Middle School Science STAAR Review

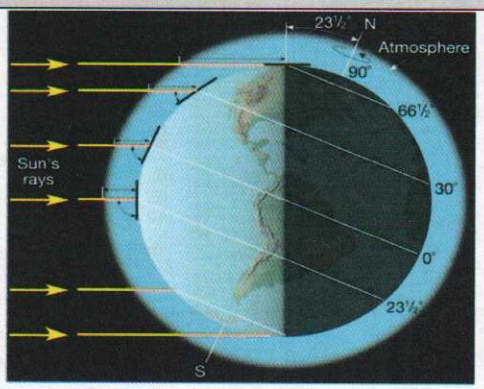
Reporting Category 3: Earth & Space

8.7.A model and illustrate how the tilted Earth rotates on its axis, causing day and night, and revolves around the Sun causing changes in seasons

Earth

Day & Night

The Earth rotates or spins around its axis. The **axis** is an imaginary line running through the center of the earth from the North Pole to the South Pole. This rotation takes 24 hours causing the sun to rise and set (night and day). Earth's axis tilts **23.5 degrees**.

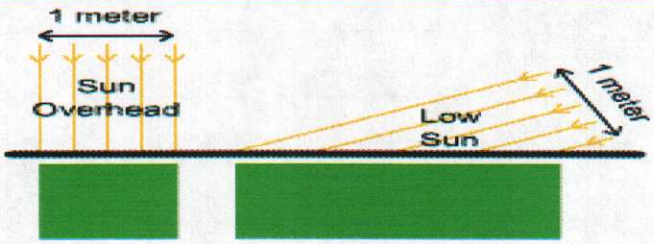


1 rotation = 24 hours or 1day

Earth & Sun

Year & Seasons

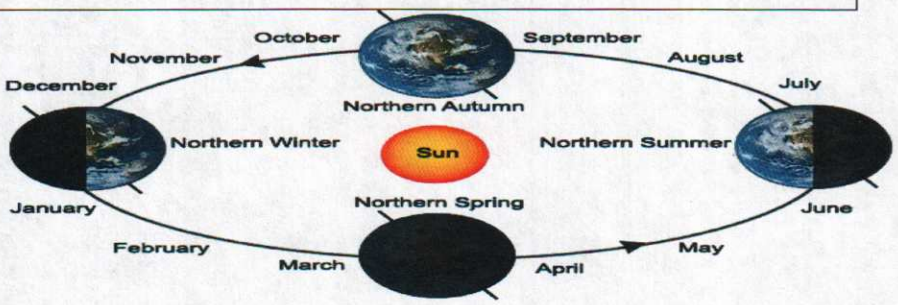
It takes just over **365 days** or **one year** for the Earth to complete one revolution around the Sun. However because of its tilt, the Sun's rays hit the Northern Hemisphere longer and more directly in the summer the in the winter. When it's summer in the **Northern Hemisphere**, it is winter in the **Southern Hemisphere**.



Earth & Sun

*Seasons – caused by **tilt of the axis***

One hemisphere is **Tilted** away from the Sun and receives less direct solar rays from the Sun. The area around the **Equator** isn't affected by Earth's **Tilt**. Because it's in the middle, it will always have direct solar rays all year round. And this is the **reasons for the seasons** in the Northern and Southern Hemispheres. Around the equator there's only one season, Summer.



QUESTIONS:

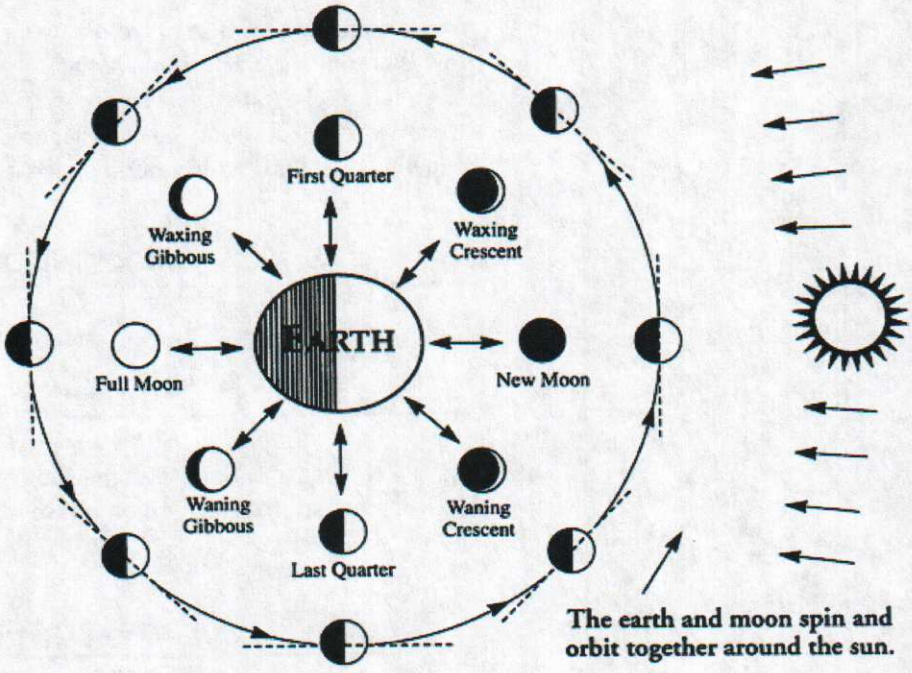
1. What is the difference between Earth's rotation and revolution?

2. Why do day and night occur? Draw a detailed picture to describe the process. Make sure to label and identify any important factors such as Earth's axis, the North Star, and the direction Earth moves.

3.. What causes seasons to occur? Use 2-3 sentences to explain the process.

8.7.B demonstrate and predict the sequence of events in the lunar cycle

Phases of the Moon



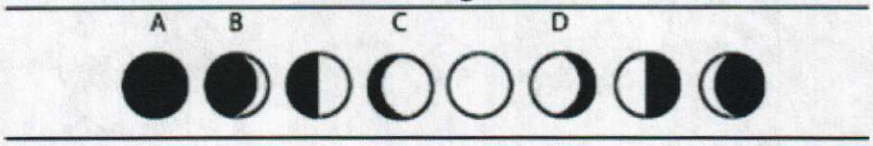
Earth, Moon & Sun

Phases	*Description of Lunar Phases*
	**New Moon:** The lighted side of the Moon faces away from the Earth. This means that the Sun, Earth, and Moon are almost in a straight line.
	**First Quarter:** The right half of the Moon appears lighted and the left side of the Moon appears dark.
	**Full Moon:** The lighted side of the Moon faces the Earth. This means that the Earth, Sun, and Moon are nearly in a straight line, with the Earth in the middle.
	**Last Quarter:** Sometimes called Third Quarter. The left half of the Moon appears lighted, and the right side of the Moon appears dark.

QUESTIONS:

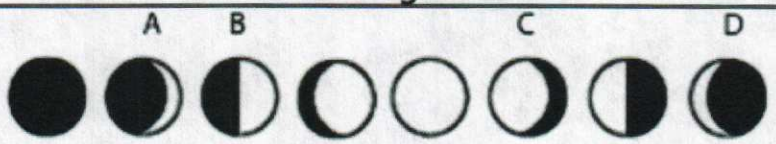
1. How is a full moon different from a new moon?
2. How is waxing different from waning?
3. What causes the lunar cycle to occur?
4. Use the choices of Moon views in Moon Diagram 1 below to answer the following question. Which moon phase is a waxing gibbous? A, B, C, or D?

Moon Diagram 1



5. Use the choices of Moon views in Moon Diagram 2 below to answer the following question. Which moon phase is a waning crescent? A, B, C, or D?
6.

Moon Diagram 2



7. How is the Moon positioned relative to the Sun and Earth during a full moon?
8. What lunar phase directly follows the waxing crescent?

9. What is caused by the combination of the light from the Sun and the Moon's orbit around Earth?
10. What Moon phase occurs when the Sun, Earth, and Moon form a right triangle and the Moon is moving towards the Sun?
11. A student is making a model of the lunar cycle. What two terms does the student need to include, which **indicate the direction** of the movement of the Moon? Circle one of the pair answers below.

Towards and away Waxing and waning Orbiting and rotating East and West

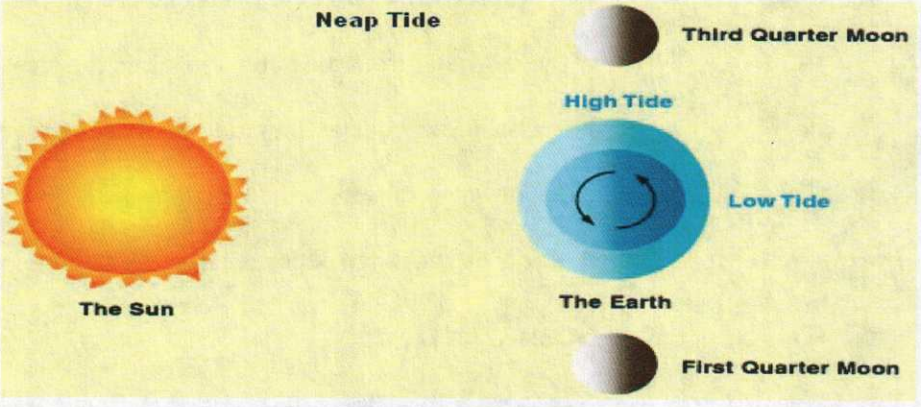
8.7.C relate the position of the Moon and Sun to their effect on ocean tides

Tides

Tides are the periodic rise and fall of the ocean waters. They are caused by the gravitational pulls of the Moon and Sun, as well as the rotation of the Earth. The Sun and Moon pull on the Earth, the water, even you!

Spring Tide

Neap Tide



QUESTIONS:

1. What effect does the gravitational pull of the Moon and the Sun have on Earth?

2. What causes tides to occur on Earth?

3. Why are we able to predict tides?

4. What is a high tide? A low tide?

5. What is a neap tide? A spring tide?

6. What are the two main causes of ocean tides?

7. The sand castle you made earlier is now washing away. What is most likely occurring?

8. You fall asleep lying on your beach towel on the moist sand near the ocean waves, but when you wake up, the edge of the ocean is much farther away from your towel. What is most likely the explanation?

9. When the Moon, Earth, and Sun system are in the positions as shown in the diagram below, what kind of tide does Earth's waters experience?

A. Neap tide
B. Spring tide
C. Low tide
D. High tide

10. When the Moon, Earth, and Sun system are in the positions as shown in the diagram, what kind of tide does Earth's waters experience?

A. Neap tide
B. Spring tide
C. Low tide
D. High tide

8.8.A describe components of the universe, including stars, nebulae, and galaxies, and use models such as the Hertzsprung-Russell diagram for classification

Components of the Universe

Nebulae	Huge clouds of dust and gas.	
Asteroids	Large rock that orbits the sun	
Comet	Made of ice, dust & small rock.	
Star	A star is ball of hydrogen and helium fueled by fusion.	

Galaxy	A collection of stars held together by the gravity. Our Solar System is in the Milky Way Galaxy (Spiral).

Types of Galaxies

Spiral	*Elliptical*	*Irregular*
		

Star Classification

Stars are classified by their **spectra** (the elements that they absorb) and **surface temperature**. There are seven main types of stars. In order of decreasing temperature, **O, B, A, F, G, K, and M**. O and B stars are uncommon but very bright; M stars are common but dim. An easy way to remember is: "**Oh Be A Fine Girl (or guy) Kiss Me**."

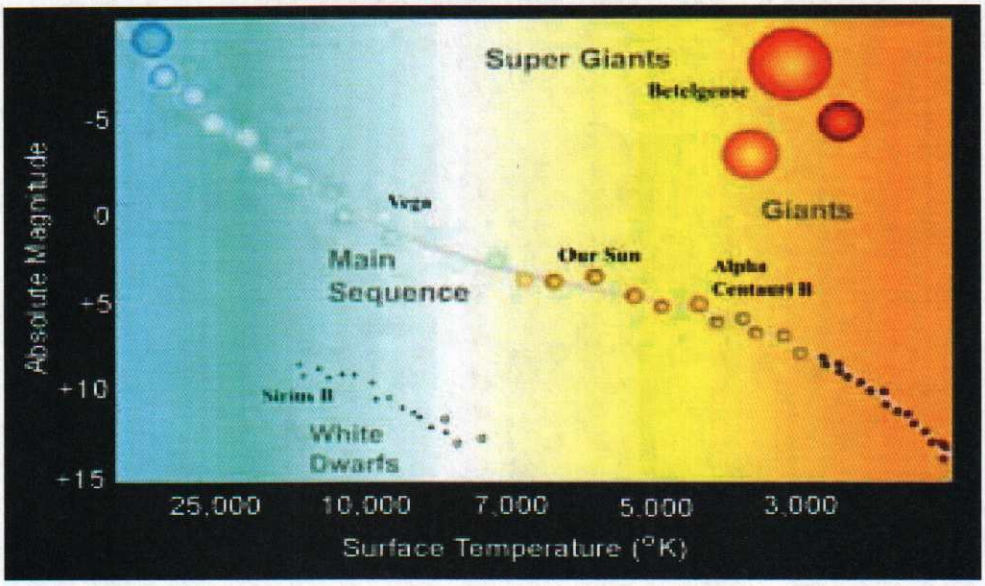
Class	Brightness	Temperature	Color
O	Brightest	30,000-60,000	Blue
B		10,000-30,000	Blue-White
A		7,5000-10,000	White
F		6,000-7,5000	Yellow-White
G		5,000-6,000	Yellow
K		3,500-5,000	Orange
M	Very Dim	2,000-3,000	Red

Hertzsprung – Russell Diagram

The H-R Diagram is a graph that plots stars color (spectral type or surface temperature) vs. its luminosity (brightness). This diagram shows 3 different types of stars:

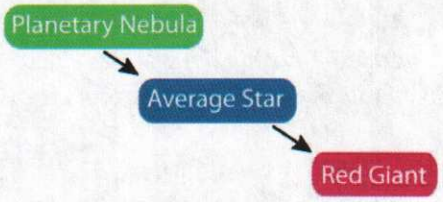
1. Most stars, including the sun, are "**main sequence stars**," fueled by nuclear fusion converting hydrogen into helium. For these stars, the hotter they are, the brighter.
2. As stars begin to die, they become **giants and supergiants** (above the main sequence). These stars have depleted their hydrogen supply and are very old.
3. Smaller stars (like our Sun) eventually become faint **white dwarfs** (hot, white, dim stars) that are below the main sequence. These hot, shrinking stars have depleted their nuclear fuels and will eventually become cold, dark, black dwarfs.

Hertzsprung – Russell Diagram



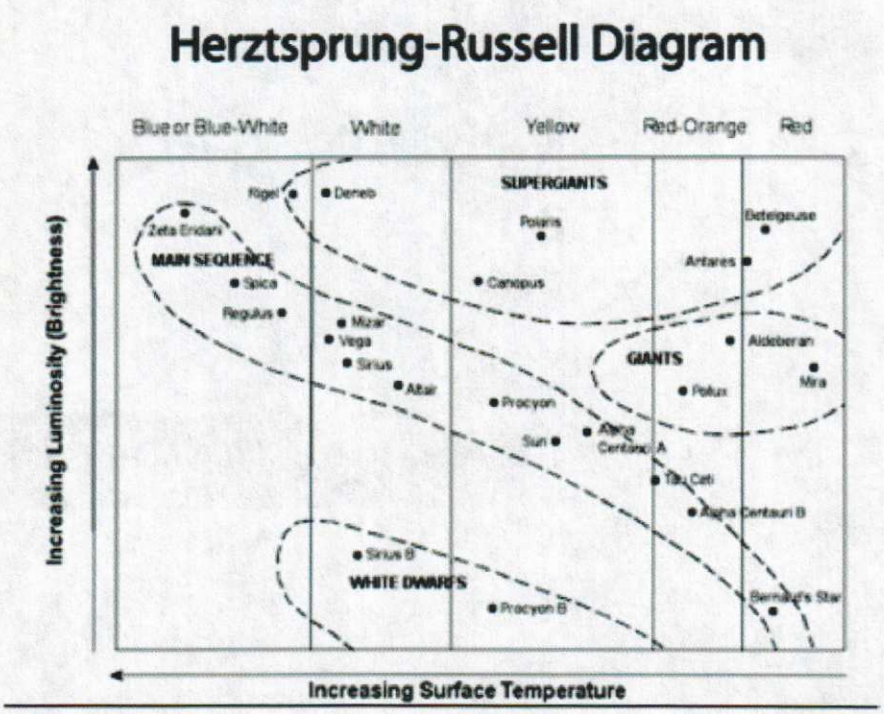
QUESTIONS:

1. A friend of yours was trying to create a flowchart showing the lifecycle of an average size star. What would you change to make it correct?



2. The major characteristic that determines the life cycle of a star is –
   A. The type of nebula that created it
   B. The mass of the star
   C. The color of the star
   D. The density of the star

3. Use the information in the diagram below to answer the question. Massive stars tend to be either blue or white in color. What does this color tell us about these stars?



4. Use the information in the diagram above to answer the question.

   The Herztsprung-Russell diagram classifies stars by their surface temperature and luminosity. If a star has a low surface temperature and is considered very dim, where would you expect it to be located on the Herztsprung-Russell diagram?

5. Which of the following can be found in galaxies?

   A. Stars, interstellar gas, and dust
   B. Stars, mini-galaxies, dust
   C. Dust, gas, and millions of black holes
   D. Lenticular galaxies and irregular galaxies

6. What are black holes, and how are they created?

7. What are nebulae, and how are they important?

8. How are stars different from each other?

9. What is the Herztsprung-Russell Diagram, and how is it used to classify stars?

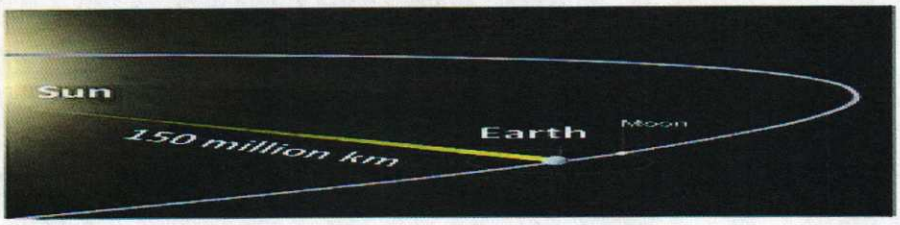
10. How are galaxies classified?

8.8.B recognize that the Sun is a medium-sized star near the edge of a disc-shaped galaxy of stars and that the Sun is many thousands of times closer to Earth than any other star

The Sun

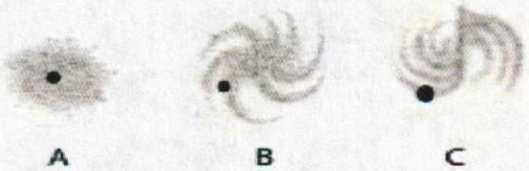
Did you know?

Our Sun is a medium size yellow star near the edge of a disc-shape galaxy of stars. The Sun is many thousands of times closer to Earth than any other star.



QUESTIONS:

1. Which of the models below is the best representation of the location of the Sun in the Milky Way galaxy?



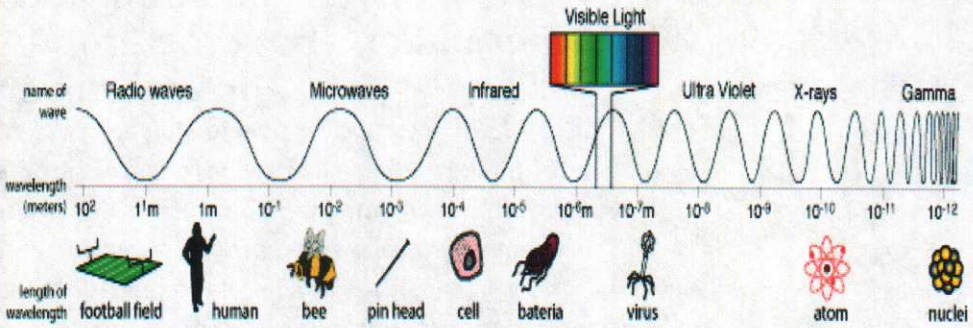
2. Describe the location of our Sun and other stars near it in relation to the Milky Way galaxy.
3. Compare a planet, a star, and a galaxy in terms of: (a) size (b) light emitting ability and (c) location.

Components of Universe	Size	Light emitting ability	Location
Planet			
Star			
Galaxy			

8.8.C explore how different wavelengths of the electromagnetic spectrum such as light and radio waves are used to gain information about distances and properties of components in the universe

Electromagnetic Spectrum

Electromagnetic Waves have different wavelengths. Waves in the electromagnetic spectrum vary in size. All electromagnetic waves travel at the same speed - **the speed of light.**



Radio waves and visible light are types of electromagnetic waves. They differ from each other in wavelength. **Wavelength** is the distance between one wave crest to the next. Other examples are microwaves, infrared, ultraviolet, X-rays and gamma-ray.

Each type of wave on the spectrum has a different effect and use. Scientists use the electromagnetic radiation given off by **components in the universe to measure distances in space and the composition of objects in our universe.**

Radio Waves

Objects in space, such as planets, comets, giant clouds of gas, stars and galaxies, give off light at many different wavelengths. Some of the light they give off has very large wavelengths – sometimes as long as a mile!

Radio telescopes look at planets, comets, giant clouds of gas, stars and galaxies. By studying the **radio waves** originating from these sources astronomers ***can learn about their composition, structure, and motion*. Radio astronomy has the advantage because sunlight, clouds, and rain do not affect observations.**

Radio Telescope

Electromagnetic waves are important because they provide scientists with important information about components of our universe. Electromagnetic waves are also used to measure distance in space.

How the EM spectrum can be use to gain in information about the Properties of Components in the Universe

Images from telescopes engineered to detect different types of electromagnetic radiation show the same astronomical object in different ways. Skilled observers can recognize certain properties of the object from these images. For instance, in the case of a nebula, the gaseous remnant of an exploding star, the color and intensity of visible light and other portions of the spectrum indicate which elements are present and in what quantity. Infrared images provide information about planets, comets, newly forming stars, and other relatively cool bodies. X- ray telescopes capture and show radiation from very hot regions in stars and from violent events like explosions or collisions.

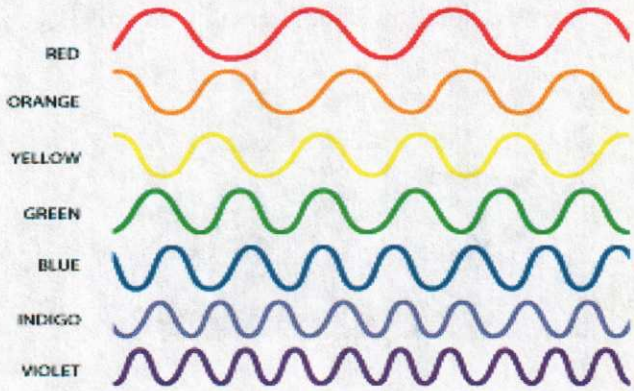
Crab Nebula X-Ray

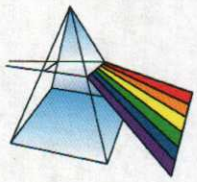
Crab Nebula Infrared

X-ray, Infrared, Visible

Light Waves

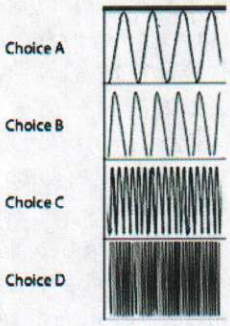
Visible light waves are the only electromagnetic waves we can see. We see these waves as the colors of the rainbow. Each color has a different wavelength. Red has the longest wavelength and violet has the shortest wavelength. When all the waves are seen together, they make white light. **Visible light helps scientists understand the chemical composition of stars.**





QUESTIONS:

1. How do astronomers use the electromagnetic spectrum to gain information about the properties of the components of the universe?
2. How do astronomers know that galaxies are moving away from Earth?
3. Look at the electromagnetic spectrum provided above. What kind of waves are the longest in the electromagnetic spectrum?
4. Which one of the choices below is the best representation of a Gamma Ray?



5. Look at the electromagnetic spectrum. List the following waves in order of HIGHEST to LOWEST frequency. (gamma rays, radio waves, orange light, infrared rays, microwaves, violet light)
6. What are radio telescopes used for?

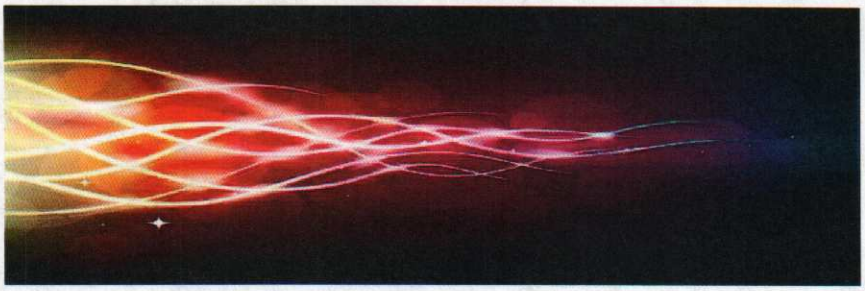
8.8.D model and describe how light years are used to measure distances and sizes in the universe

Light Years

Distances in space are SO large that is does not make sense to use a typical unit such as kilometers or miles when measuring distances. Instead, astronomers use a special unit called a **light-year** to measure the **distance** between stars and galaxies.

A light-year is the distance that light travel in one year. Proxima Centauri is 4.3 light-years away. It takes 4.3 years for light from this star to travel the distance needed to reach Earth.

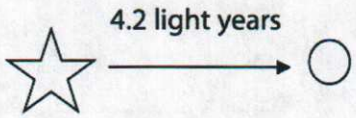
Speed of light = 300 million meters per sec or 186,282 miles per sec!



Did you know? **If a star located 65 light-years away from Earth stops giving off light energy at this very moment, it would take 65 years after the star disappeared before we would even know it! The light takes that long to reach us.**

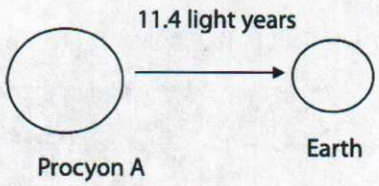
QUESTIONS:

1. The Sun is approximately 149.6 million kilometers from Earth. When making a scale model a student made the scale 1 cm = 1 million kilometers. How far away, in centimeters, will the student place the model of Earth? _____
2. Light from the Sun takes about 8.19 minutes to reach Earth and light from Proxima Centauri takes about 4.3 years. Why does light from the Sun reach Earth faster than light from Proxima Centauri?
    A. The Sun is larger than Proxima Centauri
    B. The Sun's light travels faster than the light from Proxima Centauri.
    C. Proxima Centauri's light must travel to the center of the galaxy before it comes to Earth.
    D. The Sun is much closer to the Earth than Proxima Centauri
3. What is the speed of light and how far does it travel in one Earth year?
4. How do astronomers measure distance?
5. Proxima Centauri is 4.2 light years away from Earth. How long has its light been traveling to reach us?



    A. 4.2 minutes
    B. 4.2 days
    C. 4.2 months
    D. 4.2 years

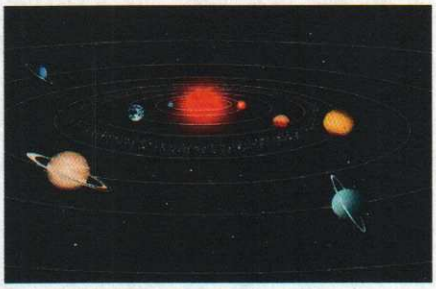
6. The star, Procyon A, is 11.4 light years away from Earth. If there is intelligent life on a planet in that solar system and they are looking at Earth with a special telescope, what are they able to see?



    A. Everything happening right now
    B. What was happening 11.4 years ago
    C. What will be happening in 11.4 years
    D. What will be happening next year

Our Solar System

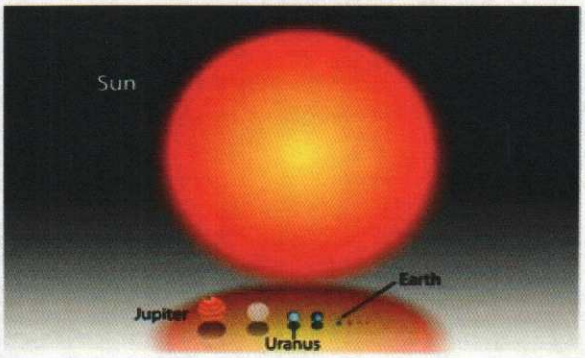
Our solar system resides in the Milky Way galaxy and is made up of the Sun, eight planets, and many moons, asteroids, meteoroids, and comets. All of the celestial bodies in the solar system move in predictable patterns known as orbits, and this motion is controlled by gravity.



Gravity is a force of attraction between two or more masses. Everything that has mass has gravity. **The more mass you have, the stronger the gravitational force you give off.**

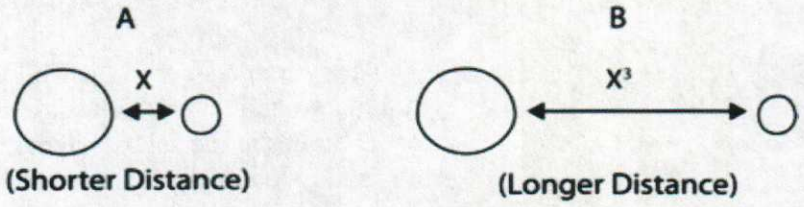
For example, Earth has more mass than the Moon, so its gravitational field is stronger.

So what planet do you think should be listed as having the greatest gravitational force?



In addition, as the distance between two masses increases, the gravitation attraction between them decreases.

For example, Earth's gravitation pull on us is strongest when we are standing on its surface compared to if we were floating in space, thousands of miles away.



Which diagram above, A or B, has the greatest gravitation attraction?

The celestial body in our solar system with the most mass and hence strongest gravitational force is the Sun. Because the Sun has the strongest gravitation field, it has the strongest influence on the motion of the other bodies in the solar system (i.e., planets).

Celestial objects, such as planets, moons, asteroids, comets, meteors, and even satellites, move within the solar system, around more massive objects (e.g., the Sun), along paths known as orbits. These paths are **determined by the momentum with which these objects are travelling and by the gravitational force they experience from other, more massive objects.**

For example, Earth's orbit around the Sun is determined by **the balance of the Sun's gravitational pull on Earth** and **Earth's momentum as it travels around the Sun**.

Without the Sun's gravitational pull, Earth would not move in a circle around the Sun, but would continue moving straight throughout the Milky Way. Without Earth's momentum, the Sun would pull Earth into it. YIKES!

Explain to your partner why the planets do not crash into each other.

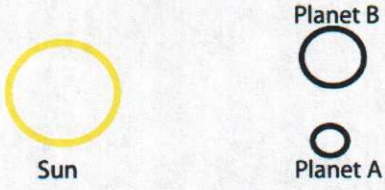
QUESTIONS:

1. Which answer best describes the term gravity?
   A. A natural, attractive force that pushes
   B. A manmade, attractive force that pulls
   C. A natural, attractive force that pulls
   D. A manmade, attractive force that pushes

2. Why do the planets in our solar system orbit the Sun?
   A. The Sun has the strongest magnetic pull
   B. The Sun is the celestial body with the greatest mass
   C. The Sun is the brightest celestial body in our solar system.
   D. The Sun was created millions of years before our planet.

3. Which two forces control the orbit of a planet?
   A. The force of motion and the force of the Sun
   B. The force of gravity and the force of motion
   C. The force of Newton and the force of gravity
   D. The force of attraction and the force of planetary motion

4. Examine the figure below. Which objects show the strongest gravitational force of attraction?



   A. The Sun and Planet A because Planet A has a greater mass than planet
   B. The Sun and Planet B because Planet B has a greater mass than planet A
   C. The gravitation force of attraction is the same between the Sun and planet A and between the Sun and planet B.
   D. None of these answers are correct

5. Which two factors affect the strength of the gravitational pull on an object?
   A. Mass and density
   B. Weight and density
   C. Weight and distance
   D. Mass and distance

6. Explain why the strength of the gravitational pull from the Sun is different on Venus than on Neptune?