

FCAT Review Lesson- Astronomy

The Earth rotates around the Sun. The path it follows around the Sun is called the orbital path. The orbital path is elliptical (see Figure 1). This means that the Earth is not always the same distance from the Sun. The Earth is closest to the Sun in January (perihelion distance 91.5 million miles) and furthest away during July (aphelion distance 94 million miles).

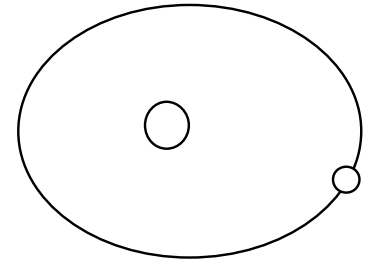


Figure 1. Earth's Orbit

While it is traveling around the Sun, it is also rotating on its own axis, like a spinning top. Unlike a top, the axis of rotation is tilted about 23° from the vertical (see Figure 2). The axis of rotation currently is aimed towards the star Polaris (the North Star)

throughout the year. This means that the northern half of the Earth is oriented towards the Sun for one part of the year, and away from the Sun for another part of the year. This is what causes the Earth to have seasons.



Figure 2. The Earth's Axis of Rotation

The Earth is not alone in its orbit around the Sun. In addition to all of the satellites that we have launched into orbit since the 1950's, the Moon is a natural satellite that has been orbiting the Earth for billions of years. The Moon takes 27.322 days to make it around the Earth one time (360°). Because the Earth is not sitting still, it takes a little longer for it to look like it made the full trip around the Earth (29.531 days). This is referred to as the Lunar month (see Figure 3).

This orbital relationship has some very important effects on the Earth, in fact, in theory, and also in fiction. Chief among the factual are the phases of the moon, and the ocean tides. (See the [Tides Gizmo](#) for more information about this topic). The Lunar cycle has also been theorized to be involved with everything from menstrual cycles to personality disorders. The many fictional accounts of werewolves and other supernatural phenomena are testament to the ancients' realization that the Earth/Moon relationship was important.

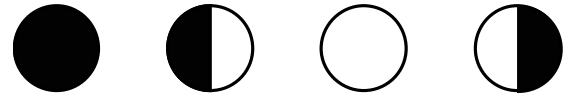


Figure 3. The phases of the Moon

For your activities for this lesson, you will be exploring the rotation of the Earth around the Sun, and the rotation of the Moon around the Earth. There are two worksheets to fill out while you are working with the gizmos, followed by a set of questions. If you have any questions about this topic, please feel free to ask your science teacher.

Astronomical unit	Moon phase
Axis	Neap tides
Gravitation	Solar systems
Gravity	Spring tide
Light	Star
Mass	Sun
Moon	Universe
Orbit	Orbital plane
Elliptical	

Go to [www.explorelearning.com](http://www.explorelearning.com)

Log in as: DAJ974

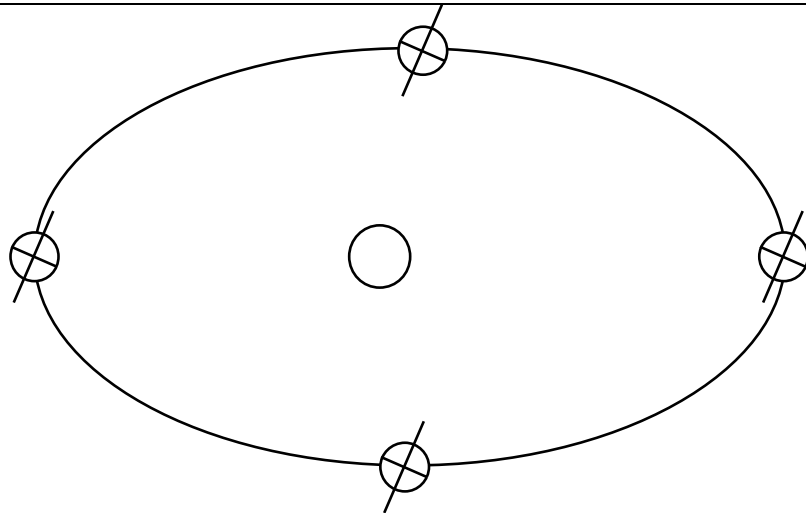
Password: sit993

Open the gizmo titled: Seasons: Earth, Moon, and Sun

Follow the instructions in each of the cells below

Look over the various controls. You can speed it up or slow it down, as needed.

Tabs across the top take you to additional info



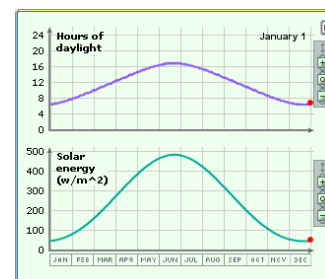
Allow it to load, and press the play button for the animation. Label the illustration below with the correct month for the 4 Earth positions shown.

You might want to speed the animation up for this part

Latitude	Month of max solar energy	Month of max daylight	Length of longest day
90° North			
60° North			
30° North			
0°			
30° South			
60° South			
90° South			

Repeat a full year cycle for cities at each of the latitudes in the table at left.

Adjust the latitude with the red latitude slider on the description tab. Press the play button, then switch over to the year graph tab. The data for the table can be read off of the graphs (like the one below).



Answer the questions under the gizmo, and then prepare a 1 paragraph summary of how the Earth's axis of rotation and its elliptical orbit lead to the different seasons. Explain how the seasons are different at the different latitudes.

Go to [www.explorellearning.com](http://www.explorellearning.com)  
 Log in as: DAJ974 Password: sit993  
 Open the gizmo titled: Moon Phases  
 Follow the instructions in each of the cells below

Look over the various controls. You can speed it up or slow it down, as needed.  
 Tabs across the top take you to additional info



Waxing Crescent

Moon light is a bit of a misnomer. The Moon is a giant dusty ball. It does not have any light of its own. The Moon simply reflects the light of the sun off of its surface. The surface of the Moon is covered with a soft powder of crushed rock, called regolith. That is why the light reflected by it is very diffused and soft.

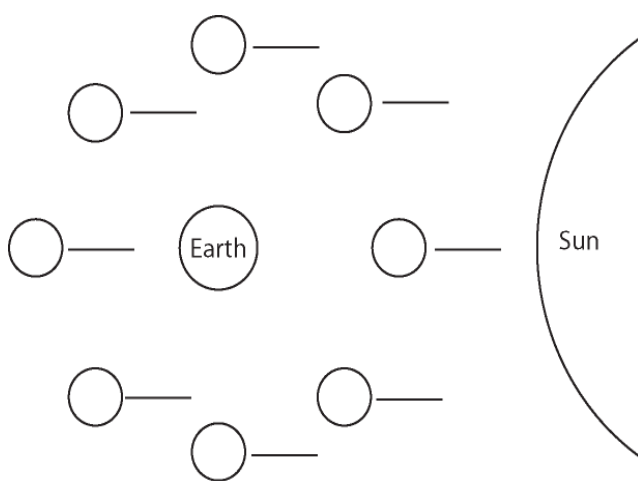
As the Moon orbits the Earth, we see different phases. The phase is caused by the light of the Sun striking the sphere of the Moon. The side facing the Sun is bright, while the side facing away from the Sun is dark. One half of the Moon is brightly lit at all times. The Earth is just not in the right spot to enjoy it all the time.

As you watch the animation, be sure to keep an eye on the flag on the moon. What does it tell you about the Moon's rotation?



Run the entire animation through once at high speed. Notice how the bright side of the Moon is always the side facing the Sun.

Reset the animation, but leave it paused. Click and drag the Moon to each of the positions indicated in the picture at left. In the circle provided, sketch the moon as it appears in the image on the right side of the gizmo (shade in the dark part).



On the line next to each moon, write the number of days through the cycle that phase appears.

Label the new moon, and the full moon. The 1<sup>st</sup> quarter moon is visible in the afternoon and evening. The 3<sup>rd</sup> quarter moon is visible after midnight, and throughout the morning. See if you can identify these positions (hint, look closely at the Earth).

What is an Eclipse? During which of these phases is it possible to have a solar eclipse? During which of these phases is it possible to have a lunar eclipse?

Answer the questions under the gizmo, and then prepare a 1 paragraph summary of how the Moon's rotation around the Earth causes the different phases/.

**Questions during Investigations Part 1:**

1. How does the Earth's tilt affect life on Earth?
2. That would the effect be, if the Earth did not rotate on an axis?
3. What would the effect be if the Earth did not revolve around the Sun (was stationary)?

**Questions during Investigations Part 2:**

1. How much of the moon is lit by the Sun at any given point?
2. What causes the phases of the Moon?

Post Quiz

<b>SC.E.1.4.1 The student understands the relationships between events on Earth and the movements of the Earth, its moon, the other planets, and the sun.</b>
<p>1. Orbital parameters, such as tilt and shape of orbit, determine seasons on Earth. What would the seasonal changes, for the middle latitudes, be if the tilt of the Earth was increased to 45 degrees?</p> <ol style="list-style-type: none"><li>A. Summers would be warmer</li><li>B. Summers would be cooler</li><li>C. Winters would be warmer</li><li>D. Spring would be warmer</li></ol>
<p>2. While doing research for an astronomy report, Nancy learned that oceanic tides are caused by the gravitational pull of the Moon and Sun on the Earth's oceans. Which phases of the moon produce the greatest changes in the height of high tide?</p> <ol style="list-style-type: none"><li>A. The gibbous and crescent Moon phases produce the greatest change.</li><li>B. The first quarter and last quarter Moon phases produce the greatest change.</li><li>C. The new Moon and full Moon produce the greatest change.</li><li>D. All phases of the moon will produce equal effect.</li></ol>
<p>3. As you gaze upon the Moon, you are only able to ever see one side. What characteristic of the Moon's movement around the Earth is responsible for this observation?</p> <ol style="list-style-type: none"><li>A. The Moon is revolving around the Earth at the same speed as the Sun.</li><li>B. The Moon is revolving around the Earth at the same speed as the Earth revolves around the Sun.</li><li>C. The Moon is revolving around the Earth at the same speed it is rotating on it's axis.</li><li>D. The Moon is revolving around the Earth at the same speed as the Earth rotates on it's axis</li></ol>