

The Solar System Trail

The Sun and Planets Information



Activity – Solar System Trail Walk

Introduction

The Solar System is our home, from where life as we know it evolved. The Sun is at the centre of the system. Around the Sun are eight planets, several dwarf planets, over one hundred moons, millions of asteroids, billions of rocks, icy objects and space... lots of it, all orbiting the Sun and held by its gravity. Light, heat and the Solar Wind stream out from the Sun to the rest of the Solar System. Planets exert their gravitational pull on Moons and other objects. The Solar System travels as a single unit, from the Sun to the smallest speck of space dust and all the space in between on its epic 225 million year orbit around our Galaxy.

The Scale of the Trail

The scale of the trail is based on the trail being 2km long, however for practical reasons Neptune and Uranus share the same position. This has shortened the trail to 1.3km. On this scale 1cm on the trail represents 22,500km in space. As you walk the trail, you are walking from the Sun through the orbits of the planets, as if walking out from the centre through the rings of an onion. In reality the planets are never aligned as they are on the trail. The position of each planet represents a point on its orbit around the Sun. For example, the walk from Earth to Mars may seem short on the trail but in reality Mars could be on the other side of the Sun as it makes its 687 day orbit.

	Diameters of Planets on the Trail	The Actual Diameters in Space	Distance of planets from the Sun on the Trail	Distance of planets from the Sun in Space
Sun	620 Millimetres	1.4 million Km	0	0
Mercury	2.1 Millimetres	4875 Km	26 meters	58 million Km
Venus	5.3 Millimetres	12104 Km	48 meters	108 million Km
Earth	5.6 Millimetres	12756 Km	67 meters	150 million Km
Moon	1.5 Millimetres	3476 km	67 meters	150 million Km
Mars	3 Millimetres	6780 km	101 meters	228 million Km
Jupiter	63 Millimetres	142984 km	346 meters	778 million Km
Saturn	52 Millimetres	120536 Km	635 meters	1433 million Km
Uranus	21 Millimetres	51118 Km	1278 meters	2872 million Km
Neptune	20 Millimetres	49532 Km	2004 meters*	4500 million km

*Neptune is at the same position as Uranus on our trail, for practical reasons.

Walking the Trail

Before you walk the trail – Spend time with the students to get familiar with the planets.

Ask for their view of the Solar System – packed, fairly full, somewhat empty, mostly empty.

You don't have to walk the full trail – younger children can walk from the Sun to Mars (100 meters), or the Sun to Saturn (635 meters) for middle classes.

Starting with the Sun, point out that the Sun is at the centre of the Solar System and the planets orbit all around it. When you get to Mercury, have them look back to the Sun and imagine it going all around it. Try and do the same with other planets.

Record their reactions once they get a sense of the actual dimensions.

Try and incorporate aspects you have worked on in class – as an example, closer to the Sun the planets have a higher temperature than further away.

The closer the planet is to the Sun, the faster the orbit – planets are at a balance point between the gravitational force of the Sun, pulling them to it, and the speed of they move on their orbit pushing them away (centrifugal force).



The Sun

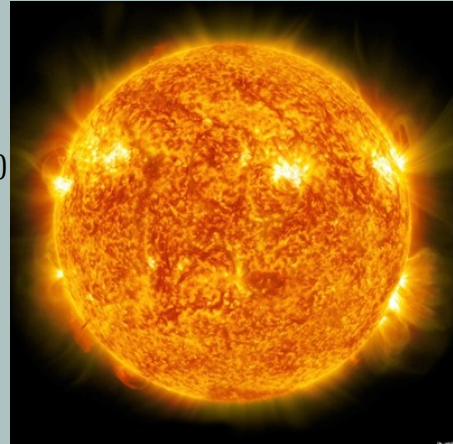
Distance from Earth – 93 million miles (150 million Km)

Surface temperature – 10000 F (5500 C)

Diameter – 865,000 miles (1.4 million Km)

Mass (earth = 1) – 330,000.

Rotation – polar 34 days, equatorial 25 days



The Sun is our local star and dominates everything around it. It looks like a very bright disk but it is a gigantic ball of burning gas, mostly hydrogen and contains 99.8% of all the mass in the Solar System. The Sun has no solid surface. Under immense pressure in its core, atoms of hydrogen fuse together to form atoms of helium in a process called nuclear fusion. During this process energy is released taking over 100,000 years to reach the surface, from where light and heat are emitted into space.

The Sun should never be observed directly with the naked eye or an optical instrument.

Mercury

Distance from Sun – 36 million miles (58 million Km)

Diameter – 3032 miles (4879 km)

Mass (Earth = 1) – 0.055

Rotation period (day) – 58.6 Earth days

Orbital period (year) – 88 Earth days

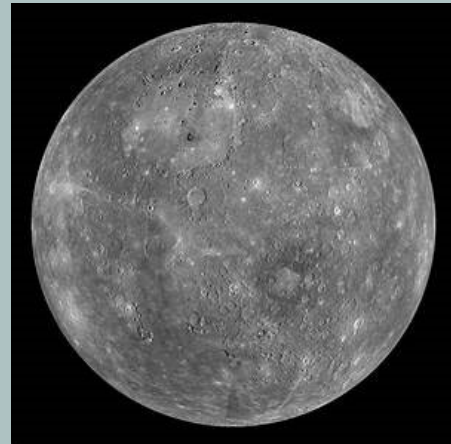
Axial tilt – 0.01 (symbol for degrees)

Minimum temperature: -290F (-180C)

Maximum temperature: 800F (430C)

Gravity (Earth = 1) – 0.38

Moons – 0



The nearest planet to the sun is also the smallest planet in the Solar System. It is a heavily cratered world with cliffs rising to 1.5 miles (2km) in height. Despite its closeness to the Sun, Mercury's sky is permanently dark as its thin atmosphere does not diffuse light. It rotates very slowly compared to Earth causing the Sun facing side to heat up and reach scorching temperatures. As it keeps rotating away from the Sun, the heat escapes into space and temperatures plunge dramatically. This hot/cold cycle resulting in the largest contrast in temperature in any planet in the Solar System.

Venus

Distance from Sun – 67.2 million miles (108 million Km)

Diameter – 7520 miles (12104 km)

Mass (Earth = 1) – 0.82

Rotation period (day) – 243 Earth days

Orbital period (year) – 224.78 Earth days

Axial tilt – 2.6

Gravity (Earth = 1) – 0.9

Average temperature: 880F (470C)

Moons – 0



The brightest planet in the sky and similar to Earth in size. It was named after the Roman Goddess of beauty and can be seen in the sky at dusk and dawn. Venus' beauty however is misleading, covered by a carbon dioxide and sulphuric acid cloud up to 55 miles (90 km) thick, it is a yellow inferno with the highest surface temperature of any other planet in the Solar System. Its thick atmosphere weighs down on its surface with a pressure 90 times that of Earth's. Equivalent to the pressure 0.6 miles (1km) deep in the ocean.

Earth

Distance from Sun – 93 million miles (150 million Km)

Diameter – 7918 miles (12742 km)

Rotation period (day) – 24 hours

Orbital period (year) – 365.26 days

Axial tilt – 23.5

Minimum temperature: -128F (-89C)

Maximum temperature: 136F (58C)

Moons – 1



Our home. On it are all the life forms that we know of, from the simplest microbe to a human. It is the only planet we know of to have water as solid, liquid and gas and three quarters of its surface is covered by saltwater oceans. Its crust both oceanic and continental is split into tectonic plates that form a varied topography of mountains and trenches. It's thin blue layer of protective atmosphere shields life from harmful radiation and meteorites. Earth is the only place we know of in which intelligent life has evolved in the Universe.

Moon

Distance from Earth – 239,000 mile (385,000km)

Diameter – 2159 miles (3474 km)

Mass (Earth = 1) – 0.012

Axial tilt – 1.5

Gravity – 0.167

Minimum temperature: -413F (-247C)

Maximum temperature: 248F (120C)



Earth's natural satellite takes 27 days to complete an orbit of our planet, always with the same side facing us. It is a rocky world with much of its surface covered by craters, some over 2 miles (3.2 km) deep. The Moon has a very thin atmosphere that does not diffuse light or retains heat leading to a great difference in temperature between its day and night. It has a much lower gravity than the Earth due to its smaller mass, so on the Moon you would weigh only a sixth of your current weight on Earth. It is the only place beyond the Earth to have been walked on by human.

Mars

Distance from Sun – 141.6 million miles (223 ml. Km)

Diameter – 4213 miles (6780 km)

Mass (Earth = 1) – 0.11

Rotation period (day) – 24.6 hours

Orbital period (year) – 687 days

Axial tilt – 25.2

Gravity – 0.38

Minimum temperature: -225F (-143C)

Maximum temperature: 95F (35C)



Mars is a cold and barren world, resembling some of the desert regions on Earth. Its red surface is due to iron rich dust that forms into dust clouds 3000ft high (1000m) and sweep over its surface for weeks at a time. It has striking features such as Valles Marineris; a canyon five times deeper and ten times longer than the Grand Canyon and Olympus Mons; the largest volcano in the Solar System. There is water on Mars, frozen in pockets or under the surface in the Poles. In the past Mars had a warmer atmosphere and liquid water on its surface.

Jupiter

Distance from Sun – 484 million miles (778 million Km)

Diameter – 88,850 miles (143,000 km)

Mass (Earth = 1) – 318

Rotation period (day) – 9.9 hours

Orbital period (year) – 11.86 years

Axial tilt – 3.1

Cloud surface temp: -162F (-108C)

Gravity – 2.36

Moons – 67+



The largest and most massive of the Solar System's planets has no solid surface to land on. Jupiter is a giant ball of gas rotating at 29,000 mph (46,000 km/h). The top layer of cloud creates beautiful bands of swirling shapes and colour. These bands rotate in opposite directions around the planet powered by constant winds that exceed category 5 hurricane speed. A prominent area called the Great Red Spot is a storm that has been raging for over 300 years. Thousands of miles deep into the thick atmosphere the pressure is so intense that hydrogen (the lightest and most abundant substance on the planet) compresses into liquid metal.

Saturn

Distance from Sun – 888 million miles (1.43 billion Km)

Diameter – 74898 miles (120536 km)

Mass (Earth = 1) – 95.2

Rotation period (day) – 10.66 hours

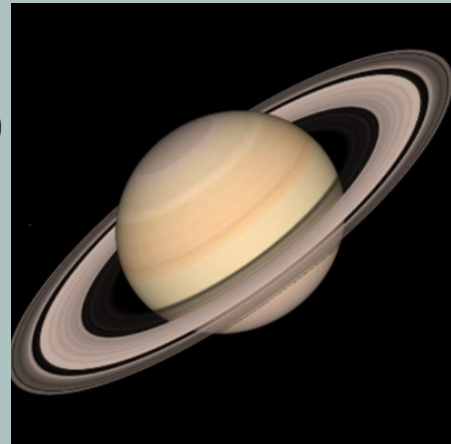
Orbital period (year) – 29.46 years

Axial tilt – 26.7

Cloud surface temp: -220F (-140C)

Gravity – 1.02

Moons – 62



The furthest planet known of by the ancients, Saturn is the second largest planet in the Solar System. This gas giant spins fast on its axis, generating high winds and electrical storms that last for months. Composed almost entirely of hydrogen, the lightest of the elements, Saturn is the least dense planet in the Solar System and would float on a large enough body of water. The magnificent ring system around the planet is made from billions of ice and rock particles ranging in size from a grain of sugar to the size of a bus.

Uranus

Distance from Sun: 1.78 billion miles (2.87 billion Km)

Diameter – 31763 miles (51118 km)

Mass (Earth = 1) – 14.5

Rotation period (day) – 17.2 hours

Orbital period (year) – 84.3 years

Axial tilt – 82.2

Cloud surface temp: -323F (-197C)

Gravity – 0.89

Moons – 27



Tipped on its side, Uranus rolls in its orbit around the Sun rather than spins. Its atmosphere is composed of hydrogen, helium and methane which gives its aquamarine colour. Beneath the atmospheres thick layer of clouds is a 9000 miles (15000km) deep ocean made of water, ammonia and methane ice. Uranus has a system of 13 dark rings made of dust and dark rock. It takes Uranus 84 years to go around the Sun and due to its unique rotation the planets North Pole experiences 21 years of night time in the winter and 21 years of day time in the summer.

Neptune

Distance from Sun – 2.8 billion miles (4.5 billion Km)

Diameter – 30775 miles (49528 km)

Mass (Earth = 1) – 17.1

Rotation period (day) – 16.1 hours

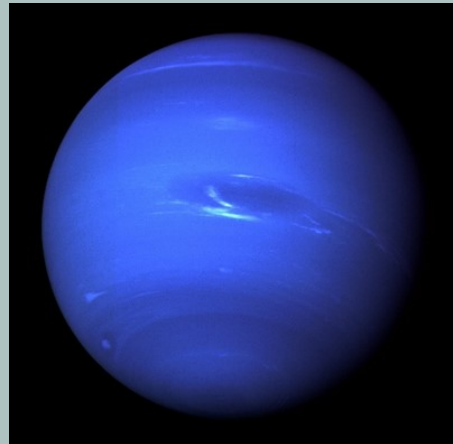
Orbital period (year) – 168.4 years

Axial tilt – 28.3

Cloud surface temp: -330F (-201C)

Gravity – 1.1

Moons – 14



The farthest known planet in the Solar System. Neptune is beyond naked-eye observation and was discovered only in the 19th century. Neptune's vivid blue colour comes partly from the methane in its atmosphere. It has a dynamic weather system and is the windiest planet in the Solar System with ferocious winds of 1,200 mph (2000 km/h), the speed of a fighter jet. The most powerful winds on earth are about 250 mph (400 km/h). Beneath the atmosphere is a deep ocean of water, ammonia and methane ice. Like Uranus, it has a system of faint rings.