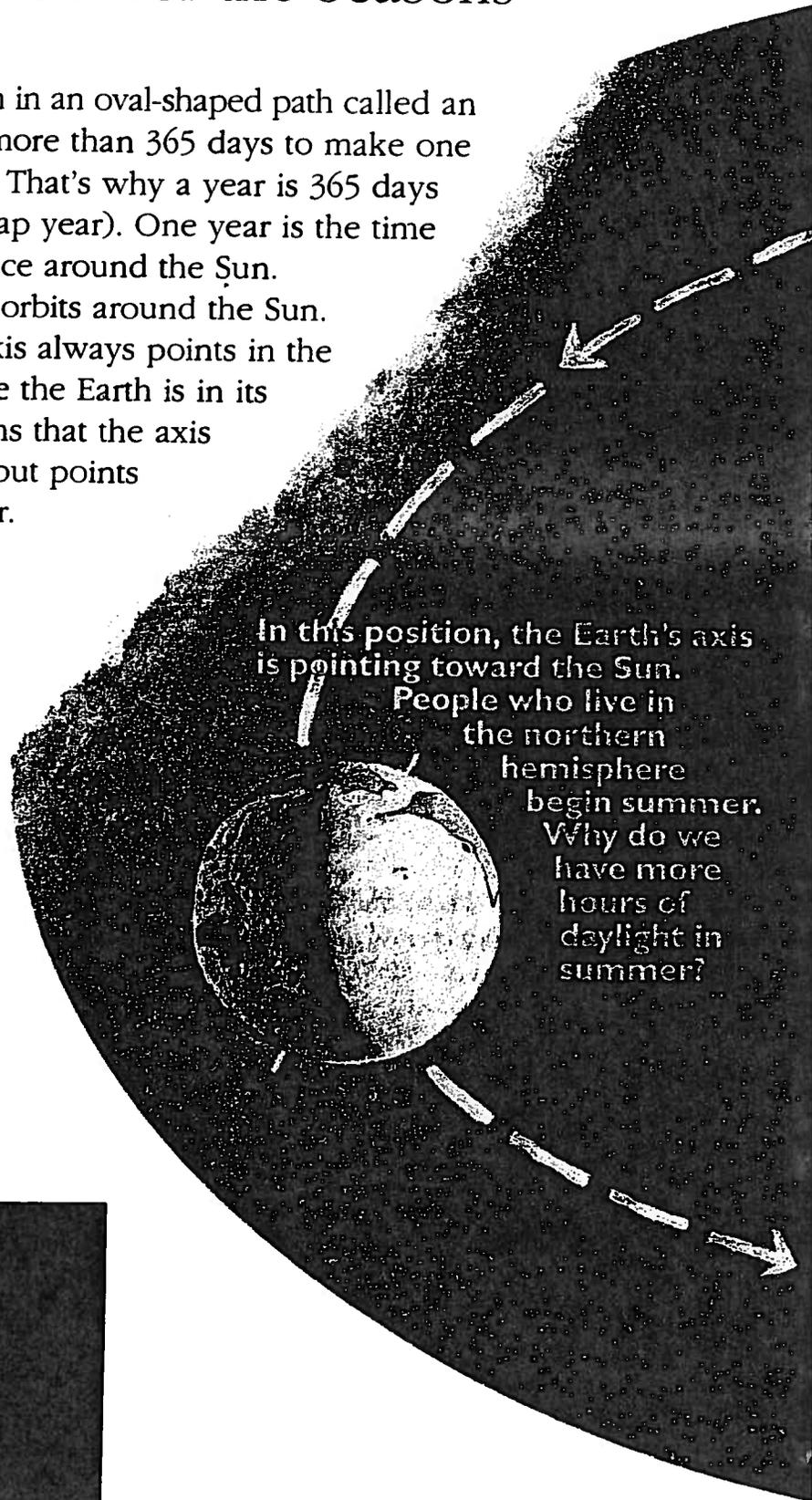
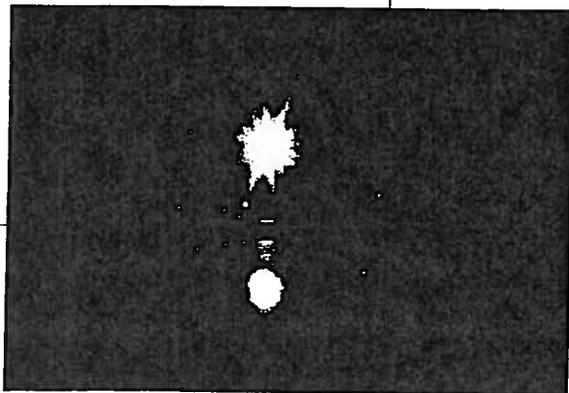
The Reasons for the Seasons

The Earth travels around the Sun in an oval-shaped path called an orbit. It takes the Earth a little more than 365 days to make one complete orbit around the Sun. That's why a year is 365 days long (and 366 days long in a leap year). One year is the time it takes for the Earth to orbit once around the Sun.

Seasons change as the Earth orbits around the Sun. The reason is that the Earth's axis always points in the same direction, no matter where the Earth is in its orbit around the Sun. This means that the axis points toward the Sun in June, but points away from the Sun in December.

DO YOU KNOW?

In summer, the Sun doesn't set in places close to the Arctic Circle. These places have continual daylight, even after midnight, as you can see in the photo. That's why any place near the Arctic Circle is called "The Land of the Midnight Sun." In winter, the opposite occurs for these places. The Sun doesn't rise, so it's dark or very dusky during the winter months.



In this position, the Earth's axis is pointing toward the Sun. People who live in the northern hemisphere begin summer. Why do we have more hours of daylight in summer?

The Earth, Sun Relationship

The Reason for Seasons

1) The Earth travels around the _____ in an oval-shaped path called an _____.

2) It takes the Earth _____ to make one complete orbit around the Sun. One "trip" around the sun is one _____.

3) The Earth's Axis always points in the _____. In June the Earth's axis is tilted _____ the sun, while in December the Earth's axis is tilted _____ the sun.

4) How does the length of day change with season?

5) What happens in the Arctic Circle during the summer? Why?

6) Define Revolution: _____

7) Identify and draw a picture that represents "revolving":

8) Summer occurs when a given location on Earth is tilted **TOWARDS** the sun. The daylight arc is **LONGER** than the nighttime arc, therefore it is warmer. Draw and label a diagram.

9) Winter occurs when a given location on Earth is tilted **AWAY** from the sun. The daylight arc is **SHORTER** than the nighttime arc, therefore it is colder. Draw and label a diagram.

1. Daytime occurs because:

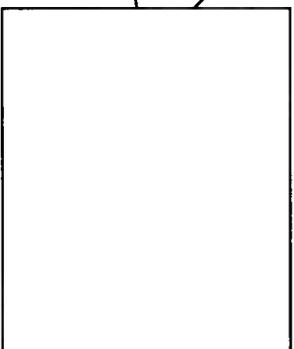
- a) The sun revolves around the Earth. So when the sun is above us (facing us), it gives us heat and light.
- b) The Earth spins. So when we spin to face the sun, it gives us heat and light.

2. Summer occurs because:

- a) During the summer months, the Earth's orbit brings it closer to the sun which makes the distance the sun's rays need to travel shorter (hotter).
- b) The Earth is tilted, so when it revolves around the sun certain parts of the world get more direct sunlight and longer days (more heat).
- c) For parts of the year, the Earth is tilted closer to the sun making the distance that sun's rays need to travel shorter, which increases Earth's surface temperature.

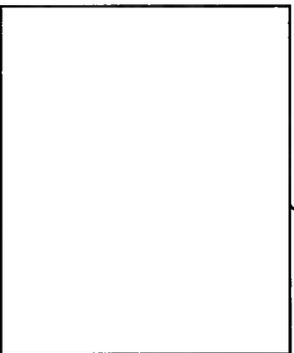
The Changing of the Seasons

Season: _____
 Equinox Date: _____
 Tilt: _____
 Sun's Rays: _____
 Days: _____

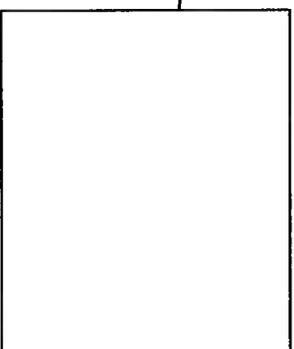


Season: _____
 Solstice Date: _____
 Tilt: _____
 Sun's Rays: _____
 Days: _____

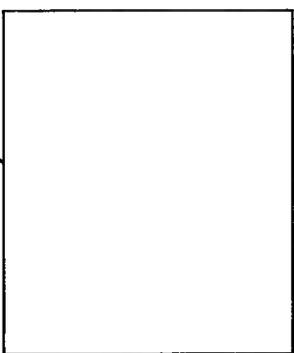
Season	Equinox	Tilt	Rays	Days
Summer	Dec. 21	Away	Direct	Equal
Winter	March 21	Side	Medium	Equal
Spring	Sept. 21	Side	Indirect	Longer
Autumn	June 21	Toward	Medium	Shorter



Season: _____
 Solstice Date: _____
 Tilt: _____
 Sun's Rays: _____
 Days: _____



Season: _____
 Equinox Date: _____
 Tilt: _____
 Sun's Rays: _____
 Days: _____



THE MOON

Earth's closest neighbor in space, the Moon is the only other world that humans have visited. Astronauts felt only one-sixth their normal weight when they were on the Moon's surface because gravity there is much weaker than on Earth. It is too feeble even to stop gases escaping into space, so the Moon is a dead world. There is no air, no liquid water, and no weather to alter its surface. The mountains, craters, lava, and dust have hardly changed over billions of years. In the daytime, the temperature on the Moon gets higher than the boiling point of water. During the night, which lasts for 14 of our days, it plunges to -300°F (-185°C).

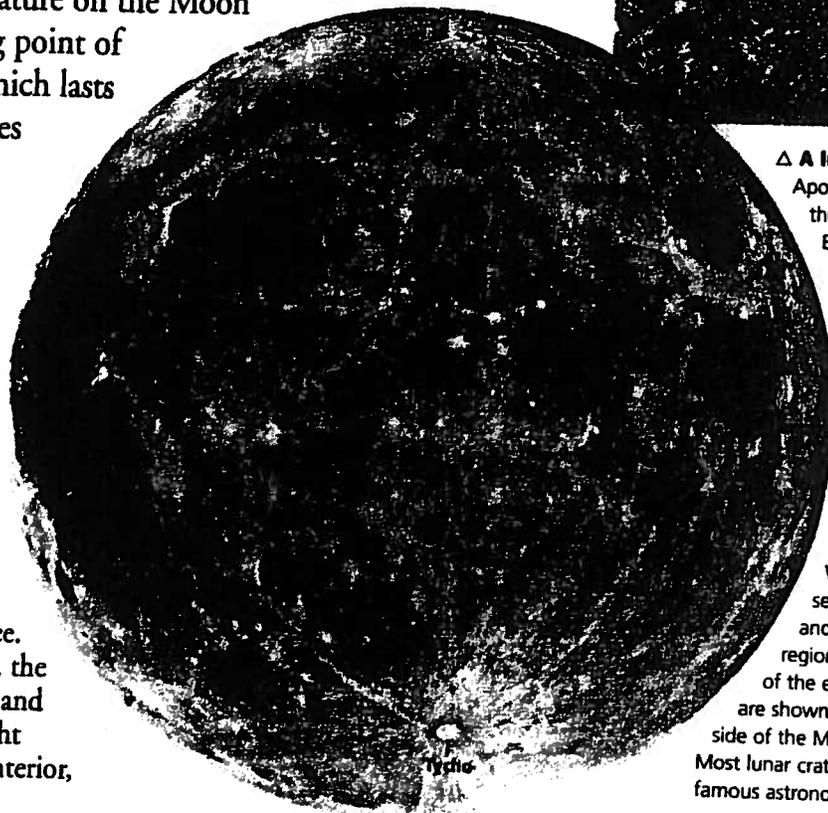
MOUNTAINS AND "SEAS"

Samples of Moon rock and soil were brought back to Earth by U.S. Apollo astronauts and by three Russian Luna probes. They show that the Moon formed about 4.6 billion years ago. Unlike on Earth, where some mountains are the youngest landforms, the mountains on the Moon are the oldest part of its surface we can see. After the mountains were formed, the Moon was battered by meteorites and asteroids. The largest punched right through the surface rocks to the interior,



▲ A lunar crater

Apollo astronauts took this view of the crater Eratosthenes, which is 36 miles (58 km) across. Its walls have slumped down to form terraces. The Sun is low in the sky, and the crater walls are casting long deep shadows.



◀ Features on the Moon

With binoculars you can see craters, dark plains, and bright mountainous regions on the Moon. Some of the easiest features to find are shown on this picture of the side of the Moon that faces Earth. Most lunar craters are named for famous astronomers or other scientists.

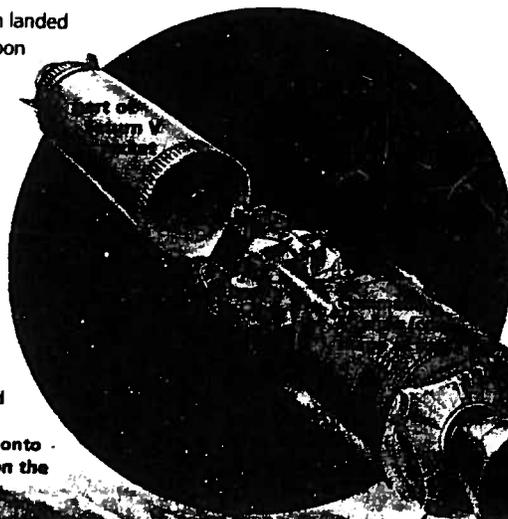
APOLLO MISSIONS TO THE MOON

The Moon landings

Six Apollo spacecraft each landed two astronauts on the Moon between 1969 and 1972.

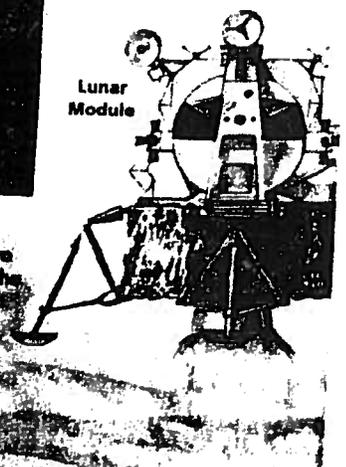
The spacecraft were launched from Earth on mighty Saturn V rockets, and had three main parts: the Command Module and Service Module (together known as the CSM), and the Lunar Module (LM).

1. The CSM, with three astronauts inside, separated from the Saturn V rocket, turned around, and docked onto the LM, which was carried on the rocket under the CSM.



2. The CSM and LM went into orbit around the Moon. The LM with two astronauts inside separated from the CSM. The third astronaut stayed aboard the orbiting CSM.

3. The LM fired rocket engines to slow it down as it fell toward the Moon's surface.



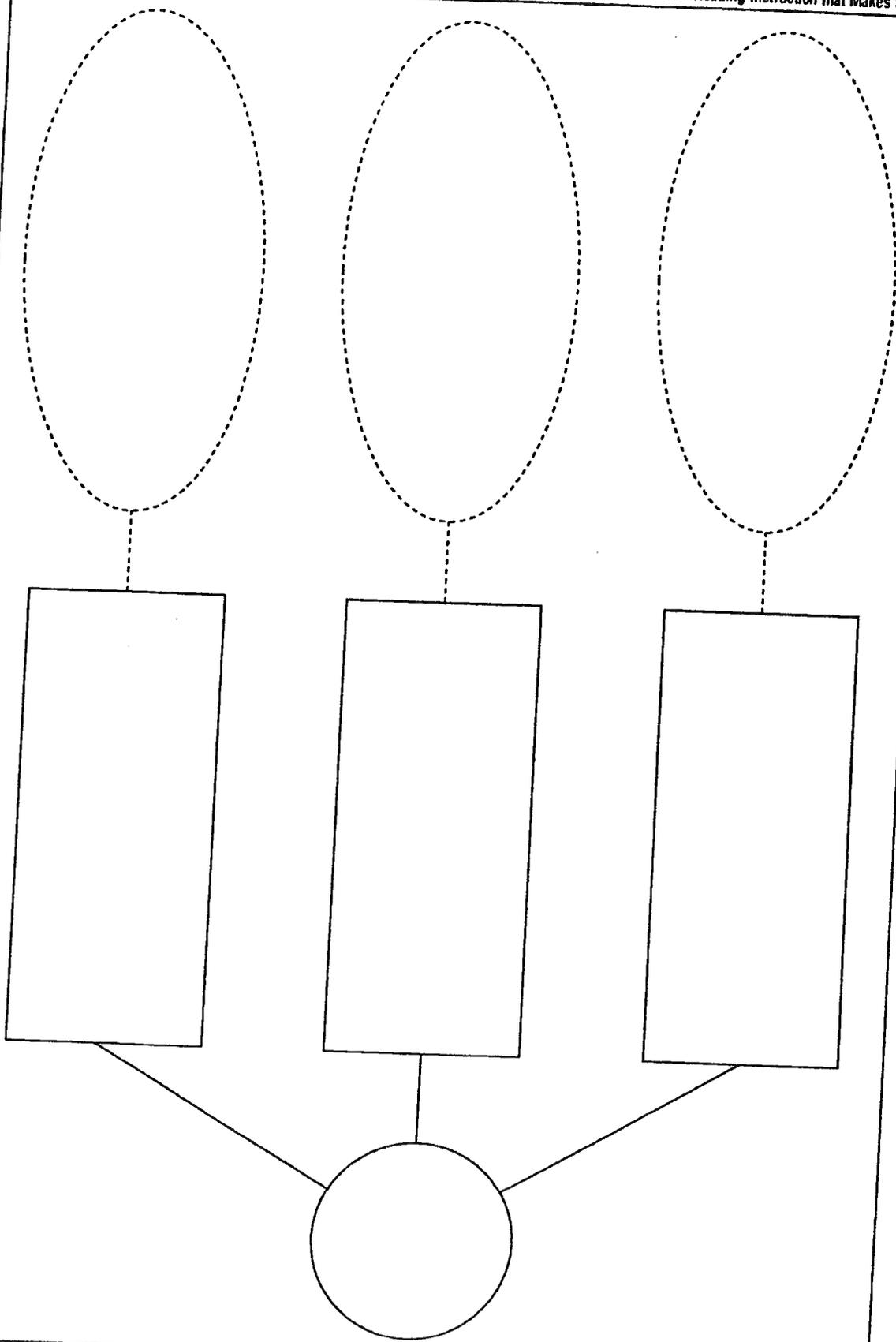
Service Module

Name _____

Date _____

Title _____

Author _____



Inferences

Earth's Moon



Phases of the Moon

The moon is the largest object in the night sky. It is 240,000 miles from Earth. The moon is our closest neighbor in space.

The moon looks much larger than the stars, but it isn't. Its diameter is only one fourth of Earth's diameter. You may be surprised to learn that the sun is about 400 times larger than the moon.

The moon is a **satellite** of Earth. A satellite is an object in space that orbits another object in space. Earth has one moon. Some planets have many moons.

The moon is the brightest object in the sky at night. But it does not give off light of its own. The moon reflects light from the sun like a giant mirror.

Have you ever seen a full moon? Have you ever seen the moon when it looks like a sliver? During a month, the moon seems to change shape. But it does not really change.

The moon seems to change shape as different amounts of the moon are lit by the sun. As more sunlight hits the moon, more light is reflected to Earth. The amount of sunlight the moon reflects changes a little each night.

The changing views of the moon are called **phases**. The pictures on this page show the phases you can see in a month.

Because the moon and Earth are close, the force of gravity between them is strong. The moon's gravity pulls the waters of Earth toward the moon. This pull makes the level of the water in the oceans change. These changes in water levels are called **tides**.

A. Answer True or False.

1. The moon is the largest object in the night sky. _____
2. The moon orbits around Earth. _____
3. The moon is 2,400 miles from Earth. _____
4. There is no force of gravity between the moon and Earth.

5. During a month, we always see the same shape of the moon.

6. A satellite is an object in space that orbits another object in space. _____

B. Fill in the missing words.

1. The changing views of the moon are called _____.
(phases, tides)
2. Some planets have many _____. (orbits, moons)
3. The moon gives off no _____ of its own. (light, gravity)
4. The moon is a _____ of Earth. (planet, satellite)
5. The changes in the levels of the oceans are called _____.
(tides, phases)
6. The brightest object in the night sky is the _____. (moon, sun)

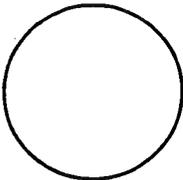
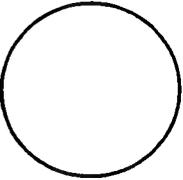
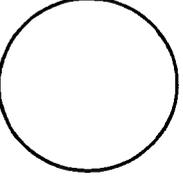
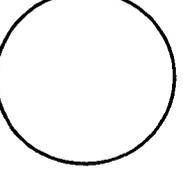
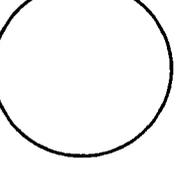
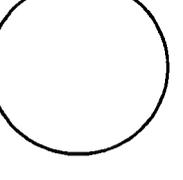
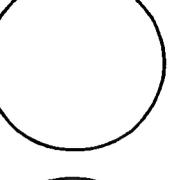
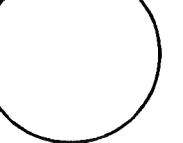
C. Answer the questions.

1. What causes tides? _____

2. Why does the moon seem to change shape? _____

Date: _____ Name: _____

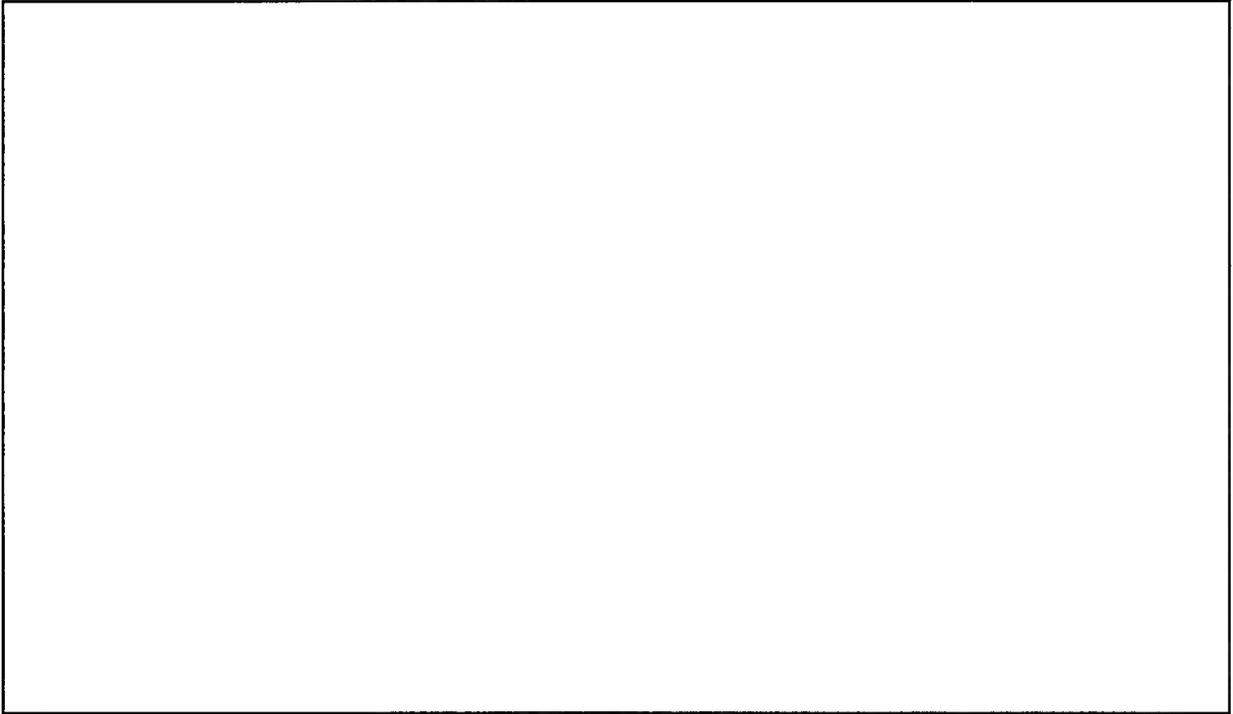
The Phases of the Moon

1.  _____
2.  _____
3.  _____
4.  _____
5.  _____
6.  _____
7.  _____
8.  _____

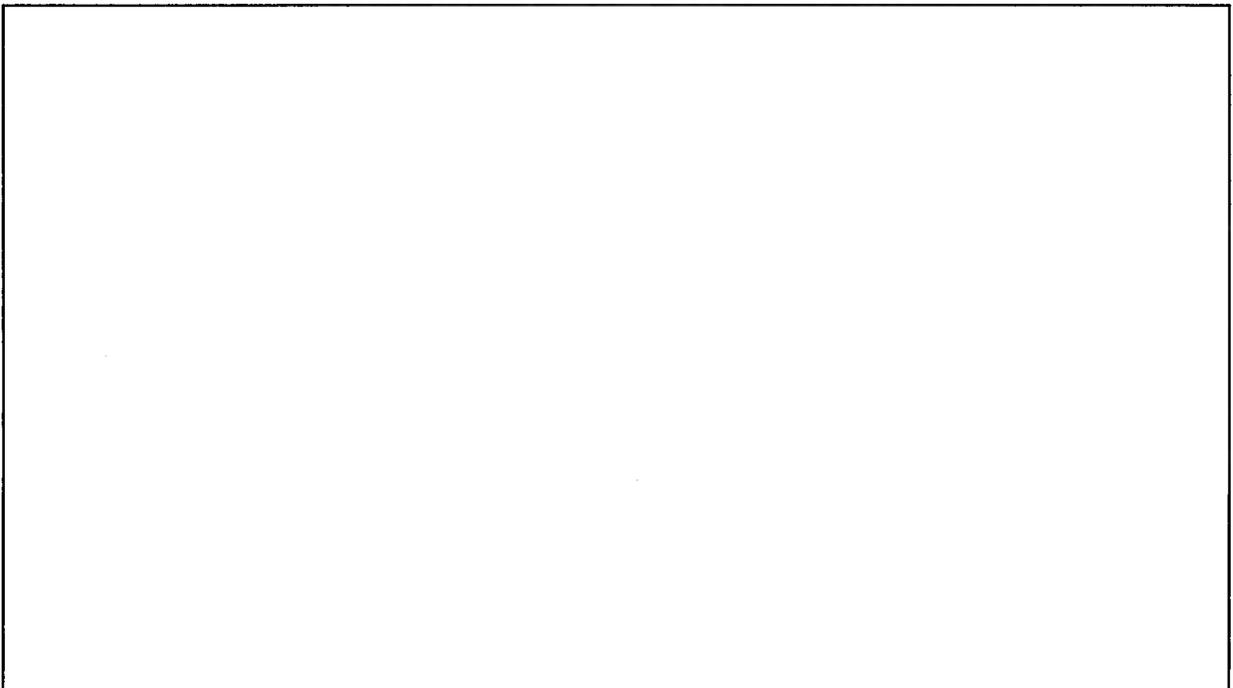
The Earth, Moon Relationship

Eclipses

1) Diagram and explain a Lunar Eclipse:



2) Diagram and explain a Solar Eclipse:



Gravity: Mass and Weight

Gravity is the attraction of one mass to another. It is the force that pulls an object downward towards the centre of the Earth. There is very little of it on the moon. This is why astronauts seem to float through the air when they walk there. They need special suits to keep them grounded.



Mass is the amount of matter in a given object. An object's mass will remain constant, whether it is on Earth or the moon. The mass of an astronaut will be the same on both places.



Weight is the force of gravity acting on an object. On the moon, an object weighs less than it would on Earth. This is because the gravitational pull is not as great as it is on Earth.



Date: _____ Name: _____

Gravitational Force

Student	Estimate of Time Holding the Book	Result of Time Holding the Book

Why do you think the book became difficult to hold up? _____

What force was acting on the book? _____

Calculating Weight on Planets/Moon

Planet/Moon	Gravity Factor	Student A's Weight
Mercury	0.284	
Venus	0.907	
Earth's moon	0.166	
Mars	0.380	
Jupiter	2.340	
Saturn	0.925	
Uranus	0.795	
Neptune	1.125	
Pluto	0.041	

Have students look at the above chart and answer the following questions:

- On which planet(s) would you weigh about the same as you do on Earth?
- On which planet would you weigh the least?
- On which planet would you weigh the most?
- How would your mass be affected on the other planets?
Explain.
