**8th Grade Science Week of April 27 – Wk 2**

Read the information on Earth, Moon, and Sun and complete questions. I have attached a page for the terms and questions that you can download, complete, and send back to me.

Assignments can be emailed to me as an attachment or take a photo of completed work and email me at drowe@tusd.net or deliver to school. **Online work can be submitted at anytime until May 8. May 8 is the drop off day for paper work.** Be sure to put name on all work submitted. If you have any questions or concerns my office hours will be daily, Monday-Friday, 10:30- 11:30 and 1:30-2:30 by email.

**Earth in Space**

The study of the moon, stars, and other objects in space is called astronomy. Ancient astronomers studied the movements of the sun and moon. They thought Earth was standing still and the sun and moon were moving. The sun and moon seem to move mainly because Earth is rotating on its axis, the imaginary line that passes through Earth’s center and the North and South poles. Earth moves through space in two major ways: rotation and revolution. The spinning of Earth on its axis is called its rotation. Earth’s rotation causes day and night. It takes Earth about 24 hours to rotate once on its axis.

The movement of one object around another object is called revolution. Earth completes one revolution around the sun every year. Earth’s path as it revolves around the sun is called its orbit. Earth’s orbit is a slightly elongated circle, or ellipse.

Many cultures have tried to make a workable calendar. A calendar is a system of organizing time that defines the beginning, length, and divisions of a year. This is not easy because Earth takes about 365¼ days to complete a revolution around the sun, and 12 moon cycles make up fewer days than a calendar year.

Sunlight hits Earth’s surface most directly at the equator. Closer to the poles, sunlight hits Earth’s surface at an angle. That is why it is generally warmer near the equator than near the poles.

Earth has seasons because its axis is tilted as it revolves around the sun. Earth’s axis is tilted ant an angle of 23.5 degrees from vertical. As Earth revolves around the sun, its axis is tilted away from the sun for part of the year and tilted toward the sun for part of the year. When the north end of Earth’s axis is tilted toward the sun, the Northern Hemisphere has summer. At the same time, the south end of Earth’s axis is tilted away from the sun. As a result, the Southern Hemisphere has winter.

The hemisphere tilted toward the sun has more daylight hours than the hemisphere tilted away from the sun. The combination of direct rays and more hours of sunlight in summer heats the surface more than at any other time of the year.

On two days each year, the sun reaches its farthest position north or south of the equator. Each of these days is know as a solstice. Halfway between the solstices, neither hemisphere is tilted toward the sun. On those two days, the noon sun is directly overhead at the equator. Each of these days is known as an equinox, meaning “equal night.” During an equinox, the length of nighttime and daytime are about the same.



**Gravity and Motion**

The English scientist Isaac Newton told a story about how watching an apple fall from a tree in 1666 had made him think about the moon’s orbit. Newton realized that there must be a force acting between Earth and the moon that kept the moon in orbit.

Newton hypothesized that the force of gravity pulls the moon toward Earth, keeping it in orbit. In Newton’s day, most scientists thought that forces on Earth were different from those elsewhere in the universe. Although Newton did not discover gravity, he was the first to realize that gravity occurs everywhere. Newton’s law of universal gravitation states that every object in the universe attracts every other object.

The strength of gravity is measured in units called newtons, named after Isaac Newton. The strength of the force of gravity between two objects depends on two factors: the masses of the objects and the distance between them. Mass is the amount of matter in an object. According to law of universal gravitation, all of the objects around you are pulling on you. You don’t notice this pull because the strength of gravity depends, in part, on the masses of the objects.

Because Earth is so massive, it exerts a much greater force on you than an object such as a book does. Similarly, Earth’s gravitational pull on the moon is large enough to keep the moon in orbit. The force of gravity on an object is known as its weight. An object’s weight can change depending on its location. On the moon, you would weigh about one-sixth of your weight on Earth. This is because the moon is much less massive than Earth, so the pull of it gravity on you would be much less.

The tendency of an object to resist a change in motion is inertia. Isaac Newton stated his ideas about inertia as a scientific law. Newton’s first law of motion says that an object at rest will stay at rest and an object in motion will stay in motion with a constant speed and direction unless acted on by an unbalanced force.

Newton concluded that two factors—inertia and gravity—combine to keep Earth in orbit around the sun and the moon in orbit around Earth. Earth’s gravity keeps pulling the moon toward it, preventing the moon from moving in a straight line off through space. At the same time, the moon keeps moving ahead because of its inertia. In the same way, Earth revolves around the sun because the sun’s gravity pulls on it while Earth’s inertia keeps it moving ahead.



**Phases, Eclipses, and Tides**

As the moon revolves around Earth, the positions of the moon, Earth, and sun change in relation to each other. The changing relative positions of the moon, Earth, and sun cause the phases of the moon, eclipses, and tides.

The same side of the moon always faces Earth. The different shapes of the moon you see from Earth are called phases. The phase of the moon you see depends on how much of the sunlit side of the moon faces Earth.

When the moon’s shadow hits Earth or Earth’s shadow hits the moon, an eclipse occurs. An eclipse occurs when an object in space comes between the sun and a third object and casts a shadow on that object. There are two types of eclipses: solar and lunar.

A solar eclipse occurs when the moon passes directly between Earth and the sun, blocking sunlight from Earth. The moon’s shadow then hits Earth. So a solar eclipse occurs when a new moon blocks your view of the sun. The darkest part of the moon’s shadow is called the umbra. From any part of the umbra, the moon completely blocks light from the sun. Only people in the umbra see a total eclipse. Another part of the shadow is less dark and larger than the umbra. It is called the penumbra. From within the penumbra, people see a partial eclipse because part of the sun is still visible.

A lunar eclipse occurs at a full moon when Earth is directly between the moon and the sun. During a lunar eclipse, Earth blocks sunlight from reaching the moon. The moon is in Earth’s shadow. Earth’s shadow also has an umbra and a penumbra. When the moon is completely within Earth’s umbra, you see a total lunar eclipse. A partial lunar eclipse happens when the moon moves partly into Earth’s umbra.

Tides are the rise and fall of the ocean’s water every 12.5 hours or so. The force of gravity pulls the moon and Earth toward each other. The tides are caused mainly by differences in how much the moon’s gravity pulls on different parts of Earth. As Earth rotates, the moon’s gravity pulls water toward the point on Earth’s surface closest to the moon. The moon pulls least on the side of Earth farthest away. At any one time, there are two places with high tides and two places with low tides on Earth.

Twice a month, the moon, Earth, and the sun are in a straight line. The combined forces of the gravity of the sun and moon produce a tide with the greatest difference between consecutive low and high tides, called a spring tide. Also, twice a month, the pull of gravity of the sun and moon are at right angles to each other. This arrangement produces a neap tide. A neap tide has least difference between consecutive low and high tides.







**Earth’s Moon**

 In 1609, the Italian scientist Galileo Galilei heard about a telescope, a device built to observe distant objects by making them appear closer. Galileo made his own telescope by putting two lenses in a wooden tube. When Galileo pointed his telescope at the moon, he was able to see much more detail than anyone had ever seen. Recent photos of the moon show much more detail than Galileo could see with his telescope. Features on the moon’s surface include maria, craters, and highlands.

The moon’s surface has dark, flat areas, which Galileo called maria, the Latin work for “seas.” Galileo incorrectly thought that the maria were oceans. The maria are actually hardened rock formed from huge lava flows that occurred between 3 and 4 billion years ago.

Galileo saw that the moon’s surface is marked by large round pits called craters. Some craters are hundreds of kilometers across. For a long time, many scientists mistakenly thought these craters had been made by volcanoes. Scientists now know that these craters were caused by the impacts of meteoroids, chunks of rock or dust from space.

Galileo correctly inferred that some of the light-colored features he saw on the moon’s surface were highlands, or mountains. The peaks of the lunar highlands and the rims of the craters cast dark shadows, which Galileo could see. The rugged lunar highlands cover much of the moon’s surface.

The moon is dry and airless. Compared to Earth, the moon is small and has large variations in its surface temperature. To stay at a comfortable temperature, protect against sunburn, and carry an air supply, you would have to wear a bulky spacesuit if you visited the moon.

The moon is 3,476 kilometers in diameter, a little less than the distance across the contiguous United States. This is about one fourth Earth’s diameter. However, the moon has only one-eightieth as much mass as Earth.

The moon has no liquid water. However, there is evidence that there may be large patches of ice near the moon’s poles. Temperatures in these regions are so low that ice there would remain frozen.

People have long wondered how the moon was formed. Scientists have suggested many possible theories. The theory of the moon’s origin that seems to best fit the evidence is called the collision-ring theory. About 4.5 billion years ago, when Earth was very young, the solar system was full of rocky debris. Some of this debris was the size of small planets. Scientists theorize that a planet-sized object collided with Earth to form the moon. Gravity caused this material to combine to form the moon.



