

Chapter Six Science: The Solar System and Beyond Study Guide

Lesson Four

Planets-large bodies orbiting a star.

Solar System-is the Sun and all of the planets, moons, and other bodies traveling around it.

Inner planets include Mercury, Venus, Earth, and Mars

Mercury-closest planet to the Sun and the second-smallest planet.

- Has cliffs, craters, and lava flows
- Revolves around the Sun in 88 Earth days. It rotates once every 59 Earth days
- Temperatures range from -297.4 degrees F to 467 degrees F
- Very weak magnetic field
- Density is about the same as Earth
- Deep craters inside Mercury's poles may have water ice

Venus-second planet from the Sun

- Surface covered with vast plains, lava flows, thousands of volcanoes, huge mountains, and craters
- A day on Venus is longer than its year. Rotates every 243 Earth days; revolves around the Sun in 225 Earth days; rotates in the opposite direction as Earth
- Dense atmosphere of carbon dioxide and covered with clouds
- Temperatures around 900 degrees F
- 90 times the atmospheric pressure of Earth

Earth-third planet from the Sun

- Day is 23.9 hours long and the year is 365.26 days long
- slightly larger than Venus
- only known planet to support life in our solar system
- has earthquakes, volcanoes, and building up and wearing away of land masses
- temperature average is 59 degrees F
- atmosphere protects us from small debris but not large debris

Mars-fourth planet from the Sun

- rotates in 24.6 hours (similar to Earth); year is about twice as long as ours
- Mars is tilted on its axis so it also has seasons
- has huge volcanoes; mountains can be higher than Earth because there is less gravity
- home of the Mariner Valley which is a canyon that would stretch from New York City to Los Angeles on Earth (may have been formed by running water)

Atmosphere

- Mercury-no true atmosphere; hydrogen, helium, argon, oxygen, sodium, and potassium have been found
- Venus consists of carbon dioxide (96%) and nitrogen (3%)
- Mars has a thin atmosphere including carbon dioxide (95%), nitrogen (2.7%), and argon (1.6%)
- Earth's atmosphere is nitrogen (78%) and oxygen (21%); has several layers
 - troposphere-layer nearest Earth; all weather occurs here
 - stratosphere-layer just above the troposphere; home of the ozone
 - mesosphere
 - thermosphere

Asteroid-rocky or metallic objects that orbit the Sun

- found mostly in a belt between the orbits of Mars and Jupiter and orbit the Sun

Lesson Five

Outer planets include: Jupiter, Saturn, Uranus, Neptune, and Pluto. They are separated from the inner planets by the asteroid belt.

- Includes the four largest planets
- Planets rotate very rapidly

Jupiter-fifth planet from the Sun; largest planet

- Jupiter seems to have cloud belts; and is primarily hydrogen and helium
- Shown to have a Great Red Spot
- Has more than 60 satellites or moons-four largest include: Ganymede, Callisto, Io, and Europa

Saturn-sixth planet from the Sun; second largest planet

- takes almost 29.5 years to make one trip around the Sun
- has flattened poles; may be due to fast rotation (1 day = 10 hrs. 39 min.)
- atmosphere mostly hydrogen and helium
- winds move about 500 meters per second near the equator
- has seven major rings

Uranus-seventh planet from the Sun; 2.9 billion km from the Sun; 3rd largest planet

- Orbit's the Sun once every 84 Earth years
- atmosphere is 83% hydrogen, 15% helium, 2% methane; blue-green color is due to methane in upper atmosphere
- has 11 rings
- Uranus is tilted about 98° which causes summers at the North Pole for 21 years (same is true for its South Pole)

Neptune-eighth planet from the Sun; 4.5 billion km from the Sun; orbit period is 165 years

- atmosphere is composed of hydrogen, helium, methane, and water
- strongest winds of any planet; can blow 2000 km per hour
- storms have been detected
- has 13 moons; Triton is larger than Pluto

Pluto-ninth planet from the Sun; smallest

- covered with methane, nitrogen, and carbon dioxide ice
- has one satellite-Charon; the two revolve around each other about once every 6 days

Comet-ball of ice and rock that orbit's the Sun

- Most famous is Halley's comet; passes every 76 years
- Comet Hyakutake went past Earth in 1996 and will not return for 16,000 years
- Comet Hale-Bopp was seen in 1997 and it rotates about once a week and has 3 tails

Meteoroids-small asteroids

- some come from ejected materials from a passing comet; some may come from the asteroid belt

Meteor-when a meteoroid starts to burn

Meteorite-any part of a meteoroid that reaches Earth's surface

- Usually classified as three types
 - Stony meteorites-are made of rock
 - metallic meteorites-are made of metals or a mixture of metal and rock
 - Carbonaceous meteorites are rich in carbon

Jupiter's Moons

- Four largest were discovered by Galileo in 1610; are named the Galilean satellites
 - Ganymede, Io, Europa, and Callisto
 - Ganymede-largest satellite in solar system; has 2 kinds of land masses with many craters and grooves

- Io-most interesting of the satellites; has active volcanoes
- Europa-smooth world, has many cracks that may be due to its icy crust; below the crust there may be an ocean as deep as 50 km
- Callisto-very old surface with many craters

Lesson Six

Star-large, hot ball of gas, which is held together by gravity and gives off its own light.

Constellation-a number of stars that appear to form a pattern.

Magnitude-describes the brightness of a star; Absolute Magnitude-the actual brightness of a star.

Light-year-the distance light travels in a year, or about 9 trillion kilometers

Star colors-bright red (coolest), orange, yellow, white, blue (hottest)

Star Life Stages

it

-Beginning-starts as an enormous cloud of gas and dust called a nebula; gravity causes nebula to contract, as it shrinks it heats up and becomes a protostar (young star that glows as gravity makes collapse)

-Main-Sequence Stars-when a protostar reaches a temperature of several million degrees a nuclear reaction occurs; protostar now becomes a main-sequence star that is fusing hydrogen into helium; where it spends most of its life on the main sequence.

-Giants and Supergiants-when a star uses up the supply of hydrogen at its core, the star begins to expand; as it expands the star's surface gets cooler; a star is classified as a giant or a super-giant based on size.

-Final Stage: Lower-Mass Stars-As a red giant gravity is not strong enough to hold on to outer layer of gas so it slowly spreads into space. As it shrinks it heats up becoming white hot and is known as a white dwarf and can travel fast.

-Final Stage: More Massive Stars-use up energy at a fantastic rate and it becomes unstable and may become a supernova (a star that explodes). When a supergiant collapses it becomes a black hole.

Black Hole-an object whose gravity is so strong that even light cannot escape from it.

Supernova-an extremely powerful explosion in the universe.

Sun

-Corona-outermost part of Sun; can be seen from Earth only during a total solar eclipse

-Chromosphere-can only be seen only during a total eclipse; appears pinkish

-Photosphere-visible part of the sun, surface of the Sun, temperatures are about 6000 degrees C (a yellow star)

-Interior of the Sun-energy travels outward toward the Sun's surface by means of radiation and convection

-Core-center and source of all the Sun's energy; about the size of Jupiter

-a million Earth's would fit into the Sun

Lesson Seven

Galaxies-large groups of stars held together by gravity. These stars also move and orbit the center of their galaxy.

-May contain 200 billion stars

-May be about 100 billion galaxies in the universe

-Classified into 3 main groups

-Spiral Galaxy-whirlpool-like galaxy that can be tightly or loosely wound. Usually have lots of dust in their spirals.

-Elliptical Galaxy-football or basketball shaped with no spirals and very little or no dust.

-Irregular Galaxy-has no recognizable shape

Milky Way Galaxy-spiral galaxy
stars
-stars are grouped in a kind of bulge in and around the center. All stars orbit the center. Most closer to the center move faster as it orbits.
-Several spiral arms extend out from the center
-Surrounding the outer region of the Milky Way is a “halo” made up of mostly faint stars.

Our solar system is located on one of the spiral arms of the Milky Way Galaxy

Expansion Redshift-increase in wavelength of light due to space expanding

Big Bang Theory-Long ago the universe was in the form of an extremely tiny, extremely dense “atom”. It was also at a very high temperature. The high temperature and pressure resulted in a tremendous “explosion”. This big bang sent matter in all directions. As the matter expanded outward, the universe began to cool. Gravity caused the matter to collect into clumps. The clumps eventually became stars and galaxies.

Background Radiation-radiation left over from the beginning of the universe.

Quasars-an extremely bright, extremely distant, high-energy source.
-Light from quasars takes billions of years to reach Earth (which makes them really old)
-Could be galaxies in early stages
-May be connected to black holes