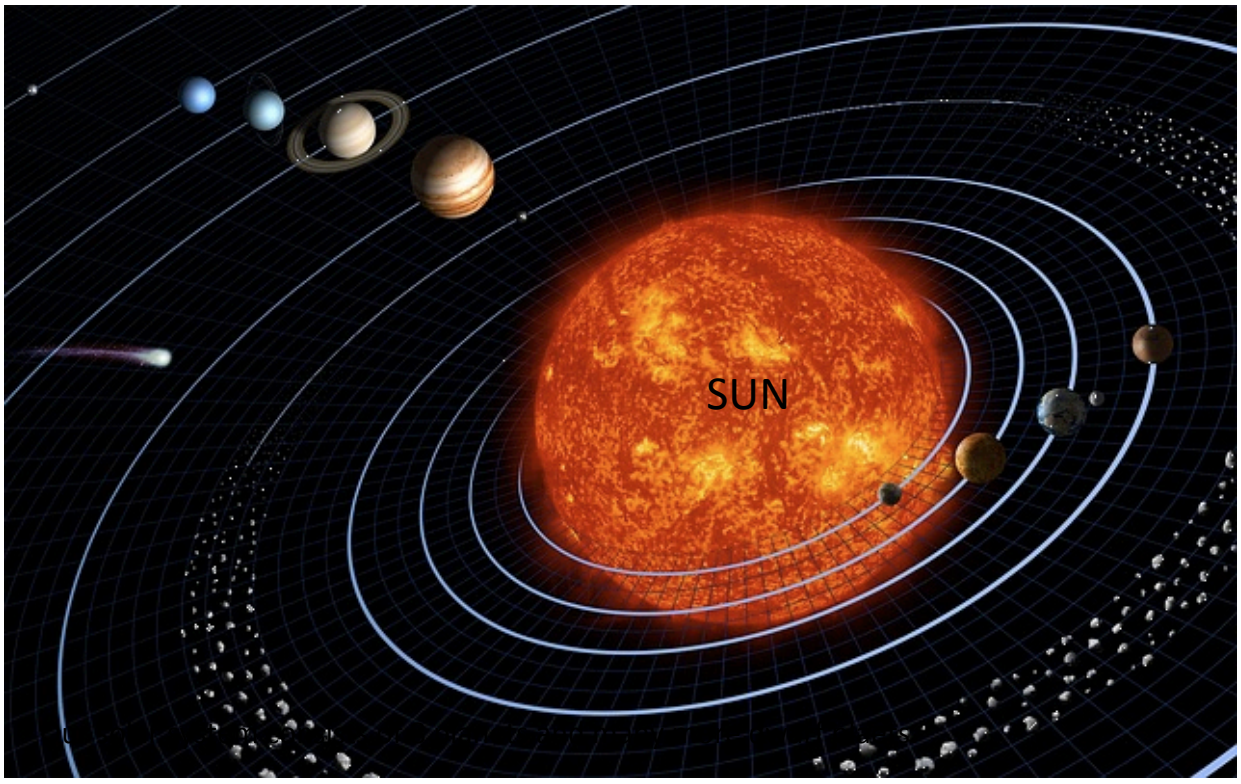
L1 Earth and the solar system?

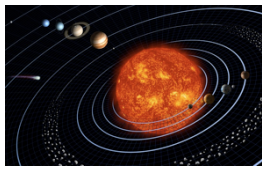
The **solar system** was formed some 4.6 billion years ago. It consists of the sun, planets, **dwarf planets**, moons and small objects that travel around the sun.



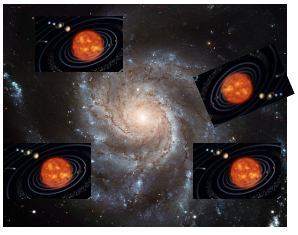
Did you know that for thousands of years people thought that the earth was the center of the universe. They believed that the earth was stationary and that everything revolved around it. This theory has now changed. The sun is in fact the center of our solar system, and the planets, and small bodies travel around the sun in an orbit. The **universe** consists of many stars, planets, solar systems and **galaxies**.

Our solar system, can be found in the Galaxy called the Milky Way. Scientists have discovered 500 solar systems that exist in our galaxy, and they believe that there are billions of other solar systems. Just think for every star that you see in the night sky, there could be a bunch of planets orbiting around it, just like in our solar system. Who knows; on one of these planets there could be life, and they could be staring right back at us.

STAR (SUN) + PLANETS = SOLAR SYSTEM



BILLIONS OF SOLAR SYSTEMS= GALAXY



BILLIONS OF GALAXIES = UNIVERSE

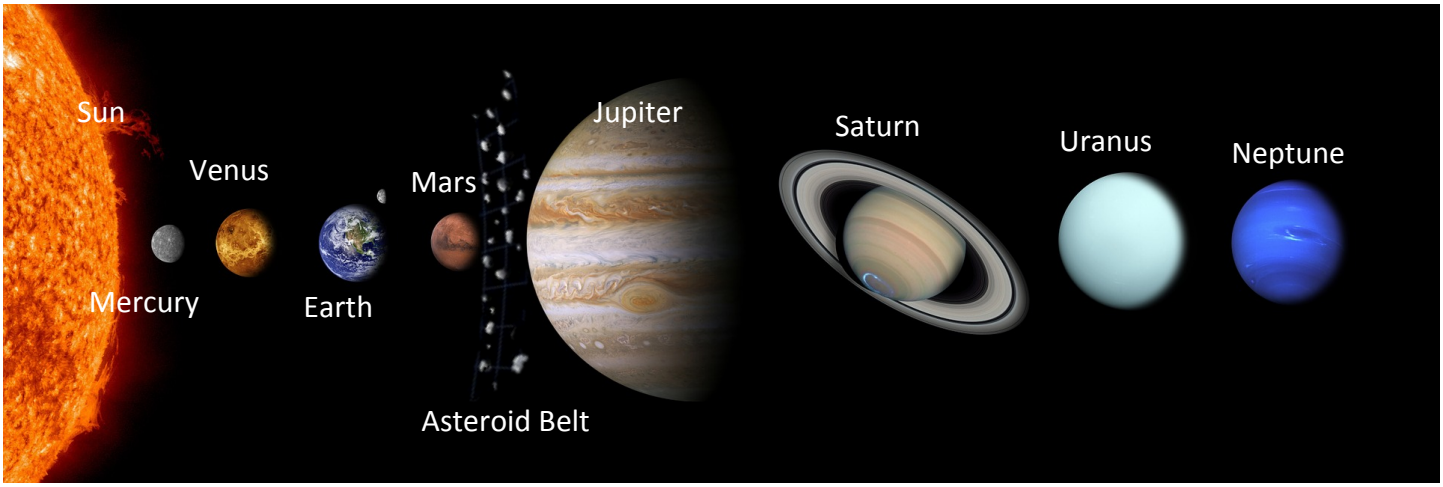
L1 Earth and the solar system? ACTIVITY

1. You now know what the solar system is, and where it fits within our universe. Thousands of years ago, scientist's views of the solar system were very different. Use the information that you have read to produce a cartoon to show how scientist's ideas about the solar system have changed. You should include information, pictures and a title.

L2: The formation of The solar System

In the infinite space of our universe, you will find a galaxy called the Milky Way. This galaxy, is not filled with chocolate, but billions of solar systems. One of these solar systems contains a rock that we call home, planet Earth.

Our solar system formed around 4.6 billion years ago. Scientists believe that a molecular cloud (sometimes called a stellar nursery), consisting of hydrogen collapsed on itself. The collapsing of the cloud resulted in the collision of hydrogen atoms, a process known as nuclear fusion. These reactions formed a star, which we call our sun. Surrounding the sun was a rotating disc of space dust and gas, over millions of years these particles of dust and gas began to collide with each other and increase in size and mass, forming the planets and many other bodies such as **comets** and **asteroids** which continue to orbit the sun along a predicted path.



WHAT IS THE SUN?

As mentioned before, the sun is a star. Next time you look into the night sky and see a star twinkling back at you, hold in you thoughts that this star, is a sun, and surrounding this sun there could be planets like ours. The sun is the largest mass, within the solar system, meaning that in comparison to all of the other planets and orbiting bodies, it is the largest and contains the most matter.

The sun is essentially made up of helium and hydrogen. The power that is generated from the sun comes from nuclear reactions that occur inside the star. Hydrogen atoms collide with other hydrogen atoms through a process called **nuclear fusion**, to produce Helium. The energy that is produced in 1 second, from the sun is the equivalent of more than a trillion atomic bombs exploding at once. This energy is seen as light, and travels through space in the form of solar radiation. When it hits our planet we feel it as heat.

THE PLANETS

There are eight planets and a number of dwarf planets that orbit the sun. You need to know that our solar system consists of the inner rock planets; mercury, Venus, Earth and Mars, and the outer gaseous planets, Jupiter, Saturn, Uranus and Neptune. The inner and outer planets are divided by a bunch of smaller rocks that form the **asteroid belt**, these rocks range in size from pebbles to huge boulders.

SATELLITES

Planet earth along with many other planets within our solar system have moons. These moons are called **satellites**, as they circle the planet along a definite path, called an orbit.

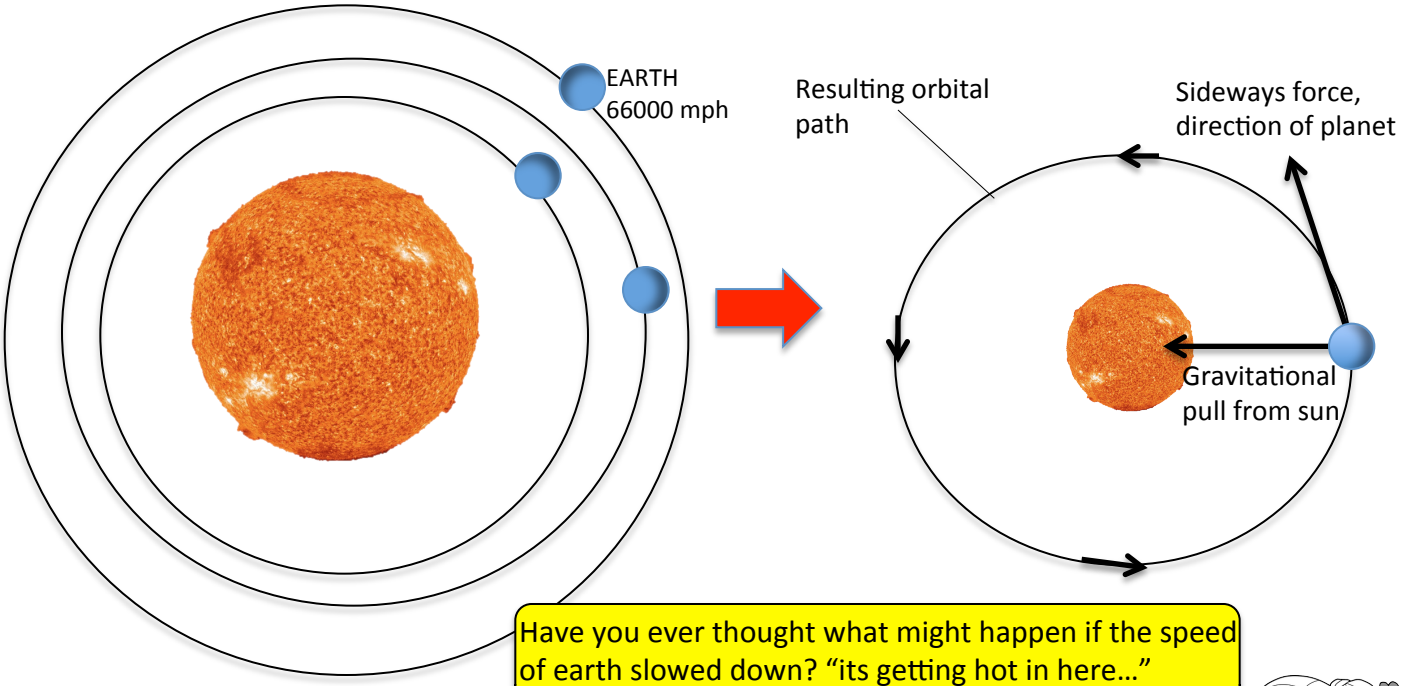
L2: The formation of The solar System ACTIVITY

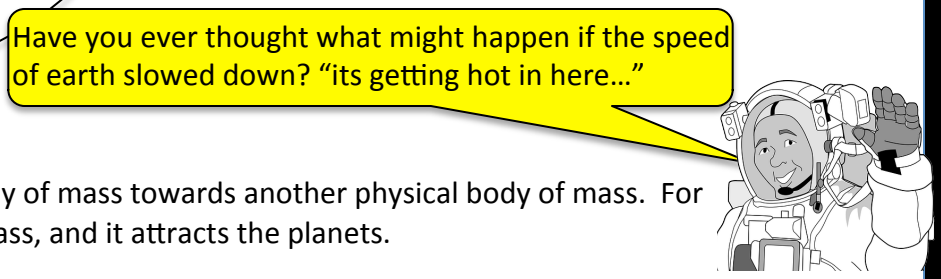
1. The Year is 4250. Our Solar system has become a tourist attraction for many Alien visitors. You work for a tourist company, your job is to promote and advertise our solar system so that more people visit. Produce a poster to promote and advertise our solar system. **Include: which planets you can see in our solar system, satellites you can visit, information about our sun and the asteroid belt.**

L3: How does the solar system stay together?

Have you ever wondered why the planets of the solar system continue to go around the sun and how the solar system stays together? Planet earth travels through space at a speed of 66000 miles per hour, at this insane speed, why does earth not fly off into space?

The reason why the earth continues to travel in its **orbit** around the sun is because of gravity. The enormous mass of the sun creates an equally huge gravitational force which pulls the planets inwards. The combination of the earth's speed through space and the gravitational pull of the sun keep Earth and the other planets of the solar system in their orbits.

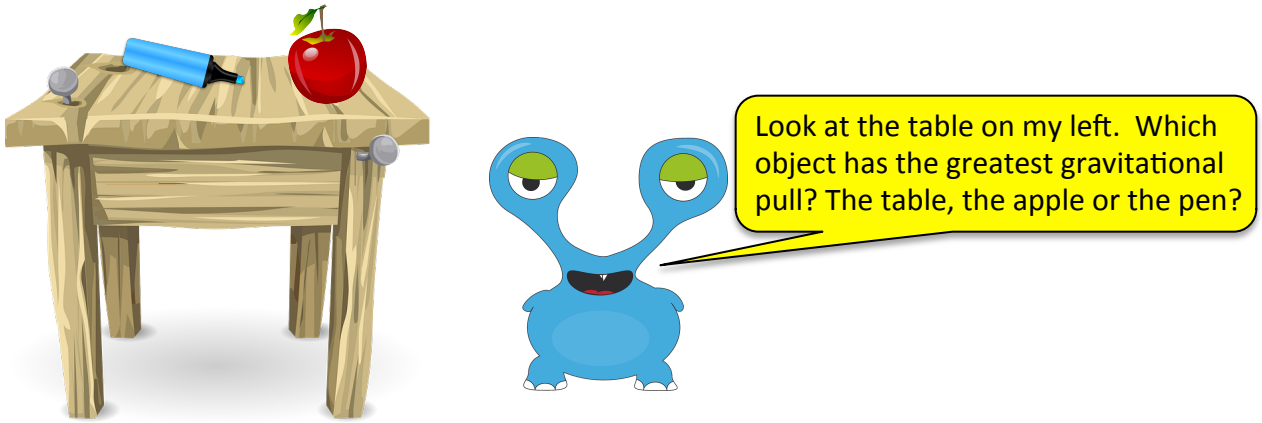




WHAT IS GRAVITY?

Gravity is the force that attracts one body of mass towards another physical body of mass. For example the sun, is a physical body of mass, and it attracts the planets.

Sir Issac Newton, stated that the heavier the object, the greater its gravitational pull. The sun is the heaviest object in our solar system, therefore it exerts the most gravitational pull. If you look around you, every object in the classroom has its own gravitational pull. The heavier the object the greater its gravitational pull.



L3: How does the solar system stay together? ACTIVITY

1. What is gravity?_____

_____

2. How fast does planet Earth travel around the sun? _____

3. What is an orbit?_____

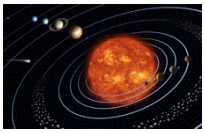
3. Produce a foladable to explain how the force of gravity holds the solar system together.

Regular 8”X10” paper

FOLD----------

FRONT

HOW DOES THE SOLAR SYSTEM STAY TOGETHER?



INSIDE

1.WHAT IS GRAVITY?

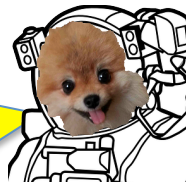
2. DIAGRAM TO SHOW HOW PLANETS STAY IN ORBIT.

3. EXPLANATION OF THE DIAGRAM

1.WHAT WOULD HAPPEN TO EARTH IF THE SUN’S GRAVITY INCREASED?

2. PICK 5 OBJECTS. LIST THEM IN ORDER OF THEIR GRAVITATIONAL FORCE

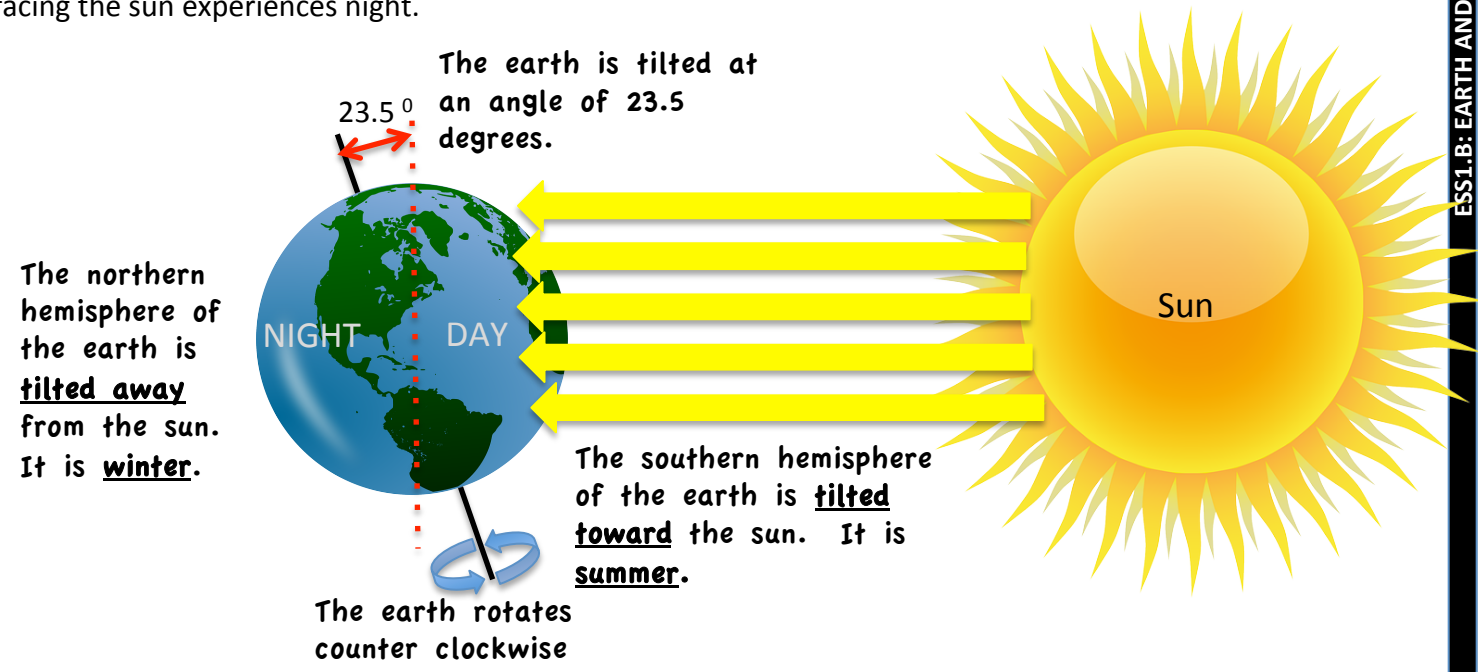
EXAMPLE: If I had 3 objects; a bike, a car and a pen, the car would have the most gravitational force, followed by the bike and the pen. Remember the larger and heavier the object the more gravitational force it has.

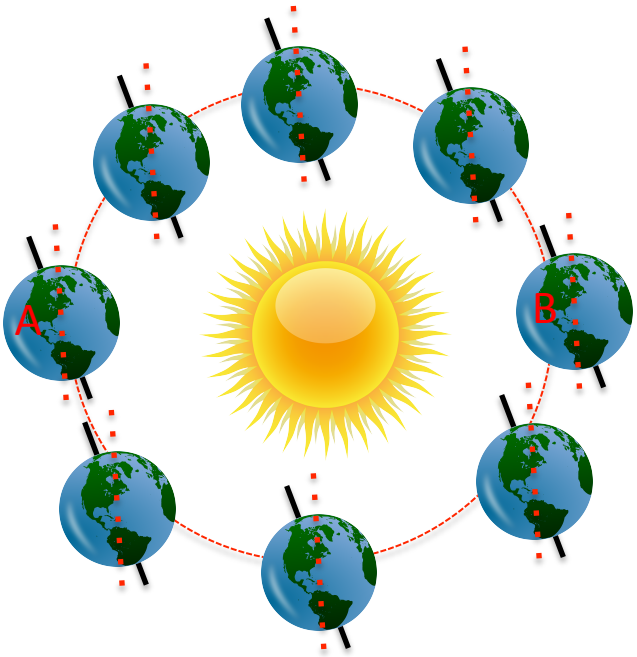


L4: The rotation of the earth and its orbit around the sun

Have you ever watched the sun travel across the sky, rising in the east and setting in the west. What is the reason behind this? Or perhaps have you wondered why it is cold in the winter and much warmer in the summer? The answer to these questions can be explained by using the model below.

Scientists have observed that the sun rises in the east and sets in the west, this means that the sun is moving from right to left. The reason for this is due to the earth rotating on its axis in a counterclockwise direction. The earth rotates fully about every 24 hours. The side that faces the sun experiences day, the side that is not facing the sun experiences night.





The earth revolves around the sun every 365 days. If you live in America at point A, you are tilted away from the sun, you would receive lower intensity rays of light from the sun, therefore experiencing winter.

At Point B, America is tilted towards the sun, you would receive higher intensity rays of light from the sun, therefore you would experience summer.

When the northern hemisphere of the earth experiences winter, the southern hemisphere will experience summer as it is closer to the sun.

The path that the earth follows as it revolves around the sun, is called an orbit.

L4: The rotation of the earth and its orbit around the sun ACTIVITY.

1. What are the 4 seasons? _____
2. At what angle is the earth tilted? _____
3. How long does it take the earth to rotate on its axis?_____
4. How long does it take for the earth to rotate around the sun?_____
5. Produce a booklet about the Earth. **Explain how we get night and day, how we get summer and winter and any additional facts that you want to add.**

Regular 8”X10” paper

FOLD----------

PLANET EARTH

DAY AND NIGHT	SEASONS
FACTS AND INFORMATION	

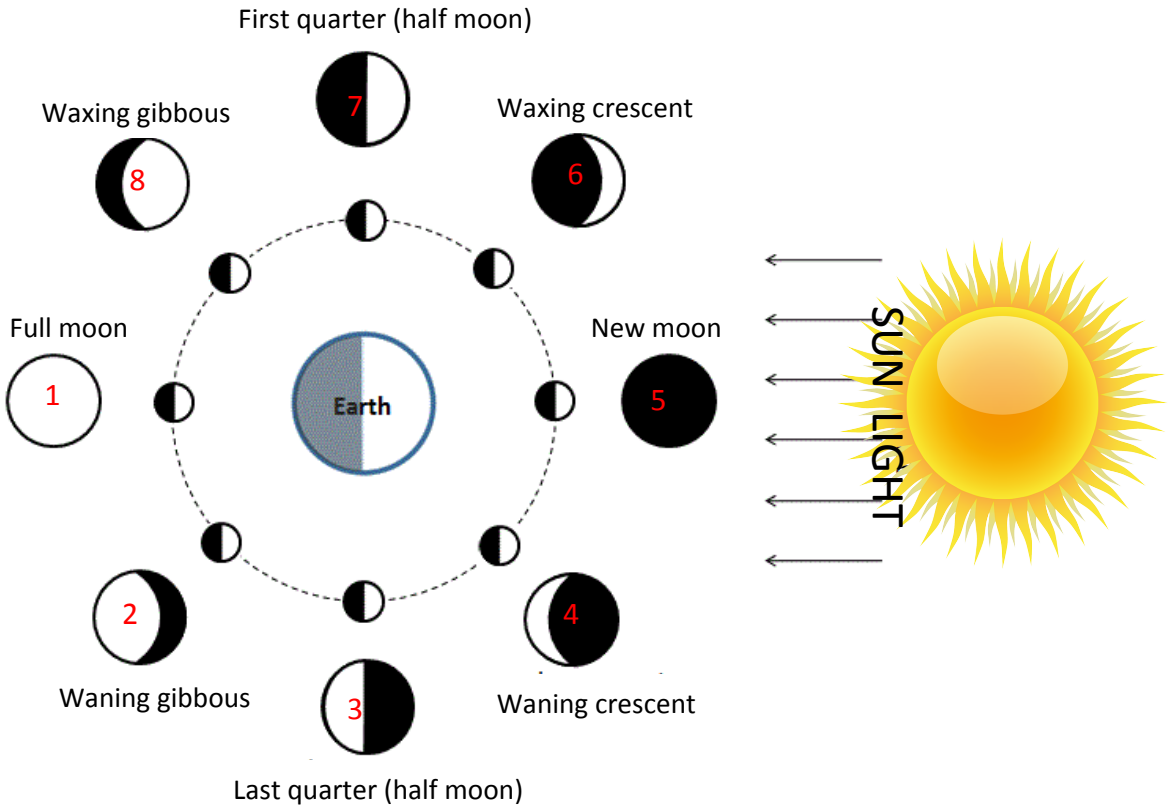
L5: The phases of the moon

Have you ever experienced a lunar or solar eclipse? How is this possible? The answer is simple, it is due to the moon and its orbit around the earth.

The moon is a natural satellite, scientists believe that it was formed from debris that were left over when a . Planet similar in size to Mars, collided with Earth. The collision occurred around the same time that earth was being formed, some 4.5 billion years ago.

The moon rotates at the same speed in which it orbits the earth, meaning that we only ever see one side of the moon, there are many conspiracies as to what lies on the dark side of the moon, some of which were explored in the movie transformers "The Dark Side of The Moon".

We see the moon because it reflects sun light. The light from the sun hits the surface of the moon and reflects this light back to earth. The model below can be used to explain the phases of the moon and solar and lunar eclipses.



Within a month the side of the moon which faces the earth changes from a full moon to a crescent and back to a full moon. The different appearances of the moon from earth can be seen through stages 1-8. The different appearances of the moon result from its changing position relative to the the sun and the Earth. As the moon revolves around the earth the amount of sunlight that hits the surface of the moon and reflects back to Earth changes. For example during a full moon all of the sunlight that hits the moon's surface reflects to earth. During a crescent moon only a fraction of the light that hits the moon surface can be seen from the Earth.

Lunar Eclipse: This happens when the earth comes in between the moon and the sun. The earth casts a shadow on the surface of the moon.

Solar Eclipse: This happens when the moon comes between the earth and the sun, and blocks all or part of the sun.

L5: The phases of the moon ACTIVITY

1. What are the 8 phases of the moon?

_____, _____, _____, _____

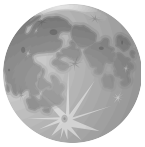
_____, _____, _____, _____

2. Produce a foldable about the moon**. Explain: How the moon formed. Describe and explain the phases of the moon. Explain how we get a solar and lunar eclipse. Include diagrams**. You may also add any additional facts.

FOLD----------

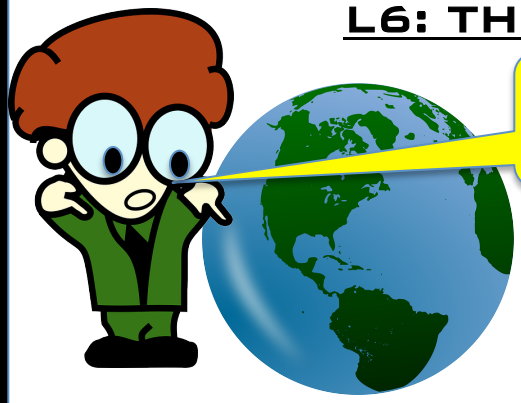
FOLD----------

THE MOON



How the Moon formed	THE PHASES of the moon	SOLAR ECLIPSE LUNAR ECLIPSE

L6: THE HISTORY OF PLANET EARTH

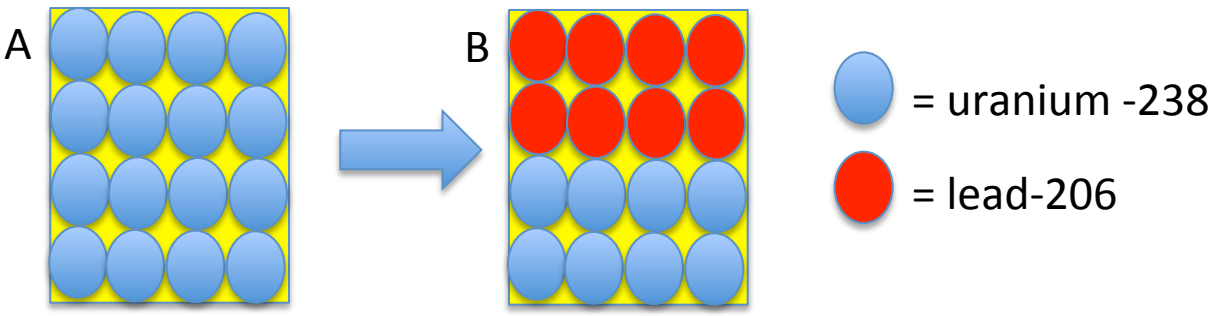


It is true that there was nobody around during the first days when planet earth began to take shape. There was no one to set the timer of the stopwatch. Scientists therefore try to calculate the age of the earth by looking at the rocks that lay within the earths crust. The only problem is that the rocks that formed when Earth was being created no longer exist as they have been melted and consumed by the molten magma that runs beneath the earths crust in a continuous process of rejuvenation, called the rock cycle, Over millions of years rocks become buried and compacted through the natural movements of the earths tectonic plates, These melted pieces of rock then make their way to the surface of the earth, via volcanoes or cracks in the surface between tectonic plates where they cool to form new rock.

The oldest rock on the planet was found in Western Australia, in Jack Hills, the age of this mineral was calculated to be around 4.4 billion years old*.

Scientists dated the rock, through a process called radiometric dating. The rock contained a radioactive isotope, lets call this the parent, and through time it will produce a daughter isotope which is stable. By calculating the percentage of parent isotopes to daughter isotopes they can calculate the age of the rock.

For example the radioactive isotope uranium-238 decays to a more stable lead-206. for half of the uranium-238 sample to decay to lead -206 it takes 4.47 billion years, this is called its half life. Therefore if you had a rock sample that contained 16 atoms, 8 of which were uranium-238 and 8 which were lead-206, your sample would be 4.47 billion years old.



Sample A, contains atoms which are just uranium -238, its age is zero years. Sample B, contains 8 atoms of lead-206 and 8 atoms of uranium-238, Half of the original sample has decayed, its age is 4.47 billion years.

Other methods that scientists use to calculate rocks and fossils on planet Earth include the use of the Geological Time Scale. The scale was determined by using radiometric dating and by exploring the order and layers in which rocks are positioned in relation to each other, you can calculate the relative date of the material that you have found.

* http://news.nationalgeographic.com/news/2014/02/140224-oldest-crust-australia-zircon-science/

L6: THE HISTORY OF PLANET EARTH ACTIVITY

1. How old do scientists believe that the Earth is?_____

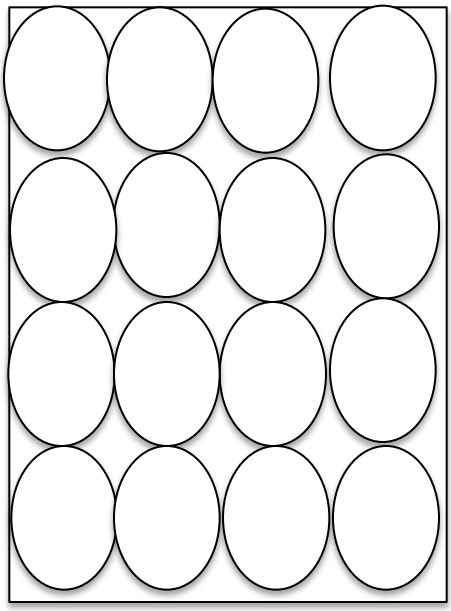
2. What is the oldest piece of rock that has been found on Planet Earth? Where was it found and how old was it?

_____

3. What are two ways in which scientists can calculate the age of the earth and the materials that are found within it?

_____

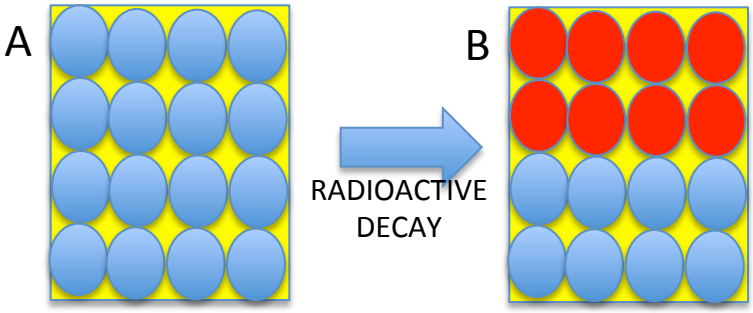
4. Radiometric dating uses the half-life of radioactive materials to calculate the age of something that is found in the earth. Certain radioactive isotopes, take a set amount of time to decay by half into another more stable material. By determining what fraction of an isotope has decayed it is possible to calculate its age.



ACTIVITY: RADIOACTIVE ISOTOPE **XYZ (Your name here)**

1. What is the name of your radioactive isotope _XYZ_____
2. Shade half of the circles, which are found in the box to the left. As you shade them set a timer. The shaded circles represent the stable radioactive material.
3. Record your time here_____
4. Multiply your time by 1000. _____. This is the half life of your Radioactive isotope in years.
5. How many un-shaded circles do you have in your box?_____ These circles represent the unstable radioactive Isotope, which has not yet decayed.

5. If a sample of radioactive isotope A has a half life of 24000 years, how old is sample B?_____



Assignment #1: Explaining eclipses, moon phases and seasons

PERFORMANCE STANDARDS:

MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons. [Clarification Statement: Examples of models can be physical, graphical, or conceptual.]

1. What are the 8 phases of the moon?

_____, _____, _____, _____,

_____,_____,_____,_____

2.Create a model to explain the phases of the moon. Your model could be 3D or graphical using a poster.

RUBRIC:	**SCORE**
1. I have a poster of the phases of the moon.	___/2
2. I have drawn examples of the phases that can be seen from Earth	___/2
3. I have explained how we see the moon from earth.	___/2
4. I have explained how we see a full moon, half moon and crescent moon.	___/2
5. My work includes labeled diagrams and is well presented.	___/2

3. Explain using a model the difference between a solar and lunar eclipse. Present your work on a separate sheet of paper.

RUBRIC:	**SCORE**
1. I have defined a solar eclipse and lunar eclipse.	___/2
2. I have an accurate diagram of a solar eclipse	___/2
3. I have an accurate diagram of a lunar eclipse	___/2
4. I have explained using my model the difference between a solar and lunar eclipse	___/2
5. My work is easy to read.	___/2

4. What are the 4 seasons? Explain using a model why it is possible for America to experience summer at the same time that Australia experiences winter. Add labels and annotations to your diagrams.

RUBRIC:	**SCORE**
1. I have explained what the 4 seasons are	___/2
2. I have explained that we experience summer when the Earth's hemisphere is titled towards the sun	___/2
3. I have explained that we experience winter when the earth's hemisphere is tilted away from the sun	___/2
4. I have explained that when Australia is tilted towards the sun, America will be tilted away from the sun	___/2
5. I have labeled diagrams to support my argument.	___/2

Assignment #2: Explaining the role of Gravity within the solar system and galaxy.

PERFORMANCE STANDARDS:

MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system. [Clarification Statement: Emphasis for the model is on gravity as the force that holds together the solar system and Milky Way galaxy and controls orbital motions within them.

1. What is gravity? _____

2. What is the difference between Mass and Weight?_____

3. Which object has the greatest amount of gravitational pull? Explain your answer.

Chair Pencil car Human

_____
_____
_____
_____

4. Use a model to explain how the solar system and the milky way galaxy stay together. Present your work on a separate piece of paper.

RUBRIC	SCORE
1. I have defined the solar system and the Milky Way Galaxy.	__/2
2. I have defined gravity.	__/2
3. I have explained which objects in the solar system and galaxy have the greatest amount of gravitational pull	__/2
1. I have explained how the galaxy and solar system stay together	__/2
2. My work is well presented and includes diagrams and labels.	__/2

5. Explain how gravity helps keep the planets of our solar system in orbit.

RUBRIC	SCORE
1. I have defined the solar system	__/2
2. I have explained what an orbit is	__/2
3. I have explained how gravity keeps the planets in their orbit	__/2
4. I have diagrams to help support my argument	__/2
5. My work is well presented.	__/2

Assignment #3:

PERFORMANCE STANDARDS:

MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system. [.

1. The solar system covers a vast area, which is sometimes very difficult to visualize. For example the diameter across the sun measures 864,900 miles. The distance between the sun and Mercury, the planet closest to the sun measures 35,980,000 miles. The numbers continue to get bigger as you go further out and away from the sun. Consequently scientists use Astronomical units, in the place of miles. This is because the units are much smaller when written on paper. For example the distance from Mercury to the sun is 0.7233 AU, which is much easier to write than 35,980,000 miles.

The table below shows the diameters (distances across) of planets and their scale model properties. Complete the table "Real life objects" by measuring different objects in your classroom which equal the "Scale Model Diameters".

PLANET	REAL DIAMETER (miles)	SCALE MODEL DIAMETER (inches)	Real life object
Sun	864,900	60	
Mercury	3,032	0.2103	
Venus	7,519	0.5216	Dime coin
Earth	7,916	0.5491	
Mars	4,212	0.2922	
Jupiter	86,870	6.026	
Saturn	72,390	5.022	
Uranus	31,520	2.186	
Neptune	30,600	2.123	

2. Go to the website http://thinkzone.wlonk.com/SS/SolarSystemModel.php explore your own scale model of the solar system. Input your own values to see how a scale model of the solar system would fit over your school or in your neighborhood.

Assignment #3:

PERFORMANCE STANDARDS:

MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.

The picture below shows a scale model of the solar system. The scale model covers an area of New York. The scale model of the sun measures 5ft in diameter, and is located at the Empire State Building. Each ring represents the scale model orbits of the inner planets.

Model scale 1: 913,386,000

Created using website http://thinkzone.wlonk.com/SS/SolarSystemModel.php

Use the scale model to answer the questions.

1. Which planet's orbit has the largest diameter?

2. In this scale model, what size is the sun?

3. Which planet's orbit has a scale diameter that extends from the Empire State Building to the store "Forever 21"?

4. By applying your knowledge of scale models, what would happen if we doubled the scale model of the sun, from 60 inches in diameter to 120 inches. Explain your answer.

Assignment #4:

PERFORMANCE STANDARDS:

MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history. [

The Geological time scale, is a chronological measurement that relates stratigraphy (study of rock layers) to time. It is used by geologists, earth scientists and paleontologists to establish relative ages of major events in Earth's history. **Study the diagram below showing rock strata, then answer the questions.**

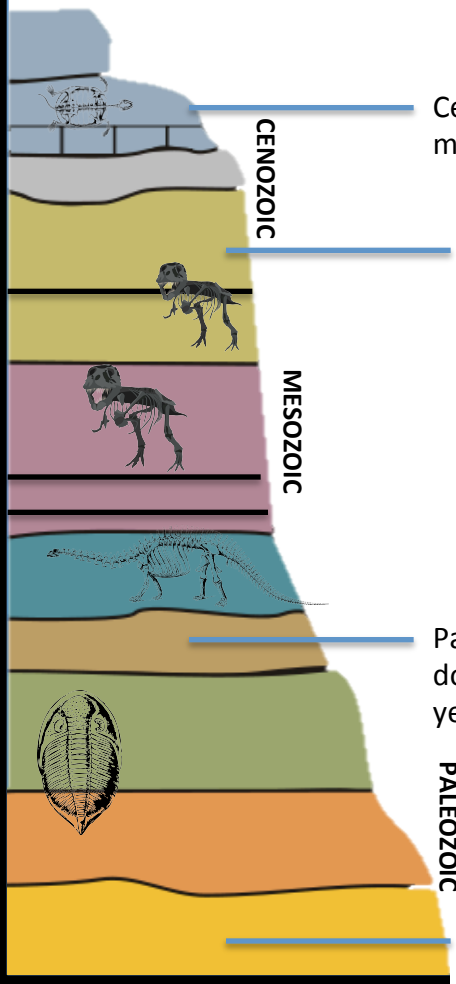
1 What do you notice about the age of the rock, the further down you go?_____

2. Based on the diagram why is it inaccurate to say that Dinosaurs, namely the T-Rex, lived 260 million years ago. Support your answer with evidence.

_____

_____

3. Study the diagram. What value does rock strata have in creating the geological time scale and organizing Earth's 4.6 Billion –year – old history?



Cenozoic (rock samples date 0.01 million years towards the top and 65 million years old towards the bottom of this section of rock)

Mesozoic (rock samples at this level are dated 66 million years old, rocks towards the bottom of this section are dated 251 million years old)

Paleozoic (rock samples at this level date 252 million years old, the further down you go through the layers you will find rock samples dated 542 million years towards the bottom).

Precambrian (rock samples at this level date 543 million years old, rocks further down date up to 4600 million years old.)

VOCABULARY

SOLAR SYSTEM: A collection of planets, dwarf planets, moons and small objects that travel around the sun.

SUN: The star that is at the center of our solar system.

GALAXY: A collection of millions or billions of stars, together with gas and dust which are held together by a gravitational force. Our galaxy is called the Milky Way.

UNIVERSE: The whole of the vast expanse known as space and everything that is included within it. It contains many galaxies.

DWARF PLANET: Worlds that are too small to be classed as a planet. Pluto is classed as a Dwarf Planet.

ASTEROID: Small rocky body that orbits the sun. They range in size from 600 miles across to dust particles.

COMET: An object in space that is made of ice and dust.

ASTEROID BELT: The region in our solar system that is located between Mars and Jupiter, it consists of many different asteroids that are of varying shape and size.

SATELLITE: An object in space that orbits a planet. Satellites can be natural; such as the moon, which orbits Earth or man made, such as the International Space Station, which was made by scientists and orbits the Earth.

ORBIT: The curved path which a planet or object in space follows, as it travels around a star, planet or moon.

GRAVITY: The force that attracts one body of mass towards another physical body of mass. For example the sun, is a physical body of mass, and it attracts the planets.

NUCLEAR FUSION: Process by which the nucleus of atoms collide to form a heavier nucleus and the release of large amounts of energy.

1. Produce a personal dictionary for the key vocabulary words. You should include the **WORD, DEFINITION, SENTENCE** and **PICTURE.**

WORD	DEFINITION	SENTENCE	PICTURE

SOLAR SYSTEM QUIZ

NAME_____ SCORE_____

1. What is the name given to a collection of planets, moons and small objects that travel around the sun?

A. GALAXY B. UNIVERSE C. SOLAR SYSTEM D. BELT E. ORBIT

2. What is at the center of our solar system?

A. EARTH B. MOON C. SUN D. GALAXY

3. What are the two major elements that are found in the sun?

A. HELIUM AND NITROGEN B. HELIUM AND HYDROGEN C. HYDROGEN AND NITROGEN

4. The sun creates energy by colliding hydrogen atoms together. What is this type of reaction called?

A. NUCLEAR FISSION B. NUCLEAR FUSION C. ATOMIC BOMBING D. NUCLEAR EXPLOSION

5. How many rocky planets are there in the solar system?

A. 4 B. 5 C. 8 D. 2

6. What name is given to the OUTER PLANETS of our solar system?

A. THE ROCKY PLANETS B. THE GAS GIANTS C. THE DEAD PLANETS D. DWARF PLANETS

7. What type of eclipse occurs when the Earth is between the sun and the moon?

A. LUNAR ECLIPSE B. SOLAR ECLIPSE C. BLOOD MOON

8. Which is the correct order of the planets In our solar system?

A. MARS, JUPITER, SATURN, URANUS, VENUS, EARTH, NEPTUNE, MERCURY
B. MERCURY, VENUS, MARS, EARTH, JUPITER, SATURN, URANUS, NEPTUNE
C. MERCURY, VENUS, EARTH, MARS, JUPITER, SATURN, URANUS, NEPTUNE
D. MERCURY, EARTH VENUS, MARS, SATURN, JUPITER, URANUS, NEPTUNE

9. What is the CORRECT name of an object in space that orbits a planet?

A. MOON B. SATELLITE C. ASTEROID D. COMET E. ORBIT

10. Which of the following has the greatest gravitational force?

A. CAR B. SKATEBOARD C. PENCIL D. HUMAN

11. When the northern hemisphere of the Earth tilts towards the sun, what season is it?

A. WINTER B. SUMMER C. FALL