Everglades K-12 Publishing's Florida Science Standards Grades 6-8 Science
Table of Contents

Next Generation Sunshine State Standards for Science Grades 6-8

Everglades K-12 Publishing's Florida Science Standards Biology End-of-Course Table of Contents by Benchmark

Next Generation Sunshine State Standards for Science Grades 6-8

Unit I The Nature of Science

Big Idea 1 The Practice of Science

SC.8.N.1.1 Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding; plan and carry out scientific investigations of various types, such as systematic observations or experiments; identify variables; collect and organize data; interpret data in charts, tables, and graphics; analyze information; make predictions; and defend conclusions.
(Also assesses SC.6.N.1.1, SC.6.N.1.3, SC.7.N.1.1, SC.7.N.1.3, SC.7.N.1.4, SC.8.N.1.3, and SC.8.N.1.4.)
SC.7.N.1.2 Differentiate replication (by others) from repetition (multiple trials).
(Also assesses SC.6.N.1.2, SC.6.N.1.4, and SC.8.N.1.2.)
SC.7.N.1.5 Describe the methods used in the pursuit of a scientific explanation as seen in different fields of science such as biology, geology, and physics.
(Also assesses SC.7.N.3.2, SC.8.N.1.5, and SC.8.E.5.10.)

Big Idea 2 Characteristics of Scientific Knowledge

SC.6.N.2.2 Explain that scientific knowledge is durable because it is open to change as new evidence or interpretations are encountered.
(Also assesses SC.7.N.1.6, SC.7.N.1.7, SC.7.N.2.1, and SC.8.N.1.6.)

Big Idea 3 Role of Theories, Laws, Hypotheses, and Models

SC.7.N.3.1 Recognize and explain the difference between theories and laws and give several examples of scientific theories and the evidence that supports them.
(Also assesses SC.6.N.3.1 and SC.8.N.3.2.)

Unit II Earth and Space Science

Big Idea 5 Earth in Space and Time

SC.8.E.5.3 Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.
(Also assesses SC.8.E.5.1 and SC.8.E.5.2.)
SC.8.E.5.5 Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).
(Also assesses SC.8.E.5.6.)
SC.8.E.5.7 Compare and contrast the properties of objects in the Solar System, including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.
(Also assesses SC.8.E.5.4 and SC.8.E.5.8.)
SC.8.E.5.9 Explain the impact of objects in space on each other, including: 1. the Sun on the Earth, including seasons and gravitational attraction; 2. the Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body.

Big Idea 6 Earth Structures

SC.7.E.6.2 Identify the patterns within the rock cycle and relate them to surface events (weathering and erosion) and subsurface events (plate tectonics and mountain building).
(Also assesses SC.6.E.6.1, SC.6.E.6.2, and SC.7.E.6.6.)
SC.7.E.6.4 Explain and give examples of how physical evidence supports scientific theories that Earth has evolved over geologic time due to natural processes.
(Also assesses SC.7.E.6.3.)
SC.7.E.6.5 Explore the scientific theory of plate tectonics by describing how the movement of Earth's crustal plates causes both slow and rapid changes in Earth's surface, including volcanic eruptions, earthquakes, and mountain building.
(Also assesses SC.7.E.6.1 and SC.7.E.6.7.)

Big Idea 7 Earth Systems and Patterns

SC.6.E.7.4 Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.
(Also assesses SC.6.E.7.2, SC.6.E.7.3, SC.6.E.7.6, and SC.6.E.7.9.)
SC.6.E.7.5 Explain how energy provided by the Sun influences global patterns of atmospheric movement and the temperature differences between air, water, and land.
(Also assesses SC.6.E.7.1.)

Unit III Physical Science

Big Idea 8 Properties of Matter

SC.8.P.8.4 Classify and compare substances on the basis of characteristic physical properties that can be demonstrated or measured: for example, density; thermal or electrical conductivity; solubility; magnetic properties; melting and boiling points; and know that these properties are independent of the amount of the sample.
(Also assesses SC.8.P.8.3.)
SC.8.P.8.5 Recognize that there are a finite number of elements and that their atoms combine in a multitude of ways to produce compounds that make up all of the living and nonliving things that we encounter.
(Also assesses SC.8.P.8.1, SC.8.P.8.6, SC.8.P.8.7, SC.8.P.8.8, and SC.8.P.8.9.)

Big Idea 9 Changes in Matter

SC.8.P.9.2 Differentiate between physical changes and chemical changes.
(Also assesses SC.8.P.9.1 and SC.8.P.9.3.)

Big Idea 10 Forms of Energy

Big Idea 11 Energy Transfer and Transformations

Big Idea 13 Forces and Changes in Motion

Everglades K-12 Publishing's Florida Science Standards Biology End-of-Course
Table of Contents by Benchmark

Unit IV Life Science

Big Idea 14 Organization and Development of Living Organisms

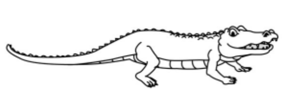
SC.6.L.14.1 Describe and identify patterns in the hierarchical organization of organisms from atoms to molecules and cells to tissues to organs to organ systems to organisms.
SC.6.L.14.2 Investigate and explain the components of the scientific theory of cells (cell theory): all organisms are composed of cells (single-celled or multicellular), all cells come from pre existing cells, and cells are the basic unit of life.
(Also assesses SC.6.L.14.3.)
SC.6.L.14.4 Compare and contrast the structure and function of major organelles of plant and animal cells, including cell wall, cell membrane, nucleus, cytoplasm, chloroplasts, mitochondria, and vacuoles.
SC.6.L.14.5 Identify and investigate the general functions of the major systems of the human body (digestive, respiratory, circulatory, reproductive, excretory, immune, nervous, and musculoskeletal) and describe ways these systems interact with each other to maintain homeostasis.
(Also assesses SC.6.L.14.6.)

Big Idea 15 Diversity and Evolution of Living Organisms

SC.6.L.15.1 Analyze and describe how and why organisms are classified according to shared characteristics, with emphasis on the Linnaean system combined with the concept of Domains.
SC.7.L.15.2 Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms.
(Also assesses SC.7.L.15.1 and SC.7.L.15.3.)

Big Idea 16 Heredity and Reproduction

SC.7.L.16.1 Understand and explain that every organism requires a set of instructions that specifies its traits, that this hereditary information (DNA) contains genes located in the chromosomes of each cell, and that heredity is the passage of these instructions from one generation to another.
(Also assesses SC.7.L.16.2 and SC.7.L.16.3.)



Big Idea 17 Interdependence

SC.7.L.17.2 Compare and contrast the relationships among organisms, such as mutualism, predation, parasitism, competition, and commensalism.
(Also assesses SC.7.L.17.1 and SC.7.L.17.3.)

Big Idea 18 Matter and Energy Transformations

SC.8.L.18.4 Cite evidence that living systems follow the Laws of Conservation of Mass and Energy.
(Also assesses SC.8.L.18.1, SC.8.L.18.2, and SC.8.L.18.3.)

Unit II **Earth Science**
Big Idea 5 **Earth in Space and Time**

SC.8.E.5.3	Distinguish the hierarchical relationships between planets and other astronomical bodies relative to solar system, galaxy, and universe, including distance, size, and composition.
SC.8.E.5.5	Describe and classify specific physical properties of stars: apparent magnitude (brightness), temperature (color), size, and luminosity (absolute brightness).
SC.8.E.5.7	Compare and contrast the properties of objects in the Solar System, including the Sun, planets, and moons to those of Earth, such as gravitational force, distance from the Sun, speed, movement, temperature, and atmospheric conditions.
SC.8.E.5.9	Explain the impact of objects in space on each other, including: 1. the Sun on the Earth, including seasons and gravitational attraction; 2. the Moon on the Earth, including phases, tides, and eclipses, and the relative position of each body.
Also Assesses:	
SC.8.E.5.1	Recognize that there are enormous distances between objects in space and apply our knowledge of light and space travel to understand this distance.
SC.8.E.5.2	Recognize that the universe contains many billions of galaxies and that each galaxy contains many billions of stars.
SC.8.E.5.4	Explore the Law of Universal Gravitation by explaining the role that gravity plays in the formation of planets, stars, and solar systems and in determining their motions.
SC.8.E.5.6	Create models of solar properties, including rotation, structure of the Sun, convection, sunspots, solar flares, and prominences.
SC.8.E.5.8	Compare various historical models of the Solar System including geocentric and heliocentric.

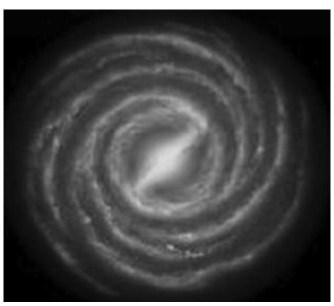
The **Universe contains** all of the matter and energy that exists. It includes our Milky Way galaxy and all other galaxies, solar systems, stars, planets, asteroids, moons and comets. All the matter in the universe is made from a combination of elements found in the Periodic Table. Understanding about the objects in the universe helps scientists learn about the formation of our planet and the life on Earth.

The ancient Greeks believed in a **geocentric** or "Earth-centered" universe. They believed that the Earth was at the center of the universe surrounded by the Sun, the Moon, five planets, and a sphere to which all the stars were attached. This idea held for many centuries.

Galileo, using his telescope, helped people to see that our solar system is actually **heliocentric**, "sun-centered". They also found out that there are many more stars than were visible to the naked eye. We now know the Sun is at the center of the solar system, with the planets moving in elliptical orbits around the Sun. The planets do not emit their own light, but instead reflect the light from the Sun.

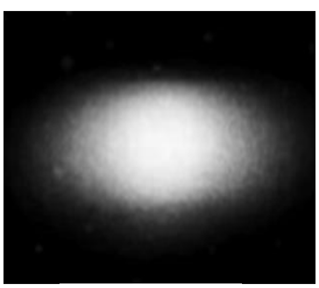
A **galaxy** is a huge collection of stars, solar systems, gas and dust held together by gravity. An average galaxy could have over 100 billion stars. Today, we know that the Universe contains about a hundred billion galaxies!

Galaxies may differ in size, shape and brightness. They are found alone, in pairs, or in larger groups called **clusters**. Galaxies are classified by shape. There are three general types: **spiral, elliptical**, and **irregular**.



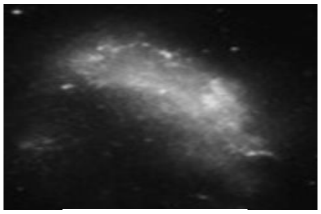
Spiral Galaxy

Spiral galaxies contain a lot of gas, dust and hot, young, newly forming stars. They are often among the brightest galaxies in the universe. Most spiral galaxies have a central bulge surrounded by a flat, rotating disk of stars. The bulge is made up of older, dimmer stars. The Milky Way, which includes Earth and our solar system, is an example of a spiral galaxy. It has large spiral arms with a bulging disk and a bar of stars in the center. Our nearest neighbor is the Andromeda Galaxy, it is also a spiral galaxy.



Elliptical Galaxy

Elliptical galaxies have the shape of a stretched-out circle. Elliptical galaxies are made up of mostly older stars, but little dust, gas, and other interstellar matter. The largest galaxies we see are elliptical galaxies.

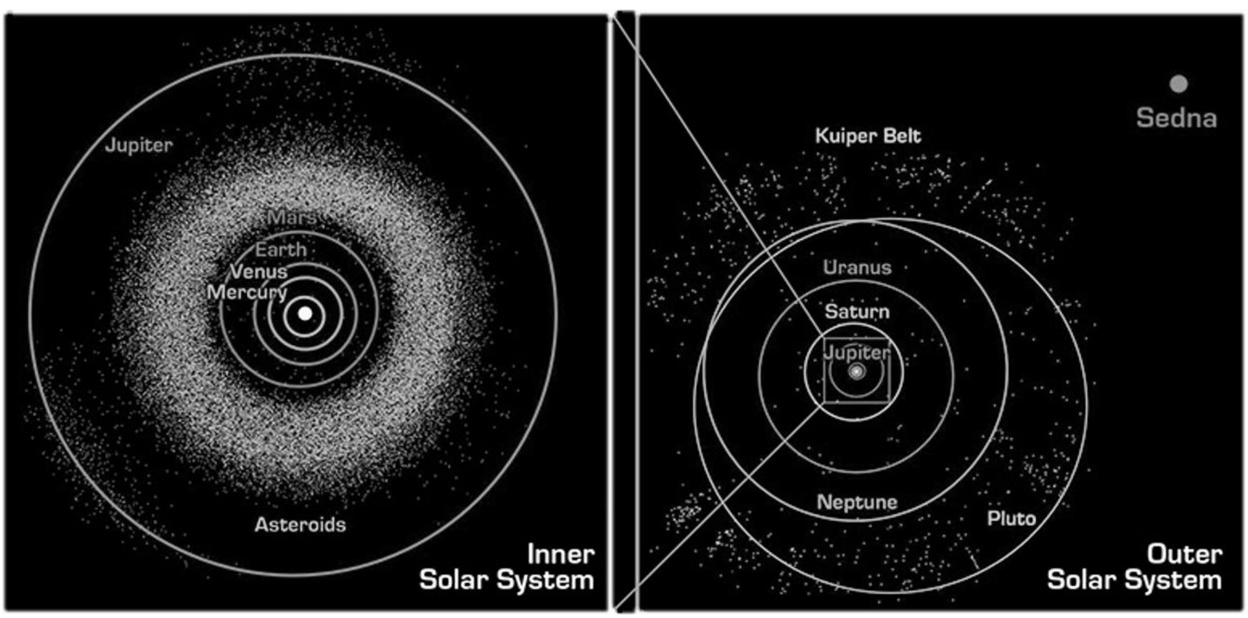


Irregular Galaxy

Irregular galaxies have no particular shape. They are the smallest galaxies and are full of gas and dust which makes them great for forming new stars. They can be very bright.

Years of gathering information about the solar system with powerful telescopes, like the Hubble Space telescope, has revealed that most objects in the solar system formed together with the Sun about 4.6 billion years ago. These clumps of material condensed from an enormous cloud of gas and dust called a **nebula**. At some point the cloud collapsed. The pressure caused by the material was so great that hydrogen atoms began to fuse into helium, releasing a tremendous amount of energy and forming our Sun. Our Sun is just one star among the hundreds of billions of stars in our Milky Way Galaxy.

A **solar system** is made up of a star and all of the objects that orbit it—planets, moons, asteroids, comets and meteoroids. The Sun is the star at the center of our solar system and is the source of our heat, light, and energy. Objects are all held in orbit around the sun by the Sun's strong gravity. Gravity is a force that keeps things together. The **law of universal gravitation** explains how the strength of the force depends on the mass of the objects and the distance between them. There are likely tens of billions of other solar systems in the Milky Way galaxy alone. Our solar system is just one tiny part of the universe as a whole.



Credit: NASA/Caltech

Distances in space are really, really big. The *Voyager 1* spacecraft is heading out of our solar system at a speed of 62,000 km per hour! But, even at that speed, it would take it 77,000 years to reach the nearest star and over a billion years to cross the Milky Way galaxy!

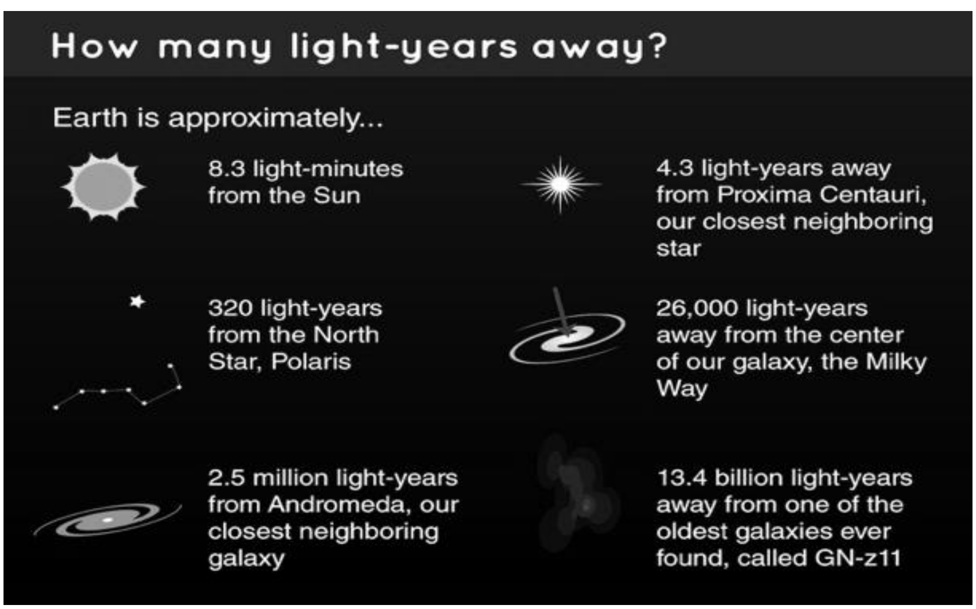
Because stars and galaxies are so far away from each other, measuring distances in miles or kilometers is very difficult because the numbers are so large. The **astronomical unit or AU** is how we measure the distances within our solar system. The distance from the Earth to the Sun is about 93,000,000 miles or 150,000,000 kilometers. The average distance from the Earth to the Sun is 1 astronomical unit or 1 AU.

Planet	Average Distance from the Sun (AU)	Planet	Average Distance from the Sun (AU)
Mercury	0.39	Jupiter	5.20
Venus	0.72	Saturn	9.54
Earth	1.00	Uranus	19.22
Mars	1.52	Neptune	30.06

For most space objects outside of our solar system scientists and astronomers use **light-years** to describe distances. One light year is equal to the distance that light travels in space in one year. A beam of light from the Sun takes only 8.3 minutes to reach the Earth.

- One light year (D) = speed x time
- The speed of light = 300,000 kilometers per second (186,000 miles per second)
- Number of seconds in a year = 31,536,000 s
- One light year (300,000km/s x 31,536,000 s) = 9,460,000,000,000 km.

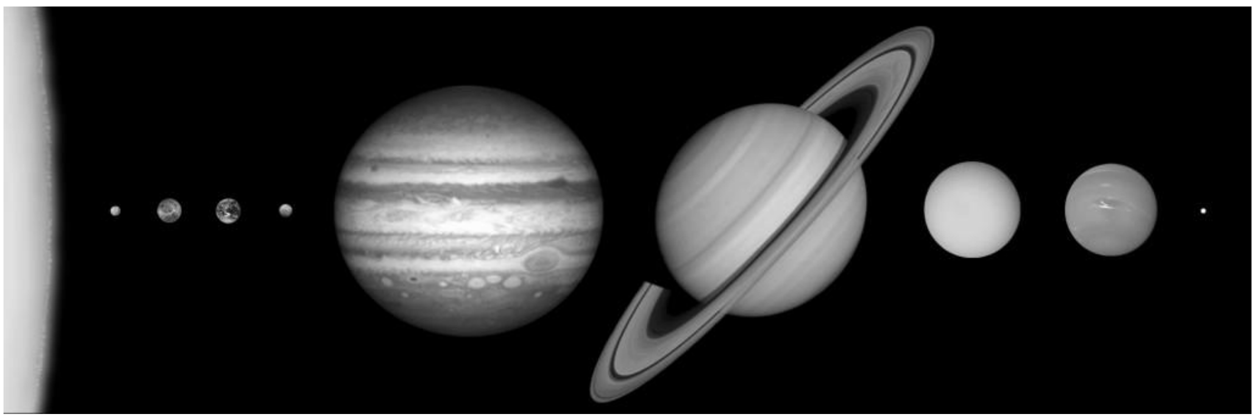
That's a HUGE distance!



https://spaceplace.nasa.gov/light-year/en/

To measure even greater distances, like the distance to other stars and galaxies, scientists use the **parsec**. A parsec is equal to about 19 trillion miles (more than 30 trillion km) or 3.26156 light years! The distance between Earth and Proxima Centauri, the nearest star to Earth, is 1.302 parsecs, which equals 4.24 light-years!

A **planet** is a celestial body that orbits a star in a nearly round shape. It must be big enough to have enough gravity to clear away any other objects of similar size near its orbit. Any large body that does not meet these criteria is now classified as a “**dwarf planet**,” and that includes Pluto. Astronomers recognize eight planets in our solar system. Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune.



Eight planets and a dwarf planet in our Solar System, approximately to scale. Pluto is a dwarf planet at far right. At far left is the Sun. The planets are, from left, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune. Credit: Lunar and Planetary Institute

The inner planets closest to the Sun (Mercury, Venus, Earth, and Mars) are called rocky or **terrestrial planets** because they are primarily made of rock and metal.

The outer planets (Jupiter, Saturn, Uranus, and Neptune) are called **gas giants** because they are primarily made out of hydrogen and helium gas and are a lot larger than the planets that are closer to the Sun.

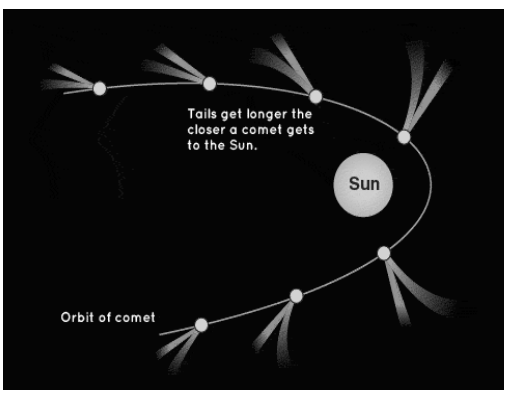
Inner Planets		**Outer Planets**	
Terrestrial planets made of rock and metal	Slow rotation	Gas giants made up of hydrogen and helium	Fast rotation
Small in size	Fast revolution	Large in size	Slow revolution
Greater density	Few moons	Lower density	Numerous moons
Thin atmospheres	No rings	Thick atmosphere	Have rings

Moons – also known as natural satellites – orbit planets and asteroids in our solar system. Earth has one moon, and there are more than 200 moons in our solar system. Most of the major planets – all except Mercury and Venus – have moons. Saturn and Jupiter have the most moons, with dozens orbiting each of the two giant planets.

Earth's moon probably formed when a large body about the size of Mars collided with Earth, ejecting a lot of material from our planet into orbit. Debris accumulated to form the Moon approximately 4.5 billion years ago (the age of the oldest collected lunar rocks). Twelve American astronauts landed on the Moon during NASA's Apollo program from 1969 to 1972, studying the Moon and bringing back rock samples

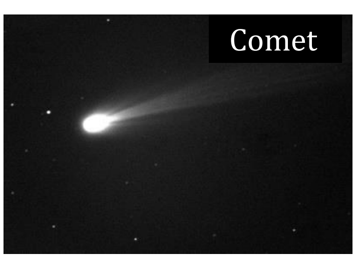
Other types of solar system objects include asteroids, meteoroids, and comets. These objects move in regular paths around the Sun. The difference between meteoroids and asteroids is mostly due to size. **Asteroids** in our solar system are found in the space between Mars and Jupiter. We call this area the **asteroid belt.** Occasionally, chunks of rock or dust break off from an asteroid, forming a **meteoroid**. If these pieces enter Earth’s atmosphere, we call them **meteors**. When this happens, meteors rub against air particles and create friction. The intense heat vaporizes most meteors, creating a streak of light known as a “shooting star. When they impact the ground, they are called **meteorites**.

Comets are cosmic snowballs of frozen gases, rock and dust that orbit the Sun. The ones we can detect are about the size of a mountain on Earth. Comets revolve around the Sun in highly elliptical orbits. When a comet's orbit brings it close to the Sun, it heats up and spews dust and gases into a giant glowing head larger than most planets. The dust and gases form a tail that stretches away from the Sun for millions of miles.

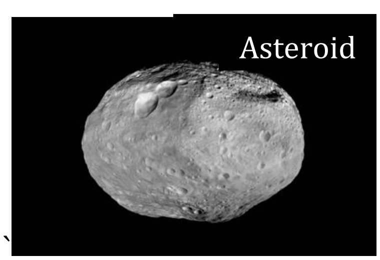


When a comet's orbit brings it close to the Sun, it heats up and spews dust and gases into a giant glowing head larger than most planets. The dust and gases form a tail that stretches away from the Sun for millions of miles.

Comet 109P/Swift-Tuttle takes 133 years to orbit the Sun once. Swift-Tuttle last reached its closest approach to the Sun in 1992 and will return again in 2125.



NASA/MSFC/MEO/Cameron McCarty



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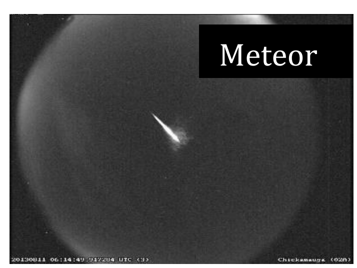
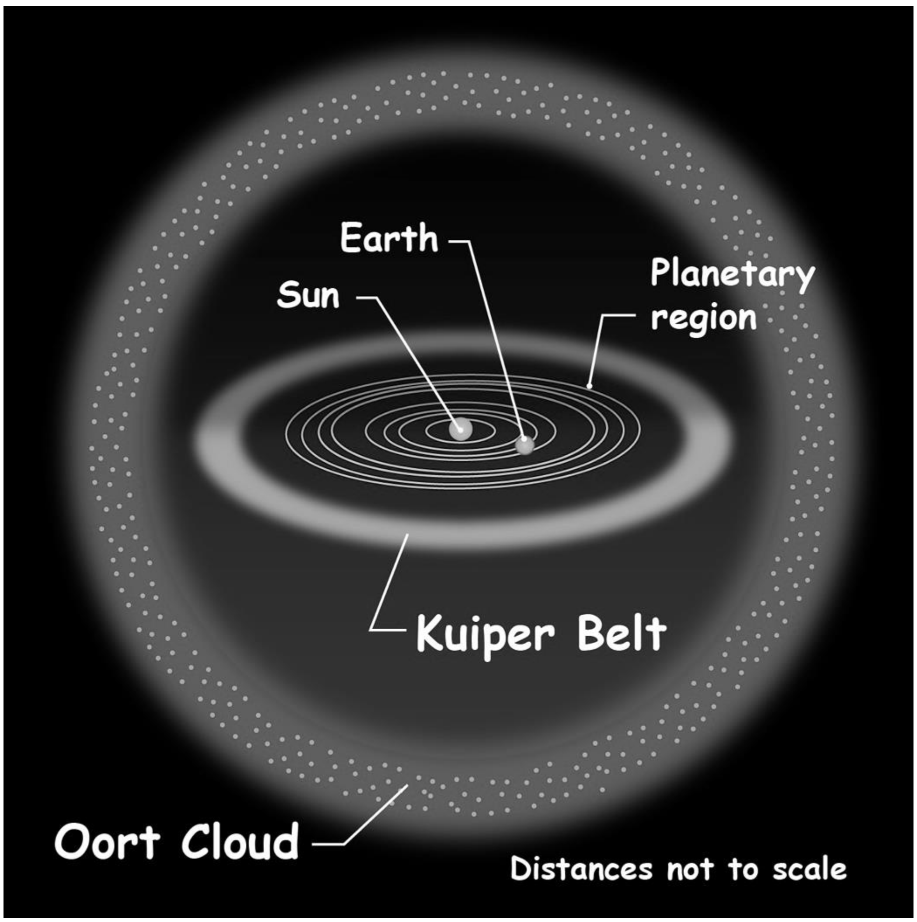


NASA/MSFC/MEO

Recently, astronomers have found dozens of objects similar to Pluto—all small, icy, rocky, and with similar orbits in the **Kuiper Belt** which lies past Neptune's orbit. Comets which take less than 200 years to orbit the Sun, originate in the Kuiper Belt. Halley's comet has an orbit that sends it close to Earth about every 75 years. The next time it will swing by is in 2061. Beyond the Kuiper belt is the **Oort Cloud**. There are likely billions of comets orbiting our Sun in the Kuiper Belt and even more distant Oort Cloud. The Oort Cloud is made of icy pieces of space debris the sizes of mountains and sometimes larger, orbiting our Sun as far as 1.6 light years away. Both the Oort Cloud and the Kuiper Belt are thought to be sources of comets.



https://spaceplace.nasa.gov/comet-quest/en/

Comparing the Planets

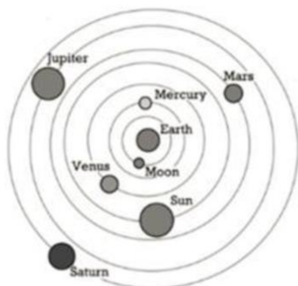
Planet	Diameter Compared to Earth	Revolution Period	Period of Rotation	Description
Mercury	about 1/3 the size of Earth	88 days	59 days	• Terrestrial planet • no moons, no rings • solid surface composed of rocky material, iron core • too little gravity to hold on to any kind of atmosphere
Venus	slightly smaller than Earth	225 days	243 days	• Terrestrial Planet • no moons, no rings • solid surface composed of rocky material, iron core • hottest planet due to trapped CO_2 causing greenhouse effect, thick, toxic clouds of sulfuric acid, • rotates backward on its axis (Sun rises in the west and sets in the east)
Earth		365 days	24 hours	• Terrestrial Planet • 1 moon, no rings • solid surface composed of rocky material, iron core • atmosphere is 78% nitrogen, 21% oxygen and 1% other ingredients
Mars	about half the size of Earth	687 days	24.6 hours	• Terrestrial Planet • 2 moons, no rings, • solid surface composed of rocky material, iron core thin atmosphere made up mostly of carbon dioxide (CO_2), argon (Ar), nitrogen (N_2), and a small amount of oxygen and water vapor • looks red due to rusted iron minerals in soil • has seasons, polar ice caps, canyons, and extinct volcanoes
Jupiter	11x Earth's size	12 years	9 hours 55 minutes	• Gas Giant • largest planet • 75 moons, several faint rings • mostly gaseous (hydrogen, helium), with very little rock and ice • Great Red Spot is a gigantic storm
Saturn	9x larger than Earth	29 years	10 hours	• Gas Giant • 82 moons, 7 rings made mostly of ice, rock and dust • Mostly gaseous (hydrogen, helium), with very little rock and ice
Uranus	4x Earth's size	84 years	17 hours	• Ice Giant • 27 moons, 13 rings • hot dense fluid of "icy" materials—water, methane and ammonia—above a small, rocky core • atmosphere of hydrogen, helium and methane • rotates backwards, on its side
Neptune	only slightly smaller than Uranus	165 years	16 hours	• Ice Giant • 14 moons, 5 rings, 4 ring arcs • hot dense fluid of "icy" materials—water, methane and ammonia—above a small, rocky core • atmosphere of hydrogen, helium, and methane

Now Try These:

1. What object is at the center of a geocentric solar system?
    A. Earth
    B. the Moon
    C. the Sun
    D. a black hole

2. The arrangement and movement of celestial objects in our solar system is best described by the
    A. spiral model.
    B. cosmic model.
    C. geocentric model.
    D. heliocentric mode.

The diagram below shows one model of a portion of the universe.

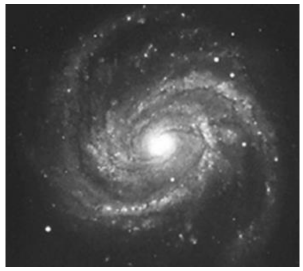


3. What type of model does the diagram best demonstrate?
    A. a heliocentric model, in which celestial objects orbit Earth
    B. a heliocentric model, in which celestial objects orbit the Sun
    C. a geocentric model, in which celestial objects orbit Earth
    D. a geocentric model, in which celestial objects orbit the Sun

4. Billions of stars in the same region of the universe are called
    A. solar systems.
    B. asteroid belts.
    C. constellations.
    D. galaxies.

5. Distance in the solar system is measured by ______________.
    A. miles
    B. kilometers
    C. astronomical units
    D. light years

The diagram below represents the shape of the Milky Way Galaxy.



6. The Milky Way Galaxy is best described as
   A. elliptical.
   B. irregular.
   C. circular.
   D. spiral.

7. A light year is a measure of how fast and far ______ travels in a _______.
   A. light, second
   B. radiation, year
   C. light, year
   D. electromagnetic waves, second

8. Compared to the distances between the planets of our solar system, the distances between stars are usually
   A. much greater.
   B. much less.
   C. about the same.
   D. changes depending on the period of revolution.

9. Which sequence correctly lists the relative sizes from smallest to largest?
   A. our solar system, universe, Milky Way, galaxy
   B. our solar system, Milky Way, galaxy, Universe
   C. Milky Way, galaxy, our solar system, universe
   D. Milky Way, galaxy, universe, our solar system

10. Which of the following is the largest in actual size?
    A. the moon
    B. Jupiter
    C. the Sun
    D. the Milky Way

11. The Sun's position in space is best described as the approximate center of
    A. a constellation
    B. the Universe
    C. the Milky galaxy
    D. our solar system

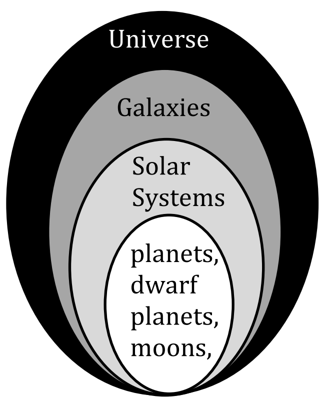
12. Three planets that are relatively large, gaseous, and have low densities are
   A. Mercury, Jupiter, and Saturn.
   B. Jupiter, Saturn, and Uranus.
   C. Venus, Jupiter, and Neptune.
   D. Mars, Jupiter, and Uranus.

13. Compared to the terrestrial planets, the gaseous giants are
   A. smaller and have lower densities.
   B. smaller and have greater densities.
   C. larger and have lower densities.
   D. larger and have greater densities.

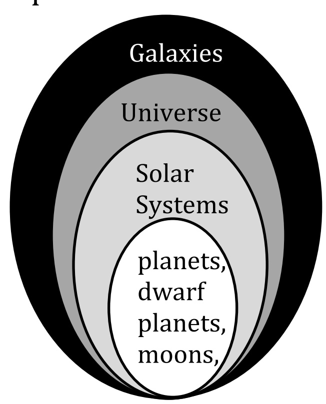
14. Which one of the following is a terrestrial planet?
   A. Saturn
   B. Uranus
   C. Mars
   D. Jupiter

15. Which diagram shows the correct relationship between these four regions?

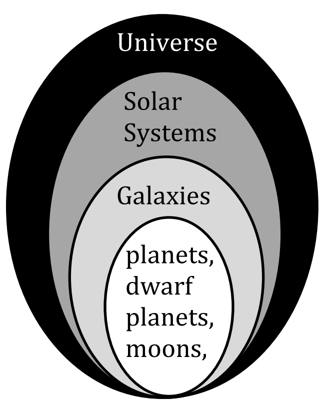
A.



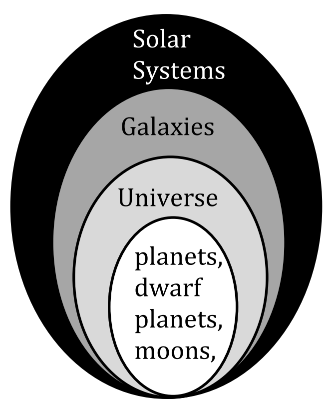
B.



C.



D.



GLOSSARY

TERM	DEFINITION	PAGE
heliocentric	Model in which the Sun is at the center of the solar system, with the planets moving in elliptical orbits around the Sun.	22, 31
herbivore	An organism that obtains nutrients only from plants.	306, 307, 308, 309
heredity	Passing of genetic traits from parents to offspring; either through asexual reproduction or sexual reproduction.	274
Hertzsprung-Russell diagram	Shows the relationship between a star's temperature and its absolute magnitude (luminosity).	42, 43
heterogeneous mixture	A type of mixture in which the individual substances can be easily seen, the mixture is not uniform throughout.	135, 137
heterotroph	An organism that cannot produce its own food. A consumer that eats other plants or animals for energy and nutrients.	306
heterozygous	An organism that has two different alleles, one dominant and one recessive, for a particular trait.	286, 287
high pressure air mass	As air cools, it becomes more dense and moves toward the ground causing the pressure to increase. High-pressure systems are usually associated with clear skies and calm weather.	101
histogram	Similar to bar graphs, but the bars must touch. The data represents continuous data, forming a range from left to right, generally over time.	15
homeostasis	The ability of an organism to maintain a stable internal environment.	235, 247, 251
homogeneous mixture	A type of mixture in which the different parts are blended evenly so that the mixture appears the same throughout.	133, 134, 137
homologous chromosomes	A pair of matching chromosomes, one inherited from each parent.	290, 293
homologous structures	Structures that are similar in related organisms, coming from a common ancestor that may or may not have the same function.	269
homozygous	A cell or organism that has identical alleles for a particular trait.	286, 287
host	The organism that a parasite lives in or on that is harmed.	302
humidity	A measure of the amount of water vapor in the air.	99
hybrid	An organism that is heterozygous, carrying one dominant and one recessive allele for a trait.	286

Unit II - Earth Science

Big Idea 5 – Earth in Space and Time

Formative Assessment 2

Select the best answer to each question.

1. Which of the following correctly ranks the distance measurements in order from largest to smallest?
   A. kilometer, AU, light year, parsec
   B. parsec, light year, AU, kilometer
   C. light year, kilometer, AU, parsec
   D. parsec, AU, light year, kilometer

2. This is the unit of measurement used to describe the distances between objects in the universe, like the distance between one galaxy and another.
   A. lightyear
   B. astronomical unit
   C. light minute
   D. kilometers

3. Which statement is true regarding measuring distances in space?
   A. An astronomical unit (AU) is larger than a light year.
   B. The time taken for light to travel through our Solar System is longer than that for light to travel through the Milky Way.
   C. The Earth is one astronomical unit (AU) from the Sun.
   D. All of the terrestrial planets are more than one astronomical unit (AU) from the Sun.

4. Which statement best describes galaxies?
   A. They are similar in size to the solar system.
   B. They contain only one star but hundreds of planets.
   C. They may contain a few hundred stars in a space slightly larger than the solar system.
   D. They may contain billions of stars in a space much larger than our solar system.

5. The Sun is an average yellow star in the Milky Way galaxy, which is described as
   A. a dwarf galaxy.
   B. a spiral galaxy.
   C. an elliptical galaxy.
   D. an irregular galaxy.

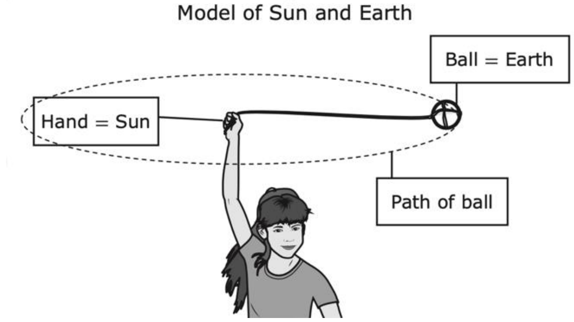
6. The Milky Way galaxy is best described as
   A. a type of solar system
   B. a constellation visible to everyone on Earth
   C. a region in space between the orbits of Mars and Jupiter
   D. a spiral-shaped formation composed of billions of stars

7. In which list are the celestial objects correctly shown in order of increasing size?
   A. galaxy → solar system → universe → planet
   B. solar system → galaxy → planet → universe
   C. planet → solar system → galaxy → universe
   D. universe → galaxy → solar system → planet

8. Bob is creating a scale model of the Solar System. He uses a basketball to represent the Sun. Which of the following should he use to most accurately represent the size of Earth?
   A. tennis ball
   B. ping pong ball
   C. marble
   D. grain of sand

A student makes a model of the sun-Earth system by swinging a ball around her head. Using this model, the student is trying to explain how Earth stays on a path around the sun.

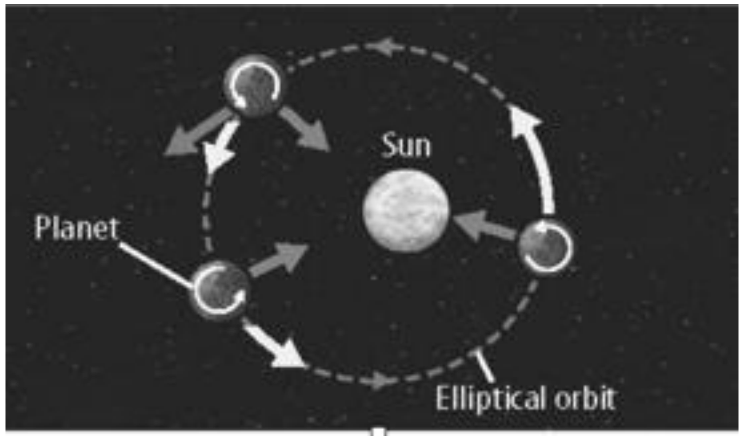
Model of Sun and Earth



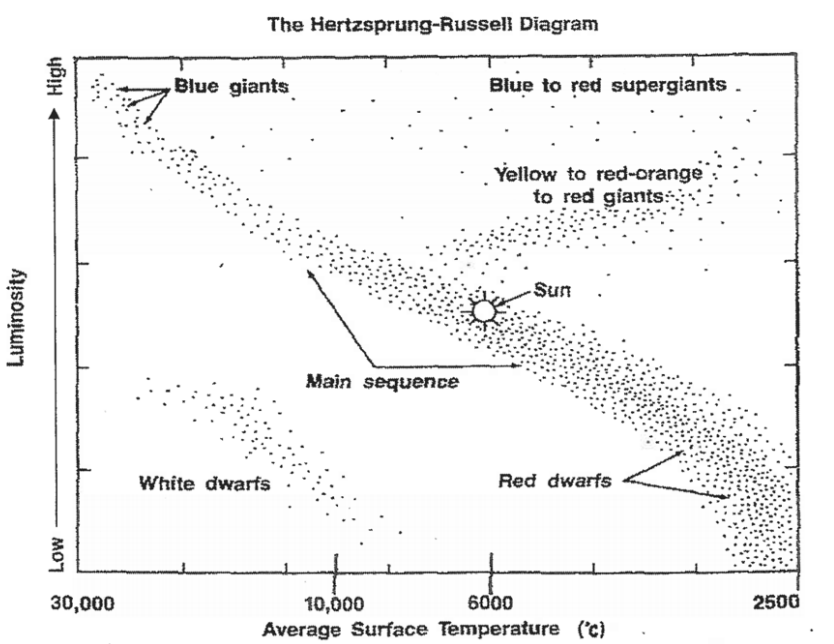
9. The student explains that this path is the result of —
   A. the magnetic attraction between Earth and the sun
   B. the gravitational attraction between the sun and Earth
   C. potential energy stored in Earth that originated in the sun
   D. electromagnetic energy from the Sun pulling on the Earth

10. The force of gravitational attraction between two objects depends on the distance between the objects and their
    A. buoyancies
    B. temperatures
    C. masses
    D. shapes

11. What causes planets and other objects in space to revolve around the Sun rather than going off in a straight line as shown by the solid lines in the image below?



A. inertia
B. pressure in space
C. gravity - Sun pulls object toward it
D. gravity - object is pulling Sun toward it



12. The Hertzsprung-Russell diagram shows
    A. the distance and brightness of a star.
    B. the brightness and temperature of a star.
    C. the distance and temperature of a star.
    D. the temperature and classification of a star.

13. kes.