

Chapter 24.1

#2 - *By what criteria are planets considered either terrestrial or Jovian?*

The criteria are their location, size, and density. The terrestrial planets (ie. Earth-like) include Mercury, Venus, Earth, and Mars, and are also known as the inner planets. The Jovian planets (ie. Jupiter-like) include Jupiter, Saturn, Uranus, and Neptune, and are known as the outer planets. The inner planets are also substantially smaller than the outer planets, which are known as gas giants. Lastly, variations in the chemical composition of planets cause differences in the density. The average density of the terrestrial planets is about 5 times the density of water, while the average density of the Jovian planets is only 1.5 times the density of water.

Chapter 24.2

#1

Briefly describe the origin & formation of the moon.

It was formed as the result of a collision between a Mars-sized object smashed into an early Earth about 4.5 billion years ago, based on Giant Impact Hypothesis. During this collision, the ejected debris was thrown into orbit around Earth and gradually coalesced to form the Moon.

Like the other planets, Earth formed from the leftover cloud of dust and gas orbiting the young sun. In the early solar system, a number of bodies were created that never made it to full planetary status. One of these could have crashed into Earth not long after the young planet was created.

#4

How is crater density used in the relative dating of surface features on the Moon?

Scientists count the number of craters per unit area on the lunar surface. They believe that the greater the crater density, the older the features are. This evidence suggests that after the Moon coalesced, it passed through four phases:

1. Formation of the original crust
2. Excavation of the large impact basins
3. Filling of maria basins
4. Formation of rayed craters.

Chapter 24.3

#2

Why are the surface temperatures so much higher on Venus than on Earth?

Venus has the most dense atmosphere of the terrestrial planets, consisting of 97% Carbon Dioxide, which creates an extreme greenhouse effect. This results in the all-time high temperatures during day and night on Venus at around 450 degree Celcius (900 degree Fahrenheit).

#5

Why are the largest volcanoes on Earth so much smaller than the largest one on Mars?

On Mars, there is no plate tectonics, so successive eruptions accumulate in the same location. As a result, enormous volcanoes are formed. On Earth, since there are plate tectonics that are constantly moving and interacting with one another, eruptions from mantle tend to produce a chain of volcanic structures, like the Hawaiian Islands.

Terrestrial Planets

Mercury

- The innermost and smallest planet
- Revolves around Sun in 88 days
- 100x less magnetic field than Earth
- Rotation on its axis takes 176 Earth days
- Has the widest range of temperature extremes (from -173 to 427 degrees celcius)

Venus

- Has the most dense atmosphere (~97% carbon dioxide)
- One Venus day = 244 Earth days
- Orbits Sun once every 225 Earth days
- Rotates in the opposite direction of other planets
- Surface is covered by a thick cloud layer, making it invisible
- Name is derived from the Roman goddess of love & beauty

Earth

- The only recognized planet that supports an atmosphere with free oxygen
- Comprises of ~70% water
- ~92,956,050 miles from the Sun
- Due to gravity, weigh will be less at the equator than at one of the poles
- Shape: a squashed sphere

Mars

- "Red Planet"
- Revolves around Sun in 687 Earth days

- Surface temperature range: -140 to 20 degree Celcius
- Has half of the diameter of Earth
- Similarity with the Moon: Pitted with impact craters

Chapter 24.4

#1

What is the nature of Jupiter's Great Red Spot?

The colors on Jupiter's surface are thought to be by-products of chemical reactions occurring in Jupiter's atmosphere. Jupiter's convective flow produces alternating dark-colored belts and light-colored zones. The convective circulation, along with Jupiter's rapid rotation, generates high-speed, east-west flow observed between the belts and zones. The largest storm on the planet is known as the Great Red Spot. This enormous anticyclonic storm that is twice the size of Earth has been known for 300 years.

#2

Why are the Galilean satellites of Jupiter so named?

They are the four largest satellites, and are named after Galileo, the scientist who discovered them.

#3

What is distinctive about Jupiter's satellite Io?

It is about the same size as Earth's moon. It is one of the only three volcanically active bodies known to exist in the solar system.

#4

Why are many of Jupiter's small satellites thought to have been captured?

Jupiter's small satellites revolve in the opposite direction (retrograde motion) of the largest moons and have elongated orbits steeply inclined to the Jovian equator. These satellites appear to be asteroids or comets that passed near enough to be gravitationally captured by Jupiter or are remnants of the collisions of larger bodies.

#5

How are Jupiter and Saturn similar to one another?

Both Jupiter and Saturn are huge gas planets, have a lot of moons, have no solid ground, and have rings.

#6

What two roles do ring moons play in the nature of planetary ring systems?

Ring moons appear to maintain the structure and orbit of the ring systems by exerting gravitational influence on the particles. Also, the ring particles are thought to be debris ejected from the moons so that material is continually being recycled between the rings and the ring moons.

#7

How are Saturn's satellite Titan and Neptune's satellite Triton similar to one another?

Titan and Triton are the only satellites in the solar system known to have substantial atmospheres.

#8

Name three bodies in the solar system that exhibit active volcanism

- Jupiter's moon Io
- Earth
- Neptune's moon Triton

Jovian Planets

Jupiter

- 4th brightest object in our solar system
- Has a faint ring system around it
- Has 67 confirmed moons, divided into 3 groups
 - Inner Moons
 - Outer moons
 - Galilean moons (Io, Europa, Ganymede, Callisto)
 - Ganymede - the largest moon in the solar system
- Has the shortest day of eight planets: it rotates very quickly, turning on its axis once every 9 hours and 55 minutes.
- Has very strong magnetic field
- One orbit of Sun takes Jupiter 11.8 Earth years

Saturn

- The flattest of eight planets
- Least dense planet in solar system
- Can be seen with naked eye - one of the only five planets with this characteristic
- One orbit of Sun takes Saturn 29.4 Earth years
- Has the fastest winds
- Has 150 moons and smaller moonlets

- The largest moons are Titan and Rhea (Titan is the second largest moon in Solar System after Ganymede)

Uranus

- The coldest planet in solar system
- Second least dense planet after Saturn
- Has 13 rings that are known
- Rotates on its axis once every 17 hours and 14 minutes
- Also known as the “ice giant” due to its icy mantle surrounding its iron core
- Has 27 known moons
 - Notable Moons: Oberon, Titania, Miranda, Ariel, and Umbriel
- One orbit of Sun takes Uranus 84 Earth days

Neptune

- Has the second largest gravity
- One orbit of Sun takes Neptune 164.8 Earth years
- Takes 18 hours to complete one rotation on its axis
- Has 14 known moons; Triton being the largest one
- Average surface temperature = -214 degree Celsius (-363 degree Fahrenheit).

Chapter 24.5

#2

Compare and contrast asteroids and comets

They are both small solar system bodies, and they are both leftover material from the formation of the solar system. Asteroids are composed of rocky and/or metallic material with composition somewhat like the terrestrial planets, whereas comets are loose collections of ices, dust, and small rocky particles that originate in the outer reaches of the solar system. Asteroids formed closer to the Sun, where it was too warm for ices to remain solid, whereas comets formed farther from the Sun where ices would not melt (when they approach the sun, some of their ice melts and vaporizes to form a tail)

#3

What do you think would happen if Earth passed through the tail of a comet?

When that happens, some materials will be lost by the comet, resulting in a meteor shower when they enter our atmosphere. This meteor shower occurs when Earth passes through the trail of dust and gas left by a comet along its elliptical orbit.

#7

Why was Pluto demoted from the ranks of the officially recognized planets

Although it is a celestial body that orbits the Sun, and is spherical due to its own gravity, it is not large enough to sweep its orbits clear of other debris. It has to have all 3 characteristics to be recognized as a planet, thus it was demoted. Instead, it is designated to a new class of solar system objects called dwarf planets.