

Grade 9 Science

Astronomy

Class 15

Overall Expectations

- Assess some of the costs, hazards, and benefits of space exploration and the contributions of Canadians to space research and technology
- Investigate the characteristics and properties of a variety of celestial objects visible from Earth in the night sky
- Demonstrate an understanding of the major scientific theories about the structure, formation, and evolution of the universe and its components and of the evidence that supports these theories

Astronomy

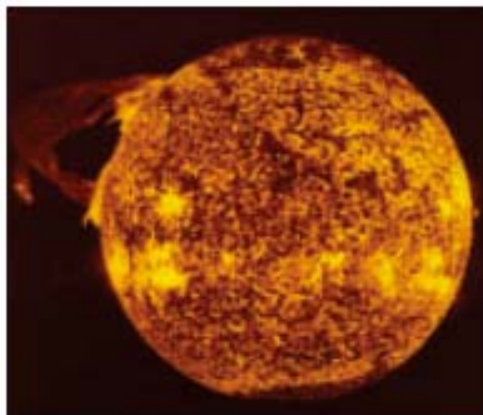
- The branch of science that studies objects beyond the Earth
- Universe – everything that exists, including all energy, matter and space

Stars

- A massive collection of gases held together by its own gravity and emitting huge amounts of energy

Sun

- The sun is a star that is average in size but it appears bigger and brighter due to its proximity to Earth



Planets

- A large celestial object that travels around a star

- 8 planets:

- Mercury
- Venus
- Earth
- Mars
- Jupiter
- Saturn
- Uranus
- Neptune

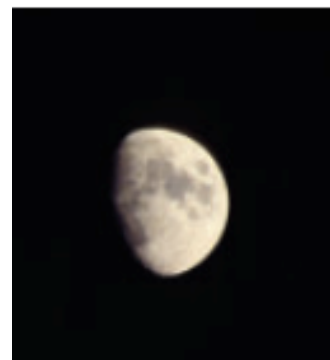
Terrestrial Planets

Gas Giants



Moons

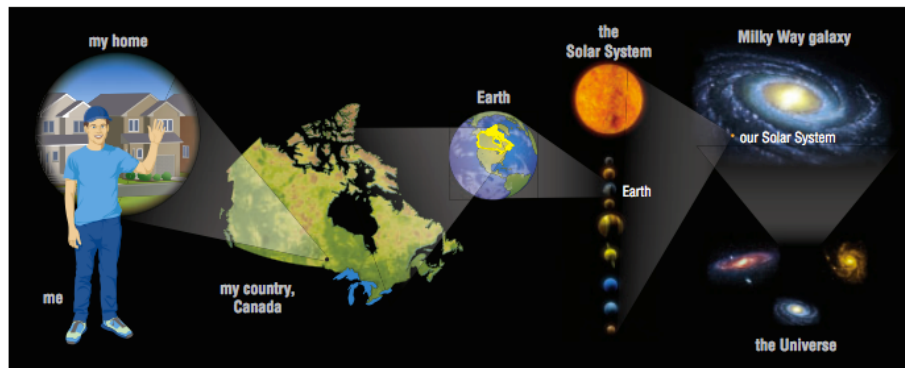
- A celestial object that travels around a planet or dwarf planet in an orbit (satellite)
- Some planets have no moons (Mercury, Venus); some have many moons (Jupiter and Saturn have 60+ moons)



Galaxies

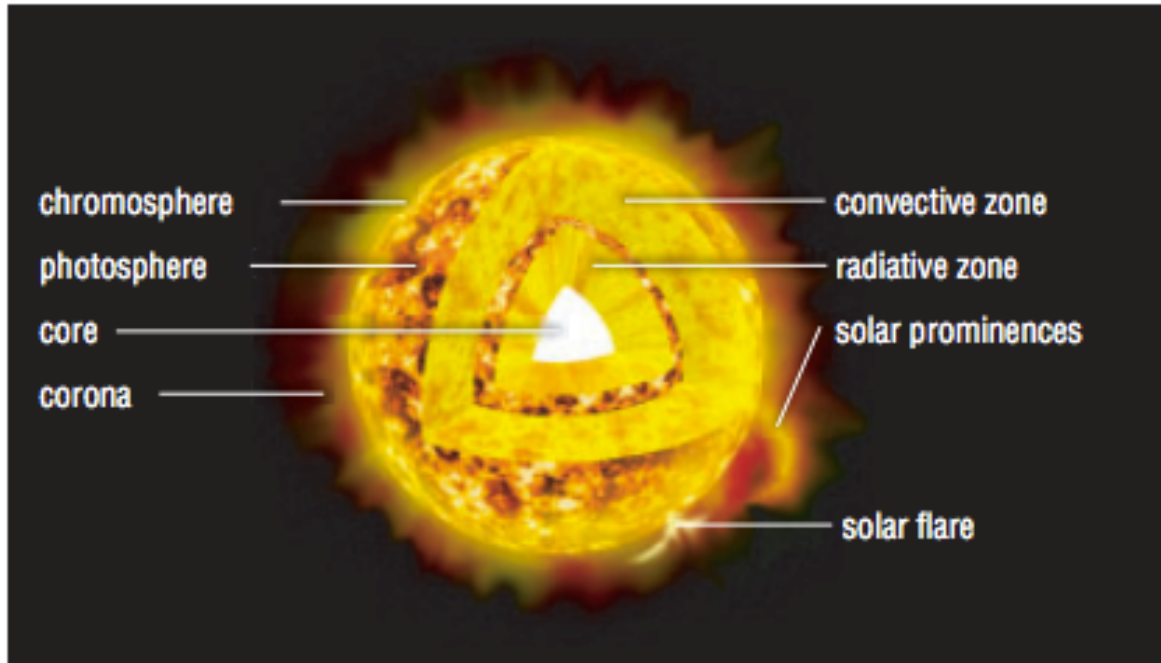
- A huge rotating collection of gas, dust and billions of stars, planets and other celestial objects

Milky Way



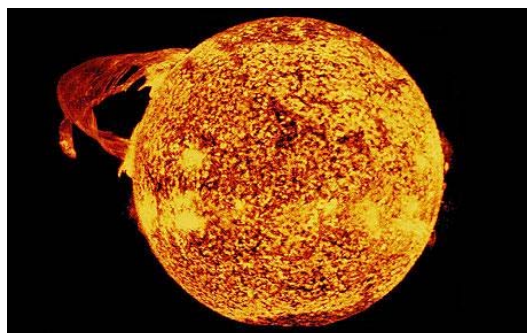
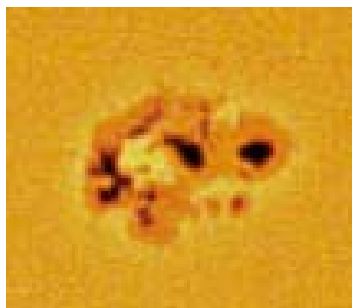
The Sun

- Composed of many layers of gas
- Core – high temperatures 15 000 000°C and pressures causes nuclear fusion, which releases lots of energy
- Radiative Zone → Convective Zone, where hotter substances rise and colder substances fall → Photosphere (5500°C) → Atmosphere (Chromosphere and Corona)



Surface of the Sun

- Appears as hot, boiling liquid on the surface
- Sunspots – darker, cooler areas caused by disturbances in the Sun's magnetic field
- Solar flares - found in active regions near sunspots that release large quantities of gas and charged particles

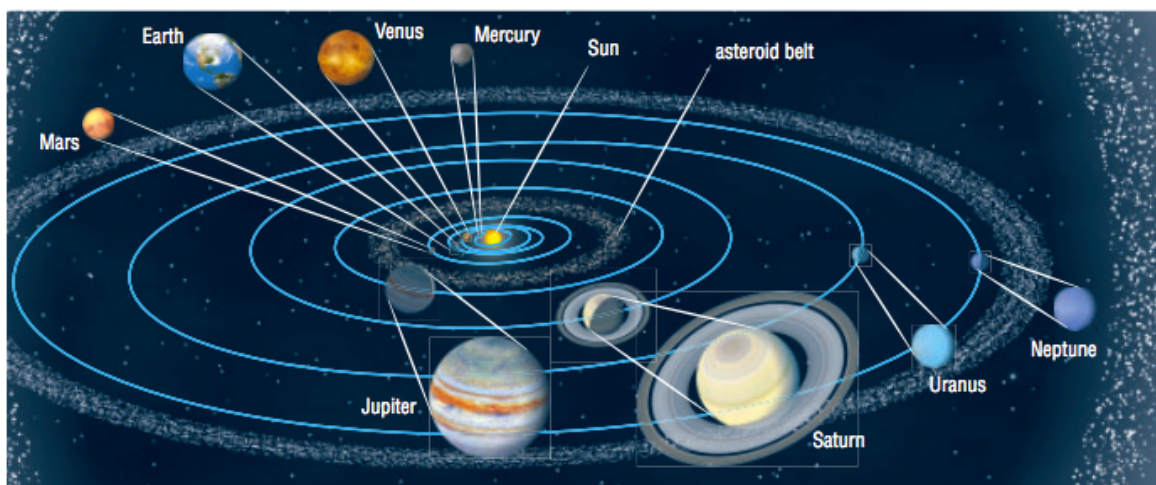


Auroras

- Earth is surrounded by a magnetic field that is strongest near the North and South Poles
- Solar winds traveling toward the Earth follow the lines of the magnetic force producing a display of light in the night sky
 - Aurora Borealis – Northern Lights
 - Aurora Australis – Southern Lights



Planets



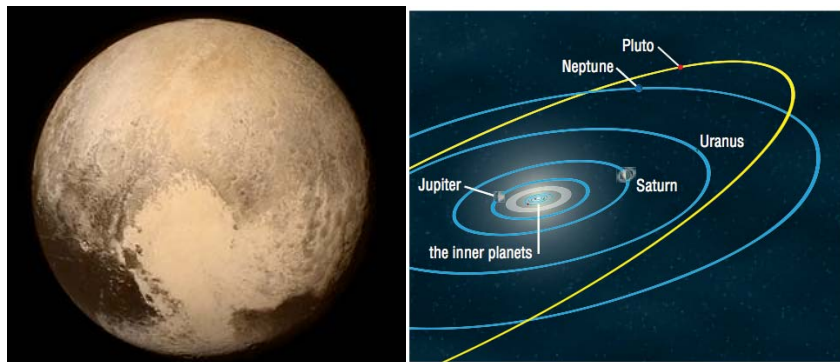
- Astronomical Unit (AU) – average distance between the Sun and the Earth – 150 million km
 - Ex: Jupiter is 780 million km from the Sun

Planet

- Be in orbit around a star
- Have enough mass to be pulled into a stable sphere shape by gravity
- Dominate its orbit (i.e. its mass must be greater than anything else that crosses its orbit)
 - Terrestrial Planets: Mercury, Venus, Earth, Mars
 - Gas Giants: Jupiter, Saturn, Uranus and Neptune

Dwarf Planet

- Dwarf planets orbit the Sun and have a spherical shape however they do not dominate their orbits
 - Ex: Pluto, Ceres, Haumea, Makemake, Eris

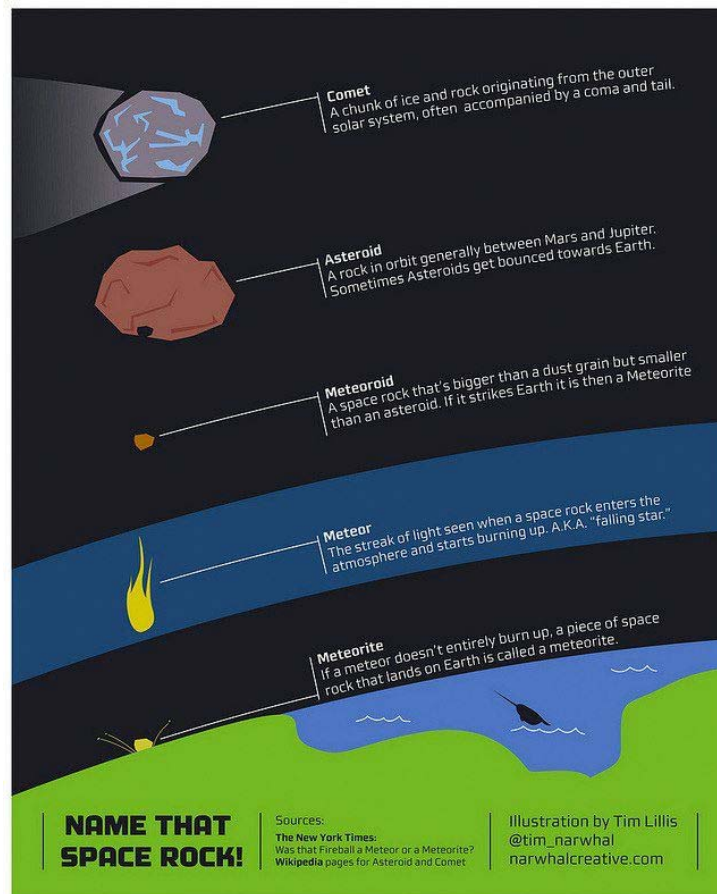


Other Celestial Objects

- **Asteroids** – rock and metal that orbit the Sun; lie in the asteroid belt (between Mars and Jupiter)
 - Some are round but mostly are irregular-shaped
- **Meteoroids** – smaller than an asteroid and can get pulled in by Earth's gravity
 - Shooting star is due to the friction between the meteoroid and the Earth's atmosphere causing it to burn up
 - Remains = Meteorites that cause a crater



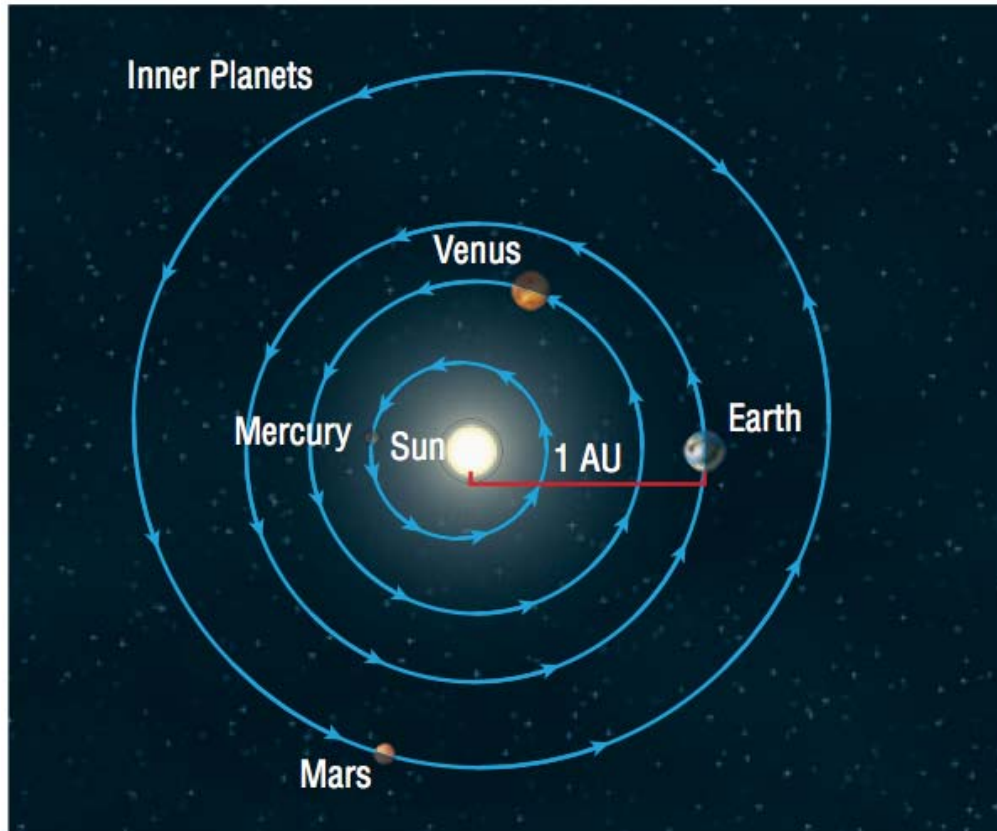
- **Comets** – large chunks of ice, dust and rock that orbit the Sun
 - Short period – originate from a region near Neptune and travel around the Sun in less than 200 years
 - Long period – originate from a region near Pluto and takes over 200 years to travel around the Sun



Rotation of the Earth

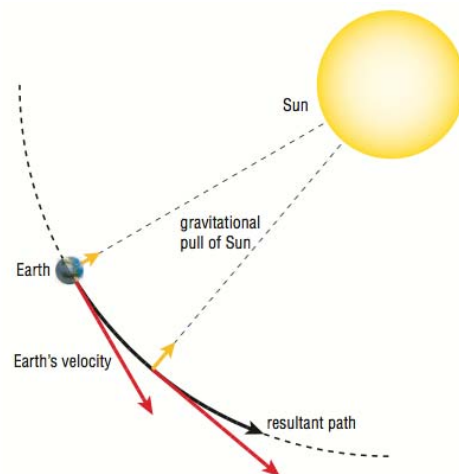
- Earth makes one complete rotation, in a west to east direction once each day
- As it spins on its axis, it also revolves around the Sun in an elliptical orbit
 - One orbit = 365.25 days
 - Tilt is 23.5° from the vertical

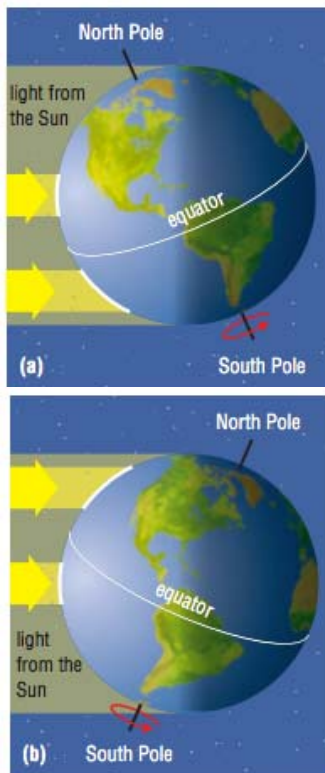




Gravitational Force

- What keeps the Earth orbiting the Sun and the Moon orbiting the Earth?
- Gravitational force is the force of attraction between all masses in the Universe
- The greater the mass of an object, the stronger its gravitational force





Seasons

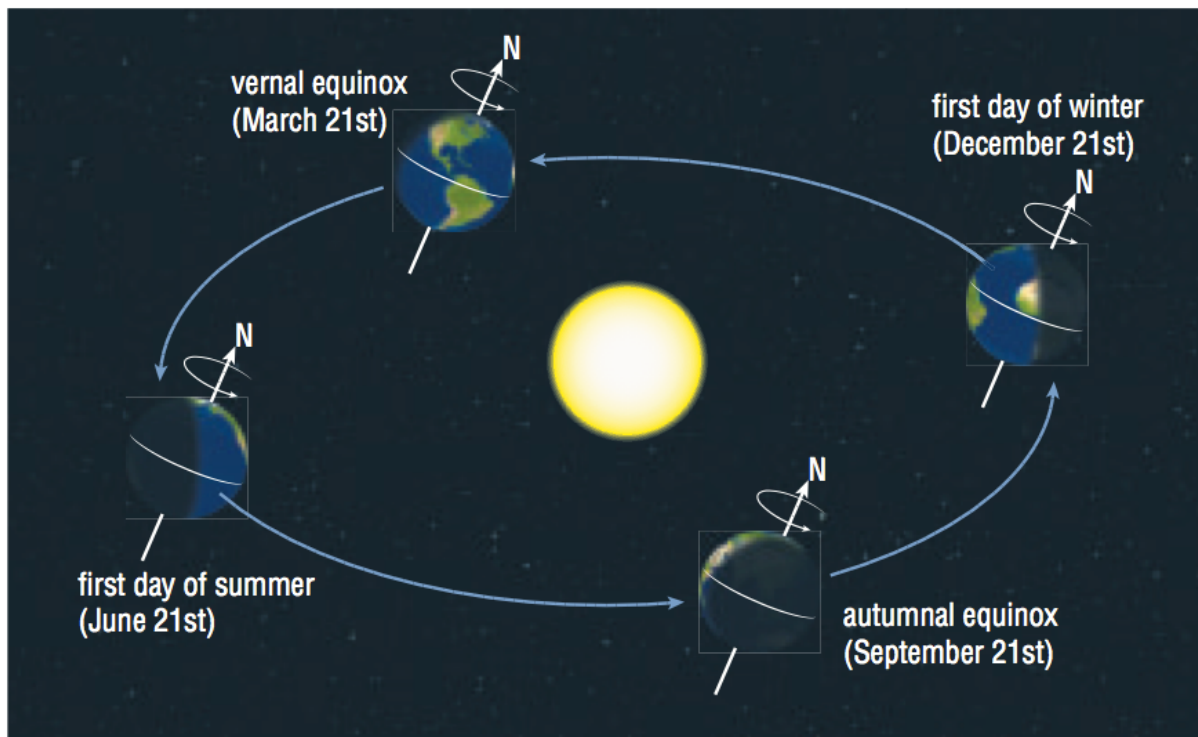
- Seasons change because of Earth's tilt NOT because of the distance to the Sun
- Northern Hemisphere
 - Earth is farthest from the Sun around July 4; Northern Hemisphere is tilted toward the Sun
 - Earth is closest to the Sun around January 3rd; North Hemisphere is tilted away from the Sun
- Southern Hemisphere - reverse

Solstice

- Occurs two times each year when the tilt of the Earth's axis is tilted closest or furthest away from the Sun
 - Longest day (around June 21 – first day of summer) and shortest day of the year (around December 21 – first day of winter)

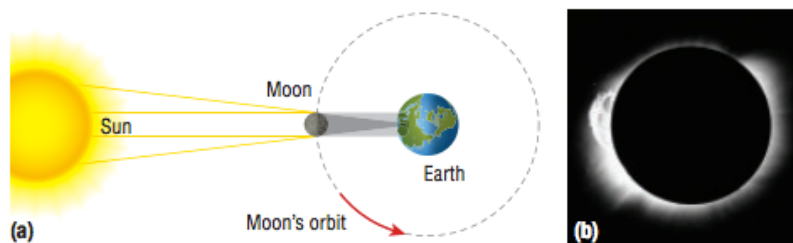
Equinox

- 2 days in a year when hours of day = hours of darkness
 - Around March 21 (first day of spring) and around September 21 (first day of autumn)

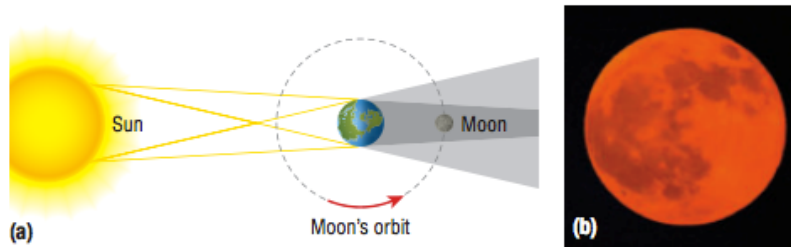


Eclipses

- Darkening of a celestial object due to the position of another celestial object
 - **Solar Eclipse** – when the moon blocks the sun from being observed from Earth



- **Lunar Eclipse** – when the Earth is positioned between the Moon and the Sun casting a shadow on the Moon



- Eclipses should not be viewed with the naked eye because the Sun's powerful rays can damage your eyes when it is not fully hidden behind the moon