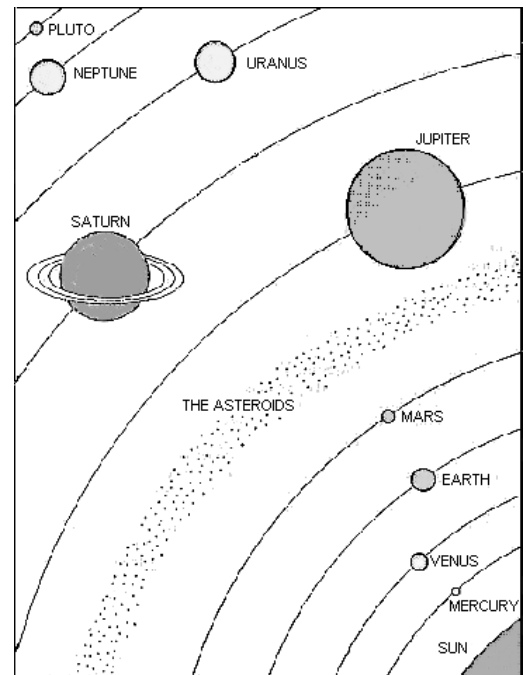


## Space

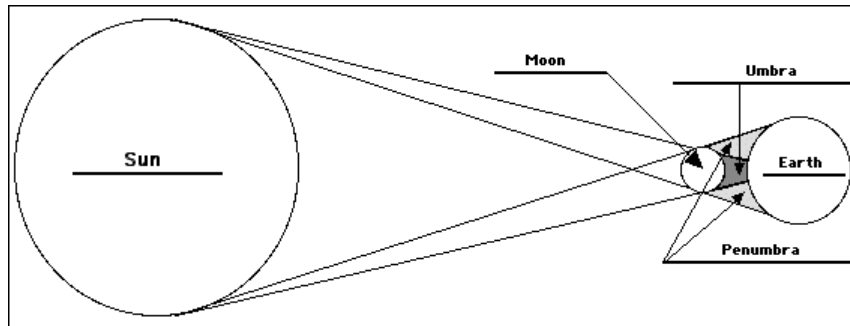
- ❑ The solar system consists of the Sun, nine planets, the asteroid belt and a number of comets. Gravity holds all these bodies in orbit around the Sun.
- ❑ The planets are (in order, moving away from the Sun): Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune and Pluto. A mnemonic may be useful to help you name the planets in order. Eg. **My Very Easy Method Just Speeds Up Naming Planets**. The planets (except Pluto) have elliptical (almost circular) orbits in the same plane. The orbit of Pluto is much more elliptical and at an angle to the plane of the other planets. The planets and moons are seen by the reflected light of the Sun. The asteroid belt, made up of dust and rocks, lies between the four inner planets and the outer planets. The further a planet is from the sun the weaker the pull of gravity is on it.

- **Sun** - The Sun is a star at the centre of our Solar System.
- **Mercury** - Mercury is the planet closest to the Sun.
- **Venus** - Venus is the second planet from the Sun. It is the hottest planet.
- **Earth** - Earth is the third planet from the Sun and the planet we live on.
- **Mars** - Mars is a red planet and the fourth planet from the Sun.
- **Jupiter** - Jupiter is the fifth planet from the Sun. This gas giant is the largest planet.
- **Saturn** - Saturn is the sixth planet from the Sun. This gas giant has large, beautiful rings.
- **Uranus** - Uranus is a gas giant and is the seventh planet from the Sun.
- **Neptune** - Neptune is a gas giant and is usually the eighth planet from the Sun
- **Pluto** - Pluto is a rocky planet that is usually the farthest planet from the Sun. It is the smallest planet.

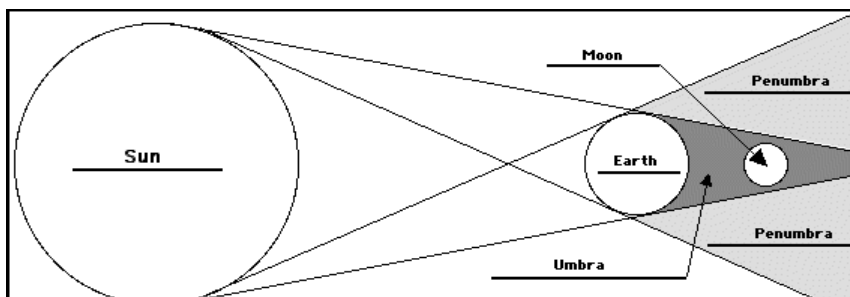


- ❑ The Earth and some other planets have one or more moons. It takes the moon just more than 27 days to make a complete orbit of the Earth. This is called a lunar month. Moons are natural satellites. Man-made or artificial satellites orbit the Earth to study what is happening or transmit information between distant parts of the Earth, monitor the weather and other conditions on Earth, or observe the rest of the solar system and beyond (Eg. The Hubble telescope).
- ❑ Comets have elliptical orbits, which take them close to the sun and then far away again. The time to complete an orbit varies from a few years to millions of years. The speed of a comet increases as it gets closest to the sun and is greatest when the comet is nearest to the sun. When they get close to the sun comets are often visible from Earth as the sun's heat vaporises material from the surface to form a tail. Comets slow down as they move away from the sun.
- ❑ Time: A day is how long it takes for a planet to **turn on its axis**. An Earth day takes 24 hours, but one rotation of Mercury takes 58.6 Earth days. A year is the time taken for a planet to orbit the Sun. The further a planet is from the Sun, the weaker the pull of gravity on it and the greater its orbit. The further from the Sun a planet is, the longer its year. Mercury is closer to the Sun than Earth and orbits the Sun in 88 Earth days. A year on Earth takes 365  $\frac{1}{4}$  days.

- ☐ A solar eclipse happens when the moon blocks our view of the sun. This happens when the Moon is exactly between the Sun and the Earth. A partial solar eclipse is when the Moon only covers part of the solar disc. A total solar eclipse is when the Moon appears to cover the entire solar disc. Total solar eclipses are only visible from a very small area on Earth that moves across the Earth's surface (as the Earth rotates). The umbra is an area of total shadow, the penumbra is partial shadow. The order is *SUN-MOON-EARTH*.



- ☐ In a lunar eclipse the order is *SUN-EARTH-MOON*.



The Moon's orbit is tilted 5 degrees to the plane of the Earth's orbit, and so it is often above or below the Sun-Earth line when the Moon is full or new. This is why we don't get a solar and a lunar eclipse each month.

## STARS


- ☐ A very large group of stars is called a galaxy. Our Sun is one of the many stars which make up the Milky Way galaxy. The star pattern we see in the night sky moves across the sky as the Earth turns on its axis. The pattern also changes from day to day throughout the year as we orbit around the Sun. The viewing point of the observer changes and stars appear to have moved.
- ☐ Stars are different colours at different stages in their life, depending on their temperature.
- ☐ Stars have formed from massive clouds of dust and gas in space.
  - Gravity pulls dust and gas together. As the mass falls together it gets hot.
  - When it is hot enough for the hydrogen nuclei to fuse together to make helium a star is formed
  - The fusion process releases energy, keeping the core of the star hot.
  - This is the stable phase in the life of the star. Our Sun is at this stable phase in its life.





- When all the hydrogen has been used up larger nuclei begin to form and the star may expand, becoming a red giant.
- When all the nuclear reactions are over a small star, like our Sun, may begin to contract under the pull of gravity. It becomes a white dwarf which fades and changes colour as it cools.
- A larger star with more mass will go on making nuclear reactions, getting hotter and expanding until it explodes as a supernova. An exploding supernova throws hot gas and dust into space, and may eventually shrink to become a black hole.
- At the end of its life a star may explode into a cloud of dust and gas. New stars are being formed from the debris of old stars.


## Phases of the Moon

Sunlight falling on the Moon's surface is reflected. As the Moon revolves around the Earth we see different areas of the illuminated Moon. We call this the **phases of the Moon**. Of course the Sun always shines on half the Moon but we cannot always see the illuminated side. The part we can see gives us the phases of the Moon. See opposite for November 2005.

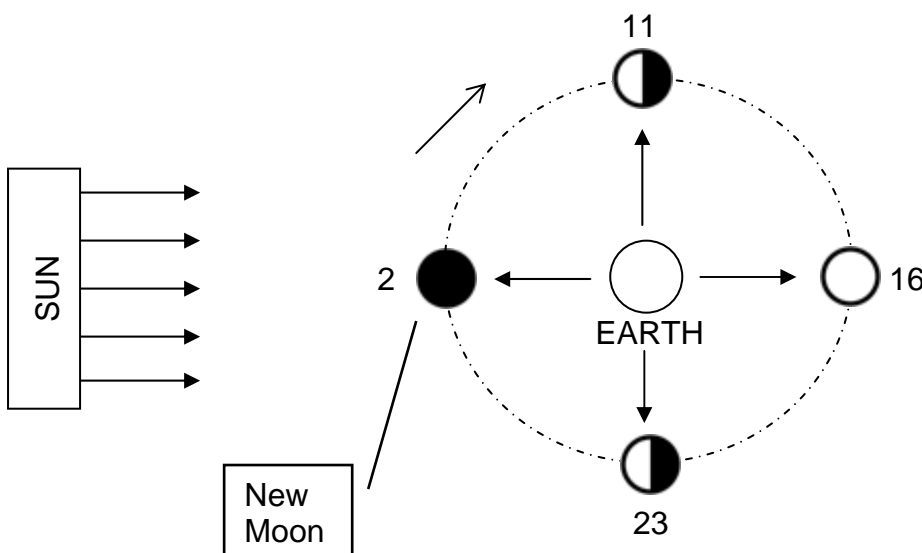
 A New Moon cannot be seen from the Earth. Only the dark side is facing us (2)

 At First Quarter we see half of the Moon (11)

 We see the entire sunlit side of the Full Moon (16)

 At Third Quarter we see half of the Moon (23)

Mon	Tue	Wed	Thur	Fri	Sat	Sun
	1	2 New	3	4	5	6
	Rise: 04:18 Set: 19:40	Rise: 04:50 Set: 20:54	Rise: 05:32 Set: 22:05	Rise: 06:26 Set: 23:06	Rise: 07:32 Set: 23:56	Rise: 08:46 Set: NIL
7	8	9	10	11	12	13
Set: 00:35 Rise: 10:05	Set: 01:06 Rise: 11:23	Set: 01:31 Rise: 12:39	Set: 01:54 Rise: 13:54	Set: 02:15 Rise: 15:09	Set: 02:36 Rise: 16:23	Set: 02:59 Rise: 17:39
14	15	16 Full	17	18	19	20
Set: 03:26 Rise: 18:54	Set: 03:59 Rise: 20:06	Set: 04:39 Rise: 21:12	Set: 05:28 Rise: 22:08	Set: 06:25 Rise: 22:53	Set: 07:28 Rise: 23:29	Set: 08:33 Rise: 23:57
21	22	23	24	25	26	27
Set: 09:38 Rise: NIL	Set: 00:20 Rise: 10:41	Set: 00:40 Rise: 11:44	Set: 00:58 Rise: 12:48	Set: 01:16 Rise: 13:50	Set: 01:34 Rise: 14:56	Set: 01:54 Rise: 16:05
28	29	30				
Rise: 02:18 Set: 17:19	Rise: 02:47 Set: 18:34	Rise: 03:26 Set: 19:49				



Imagine you are viewing the Earth with the South Pole at the centre. The moon orbits the Earth. Imagine yourself standing in the middle of the Earth. Look in the direction of the arrows to see the part of moon that is illuminated at different times of the month.