Unit 1 - Space Exploration

*Give Examples of Constellations and Asterisms:*

* Ursa Major (including the big dipper)
* Ursa Minor ( including the little dipper)
* Orion (including orions belt) [View the Constellaitons](http://www.astro.wisc.edu/~dolan/constellations/java/Ursa_Major.html)

*Describe and explain the apparent motion of the stars, moon, sun, planets, comets, asteroids.*

* **Celestial bodies** move in cyclic paths known as orbits, and they result from gravitational forces
* Planets, the Sun, and moons revolve (spin) around a **central axis**. (Think about a spinning globe)

*Describe the contributions made by various individuals to our knowledge and understanding of celestial bodies and their motions.*

* Aristotle - Believed in a geocentric model of the universe, and all celestial bodies moved in circular patterns around earth.
* Ptolmey - First to describe the universe as geocentric, meaning the earth was at the center.
* Copernicus –Believed the Sun was the center of the solar system (Heliocentric). Also believed that the earth rotated on its axis.
* Galileo (Important) First to use a telescope to study the sky. Believed in a heliocentric model of the universe, and his ideas were directly opposed to those of the church at the time.
* Kepler (Important) - Successfully described the motion of the planets as being elliptical.
* Newton - Discovered the idea of gravity.

[Astronomer Bios](http://www.seasky.org/spacexp/sky5e.html) [Astronomer Bios](http://kids.librarypoint.org/early_astronomers)

*Identify Early Technologies that advanced scientific observations about the solar system:*

* Stone Circles [Video](http://www.youtube.com/watch?v=hxl-RpKA6hQ)
* Astrolabe [Image](http://www.google.ca/imgres?imgurl=http://sitemaker.umich.edu/socio-functional/View/da.data/000000000000000000000000000000000000000002281787/%255Bimage1%255D/filename&imgrefurl=http://sitemaker.umich.edu/socio-functional/View%26mode%3Dsingle%26recordID%3D000000000000000000000000000000000000000002281787&usg=__K3SzK9MS_FeTk0Uz3yL4s1DHcmQ=&h=600&w=800&sz=88&hl=en&start=0&zoom=1&tbnid=02Vl0jwh-khx3M:&tbnh=116&tbnw=155&ei=yW7iTdK8KYLPgAepyZjCBg&prev=/search%3Fq%3Dastrolabe%26um%3D1%26hl%3Den%26sa%3DN%26rlz%3D1R2TSCA_enCA428%26biw%3D1345%26bih%3D521%26tbm%3Disch&um=1&itbs=1&iact=rc&dur=305&page=1&ndsp=27&ved=1t:429,r:1,s:0&tx=88&ty=32)
* Early Telescope [Image](http://www.google.ca/imgres?imgurl=http://www.seasky.org/spacexp/assets/images/gelileo2.gif&imgrefurl=http://www.seasky.org/spacexp/sky5e03.html&usg=__sDjWbKOMpoFPCMB1arZ3ri7wZH8=&h=163&w=130&sz=10&hl=en&start=0&zoom=1&tbnid=5LzyjZhXIUuuLM:&tbnh=124&tbnw=99&ei=DG_iTcioCMfXgQeii9W6Bg&prev=/search%3Fq%3Dearly%2Btelescope%26um%3D1%26hl%3Den%26rlz%3D1R2TSCA_enCA428%26biw%3D1345%26bih%3D521%26tbm%3Disch&um=1&itbs=1&iact=hc&vpx=344&vpy=110&dur=184&hovh=130&hovw=104&tx=118&ty=72&page=1&ndsp=26&ved=1t:429,r:2,s:0&biw=1345&bih=521)

*Describe the Characteristics of the following parts of the solar system:*

* **The Sun** 
  + 300 000 more mass than the earth
  + Rotates about a central axis
  + Contains Hydrogen and Helium
  + Chemical Reactions in the sun give off radiation, including heat
  + Contains Sun Spots, gives off solar flares, solar prominences
* **Terrestrial Planets (Inner Planets)**
  + Small in Size
  + Slow Spinning, Small Orbits
  + Solid and Rocky
  + Relatively Warm
  + Dense
* **Jovian Planets (Outer Planets)**
  + Large
  + Fast Spinning, Large Orbits
  + Gaseous
  + Far From Sun
  + Relatively Cold
  + Less Dense
* **Dwarf Planets**
  + Pluto is no longer considered a planet, due mainly to the fact that it’s size compared to other nearby objects, such as large asteroids, is not that big. Also, it’s orbit is very strange, and actually crosses over the orbit of Neptune. [Video](http://www.youtube.com/watch?v=9b25dPQ9ORY)
* **Moons**
  + Moons are celestial bodies that orbit a particular planet. Earth has only one moon, other planets may have many moons. Jupiter, for example, has 63 moons.
* **Comets, Asteroids, Meteroids**  [Video](http://www.youtube.com/watch?v=4VMR8w3Obg0)
  + A **Comet** is comparable to a ‘dirty snowball’. It usually has a ‘tail’ that can be seen caused by the comet being heated up by the sun, evaporating the ice from the comet. The tail of a comet points away from the sun. Comets may be either **short period** or **long period** comets. A short period comet orbits the sun quickly, a long period takes a long time to complete its orbit.
  + An **Asteroid** is a small rocky body that orbits the sun. Many asteroids are found in the **asteroid belt**, which is found between Jupiter and Mars.
  + A **Meteoroid** is a small (sand to boulder sized) piece of rock in space. When a meteoroid enters the atmosphere of a planet, it becomes a **meteor**. If a meteor reaches the surface of a planet, it is known as a **meteorite**. The place where a meteorite reaches earth is known as the **impact site**.

***Describe the effect of solar phenomena on Earth:***

* **Solar Radiation** - Energy given off from the sun, such as heat and light. Other types of radiation are emitted too, and can have an effect on things such as satellites, TV and radio. **Sun Spots** are cool parts of the sun that emit less radiation than the rest of the sun, and appear as black spots on the surface.
* The **Aurora Borealis** and **Aurora Australisis** are caused when solar storms release large amounts of energy from the sun and interact with the atmosphere near the poles of the earth. They cause bright lights to form in the sky known as the Northern and Southern Lights. [Video](http://www.youtube.com/watch?v=013LX5fO_TU&feature=fvsr)

*Recognize that Canada has played a major role in space exploration*

* Canada has contributed to space exploration through:
  + Creating the Canadarm 1.
  + Participating in the International Space Station
  + Creating the Canadarm 2
  + Creating the Canadahand
* Some Canadian Astronauts in the past include
  + [Roberta Bondar](http://www.asc-csa.gc.ca/eng/missions/sts-042/bondar.asp) – First Canadian Woman In Space
  + [Marc Garneau](http://www.asc-csa.gc.ca/eng/astronauts/biogarneau.asp) -- First Canadian In Space
  + [Chris Hadfield](http://www.asc-csa.gc.ca/eng/astronauts/biohadfield.asp)  -- First Canadian to Walk in Space

*Identify some technologies used to explore space:Important Technologies for space exploration include:*

* + Rocket Propulsion, Space Suits, Satellites, Probes, Rovers, Optical Telescopes, Radio Telescopes.
  + Some Very Important telescopes in space exploration today include:
    - * Hubble Space Telescope
      * Canada-France-Hawaii Telescope
      * Very Large Array Telescope

*Explain the Need for new evidence in order to continually test existing theories about the composition and origin of our universe:*

* Due to the fact that we have created many new technologies, we have been able to learn large amounts about our universe in the past century.
* Define:
  + - **Galaxy:** a massive collection of stars, star remains, dust, gas and dark matter. They come in 3 main types:
      * Elliptical Galaxies - Round or Oval Shape
      * Spiral Galaxies - Have a center with round ‘arms’ Like The Milky Way
      * Irregular Galaxies - Odd shaped, due to the interaction of more than one galaxy.
    - **Solar System:** Consists of the sun and all the objects that orbit it due to gravity, such as planets, asteroids, comets etc.
    - **Universe:** Everything that exists, including planets, stars, galaxies and ‘intergalactic space’

*Describe Theories on the Origin and evolution of the Universe*

* **Big Bang Theory**- Suggests that, since the universe is expanding, then it must have been much smaller at one point. It is proposed that 13.7 billion years ago the universe was a very hot, dense mass that has been expanding ever since.
* **Oscillation Theory** - Suggests that the universe will expand outward to a certain point in time, then due to gravity will collapse again, resulting in a `big crunch` and will then expand once again in another big bang.

Describe past and present theories related to the formation of the solar system:

* **Stellar Collision Theory:** States that the solar system formed from astronomical collisions in space.
* **Nebular Hypothesis:** States that the solar system formed from the collapsing of gas and dust to form the sun and planets.

*Compare the units used to measure distances in space:*

* **Light Year** - The distance light can travel in one earth year.
* **Astronomical Unit** - The distance between the earth and the sun.

*Describe and Classify the major components of the universe:*

* **Nebula –** Clouds of Dust and Gas
* **High Mass Stars -** Have the mass of the sun or greater, burn very bright but do not last very long, since they use their fuel quickly.
* **Low Mass Stars -** Are small and stay that way most of their life. They burn slowly and have a long life, they are not as bright as high mass stars.
* **Black Holes -** A sphere of very tightly packed material created when a star collapses on itself. The gravity is so strong not even light can escape.
* **Quasar -** An area of high electromagnetic energy that develops as a supermassive black hole in the center of a galaxy attracts matter to itself.

*Describe the Life Cycles of Stars*

A star begins when it forms from the gas and dust of a nebula. Gravity pulls the gas and dust together. As the mass grows, materials collapse together. This causes the temperature of the core to become hot, causing nuclear fusion to begin, releasing high amounts of energy.

A star can take 3 possible paths in its formation, depending on it`s size.

1. Low mass Stars (dwarf) Stay small most of their lives and burn slowly (100 billion years). They may eventually turn into hot `white dwarfs` and burn out quietly.
2. Intermediate mass stars (like the sun) have a life of about 10 billion years. They may eventually expand into a red giant. It collapses to become a white dwarf, and cools to become a black dwarf over time
3. High mass stars (Giant) Use their fuel quickly, and then expand to become a supergiant. They eventually explode, forming a **supernova** and eventually collapse to form a **black hole** or **neutron star**.

*Identify some of the benefits and negative consequences of space exploration:*

Benefits: Development of new technologies, adding to our understanding of the universe

Drawbacks: Use of resources that could be used on solving problems on earth