

Space Science

-Space science is the study of the **universe**, including its **structure, components, and essential characteristics**. (Space science usually excludes the study of Earth.) These fields of study are further classified according to specific topics, such as:

- _____ study of celestial objects, including stars, galaxies, and planets.
- _____: study of the physics and physical properties of the universe.
- _____ search for and study of extraterrestrial life.
- _____ study of planets.

Universe

“BIG BANG”:

explosion of a single atom (**primordial atom**) created space, time, and all matter.

- occurred less than _____ years ago.
- cause and what existed/happened before hand is unknown.
- celestial objects still moving away from each other universe is expanding, but not from a central point.

STARS:

- balls of glowing gas that create energy through _____.
- classified according to color and temperature

GALAXIES:

- large collection of matter held together by gravitational attraction.
- classified by shape: spiral, elliptical, irregular.
- Milky Way Galaxy is _____.

Solar System:

- The solar system consists of many objects in predictable orbit around the sun.
- Orbits are predictable because the sun's _____ keeps the planets, asteroids, and comets in a regular orbits
- Most orbits are ellipses (ovals), rather than perfect circles.

Planets:

- usually categorized by composition or size.
- _____ planets (Mercury, Venus, Earth, Mars):
 - have a solid surface made of rock and metal.
 - have a slow rotation, high density, and few satellites.
 - are also called small planets, with diameters less than 13,000 km.
- _____ planets (Jupiter, Saturn, Uranus, Neptune):
 - are composed of gas and liquid such as hydrogen and helium.
 - have a rapid rotation, low density, and many satellites.
 - are also called giant planets, with diameters greater than 48,000 km.

Sun

Discovered	known since prehistoric times
Satellites	8 official planets large number of smaller objects including Pluto, asteroids, and comets
Size (diameter)	865,000 miles almost 10 times larger than Jupiter
Length of rotation	25 Earth days
Temperature at surface	9,900°F temperature of core is almost 281,000,000°F
Composition	70% hydrogen. 28% helium, and 2% other metals
Essential Knowledge	star with average size, brightness, and intensity classified as a yellow dwarf provides the energy needed for life on Earth
Fun Facts	sun contains more than 99.8% of the total mass of the solar system more than 100 billion stars in the Milky Way Galaxy

Mercury

Discovered	known since prehistoric times
Satellites	0
Size (diameter)	3,030 miles
Distance from sun	36 million miles
Length of orbit	88 Earth days
Length of rotation	58.6 Earth days
Temperature at surface	-292°F to 800°F
Surface features	rocky and heavily cratered closely resembles Earth's moon
Atmosphere	very thin
First visited by spacecraft	Mariner 10 in 1974-1975 NASA's Messenger will make several flybys in 2011
Essential Knowledge	closest planet to the sun has a highly eccentric orbit
Fun Facts	named after Roman god of commerce, travel, and thievery often visible with binoculars, but is always very close to the sun, so is only visible at dawn and dusk

Venus

Discovered	known since prehistoric times
Satellites	0
Size (diameter)	7,520 miles
Distance from sun	67 million miles
Length of orbit	224.7 Earth days
Length of rotation	243.2 Earth days
Temperature at surface	870°F
Surface features	flat, volcanic plains and shallow craters
Atmosphere	very thick cloud layer of sulfuric acid in a carbon dioxide atmosphere
First visited by spacecraft	Mariner 2 in 1962
Essential Knowledge	has most nearly circular orbit of any planet roughly the same size as Earth, at 95% of Earth's diameter and 80% of Earth's mass
Fun Facts	named for Roman goddess of love and beauty one Venus day lasts longer than Venus year dense clouds prevent even the most powerful telescopes from seeing surface

Earth

Discovered	understood during 16 century that Earth is another planet orbiting the sun
Satellites	1
Size (diameter)	7,930 miles
Distance from sun	93 million miles
Length of orbit	365.25 days
Length of rotation	23 hours, 56 minutes
Temperature at surface	-95°F to 130°F
Surface features	71% covered with water many different landforms and ecosystems have developed
Atmosphere	77% nitrogen, 21% oxygen, and traces of argon, carbon dioxide, and water
Essential Knowledge	only known planet to support life oldest known fossils of living organisms are 3.9 billion years old only planet with liquid water on surface
Fun Facts	only planet with an English name not derived from Greek or Roman mythology Earth's core can reach temperatures higher than surface of sun light from sun takes about eight minutes to reach Earth

Moon

Discovered	known since prehistoric times
Satellites	2,160 moons
Size (diameter)	2,390 miles
Distance from sun	
Length of orbit	29.5 Earth days
Length of rotation	27.3 Earth days
Temperature at surface	-245°F to 220°F
Surface features	rocky and heavily cratered
Atmosphere	none
First visited by spacecraft	Luna2 in 1959 Neil Armstrong was the first human to walk on the moon (July 20, 1969)
Essential Knowledge	gravitational forces between Earth and moon create high and low ocean tides revolution of the moon around Earth, and its location with respect to the sun, create phases of the moon seen in Earth's sky
Fun Facts	only extraterrestrial body to have been visited by humans only 12 people have walked on moon

Mars

Discovered	known since prehistoric times
Satellites	2
Size (diameter)	4,220 miles
Distance from sun	141 million miles
Length of orbit	687 Earth days
Length of rotation	24 hours, 37 minutes (Earth time)
Temperature at surface	-184°F to 77°F
Surface features	red dust covering a rocky desert environment craters, canyons, volcanoes, polar ice caps
Atmosphere	very thin composed mostly of carbon dioxide
First visited by spacecraft	Mariner 4 in 1965
Essential Knowledge	has some of the most varied terrain of any terrestrial planet easily visible from Earth with the unaided eye
Fun Facts	named for Roman god of war nicknamed the Red Planet several spacecraft and rovers" have landed on and explored surface surface area equivalent to Earth's land surface area

Asteroid Belt

Discovered	first asteroid discovered by Giuseppe Piazzi in 1801 many more discovered by mid 1800s
Size (diameter)	range from a few feet to hundreds of miles wide
Distance from sun	
Length of orbit	elliptical orbit of asteroid belt around sun takes three to six Earth years
Composition	rocky material remaining from the formation of the solar system
Essential Knowledge	located between the orbits of Mars and Jupiter
Fun Facts	total mass of all asteroids equals less than that of Earth's moon largest discovered asteroid is as big as Texas

Jupiter

Discovered	known since prehistoric times
Satellites	63 known
Size (diameter)	89,350 miles
Distance from sun	484 million miles
Length of orbit	11.86 Earth years
Length of rotation	9 hours, 55 minutes (Earth time)
Temperature at cloud tops	-238°F
Composition	no solid surface 90% hydrogen and 10% helium increasing density condenses gas to liquid and metal in the core alternating bands of light and dark clouds circle planet
Atmosphere	
First visited by spacecraft	Pioneer 10 in 1973
Essential Knowledge	largest planet Great Red Spot has been observed since 17th century and is big enough to hold two Earths
Fun Facts	named for the Roman king of the gods more than twice as massive as all other planets combined Galileo Galilei's discovery of four moons in 1610 was first observation of celestial movement not centered around Earth

Saturn

Discovered	known since prehistoric times first observed with telescope by Galileo Galilei in 1610
Satellites	60 known
Size (diameter)	74,900 miles
Distance from sun	886 million miles
Length of orbit	29.4 Earth years
Length of rotation	10 hours, 40 minutes (Earth time)
Temperature at cloud tops	292°F
Composition	no solid surface 75% hydrogen, 25% helium rings composed of innumerable small particles, primarily water ice, in orbit around the planet
First visited by spacecraft	Pioneer 11 in 1979
Essential Knowledge	least dense of all planets has most prominent and easily visible rings of any giant planet rings are less than 1 km thick
Fun Facts	named for Roman god of agriculture (father of Jupiter) has the strongest winds in the solar system, measured at over 1,100 mph at the equator

Uranus

Discovered	Sir William Herschel, 1781
Satellites	27 known
Size (diameter)	31,765 miles
Distance from sun	1.785 billion miles
Length of orbit	83.8 Earth years
Length of rotation	17 hours, 14 minutes (Earth time)
Temperature at cloud tops	-345°F
Composition	no solid surface consists of hydrogen, helium, and methane
First visited by spacecraft	Voyager 2 in 1986 (only visit)
Essential Knowledge	not visible to the unaided eye
Fun Facts	named for the Greek sky god and father of the Titans (including Cronus/Saturn)

Neptune

Discovered	Johann Gottfried Galle, 1846
Satellites	13 known
Size (diameter)	30,775 miles
Distance from sun	2.795 billion miles
Length of orbit	163.7 Earth years
Length of rotation	16 hours, 7 minutes (Earth time)
Temperature at cloud tops	-346°F
Composition	no solid surface consists of hydrogen, helium, and methane
First visited by spacecraft	Voyager 2 in 1986 (only visit)
Essential Knowledge	not visible to the unaided eye atmosphere makes the planet appear blue
Fun Facts	named for Roman god of the sea has very faint and thin rings

Pluto

Discovered	Clyde Tombaugh, 1930
Satellites	3
Size (diameter)	1,485 miles
Distance from sun	3.65 billion miles
Length of orbit	248 Earth years
Length of rotation	6 days, 9 hours (Earth time)
Temperature at surface	-391°F to -346°F
Composition	little is known
First visited by spacecraft	never visited by spacecraft <i>New Horizons</i> spacecraft launched in 2006 and scheduled to reach Pluto in 2015
Essential Knowledge	classified as a “dwarf planet” not visible to the unaided eye orbit is highly eccentric sometimes closer to sun than Neptune
Fun Facts	smaller than seven of the solar system’s moons light from sun takes about five and a half hours to reach Pluto