The Solar System Essay, Research Paper

The Solar System consists of the Sun, the nine planets and their satellites; the comets, asteroids, meteoroids, and interplanetary dust and gas. It is composed of two systems, the inner solar system and the outer solar system. The inner solar system contains the Sun, Mercury, Venus, Earth and Mars. The outer solar system contains Jupiter, Saturn, Uranus, Neptune and Pluto.

The inner planets are relatively small and made primarily of rock and iron. The asteroids orbit the sun in a belt beyond the orbit of Mars, tumbling and sometimes colliding with one another. Made mostly of rock and iron, the asteroids may be the remnants of a planet that never formed. The outer planets, with the exception of Pluto, are much larger and made mainly of hydrogen, helium, and ice. Many astronomers believe that Pluto was and interstellar wanderer that was captured by the Sun?s gravity and was not an original part of the solar system.

The orbits of the planets are ellipses with the sun at one focus, though all except mercury and Pluto are very nearly circular. The orbits of the planets are all more or less in the same plane that is called the ecliptic. The ecliptic is inclined only seven degrees from the plane of the ecliptic with and inclination of seventeen degrees. Again with the exception of Pluto, the planets all orbit the sun in almost the same plane.

The average distance of the earth to the sun is used as a standard for measuring distances in the solar system and is called an astronomical unit (AU). One AU is about 93 million miles or 150 million kilometers. Mercury the planet closest to the sun is at about 0.387 AU. Pluto is the outermost planet, and it is 39.44 AU from the sun. The heilopause is the boundary between the solar system and interstellar space, and it is about 100 AU from the sun. The comets, however, achieve the greatest distance from the Sun; they have highly eccentric orbits ranging out to 50,000 AU or more.

The Sun is a regular star of intermediate size and luminosity. It is one of more than 100 billion stars in our galaxy. The Sun is by far the largest object in our solar system. The Sun is personified in many mythologies, the Greeks called it Helios and the Romans called it Sol. Sunlight and other radiation are produced by the conversion of hydrogen into helium in the Sun?s hot, dense interior. The Sun is, at present, about 75% hydrogen and 25% helium by mass; everything else amounts to only 0.1%. This changes slowly over time as the Sun converts hydrogen to helium in its core. The Sun?s outer layers exhibit different rotation, at the equator the surface rotates once every 25.4 days: near the poles it?s as much as 36 days. This weird behavior is caused by the fact that the Sun is not a solid body like the Earth. The different rotation extends considerably down into the interior of the Sun but the core of the Sun rotates as a solid body. The Sun?s core conditions are extreme. The pressure is 250 billion and the temperature is 15.6 million Kelvin. At the center of the core the Sun?s density is more than 150 times that of water. The surface of the Sun, called the photosphere, is at a temperature of about 5800 K. For the Sun?s entire steadiness, it is an extremely active star. On its surface dark sunspots bounded by intense magnetic fields come and go in 11-year cycles. Sudden bursts of charged particles from solar flares can cause auroras and disturb radio signals on Earth; and a continuous stream of protons, electrons and ions leave the Sun and move out through the solar system, spiraling with the Sun?s rotation. This solar wind shapes the ion tails of comets and leaves its traces in the lunar soil. The Sun is about 4.5 billion years old. Since its birth it has used up about half of the hydrogen in its core. It will continue to radiate ?peacefully? for another 5 billion years or so. But eventually it will run out of hydrogen fuel. It will then be forced into radical changes which, though commonplace by stellar standards will result in the total destruction of the Earth and probably the creation of a nebula.

Today there are nine major planets in the solar system. They are currently known as Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto.

The planet that is closest to the Sun is Mercury. It is about 36 million-miles from the Sun and its period of revolution is 88 days. Mercury is surprisingly dense, apparently because it has an unusually iron core. With only a transient atmosphere, Mercury has a surface that still bears the record of bombardment by asteroidal bodies early in its history. Mercury passes through phases similar to those of the moon as it completes each revolution around the Sun. It has such a thin atmosphere that in a single day it reaches temperatures of up to 750\*F. At night, it gets as cold as -300\*F. This planet can only be seen for a short time before or after sunset. Mercury is the second smallest planet in the solar system, having a diameter of about 3,000 miles. Its mean density can compare to the earth. Its small mass and proximity to the Sun prevent it from having an appreciable atmosphere. The surface of Mercury is lots like that of the moon.

Venus is the second planet from the Sun. It is often called the Evening Star or Morning Star, and it is brighter than any object in the sky except the Sun and the moon. Venus can really never be seen much longer than 3 hrs. before or after sunrise. Venus revolves around the Sun at a distance of about 67 million miles. Venus is often referred to as the sister planet of the Earth because it is only slightly smaller in size and mass. Venus is covered with a thick blanket of clouds that hides its surface from view. The thick atmosphere is composed mainly of carbon dioxide, with a slight amount of water vapor and some nitrogen and their elements. The high surface temperature is assumed to result partly from the greenhouse effect because it is blocked out by the top layer. Venus rotates on its axis in a retrograde direction with a period of about 243 days. As a result of the Greenhouse effect Venus is the hottest of any planet about 477\*C. Venus lies between the orbit of the Sun and Earth, so Venus passes through phases like the moon, varying from a large bright crescent (when it is close) to a silvery disk (when it is far away). Venus comes closer to the Earth than any other planet. The surface of Venus is thought to be erratic and stormy, but radio waves indicate the possibilities of two long mountain ranges. Scientists have estimated that the surface of Venus is only about 800 million years old.

Earth is the fifth largest planet and the only planet definitely known to support life. Due to gravitational forces the earth is molded into a sphere. However, the earth is not an exact sphere, being slightly flattened at the poles and bulging at the equator. The earth?s surface is divided into dry lands and oceans. Surrounding the earth is an envelope of gases called the atmosphere, which is mostly made of nitrogen and oxygen. The Earth is divided into several layers which have distinct chemical and seismic properties. The crust varies considerably in thickness; it is thinner under the oceans, and thicker under the continents. The inner core and crust are solid; the outer core and mantle layers are plastic or semi-fluid. Most of the mass of the Earth is in the mantle, the rest is in the core, and the part we inhabit is a tiny fraction of the whole. Unlike the other planets, Earth?s crust is divided into several separate solid plates, which float around independently on top of the hot mantle below. The Earth is 4.5 to 4.6 billion years old, but the oldest known rocks are about 4 billion years. Rocks older than 3 billion years are rare. The surface of the Earth is made up of 71% water.

Mars is known as the ?Red Planet?, because of its striking red appearance. The planet has a very thin atmosphere consisting mainly of carbon dioxide, with some nitrogen and argon. The average distance of Mars from the Sun is about 141 million miles. Mars has an extreme day-to-night temperature range, resulting from its thin atmosphere. Strong evidence exists that Mars once had liquid water on its surface, but now its carbon dioxide atmosphere is so thin that the planet is dry and cold, with polar caps of frozen water and solid carbon dioxide, or dry ice.

Jupiter is the first of the ?Gas Giants?, and the fifth planet from the Sun. Its ?Great Red Spot? is its most well known feature. If Jupiter was hollow, you could fit over 1,000 earths inside it. Jupiter?s orbit lies beyond the ?asteroid? belt at a average distance of 483.6 million miles from the Sun. Jupiter is the first planet of the outer planets. The atmosphere of Jupiter is composed mainly of hydrogen, helium, methane, and ammonia. The atmosphere appears to be divided into a number of light and dark bands parallel to its equator and shows a range of complex features, including a storm called the Great Red Spot. Located in the Southern Hemisphere the storm rotates counterclockwise and has been observed ever since 1664. Also in the Southern Hemisphere are three white ovals that formed in 1939. According to Scientists Jupiter has no solid rock surface. Jupiter radiates about four times as much heat energy as it receives from the sun, implying an internal heat source. The temperature on Jupiter ranges from about 190\*F to 9\*F. Its magnetosphere, rings and satellites make it a planetary system unto itself. One of Jupiter?s largest moons, Io, has volcanoes that produce the hottest surface temperature in the Solar System. At least four of Jupiter?s moons have atmospheres, and at least three show evidence that they contain liquid or partially-frozen water.

Saturn is the sixth planet from the Sun. It is also the second largest in mass, but has the largest equatorial distance. Winds on Saturn can reach up to 1,100 miles per hour. Saturn is less dense than water by 30%. Saturn?s orbit lies between those of Jupiter and Uranus, its average distance from the Sun is about 886 million miles, almost twice that of Jupiter. Saturn appears in the sky as a yellow, starlike object of the first magnitude. When viewed through a telescope, it is seen as a golden sphere, crossed by a series of lightly colored bands parallel to the equator. Saturn is covered with a thick atmosphere composed mainly of hydrogen and helium, with some methane and ammonia. Its temperature is believed to be about 270\*F. Saturn rivals Jupiter, with a much more intricate ring structure and more satellites. One of Saturn?s moons, Titan, has an atmosphere thicker than that of any other satellite in the solar system.

Uranus is the seventh planet from the Sun, and it is the largest. Uranus is titled to the side. It spins north-south instead of east-west. It?s many rings go around the north and south poles instead of around the equator. Uranus has a diameter roughly four times that of Earth. Through a telescope, Uranus appears as a greenish disk, slightly elliptical because of its rapid rotation. The temperature is estimated to be about -330\*F. Uranus has twenty known natural satellites with a diameter ranging in size from 986 miles down to 14 miles.

Neptune is the outer most of the ?Gas Giants?. Its orbit is 165 Earth years. Methane gases give Neptune its blue/green color. It has a Great Dark Spot, much like Jupiter. The average distance from Neptune to the Sun is about 2.8 billion miles. Neptune has a thick atmosphere along with the other outer planets. It has about the same temperature as Uranus.

Pluto is the farthest from the Sun, but because of its eccentricity in orbit, it is closer that Neptune?s 20 years of its 249 year orbit. Pluto is mostly ice and rock. Pluto?s diameter is about 12,200 miles. Pluto and Charon (moon) are unique in that they both keep the same side facing one another at all time because they rotate synchronously as Chiron orbits Pluto.

The asteroids are small rocky bodies that move in orbits primarily between the orbits of Mars and Jupiter. Numbering in thousands, asteroids range in size from Ceres, to microscopic grains. Some asteroids are perturbed, or pulled by forces other than their attraction to the Sun, into eccentric orbits that can bring them closer to the Sun. If the orbits of such bodies intersect that of Earth, they are meteors and recovered fragments are termed meteorites. Laboratory studies of meteorites have revealed much information about primitive conditions in our solar system. The surfaces of Mercury, Mars, and several satellites of the planets show the effects of an intense bombardment by asteroidal objects early in the history of the solar system. On Earth that record has eroded away, except for a few recently found impact craters.

Some meteors and interplanetary dust may also come from comets, which are basically aggregates of dust and frozen gases. Comets orbit the Sun at distances so great that stars enter orbits that bring them into the inner solar system can perturb them. As comets approach the Sun, they released their dust and gases to form as spectacular coma and tail.

The planet is a very broad term to discuss because there are so many different parts that you can explore. The solar system is huge and just imagine what would happen if we found another solar system! The inner planets are Mercury, Venus, Earth and Mars. The outer planets are Jupiter, Saturn, Uranus, Neptune and Pluto. There is a big difference between the two different groups.