**PEN Code: SCX 019**

**PEN Subject Title: Astronomy**

**Astronomy** – is the scientific study of stars, planets and other things in space.

**Astronauts** – are scientist that explains concepts about astronomy.

1. **THEORIES OF THE ORIGIN OF THE UNIVERSE**

**1. Steady State Theory**

* The universe has always been as it is today
* New matter is always being produced
* The universe is continuously contracting and expanding.

**2. BIG-BANG THEORY**

* Billions of years ago the universe was packed in a small space-Primeval Atom
* It explodes and threw matter in all directions
* The explosion caused the formation of the galaxies.

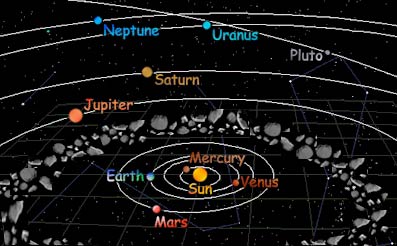
**3. CREATION THEORY**

* God created the Heavens and the Earth.
* Adam and Eve
* Religion

1. **COSMIC LANDSCAPE**

* **Solar System -** refers to a star and all the objects that travel in orbit around it.
* **Sun** (Sol) – is the star at the center of the Solar System and is by far the most important source of energy for life on Earth. It is a nearly perfect spherical ball of hot plasma with internal convective motion that generates a magnetic field via a dynamo process.
* **Planet** – is an astronomical object orbiting a star or stellar remnant
* **Moon** (Luna) – The natural satellite of the Earth. It reflects light from the sun to the Earth.
* **Star** – is a luminous sphere of plasma held together by its own gravity.
* **Galaxy** – is a gravitationally bound system of stars, stellar remnants, interstellar gas and dust, and dark matter.

**YOUR CURRENT LOCATION: PHINMA Araullo University, Brgy. Bitas, Cabanatuan City, Nueva Ecija, Philippines, Asia, Earth, Solar System, Milky Way, Local Cluster, Super Cluster, Universe**

1. **THE SOLAR SYSTEM**

In our solar system, nine planets circle around our Sun. The Sun sits in the middle while the planets travel in circular paths (called **orbits**) around it. These nine planets travel in the same direction (**counter- clockwise** looking down from the Sun's North Pole).

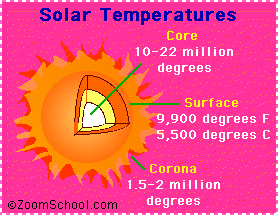
**The solar system is made up of two parts:**

* The inner solar system contains **Mercury, Venus, Earth and Mars**. These four planets are closest to the Sun.
* The outer solar system contains **Jupiter, Saturn, Uranus, Neptune and Pluto.**
* The inner planets are separated from the outer planets by the **Asteroid Belt.**

**Important Terms:**

* **Revolution –** is the movement of a planet around the sun.
* **Rotation –** is the movement/spinning of a planet on its axis.
* **Axis –** is an invisible line around which an object rotates, or spins. The points where an axis intersects with an object's surface are the object's North and South Poles.

1. **THE SUN**

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- The Sun is 93 million miles away from Earth. (It takes sunlight 8.5 minutes to reach Earth.)

- Surface Temperature: 10,000 degrees (F)

- Core Temp: 22,000,000 degrees

- Corona Temp: 2,000,000 degrees

1. **THE PLANETS**

**IT’S NEVER A PROBLEM ANYMORE:**

**My Very Enlarged Mother Just Served Us Nine Pizzas**

http://kids.nineplanets.org/saturn.htm

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**Mercu**ry is the planet closest to our Sun, and it is the eighth largest of the nine planets. Mercury is a small, rocky planet - much like our Moon. It is covered with craters and has changed very little from when it was first formed.

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**Venus** is the second planet from the Sun, and the sixth largest of all the nine planets. Venus is a small, rocky planet blanketed in a thick layer of yellowish clouds. These clouds are not made of water (like the ones here on Earth). Instead, they are formed from a poison called sulfuric acid.

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**Earth** is the third planet from the Sun, and the fifth largest of the nine planets. Earth is a small, rocky planet which supports a variety of life! As far as we know, Earth is unique from all other planets in this respect.

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**Mars** is the fourth planet from the Sun, and the seventh largest of the nine planets. Mars is a small, rusty, and rocky planet which is cold and lifeless. Mars has permanent ice caps at both poles made up mostly of solid carbon dioxide. We know this as "dry ice.

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**Jupiter** is the fifth planet from the Sun and by far the largest of all nine planets. Jupiter is more than twice as massive as all the other planets combined - It's 318 times bigger than the Earth! Jupiter is a giant gas planet which is made up of about 90% hydrogen and 10% helium.

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**Saturn** is the sixth planet from the Sun, and the second largest of the nine planets. Saturn is a giant gas planet which is made up of about 75% hydrogen and 25% helium. It's most famous for its thousands of beautiful rings.

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**Uranus** is the seventh planet from the Sun and the third largest of the nine planets (in size). Uranus is larger in size but smaller in weight than Neptune. Uranus is a giant gas planet which is made up of mostly rock and various ices.

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**Neptune** is the eighth planet from the Sun and the fourth largest (by size) of the nine planets. Neptune is smaller in size but it's heavier than Uranus. Neptune is a giant gas planet which is most likely made up of various "ices" and rock.

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**Pluto** used to be the farthest planet from the Sun (usually) and by far the smallest of the nine planets. Pluto is smaller than seven of the solar system's moons! Pluto is a small, icy "dwarf planet". Scientists are still unsure as to exactly what it's made of.

**ASTRO-TRIVIA:**

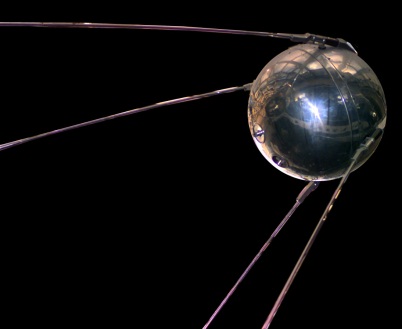
**2006 – Pluto was reclassified as a Dwarf Planet.**

**2014 – Pluto is back in… sort of.**

* **Officials Outlined Requirements For Planet Designation, including**:

1. Orbit around the sun.
2. Have sufficient mass to assume hydrostatic equilibrium (science talk for “the planet must be round”).
3. Have “cleared the neighborhood” around its orbit (science talk for “must be the biggest thing in its orbit”).
4. **THE SATELLITES**

**Satellite** – it is a man-made object or a celestial body that revolves around another celestial body, it is because of gravitational pull.

**Two Types of Satellite:**

1. **Artificial satellite** – is man-made object which has been intentionally placed into orbit for observation, communication, navigation, weather, and research. Example:

**Sputnik 1** – The world's first artificial satellite. It was launched by the Soviet Union in 1957.

1. **Natural satellite** – is a celestial body that orbits another body. Example:

**Ganymede** – a moon of Jupiter is the largest in this solar system. At 5,268 km at the equator, it is larger than Mercury, the dwarf planet Pluto, and three times larger than the Moon orbiting Earth. According to information from NASA, if Ganymede were to break free of Jupiter’s gravitational pull it would be classified as a planet.

1. **THE STARS**

**LIFE OF A STAR: FOUR STAGES**

1. **Yellow Star** – medium-hot star. Nuclear reaction occurring.

**Example: Sun**

1. **Red Giant** – As nuclear fuel is used up, star expands and turns red. Lasts for about 100 million years. When our sun is a Red Giant, it will expand and swallow up the inner planets—Mercury, Venus, Earth & Mars.

**Example:** **NML Cygni** – The largest Red giant and it is part of Cygnus constellation.

1. **White Dwarf** - most of the stars fuel in the outer layers is used up. Shrinks and collapses (about the size of Earth but heavier). Gives off a white light.

**Example: Sirius** – The largest white dwarf and it can be found in the constellation Canis Major.

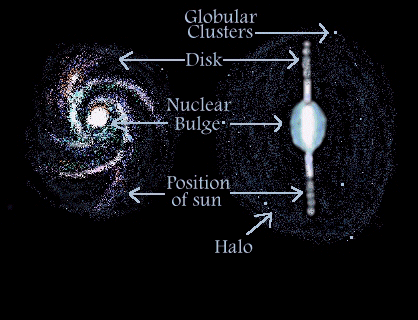
1. **Black Dwarf** – remaining fuel is used up. Star is dead.

**(No black dwarfs are expected to exist in the universe yet.)**

1. **THE GALAXY**

**TYPES OF GALAXY IN THE UNIVERSE**

1. **Elliptical galaxy –** shaped like a spheriod, or elongated sphere. In the sky, where we can only see two of their three dimensions, these galaxies look like elliptical, or oval, shaped disks.



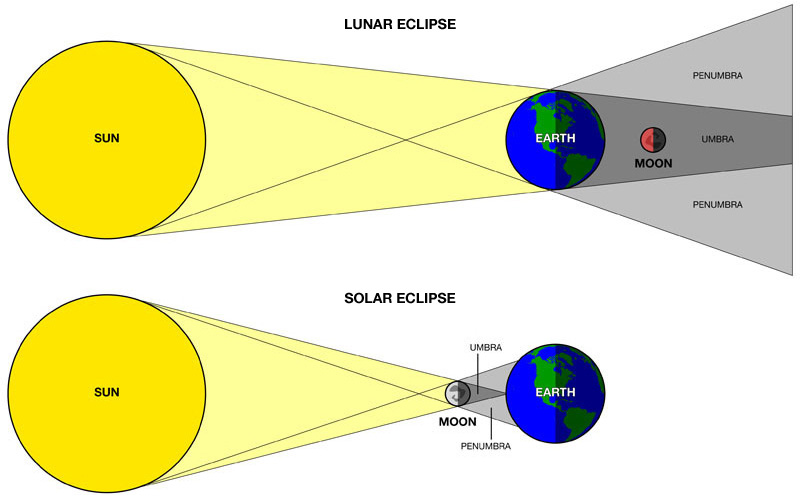
1. **Spiral galaxy –** have three main components: a bulge, disk, and halo. The bulge is a spherical structure found in the center of the galaxy. This feature mostly contains older stars. The disk is made up of dust, gas, and younger stars. The disk forms arm structures. Our Sun is located in an arm of our galaxy, the **Milky Way**.



1. **Irregular galaxy –** have no regular or symmetrical structure.

1. **ECLIPSE**

**Eclipse**– is an astronomical event that occurs when an astronomical object is temporarily obscured, either by passing into the shadow of another body or by having another body pass between it and the viewer.



* **Solar eclipse** – is a type of eclipse that occurs when the Moon passes between the Sun and Earth.

**There Are Four Types of Solar Eclipses:**

* 1. **Partial** - Moon's penumbral shadow traverses Earth (umbral and antumbral shadows completely miss Earth)
  2. **Annular** - Moon's antumbral shadow traverses Earth (Moon is too far from Earth to completely cover the Sun)
  3. **Total** - Moon's umbral shadow traverses Earth (Moon is close enough to Earth to completely cover the Sun)
  4. **Hybrid** - Moon's umbral and antumbral shadows traverse Earth (eclipse appears annular and total along different sections of its path). Hybrid eclipses are also known as annular-total eclipses.
* **Lunar eclipse** – occurs when the Moon passes directly behind the Earth into its umbra (shadow). This can occur only when the Sun, Earth, and Moon are aligned (in "**syzygy**") exactly, or very closely so, with the Earth in the middle.

**Astronomers Recognize Three Basic Types of Lunar Eclipses:**

**1. Penumbral Lunar Eclipse**

* + - The Moon passes through Earth's penumbral shadow.
    - These events are of only academic interest because they are subtle and hard to observe.

**2. Partial Lunar Eclipse**

* + - A portion of the Moon passes through Earth's umbral shadow.
    - These events are easy to see, even with the unaided eye.

**3. Total Lunar Eclipse**

* + - The entire Moon passes through Earth's umbral shadow.
    - These events are quite striking due to the Moon's vibrant red color during the total phase (totality).