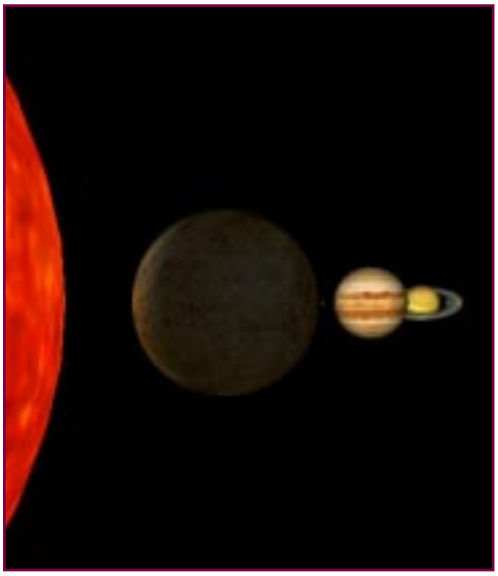
# DATA SHEETS - SOLAR SYSTEM



- The Sun is at the centre of the Solar System.
- Nine planets orbit the Sun, and several of these have moons.
- Together with asteroids and comets, these make up the Solar System.
- Most of the Solar System is empty space.
- More than 99% of the mass of the Solar System is in the Sun.
- The planets are like tiny specks of matter, orbiting around the Sun.

# DATA SHEETS - SUN

- **The Sun is just an ordinary star, and has existed for about 4500 million years.**
- **Like other stars, it's a huge spinning ball of gas, with nuclear reactions taking place continuously at its centre. These generate immense amounts of heat and light.**
- **The planets follow elliptical orbits around the Sun.**
- **They are held in their orbits by the pull of the Sun's gravity.**
- **The planets closest to the Sun are the warmest.**
- **The Sun's radiation (heat, light and ultraviolet) provides most of the energy which keeps the planets warm.**
- **Its surface temperature is about 5500˚C, but its core is much hotter – 14 million degrees!**
- **Spacecraft from Earth keep an eye on the Sun.**
- **Our weather can be affected by radiation from the Sun.**
- **Communications satellites can also be damaged by radiation.**

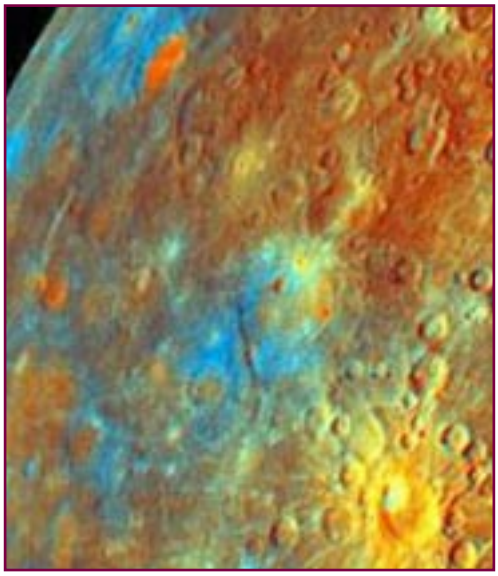
# DATA SHEETS - ALL ABOUT THE SUN

| | Sun | Earth |
|---|---|---|
| **Diameter** | 1,400,000 km | 12,800 km |
| **Time to turn on axis** | 25 days at equator<br>35 days at poles | 24 hours |
| **Mass** | 2 x $10^{30}$ kg | 6 x $10^{24}$ kg |
| **Density** | 1410 kg/$m^3$ | 5500 kg/$m^3$ |
| **Surface gravity** | 28 N/kg | 10 N/kg |
| **Surface temperature** | 5500˚C | 22˚C |
| **Core temperature** | 14,000,000˚C | 4000˚C |

# DATA SHEETS - MERCURY

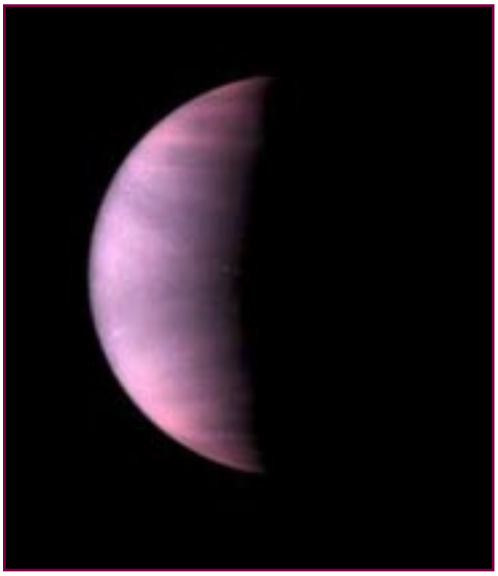
- **Mercury is the closest planet to the Sun so it experiences extreme temperatures.**
- **Its rocky surface is covered with craters.**
- **These formed early in its history, when it was bombarded by rocks from space.**
- **One day & night on Mercury lasts for 176 Earth days, but a year only lasts 88 Earth days.**
- **The daytime temperature is about 430˚C, but by night it plunges to -180˚C.**
- **Mercury has very little atmosphere.**
- **This lack of insulation is one reason why there is such a huge change in temperature from day to night.**
- **There is no sign of water, so it is not a very hospitable place for life.**
- **Mercury was visited in the 1970s by the Mariner 10 probe, which mapped its surface.**

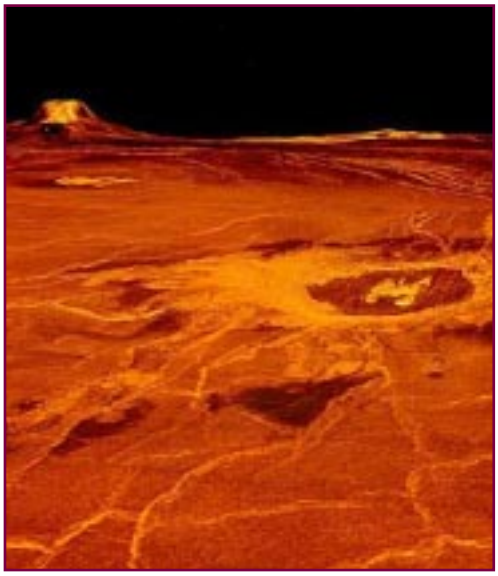
# DATA SHEETS - ALL ABOUT MERCURY



| | Mercury | Earth |
|---|---|---|
| **Diameter** | 4,900 km | 12,800 km |
| **Average distance from Sun** | 58,000,000 km | 150,000,000 km |
| **Time to orbit Sun - a 'year'** | 3 months | 12 months |
| **Time to turn on axis - a 'day'** | 1400 hours | 24 hours |
| **Tilt of axis** | zero | 23.5˚ |
| **Speed around orbit** | 48 km/s | 30 km/s |
| **Mass** | 3 x $10^{23}$ kg | 6 x $10^{24}$ kg |
| **Density** | 5430 kg/$m^3$ | 5500 kg/$m^3$ |
| **Surface gravity** | 4 N/kg | 10 N/kg |
| **Surface temperature** | -180 to +430˚C | 22˚C |
| **Atmosphere** | very very thin | 9%$N_2$, 20%$O_2$, 0.03%$CO_2$ |
| **Moons** | none | 1 |

# DATA SHEETS - VENUS





- **Venus is a rocky planet, and is the hottest in the Solar System.**
- **The surface environment is hostile to life, with sulphuric acid clouds and a 96% carbon dioxide atmosphere.**
- **These factors combine to create a dramatic greenhouse effect and cause the high temperatures.**
- **Venus has been visited by several spacecraft from Earth.**
- **Some orbited the planet, while others landed on its surface.**
- **When spacecraft parachuted down through Venus's thick atmosphere, they found it was a rocky planet, like Earth and Mars. Its atmosphere is mostly carbon dioxide, and this acts like a blanket, trapping heat from the Sun.**
- **The average temperature is nearly 500˚C.**
- **The Magellan spacecraft started orbiting Venus in 1989 in order to map the planet's surface. It used radar waves to scan the planet's surface, just like a bat listening to ultrasound echoes. The image on the right shows mountains and valleys on the planet's surface. Venus is highly volcanic, and larva forms solid waterfalls over much of its surface.**

# DATA SHEETS - ALL ABOUT VENUS

| | Venus | Earth |
|---|---|---|
| **Diameter** | 12,000 km | 12,800 km |
| **Average distance from Sun** | 108,000,000 km | 150,000,000 km |
| **Time to orbit Sun - a 'year'** | 7.5 months | 12 months |
| **Time to turn on axis - a 'day'** | 5830 hours | 24 hours |
| **Tilt of axis** | 2.7˚ | 23.5˚ |
| **Speed around orbit** | 35 km/s | 30 km/s |
| **Mass** | 5 x $10^{24}$ kg | 6 x $10^{24}$ kg |
| **Density** | 5300 kg/$m^3$ | 5500 kg/$m^3$ |
| **Surface gravity** | 9 N/kg | 10 N/kg |
| **Surface temperature** | +465 ˚C | 22˚C |
| **Atmosphere** | 95% carbon dioxide | 79%$N_2$, 20%$O_2$, 0.03%$CO_2$ |
| **Moons** | none | 1 |

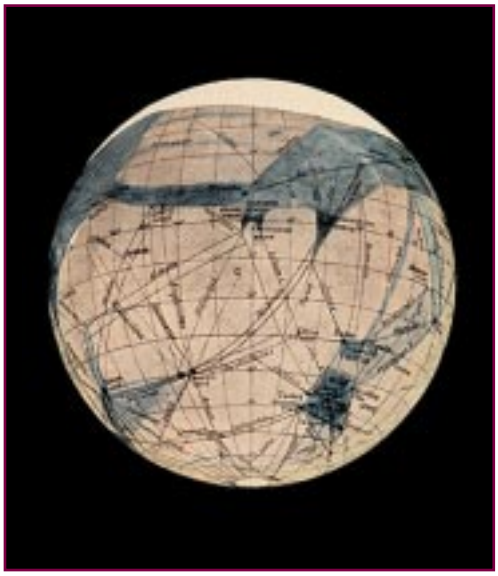
# DATA SHEETS - EARTH

- **The Earth** is made of rock, but just over 70% of the surface area is covered by water.
- From its blue and white appearance, distant observers could tell that our planet has abundant water and an atmosphere.
- Because the Earth spins fairly quickly on its axis, the surface temperature does not get too hot during the day or too cold at night.
- Probes travelling out into space have looked back at Earth. They can detect methane and oxygen in the atmosphere – two gasses which are produced by living organisms.
- The atmosphere also contains a layer of ozone, a gas which protects us from dangerous ultraviolet radiation from space.
- Unfortunately, pollution of the atmosphere by humans has damaged the ozone layer so that we are exposed to more radiation than is good for us.

# DATA SHEETS - ALL ABOUT EARTH

| | Earth |
|---|---|
| **Diameter** | 12,800 km |
| **Average distance from Sun** | 150,000,000 km |
| **Time to orbit Sun - a 'year'** | 12 months |
| **Time to turn on axis - a 'day'** | 24 hours |
| **Tilt of axis** | 23.5˚ |
| **Speed around orbit** | 30 km/s |
| **Mass** | 6 x $10^{24}$ kg |
| **Density** | 5500 kg/$m^3$ |
| **Surface gravity** | 10 N/kg |
| **Surface temperature** | 22˚C |
| **Atmosphere** | 79%$N_2$, 20%$O_2$, 0.03%$CO_2$ |
| **Moons** | 1 |

# DATA SHEETS - MARS



- **Mars is the fourth planet from the Sun, so it is colder than the Earth. Its dry surface is covered with craters and extinct volcanoes.**

- **Recently, astronomers have found channels on the surface of Mars which look as though water once flowed there. There may be small amounts of ice close to the poles, or in the deepest craters. Future probes will look for evidence of water underground.**

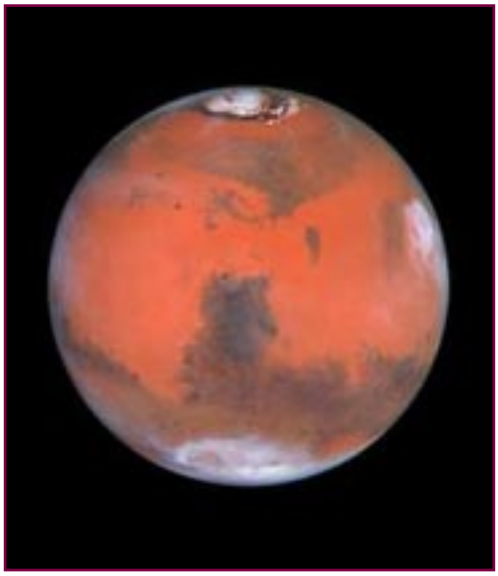
- **The Martian atmosphere is much thinner than Earth's. Visiting astronauts will have to take their own supply of air to breathe, or they will have to manufacture it from Martian rocks.**

- **In the nineteenth century, an Italian astronomer mapped channels which he saw on the surface of Mars using his telescope. He called these 'canali'.**

- **Unfortunately, this was translated into English as 'canals'. Some astronomers thought these canals were evidence of civilised creatures on Mars, and drew maps showing where they lived.**

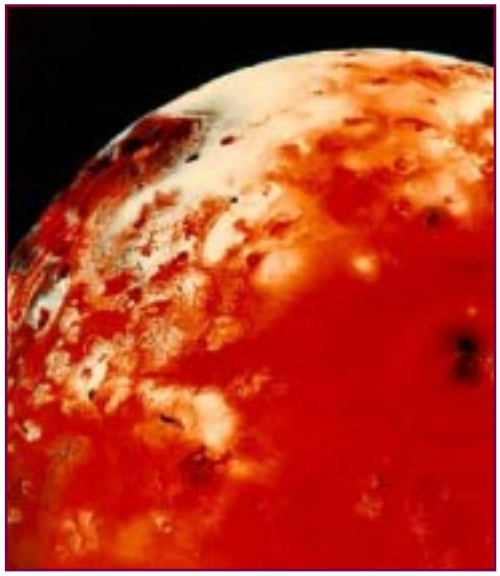
- **The picture on the right was drawn by Percival Lowell, an American astronomer.**

# DATA SHEETS - ALL ABOUT MARS



| | Mars | Earth |
|---|---|---|
| **Diameter** | 6,800 km | 12,800 km |
| **Average distance from Sun** | 228,000,000 km | 150,000,000 km |
| **Time to orbit Sun - a 'year'** | 22.5 months | 12 months |
| **Time to turn on axis - a 'day'** | 24.6 hours | 24 hours |
| **Tilt of axis** | 24˚ | 23.5˚ |
| **Speed around orbit** | 24 km/s | 30 km/s |
| **Mass** | $6 \times 10^{23}$ kg | $6 \times 10^{24}$ kg |
| **Density** | 4000 kg/$m^3$ | 5500 kg/$m^3$ |
| **Surface gravity** | 4 N/kg | 10 N/kg |
| **Surface temperature** | -120 to +25 ˚C | 22˚C |
| **Atmosphere** | very thin - 95% carbon dioxide | 79%$N_2$, 20%$O_2$, 0.03%$CO_2$ |
| **Moons** | 2 | 1 |

# DATA SHEETS - JUPITER



- **Jupiter is known as a 'gas giant' and is the largest planet in the Solar System.**
- **Its most noticeable feature is the Great Red Spot.**
  **This is actually a giant storm that has been raging for at least 300 years.**
- **Jupiter's surface is liquid hydrogen, so would be no use for life.**
  **However, one or more of its moons might support life, alternatively they might be suitable as a base for visitors from Earth.**
- **Jupiter has at least 28 moons – new ones are still being discovered.**
- **Ganymede is the largest. Its icy surface is covered with craters.**
- **Europa has a smooth surface of ice. There may be a huge ocean of water beneath.**
- **Io is splotched with red, orange and yellow. Shown on the right.**
- **These are signs of active volcanoes, spraying sulphur compounds into its atmosphere.**

# DATA SHEETS - ALL ABOUT JUPITER

| | Jupiter | Earth |
|---|---|---|
| **Diameter** | 143,000 km | 12,800 km |
| **Average distance from Sun** | 778,000,000 km | 150,000,000 km |
| **Time to orbit Sun - a 'year'** | 142 months | 12 months |
| **Time to turn on axis - a 'day'** | 10 hours | 24 hours |
| **Tilt of axis** | 3˚ | 23.5˚ |
| **Speed around orbit** | 13 km/s | 30 km/s |
| **Mass** | $2 \times 10^{27}$ kg | $6 \times 10^{24}$ kg |
| **Density** | 1330 kg/$m^3$ | 5500 kg/$m^3$ |
| **Surface gravity** | 26 N/kg | 10 N/kg |
| **Surface temperature** | -150 ˚C | 22˚C |
| **Atmosphere** | mostly $H_2$, some He | 79%$N_2$, 20%$O_2$, 0.03%$CO_2$ |
| **Moons** | at least 28 | 1 |

# DATA SHEETS - ALL ABOUT EUROPA

| | Europa | Earth |
|---|---|---|
| **Diameter** | 3,140 km | 12,800 km |
| **Average distance from Jupiter** | 671,000 km | 150,000,000 km |
| **Time to orbit Sun - a 'year'** | 142 months | 12 months |
| **Time to turn on axis - a 'day'** | 3.6 days | 24 hours |
| **Tilt of axis** | - | 23.5˚ |
| **Speed around orbit** | 13 km/s | 30 km/s |
| **Mass** | $5 \times 10^{22}$ kg | $6 \times 10^{24}$ kg |
| **Density** | 3040 kg/$m^3$ | 5500 kg/$m^3$ |
| **Surface gravity** | 2 N/kg | 10 N/kg |
| **Surface temperature** | Unknown | 22˚C |
| **Atmosphere** | Unknown | 79%$N_2$, 20%$O_2$, 0.03%$CO_2$ |
| **Moons** | - | 1 |

# DATA SHEETS - SATURN

- **Saturn** is a 'gas giant' and the planet is famous for its rings, which are made of pieces of icy rock. The other gas giants – Jupiter, Uranus and Neptune – also have thin rings.
- Saturn's surface is liquid nitrogen and its atmosphere is mostly hydrogen gas.
- It has at least 30 moons, and in 2005 it will be visited by the Cassini-Huygens space probe.
- Thy Huygens probe will parachute down onto Titan, one of Saturn's moons.
- Titan is Saturn's largest moon. Although very cold, it has an atmosphere similar to Earth's – mostly nitrogen.
- Below the atmosphere, there may be liquid methane (natural gas).
  The Huygens probe will survive only 3 hours as it descends into this strange world.

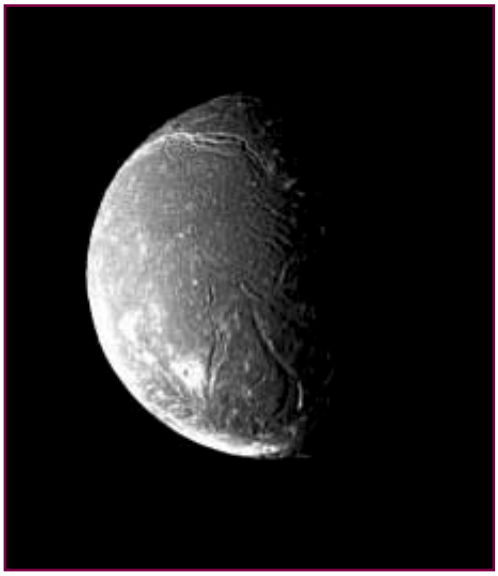
# DATA SHEETS - ALL ABOUT SATURN

| | Saturn | Earth |
|---|---|---|
| **Diameter** | 121,000 km | 12,800 km |
| **Average distance from Sun** | 1,427,000,000 km | 150,000,000 km |
| **Time to orbit Sun - a 'year'** | 354 months | 12 months |
| **Time to turn on axis - a 'day'** | 11 hours | 24 hours |
| **Tilt of axis** | 27˚ | 23.5˚ |
| **Speed in orbit around Sun** | 9.6 km/s | 30 km/s |
| **Mass** | 6 x $10^{26}$ kg | 6 x $10^{24}$ kg |
| **Density** | 690 kg/$m^3$ | 5500 kg/$m^3$ |
| **Surface gravity** | 9 N/kg | 10 N/kg |
| **Surface temperature** | -180 ˚C | 22˚C |
| **Atmosphere** | mostly $H_2$, some He | 79%$N_2$, 20%$O_2$, 0.03%$CO_2$ |
| **Moons** | at least 30 | 1 |

# DATA SHEETS - ALL ABOUT TITAN

| | Titan | Earth |
|---|---|---|
| **Diameter** | 3,140 km | 12,800 km |
| **Average distance from Saturn** | 1,222,000 km | 150,000,000 km |
| **Time to orbit Sun - a 'year'** | 354 months | 12 months |
| **Time to turn on axis - a 'day'** | 16 days | 24 hours |
| **Tilt of axis** | - | 23.5˚ |
| **Speed in orbit around Sun** | 9.6 km/s | 30 km/s |
| **Mass** | $1.4 \times 10^{23}$ kg | $6 \times 10^{24}$ kg |
| **Density** | 1900 kg/$m^3$ | 5500 kg/$m^3$ |
| **Surface gravity** | 2 N/kg | 10 N/kg |
| **Surface temperature** | Unknown | 22˚C |
| **Atmosphere** | mostly nitrogen | 79%$N_2$, 20%$O_2$, 0.03%$CO_2$ |
| **Moons** | - | 1 |

# DATA SHEETS - URANUS



- **Uranus is a cold 'gas giant' with a temperature of -200˚C.**
  **Its atmosphere is a mixture of hydrogen, helium and methane.**

- **Its bluish appearance is caused by the abundant methane, which absorbs red light.**

- **Uranus was visited by Voyager 2 in 1986.**

- **The spacecraft found a featureless planet with thin clouds in its atmosphere.**

- **The Voyager spacecraft discovered several moons orbiting Uranus.**
  **These have rocky, cratered surfaces.**

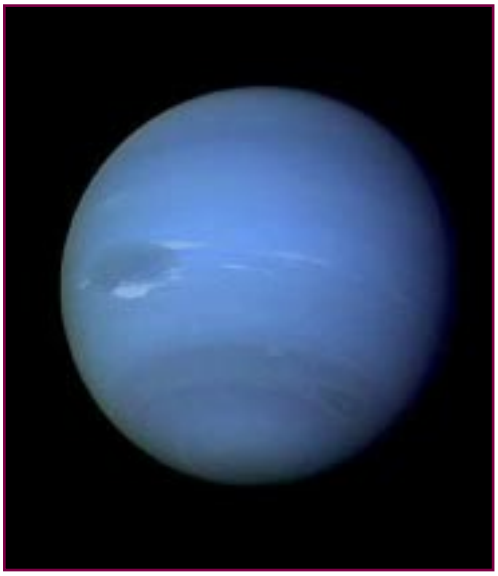
- **These are signs of volcanoes on one of the moons, Ariel, shown on the right.**

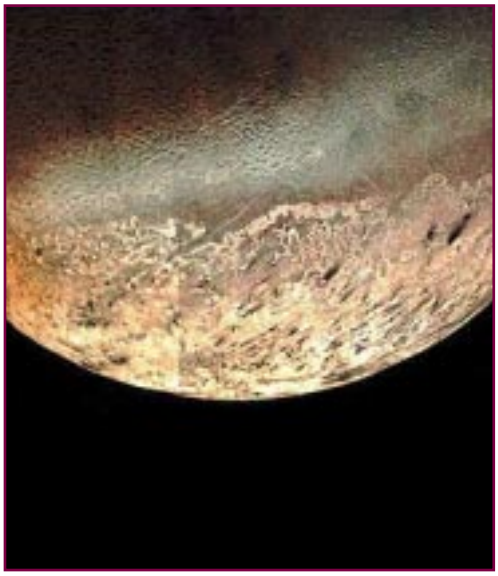
- **Uranus is tilted on its side – its axis points towards the Sun.**
  **This may be a result of a giant collision some time in the past.**

# DATA SHEETS - ALL ABOUT URANUS

| | Uranus | Earth |
|---|---|---|
| **Diameter** | 50.,500 km | 12,800 km |
| **Average distance from Sun** | 2,871,000,000 km | 150,000,000 km |
| **Time to orbit Sun - a 'year'** | 1008 months | 12 months |
| **Time to turn on axis - a 'day'** | 17.2 hours | 24 hours |
| **Tilt of axis** | 98˚ | 23.5˚ |
| **Speed around orbit** | 7 km/s | 30 km/s |
| **Mass** | $9 \times 10^{25}$ kg | $6 \times 10^{24}$ kg |
| **Density** | 1290 kg/$m^3$ | 5500 kg/$m^3$ |
| **Surface gravity** | 8 N/kg | 10 N/kg |
| **Surface temperature** | -210 ˚C | 22˚C |
| **Atmosphere** | mainly $H_2$, some He and $CH_4$ | 79%$N_2$, 20%$O_2$, 0.03%$CO_2$ |
| **Moons** | at least 10 | 1 |

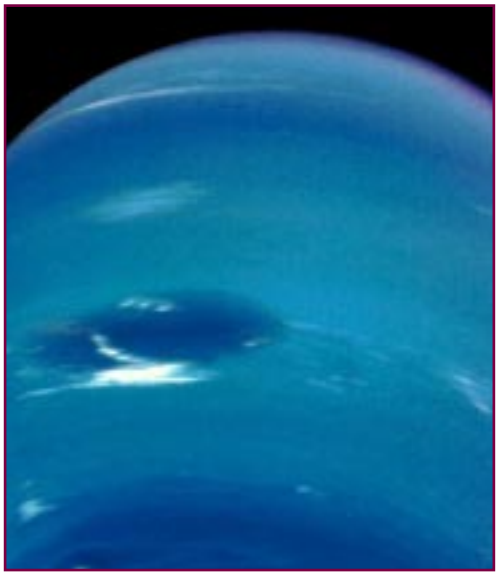
# DATA SHEETS - NEPTUNE





- **Neptune and Uranus are sometimes thought of almost as twins because of their similar characteristics.**
- **Neptune's surface is covered by an ocean of water and gasses, and its atmosphere is made up of methane, hydrogen and helium.**
- **The Great Dark Spot that you can see on the left of this image is a huge cyclonic storm taking place in the planet's atmosphere.**
- **Neptune's largest moon is Triton, shown on the right, the coldest object in the Solar System.**
- **Triton's surface shows signs of volcanic activity. Its poles are covered with methane ice.**
- **Triton has an atmosphere of nitrogen (from its volcanoes) and methane.**

# DATA SHEETS - ALL ABOUT NEPTUNE

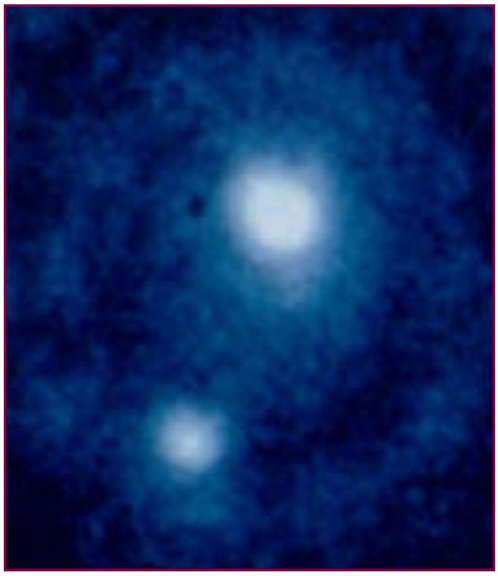


| | Neptune | Earth |
|---|---|---|
| **Diameter** | 49,500 km | 12,800 km |
| **Average distance from Sun** | 4,497,000,000 km | 150,000,000 km |
| **Time to orbit Sun - a 'year'** | 1978 months | 12 months |
| **Time to turn on axis - a 'day'** | 16.1 hours | 24 hours |
| **Tilt of axis** | 29˚ | 23.5˚ |
| **Speed around orbit** | 5 km/s | 30 km/s |
| **Mass** | $1 \times 10^{26}$ kg | $6 \times 10^{24}$ kg |
| **Density** | 1640 kg/$m^3$ | 5500 kg/$m^3$ |
| **Surface gravity** | 11 N/kg | 10 N/kg |
| **Surface temperature** | -210 ˚C | 22˚C |
| **Atmosphere** | mainly $H_2$, some He and $CH_4$ | 79%$N_2$, 20%$O_2$, 0.03%$CO_2$ |
| **Moons** | at least 8 | 1 |

# DATA SHEETS - PLUTO

- **Pluto is the most distant planet from the Sun and it is tiny – just 2284km in diameter.**
- **Some astronomers have suggested that it is more like a comet than a true planet.**
- **Pluto is orbited by a single moon, Charon.**
  **Charon is half the diameter of Pluto, and orbits close to its surface.**
- **The two Voyager spacecraft have flown out beyond the orbit of Pluto.**
- **Travelling at 14.8 km/s, they are well on their way out of the Solar System.**
- **NASA scientists are still in touch with these craft, despite the fact that it takes many hours for their signals to travel back to Earth.**

# DATA SHEETS - ALL ABOUT PLUTO

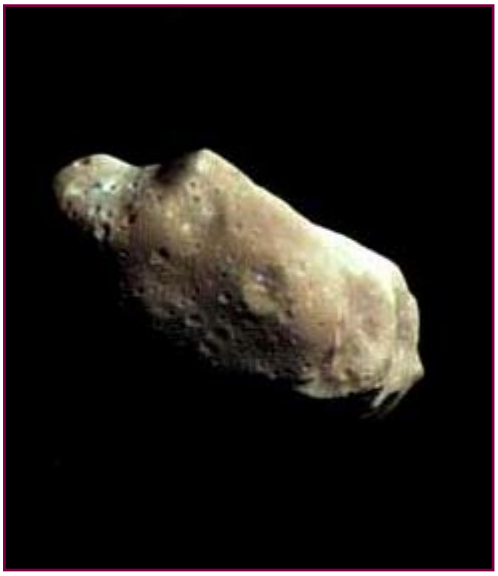


| | Pluto | Earth |
|---|---|---|
| **Diameter** | 2,300 km | 12,800 km |
| **Average distance from Sun** | 5,913,000,000 km | 150,000,000 km |
| **Time to orbit Sun - a 'year'** | 2982 months | 12 months |
| **Time to turn on axis - a 'day'** | 153 hours | 24 hours |
| **Tilt of axis** | 118˚ | 23.5˚ |
| **Speed around orbit** | 5 km/s | 30 km/s |
| **Mass** | $1 \times 10^{22}$ kg | $6 \times 10^{24}$ kg |
| **Density** | 2030 kg/$m^3$ | 5500 kg/$m^3$ |
| **Surface gravity** | 0.4 N/kg | 10 N/kg |
| **Surface temperature** | - 230 ˚C | 22˚C |
| **Atmosphere** | mainly $N_2$, some $CH_4$? | 79%$N_2$, 20%$O_2$, 0.03%$CO_2$ |
| **Moons** | 1 | 1 |

# DATA SHEETS - COMETS

- **A comet is a ball of dust and ice, which travels through the Solar System.**
- **Most of the time it will be a long way from the Sun, but periodically its orbit brings it close.**
- **As a comet approaches the Sun, it moves faster and faster, pulled by the Sun's gravity. As it heats up, dust and gas boil off producing a tail that streams behind it as it moves.**
- **A comet has two tails: The gas tail points directly away from the Sun, pushed back by the 'solar wind' – electrically charged particles streaming out from the Sun. The dust tail lags behind the gas tail.**
- **Comets leave a trail of dust particles in space. When the Earth's orbit takes it through one of these trails, the particles burn up in outer atmosphere and we see a meteor shower ('shooting stars').**
- **Halley's comet is a regular visitor.**
  **It orbits the Sun every 76 years, and has been observed 30 times since 240 BC.**
- **Some comets have such large orbits that they do not return for millions of years.**
- **If you are the first person to notice a new comet, you can have it named after yourself.**

# DATA SHEETS - ASTEROIDS



- **An asteroid** is a lump of rock that orbits the Sun.
  Most asteroids are found in the Asteroid Belt, a wide area between Mars and Jupiter.
- If it wasn't for Jupiter's gravitational pull, these asteroids might have consolidated to form another planet.
- Asteroids that are not confined to the Asteroid Belt follow different orbits through the Solar System. These can intersect with the orbits of the planets, and can therefore pose a threat to life.
- Asteroids are much smaller than Earth. The biggest, Ceres, is 920km across.
- Asteroids have been photographed by passing spacecraft.
  A NASA craft even landed on one.
- They mostly have irregular shapes, with cratered surfaces.
- They are mostly made of rock, though some seem to be almost pure iron.