# Touring the Night Sky

Section 8.1

## The Universe

Everything that exists anywhere

**Geocentric View**

Earth is at the centre of the universe (Aristotle)

**Heliocentric View**

Sun is the centre, Earth travels westward around it (Copernicus)

## Galaxies

Massive, rotating, gravitationally bound system that consists of stars, planets, dust, gas, and other celestial objects

**Our galaxy is?**

Milky Way

## Solar Systems

A star, together with the planets, moons, asteroids, comets and dust, which revolve around it in its gravitational field.

**Our star is?**

The sun

# Stars

Massive collection of gases, held together by its own gravity and emitting huge amounts of energy (fusion = nuclear reaction)

**Our sun is a star - enormous ball of hot, glowing gases**

**All stars are <u>LUMINOUS</u>**

# Luminous vs Non-Luminous

<u>Luminous</u>: Simply means the object produces its own light - **Only stars do this!**

<u>Non-Luminous</u>: Cannot see with naked eye - they need to reflect light from a star

- **Planets & Moons are non-luminous**

# Planets

A large, round celestial object that travels around a star

**Terrestrial = rocky surface similar to Earth**
**(the 4 closest to the sun: Mercury, Venus, Earth & Mars)**

**Gas Giants = composed of gas & liquids**
**(the 4 furthest from the sun: Jupiter, Saturn, Uranus, Neptune)**

# Moons

Type of satellite: object that orbits a planet

**Earth has one moon**

**Mercury and Venus have none**

**Jupiter and Saturn each have 60 or more**

## Other objects found in our solar system

- **asteroids: small rocky objects rich in minerals, orbit around sun, from a ring called the asteroid belt (between Mars & Jupiter – separates the terrestrial and gas planets)**
- **comets: large chunks of ice and dust travelling in long elliptical orbits around the sun**
- **meteors/meteoroid/meteorites: space rocks that look like streaks of light as they heat up due to friction with our atmosphere, vapourize, or reach Earth (meteorite hit Russia in 2013)**
- **space station: large satellite designed to support humans in order to conduct research & other space-related activities (orbits Earth)**

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## Scientific Notation

Scientific notation is a way of writing numbers that are **too big** or **too small** to be conveniently written in decimal form.

| Standard Form | Scientific Notation |
|---|---|
| 54 000 000 000 | |
| 8 745 000 000 000 | |
| 0. 000 000 000 583 | |
| 0. 000 000 66 | |

**Remember**: Only one number goes in front of the decimal!

Examples of values that can be written as scientific notation are:

- The mass of an electron is approximately
0.000 000 000 000 000 000 000 000 000 000 910 938 22 kg.
In scientific notation, this is written **$9.1093822\times10^{-31}$ kg**.

- The mass of the Earth is about
5 973 600 000 000 000 000 000 000 kg.
In scientific notation, this is written **$5.9736\times10^{24}$ kg**.

- The circumference of the Earth's is approximately
40 000 000 m.
In scientific notation, this is **$4\times10^{7}$ m**.

## Measuring Distance in Space

**Astronomical Unit (AU):**

**Measuring distance IN our Solar System**

**Average distance from Earth to Sun ($1.5 \times 10^7$ km = 15 million km)**

Ex: Jupiter is 780 million km from the Sun. This is equal to 5.2 AU (in other words, 5 times further from the Sun than Earth is)

**Light Years (ly)**

**Measuring distance BEYOND our Solar System**

**Distance light travels in one year ($9.46 \times 10^{12}$ km = almost 10 trillion)**

Ex: Proxima Centauri is $4.01 \times 10^{13}$ km from Earth. This is equal to 4.24 ly.

## How to calculate ly?

**Ex: Proxima Centauri is $4.01 \times 10^{13}$ km from Earth. This is equal to 4.24 ly.**

How did we solve this?

1 ly = $9.46 \times 10^{12}$ km

If Proxima Centrauri is $4.01 \times 10^{13}$ km from Earth and 1 ly = $9.46 \times 10^{12}$ km, then:

$$4.01 \times 10^{13}\ \text{km} \times \frac{1\ \text{ly}}{9.46 \times 10^{12}\ \text{km}} = 4.24\ \text{ly}$$

# Homework

- Read section 8.1 (p. 305)
- Do Q's# 1-9 (p. 308)
- Read ahead, Section 8.2 (p. 309)