Chapter 19

Exploring Space

Lesson 1

- **Space** is the space beyond the atmosphere of the Earth
- Some space objects are visible to the human eye
- There are patterns in the universe (all known objects in space)

Arrangement of Universe

- Earth
- **Solar System**-9 planets orbiting the sun
- **Milky Way**-group of lots of stars held together by their own gravity
- **Universe**-everything-all matter and energy

Constellations

- **Constellations** are a group of stars that form a pattern in the sky
- Stars in a constellation are usually not close to each other
- Constellations parade through the sky on a rotational basis
- Polaris-north star (above the north pole)

- Constellations are used to navigate and locate items in space
- Constellations are used to tell time
- Constellations are even used to develop horoscope and predict characteristics about people, What is your sign?
- Constellations appear to move due to Earth's rotation

Planet

- Greek word that means “wanderer”
- Planets move among the constellations
- Earth and other planets orbit the sun
- The moon is our closest neighbor

Our Solar System

- Inner planets closest to the sun: Mercury, Venus, Earth and Mars
- Asteroid belt
- Jupiter, Saturn, Uranus, Neptune, Pluto
- Is Pluto really a planet?

Lesson 2

- Light and other forms of radiation carry information about space
- **Electromagnetic radiation** travels in all directions in certain types of waves
- Scientists interpret these waves to learn more about our universe-size, distance, movement, contents, changes, etc…

Electromagnetic Spectrum

- **Electromagnetic Spectrum**- the entire range of radiant energy carried by electromagnetic waves
- Radio waves, microwaves, infrared light waves, ultraviolet light waves, xrays, and gamma rays combine to make the electromagnetic spectrum
- The wavelength varies as the type of radiation changes with radio waves being slow and further apart but gamma rays being fast and close together

Visible light

- A prism is used to separate wavelengths of light into different colors
- ROY G BIV
- Red has the longest wavelength while violet has the shortest wavelength
- Visible light is a tiny part of the larger spectrum

Telescopes

- Astronomers use telescopes to collect information about space
- Telescopes gather electromagnetic radiation
- Each type of radiation provides different information about objects in space
- Different colors or shades reveal patterns in the universe

Reflecting Telescope

- Uses a curved mirror to gather light
- Very popular type used in homes
- Bounces the wavelength off a mirror into the eyepiece to be observed
- “bounces” or “reflects” light
- Clouds and other objects in the atmosphere can distort wavelengths

Refracting Telescope

- Uses curved piece of glass to gather light
- Focuses to form image near other end of scope
- Eye piece magnifies it
- “Bends” light
- Clouds and other space objects can distort the image

Radio Telescopes

- Uses curved metal surface called a dish to gather waves and focuses them onto an antenna in the middle of the dish
- Satellite radio and tv
- Not affected by weather or the atmosphere and works in daylight
- Radio waves pass freely through the atmosphere

Space Telescopes

- Atmosphere does not interfere since it orbits in space
- Sends images back to Earth electronically
- Obtains very clear images
- Gathers all types of radiation from the total spectrum

Telescopes in space?

- 1990 Hubble telescope placed in orbit
- 1991 Compton Gamma Ray Observatory placed in orbit
- 1999 Chandra X Ray Observatory place in orbit
- Operated from Earth
- Combine images to gain clear information

Lesson 3

- Spacecraft and astronauts help us explore beyond Earth-in space
- A **rocket** is a vehicle designed to propel itself by ejecting exhaust gas from one end.
- Astronauts take everything necessary for survival with them including air, water, and food
- NASA-National Aeronautics and Space Administration

Orbiting Earth

- A **satellite** is any small object that orbits a larger object.
- A **space station** is a satellite in which people can live and work for long period of times orbiting Earth
- MIR, U.S. and Russia worked to create a space station and worked as partners in space

Moon Missions

- **Lunar**- refers to anything related to the moon
- Space Race during JFK administration
- 1957 Sputnik by Soviet Union was 1st satellite in space
- 1961 Soviets sent 1st human in space
- 1969 United States landed on the moon 1st- Apollo
- **Project Apollo** was a series of space missions designed to send people to the moon.

International Space Station

- U.S., Russia and 15 other nations created the ISS 1998
- Larger than 2 football fields and had to be launched into space in pieces
- 1st crew arrived in 2000
- Perform experiments and make observations

NASA Launches

- More than 100 since 1981
- Spacecraft now can be used over and over to carry satellites, equipment and labs into space
- Space travel remains a dangerous activity
- Most launches occur in Florida or California

Other worlds?

- Humans have not landed on other planets
- Spacecraft carry instruments to test the compositions and characteristics of other planets
- Data and images sent to Earth through radio waves
- Computers guide the unmanned spacecraft

- Spacecraft have visited all the major planets in our solar system except Pluto, the dwarf planet
- Spacecraft have also visited other moons and comets

3 Stages of Space Exploration

- 1st Flyby: Passes one or more planets without orbiting but may last for decades collecting data and images for brief periods at a time
- 2nd Orbiter: actually orbits the planet for several months to years viewing the surface and keeps track of changes-creates a detailed map

- 3rd Probes: Instruments land on a planet and provides detailed clues to the history of the planet
- Landed on the moon, Venus, Mars
- 1997 Pathfinder on Mars gave evidence that water once flowed over the surface

Combining Missions

- Orbiters and probes work together often to send information to Earth
- Future space missions may involve even more complex combinations of spacecraft

Lesson 4

- Space exploration benefits society
- Gives us new and different view points
- Understanding gravity, craters, atmospheres and astroids

Space Technology

- Provides technology that makes life on Earth easier
- Each day you probably benefit from some object or material or product that was developed for the space program

Satellite Views of Earth

- Collect data from every region of Earth
- Weather satellites show conditions throughout the atmosphere making watches and warning more accurate
- Satellites are used to preserve wildlife, conserve natural resources and mapping the world

Spinoffs

- Space technology spinoffs are found in homes, offices, schools and hospitals
- Weight issue helps to design small instruments to diagnose and treat diseases and disabilities
- Fire resistant materials help homebuilders and firefighters
- Purifying water, air and food

Hydroponics

- Growing plants in space
- 1997 moss plants were sent to grow in space and returned to compare with those grown on Earth
- Space moss grew in a spiral pattern due to the lack of gravity
- Questioned-can astronauts grow their own food in space?

Chapter 19 Review

- Some space objects are visible to the human eye.
- Telescopes allow us to study space from Earth.
- Spacecraft help us explore beyond Earth.
- Space exploration benefits society.
- Complete review on page 677. ☐