

## CORNELL NOTES

Directions: You must create a minimum of 5 questions in this column per page (average). Use these to study your notes and prepare for tests and quizzes. Notes will be turned in to your teacher at the end of the Unit for scoring.

# UNIT 3: Chapter 8: The Solar System (pages 216-249)

## I. Planet Motion

### A. Models of the Solar System

1. **Geocentric Model**- Earth was considered the **center** of our solar system

a. The word **planet** comes from Greek word "planasthai" which means "to wander"

b. Original theory developed by **Ptolemy**

c. Irregular motion of planets compared to stars made this model very complex

2. **Heliocentric Model**- Sun was center of solar system

a. Developed by Polish astronomer **Nicholas Copernicus in 1543**

b. Said Moon revolves around Earth, and planets revolve around Sun

c. **Galileo** confirmed this theory after developing telescope and viewing phases of Venus and moons of Jupiter

### B. Understanding the Solar System

1. Many scientists contributed to our understanding of our solar system

a. **Johannes Kepler**- discovered planets travel around the Sun in **ellipses**, not circles

b. Kepler also discovered planets travel at different **speeds** in their orbits

1). **Closer planets travel faster** (Mercury takes only 88 days to complete one orbit)

2). **Outer planets travel slower** (Pluto takes 248 years to complete on orbit)

2. To measure large distances within our solar system, astronomers use an **astronomical unit (equals average distance from Earth to the Sun (about 150 million km))**

3. The nine planets can be classified in several ways

a. **Size** and other characteristics

1). **Terrestrial planets** -those like Earth

2). **Jovian Planets**- giant planets like Jupiter

b. By location

1). **Inner Planets**- between Sun and asteroid belt

2). **Outer Planets**- those beyond asteroid belt

4. Origin of the Solar System

a. Hypothesized that started as large **cloud of gas, ice, and dust about 4.6 billion years ago**

b. Began to **condense** and fragment because of **gravitational instability**

c. Increased **density** caused matter to **pull** towards the center and rotate

d. Caused it to flatten into a **disk** with a **dense center**

e. **Sun** formed when hydrogen fused into helium when it reached about **10 million degrees Celsius**

C. Other Solar Systems

1. Astronomers have developed new techniques and technologies to find planets around other stars

2. Scientists hypothesize there are many Earth-like planets in the Universe

II. The Inner Planets

A. **Mercury**- Second smallest and closest planet to the Sun

1. Surface looks much like the Moon's

2. Low gravitational pull (small planet)

3. Surface experiences extremes in temperature (427°C to -170°C)

4. No atmosphere

#### B. **Venus**- Second planet from Sun

1. Venus and Earth are similar in some respects- **Size** and **masses** about the **same**

2. Differs from Earth in that Venus has **dense atmosphere** which has 92 times the surface pressure as Earth

a. Clouds on Venus contain droplets of Sulfuric Acid

b. Clouds so **dense** only 2 percent of sunlight reaches the planet's surface

3. Greenhouse effect of atmosphere causes **high surface temperatures** of 450° to 475°

#### C. **Earth**- Third planet from the Sun

1. Unlike other planets, surface temperature on Earth allows **water** to exist as a **solid**, a **liquid** and a **gas**

2. **Atmosphere** causes most meteors to burn up before they reach surface

3. **Ozone** in atmosphere protects life from Sun's intense radiation

4. **Life exists** all over the planet

#### D. **Mars**- Fourth planet from the Sun

1. Also called the "**red planet**" (because iron oxide is some of the weathered rocks give it a reddish color)

2. Mars is also tilted on its axis so has **seasons** like Earth

3. **Polar ice cap** gets larger during Martian winter

4. **Planet changes color** when seasonal changes create **winds** that blow dust

5. Thin atmosphere made mostly of carbon dioxide. Does **not** filter out harmful rays from the sun

6. **Temperature** ranges from 37°C to -123 °C

7. Mars has two small, heavily cratered **moons** called **Phobos** and **Deimos**

8. Features on Mars surface suggest that **water** was once present.

9. **Mars** has been a focal point of **NASA planetary exploration** for years

a. Mariner 9 Space Probe- one of earliest missions that orbited the planet (1971-1972)

b. Lastest mission was the **Mars Exploration Rover Mission.**

10. Martian **meteorites** have provided a great deal of scientific information

### III. The Outer Planets

#### A. **Jupiter**- the fifth planet from the Sun

1. Composed mostly of **hydrogen** and **helium**, with some ammonia, methane, and water vapor.

2. Scientist theorize that the atmosphere gradually changes to a **planet wide ocean of liquid metallic hydrogen** toward the middle of the planet

3. Below this is a **solid rocky core**

4. Jupiter has **colorful clouds** that are storms of swirling, high pressure gas (**Great Red Spot**- very large visible Storm)

5. **Voyager 1 and 2** flew past Jupiter, and the **Galileo** space reached Jupiter in 1995

6. Jupiter has more than **60 moons**. **Four** of these are large enough to be **considered small planets**

a. Galileo first to discover these 4 moons.

b. **Io, Europa, Ganymede, and Callisto**

c. **Ganymede** is larger than **Mercury**

d. **Io** is most **volcanically** active body in solar system

e. The other 3 moons may have **oceans** of **water** under underneath an **ice-rock crust**

#### B. **Saturn**- sixth planet from the Sun

1. known as the **ringed planet**.
2. Could have as many as **34 moons**
3. **Second largest planet**, but has **lowest density**
4. **Thick outer atmosphere** of hydrogen and helium with some ammonia, methane and water vapor
5. Gasses gradually change to **liquid hydrogen** and **helium**
6. May have small rocky core
7. **Saturn's rings** composed of countless **ice and rock particles** ranging in size from a speck of **dust** to **tens of meters across**

#### C. **Uranus**- seventh planet from the Sun

1. Discovered in **1781**
2. **Large planet** with **27 moons**
3. **Rotates** on an axis of almost **90 degrees**
4. **Atmosphere** of hydrogen, helium, and about 2% methane
5. Methane gives the planet a **blue-green color** (it absorbs red and yellow light, clouds reflect green and blue)
6. Has **mantle** of liquid water, methane, and ammonia surrounding a **rocky core**

#### D. **Neptune**- eighth planet from Sun

1. Discovered in **1846**
2. Under the atmosphere thought to have **liquid water**, **methane**, and **ammonia** covering a **rocky core**

3. Has at least **13 moons**

4. **Largest moon** called **Triton**. Has thin atmosphere

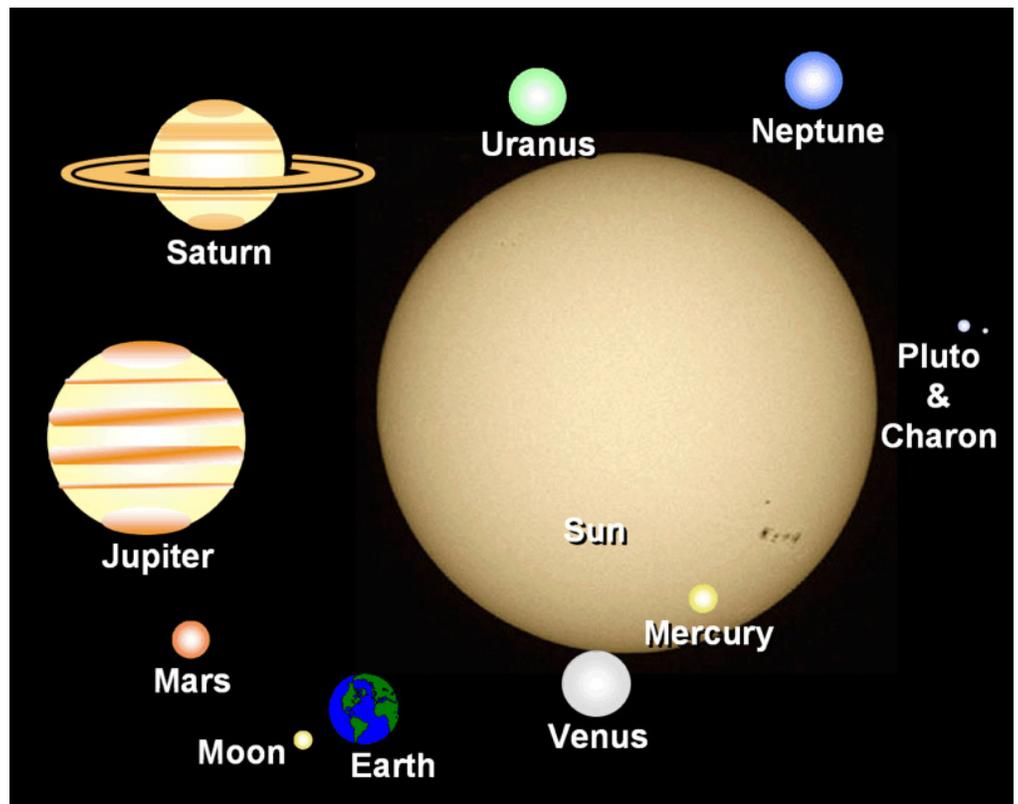
E. **Pluto**- Smallest and furthest from the Sun

1. **Unlike** the other 9 planets

2. **Thin atmosphere**

3. **Solid**, ice-rock **surface**

4. **One moon** (large compared to Pluto)



F. Comets and Other Objects

1. **Comets**- composed of **dust and rock particles** mixed with **frozen water, methane, and ammonia**.

a. As comet approaches the Sun, it begins to **vaporize**, forming bright cloud called a **coma**

b. **Solar wind** pushes on vaporized coma forming a **tail** that always points away from the Sun

c. Most come from a **vast disk of icy comets**

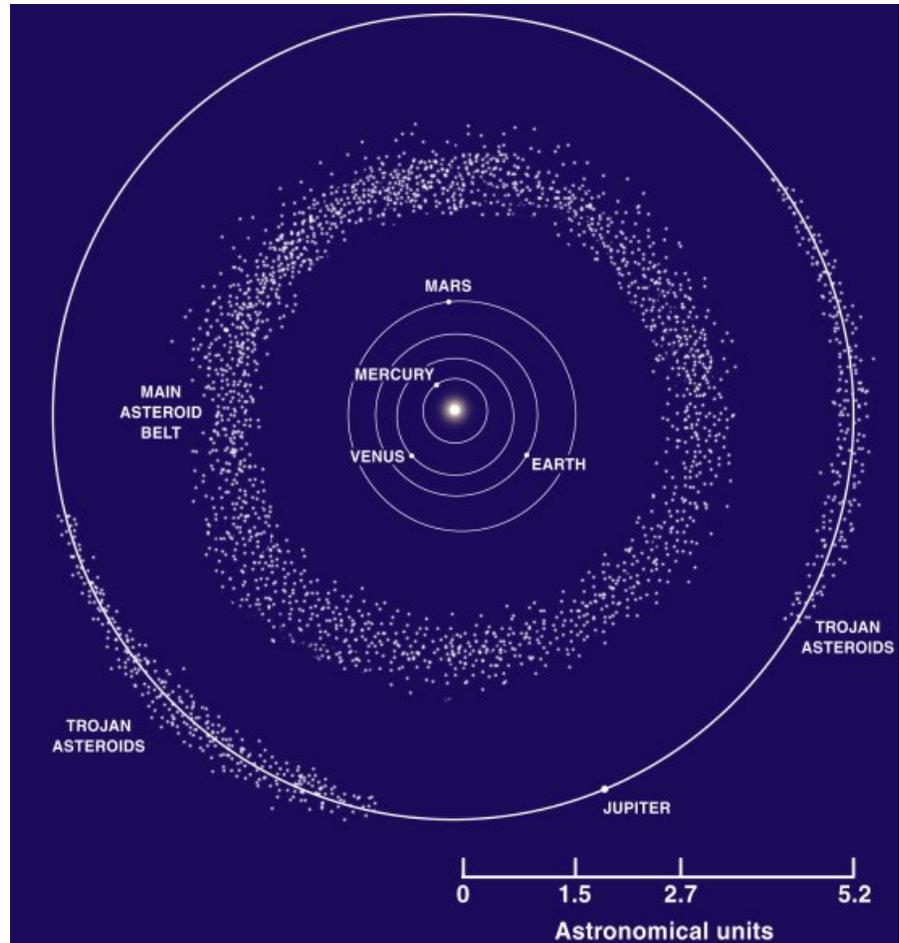
called the ***Kuiper Belt*** near Neptune's orbit

d. **Halley's comet**- returns every **76 years**

2. **Asteroids**- Rocky objects formed from material similar to planets

a. Most found in **asteroid belt**

b. **Range in size** from tiny particles to objects 940 km across



3. **Meteoroids**- other rocky objects orbiting within the solar system

a. May have **formed** when **asteroids collide** leaving trail of debris.

b. Many enter Earth's atmosphere and burn up completely ("**shooting stars**")

#### IV. Life in the Solar System

##### A. Life as We Know It

1. Carbon-based and requires water to survive
2. Life exists in many extreme environments on Earth

##### B. Can life exist on other worlds?

1. **Unlikely** because of conditions
2. Possible **extraterrestrial life**
  - a. **Mars**- possible single celled life when water existed
  - b. **Europa**- liquid ocean may exist below surface and harbor life
  - c. **Titan**- Saturn's moon. The presence of hydrocarbons on surface could supply building blocks of life