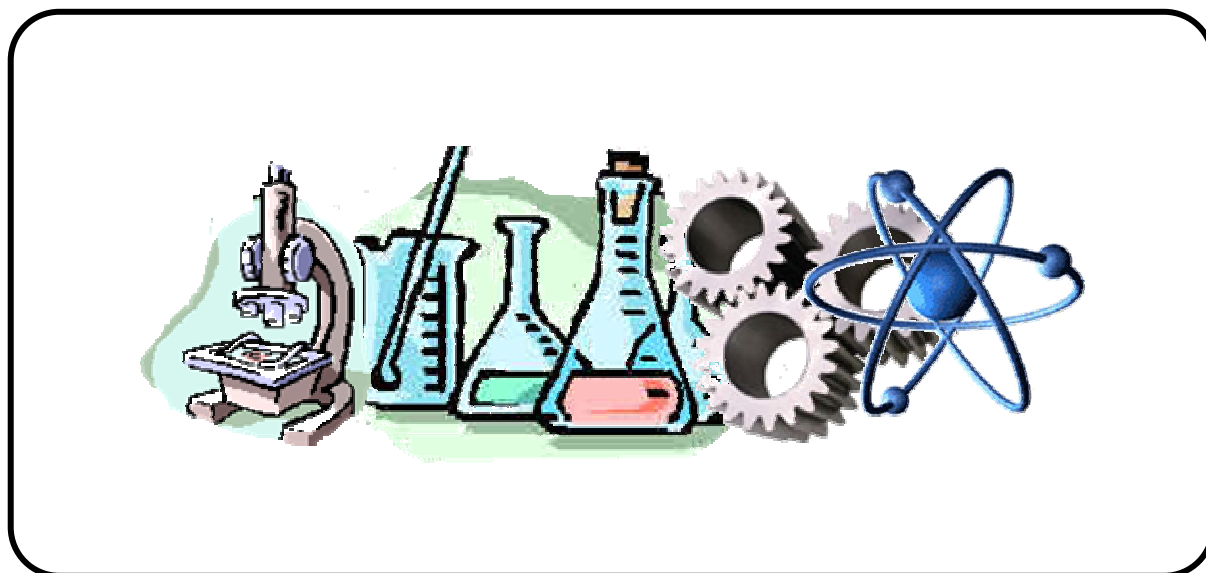


Project EASE

(Effective and Alternative Secondary Education)

INTEGRATED SCIENCE I



MODULE 17



BUREAU OF SECONDARY EDUCATION

Department of Education
DepED Complex, Meralco Avenue
Pasig City



Module 17

Minor Members of the Solar System



What this module is about

This module will take you on a fly-by tour outside the earth, providing you a closer look at the asteroids, meteors and comets. You and I will experience this one of a kind adventure. Come with me and have fun learning the following lessons:

- **Lesson 1 - Asteroids, Meteors, and Comets**
- **Lesson 2 - Space Technology**



What you are expected to learn

After going through this module you should be able to:

1. explain the occurrence of comet, meteor showers and other phenomena; and
2. identify technologies used in studying other heavenly bodies and their uses on Earth.



How to learn from this module

I know you are excited to start the adventure just as I am but remember to do the following tips to successfully achieve the objectives of this self-learning kit.

1. Read instructions carefully.
2. Follow instructions carefully.
3. Answer the pretest before you start the lesson.
4. Observe the time limit to finish the module.
5. Take note and record points for clarifications.
6. Try to achieve at least a 75% level of proficiency in the tests.
7. Work diligently and honestly.
8. Answer the posttest honestly.



What to do before (Pretest)

Before we proceed, let us see if you can answer these simple questions about our lesson. For each item, encircle the letter of the correct answer.

1. The primary chemical constituent of comets is
 - a. water
 - b. nitrogen
 - c. methane
 - d. carbon dioxide

2. A meteor shower occurs when
 - a. a meteor is about to get married
 - b. the earth passes through the asteroid belt
 - c. the head of a comet hits the earth's atmosphere
 - d. the earth passes through a swarm of dust particles in space, the remnants of a comet, once a year

3. A meteorite is
 - a. a rock from space that strikes the ground
 - b. a piece of rock passing through the earth's atmosphere
 - c. the trail left by a piece rock as it passes through the earth's atmosphere
 - d. all of the above

4. Most of the asteroids orbit the sun in a belt between the orbits of
 - a. Venus and Mars
 - b. Mars and Earth
 - c. Mars and Jupiter
 - d. Jupiter and Saturn

5. The asteroids are
 - a. miniature planets
 - b. satellites of planets
 - c. pockets of gas in the solar system
 - d. planets orbiting the stars other than the sun

6. Comet tails are the result of
 - a. interplanetary material streaming into the comet
 - b. melting and evaporation of ice from the comet core
 - c. dust collected by the comet as it moves in its orbit
 - d. solar wind blowing more gases from the central comet core

7. Why are meteorites and comets important in studying the origin of the solar system?
 - a. They have recently formed themselves.
 - b. They are recently produced fragments of planets.
 - c. They represent the material which formed the planets.
 - d. None of the above

8. The orbits of most comets, which we see in the inner solar system
 - a. are nearly circular
 - b. are highly elliptical
 - c. never come closer to the sun
 - d. are only slightly inclined to the earth's orbit

9. Most meteoroids are formed when
 - a. comets melted
 - b. volcanoes erupted
 - c. asteroids exploded or collided
 - d. satellites exploded or collided

10. Meteors are
 - a. falling stars
 - b. signals from the other worlds
 - c. solar wind particles captured by the earth's magnetic field
 - d. luminous trails left by small extraterrestrial particles rapidly passing through the air

11. Meteorites are composed of
 - a. hydrogen ice
 - b. helium ice
 - c. heavy elements like silicon
 - d. all the above

12. The first satellite to discover a comet was/were the
 - a. Mariner 2
 - b. Vikings 1 and 2
 - c. Hubble Telescopes
 - d. Infrared Astronomical Satellite

13. It was the first probe to visit Mercury
 - a. IRAS
 - b. Mariner 10
 - c. Vikings 1
 - d. StarDust

14. The first space probes to successfully land on the surface of Mars were
- IRAS and Galileo
 - Hubble Telescopes
 - Viking 1 and 2
 - Galileo and Viking 1
15. The first spacecraft to fly past an asteroid was
- Galileo
 - Cassini
 - StarDust
 - Mariner 10



Key to answers on page 18

Lesson 1 Asteroid, Meteor and Comets

Trying to scan the entire sky on moonless nights over and over again, looking for changing objects against the static background of stars, have you ever wondered what lies beyond? I am sure you will be amazed to know that there are other minor bodies that could possibly affect our lives on earth.

Asteroids

Do you know what asteroids are?

Asteroids are simply rocky or metallic objects that orbit the sun in the same way that planets orbit. Asteroids are hard to see because they reflect little light and they are always on the move. None of the asteroids has an atmosphere.

How big are they?

Asteroids come in all sizes and shapes. Some are as tiny as pebbles and some are as big as mountains. Since they are smaller than planets, they are often called minor planets or planetoids. Ceres is the largest of the asteroids. It is about 930 kilometers in diameter. Can you imagine how huge that is? Like any other big rock, they can be potato-shaped, papaya-shaped or have strange shapes!

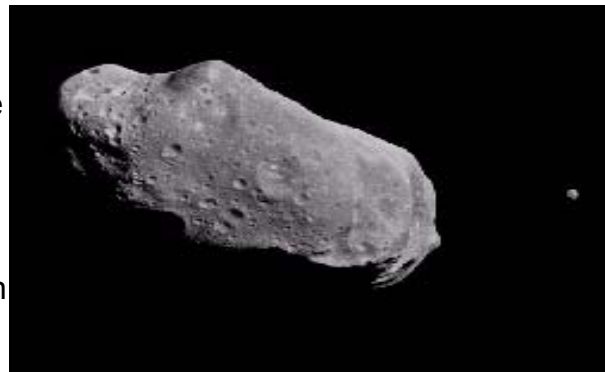


Figure 1.1 An Asteroid

Where do many asteroids orbit?

Many asteroids orbit the sun in a region between Mars and Jupiter. This area is called the **asteroid belt**. They follow a slightly elliptical path as they orbit the sun in the same direction as the planets.

Do you think it is possible for an asteroid to be pulled out of its orbit?

Yes, you're right! A larger object such as a planet may pull an asteroid out of orbit. And once an asteroid is captured by the gravitational pull of a planet, it may become a satellite of that planet. Many astronomers believe that the two satellites of Mars, Phobos and Deimos, are captured asteroids.

What prevents the asteroids in the belt from moving towards the sun and hitting the inner planets, including our Mother Earth?

If it were not for the giant planet Jupiter pulling the asteroids outward, large asteroids would constantly bombard Mercury, Venus, Mars and Earth. I hope you still remember those inner planets that you learned from your previous module.

Since the belt is closer to Jupiter than it is to the sun, Jupiter exerts more gravitational pull on the asteroids than the sun. As a result, the asteroids are kept in orbit away from the inner planets.

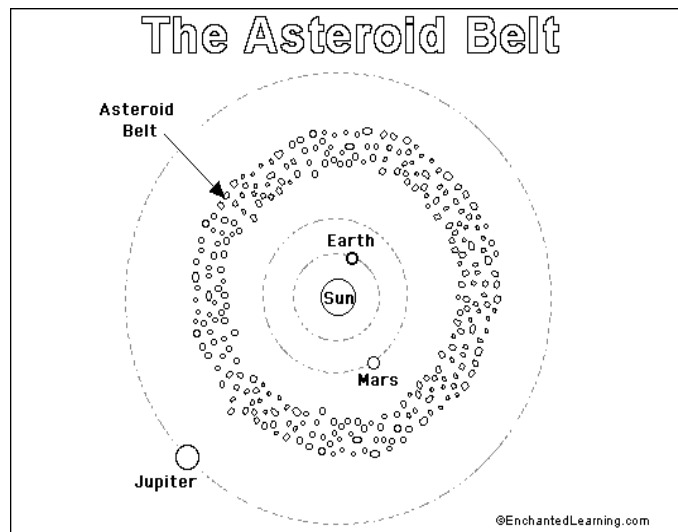


Figure 1.2 The asteroid belt

Meteor

Ask your parents, aunts or lola if they have heard an old song from the 50's called "Catch a falling Star and Put it in Your Pocket". What is a falling star? Can you catch it? Will it really fit in your pocket?

A meteoroid is a piece of stony or metallic object, which travels in space. Meteoroids travel around the sun in a variety of orbits and at various speeds. They are believed to form when asteroids hit each other as they orbit.

Like asteroids, meteoroids collide and can be pulled out of orbit or sent into earth's atmosphere or another planet.

So what happens when a meteoroid enters earth's atmosphere?

When a meteoroid enters the earth's atmosphere, friction between this object and atmospheric gases heats it to the point that it glows and becomes visible to our eyes for only a few seconds. This streak of light in the sky is known as **meteors**, sometimes called **falling or shooting stars**.

What if the meteor does not burn up completely? Would it fall to the earth?

If the meteor does not burn up completely, the remaining portion falls to earth! But don't worry; you are still lucky because most of them are very small. In addition, most debris from space falls unseen over oceans or sparsely populated areas like Antarctica. A meteor that hits the earth's surface is called a **meteorite**.

Do you have any idea how many meteorites hit the earth each year?

Based from the scientists' record, meteorites constantly hit the Earth's surface. The table below will give you an idea of the approximate size and number of meteorites that hit the Earth's surface.

Approximate size of meteorites	Number of pieces that hit the Earth
Pea-size	10 per hour
Kasoy nut-size	1 per hour
Lansones-size	1 per 10 hours
Basketball-size	1 per month
50-meter-size	1 per 100 years
1 kilometer-size	1 per 500,000 years.

Have you heard of somebody being hit by a meteorite?

There has only been one report of an "HBM" (hit by meteorite). In 1954, a meteorite, which weighed 19.84 kilograms, crashed through the roof of Ann Hodges of Sylacauga, Alabama. Do you know what happened to her? Thank God she was just slightly injured!

Comets

People have been aware of comets since ancient times. Try to ask your lola or lolo about comets, and they might tell you that a comet brings bad luck! Why?

Some people believed that comets were bad spirits who took on the appearance of the head of a woman with its long hair streaming behind. To old folks, this was a traditional sign of mourning. Sometimes, to other people, a comet appeared as a sword, a sign of war, death and famine.

Did you know?

The Hoba iron meteorite is the largest single meteorite known. It can still be found in its landing sight in Namibia. Its present weight is estimated at 66,000 kilogram. Part of the Hoba has rusted away. Therefore, its original weight may have been as much as 100,000!

Are comets really tools of the devil? What are they?

A comet is fuzzy, luminous big dirty snowball composed of rock dust wrapped around a big ball of ice. This beautiful sight in the sky moves very slowly and may remain in our sight for weeks before fading out of view.

A comet enters a huge elliptical orbit. Each time the comet passes close to the sun, it loses some of its material. When it returns to the distant part of the solar system, it gradually appears smaller and dimmer. Overtime, it disappears completely. In some cases, the comet may have a solid, rocky core that is then left to continue traveling around its orbit as a dark barren asteroid.



Figure 1.3 A comet

What are the parts of the comet?

A comet does not produce energy and light, thus it is not visible. However, as it gets closer to the sun, it become visible because the heat of the sun melts the ice of the comet and turns it to gas. This gas becomes the **coma**, which envelopes and hides the **nucleus** from our view. The nucleus is the center of the comet made of frozen water. The nucleus and the coma together are called the **head** of the comet. They become bigger and bigger as more gas and dust are released from the coma. The solar wind blows more and more gas from the coma causing it to form a **tail**, which in some comets, can reach up to 150 million kilometers in length!

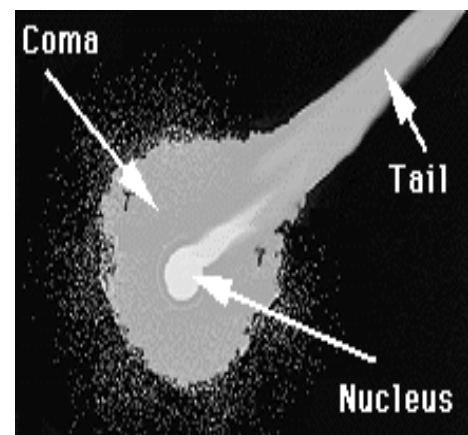


Figure 1.4 Parts of a comet

Where do they come from?

Most comets are thought to originate from a huge cloud called the Oort Cloud, which is too far away for astronomers to see.

What is Halley's comet?

Halley's comet is an example of short-period comet, with an orbital period of less than 200 years. Halley's comet makes an appearance once every 76 years, and is set to return in 2061. Other comets are long-period comets that can take up to a million year to orbit the sun. An example of such is the Hale-Bopp comet.

Could a comet crash into earth?

There is no evidence that a comet has ever crashed into earth. However, it is one possible explanation for the extinction of dinosaurs. The hypothesis is that a large comet or asteroid crashed into our planet and triggered a chain of disastrous events like earthquakes, tidal waves, causing radical changes in the climate and eventually wiped out dinosaurs.

What is a meteor shower?

A meteor shower is a phenomenon in which many meteors fall through the atmosphere in a relatively short time and in approximately parallel trajectories. A very intense meteor shower is called a meteor storm.

When do meteor showers happen?

Meteor showers and storms occur when the earth passes through a comet's orbit, and leftover comet debris bombards the earth. Meteor showers occur at a predictable time each year. The latest meteor shower experienced on earth happened in November 1999. It was named Leonid shower.

Did you know?

When a comet approaches the sun, the tail is behind the head, but as it travels away from the sun, the tail is in front. In other words, the comet's tail always points away from the sun. This is due to the effect of the solar winds.



What you will do Activity 1.1

After exploring the amazing asteroids, comets, and meteors, test yourself if you can differentiate the three:

comets, meteors, and asteroids

**Given below are some characteristics of comets, meteors and asteroids.
On the space provided, write**

- A if it refers to comets**
- B if it refers to meteors**
- C if it refers to asteroids**
- D if it refers to both comets and meteors**
- E if it refers to both meteors and asteroids**
- F if it refers to both asteroids and comets**
- G if it refers to all (comets, meteors and asteroid)**

Characteristics:

- | | |
|--|--|
| ___ 1. Progress across the sky very slowly | ___ 11. Known as falling stars or shooting stars |
| ___ 2. Remnants of the formation of the solar system | ___ 12. They glow as they enter earth's atmosphere |
| ___ 3. Reflect sunlight | ___ 13. Streak across the sky very fast |
| ___ 4. Rocky composition | ___ 14. Come in all sizes and shapes |
| ___ 5. Orbit the sun in highly elliptical orbits | ___ 15. Icy objects |
| ___ 6. Minor planets | ___ 16. Meteor showers |
| ___ 7. Mostly found between Mars and Jupiter | ___ 17. Tail always point away from the sun |
| ___ 8. Can reach 150 million km in length | ___ 18. Travel in a variety of orbits |
| ___ 9. Most have slightly elliptical orbits | ___ 19. Known as falling stars or shooting stars |
| ___ 10. Result from the collision of asteroids | |



Key to answers on page 22



What you will do

Activity 1.2

Make your own comet

Direction: To demonstrate the various components in a comet and see how the tail forms, you can make a simple model using either of the following options:

Option 1. Taken from

What you need:

- One sheet of paper
- Two long strips of shiny filler for gift bags
- One 2-inch strip of tape
- One drinking straw (not a bendy straw)
- Blow dryer
- One marker
- Scissors
- Adult helper

Here's what you do:

1. Cut slits in the paper from each corner leaving a space in the middle (like the drawing).
2. Lay the strips across the paper over the slits to make an "X."
3. Put a piece of tape across the "X" to hold the strips on to the paper.
4. Crumple the paper into a comet shape. Make sure that your strips stay on the outside.
5. Use the scissors to poke a hole through the comet.
6. Push the straw into the hole.
7. Hold the comet by the straw.
8. Use a hairdryer to show how the Sun's energy makes parts of the comet blow off to a tail. (Let the adult plug the dryer into the socket.)
9. Here is something you can do with a friend. He or she can be the Sun. Walk around the Sun holding the comet. The Sun's energy should blow on your comet as you walk.
10. See how the tail moves as you get closer to the Sun.

Option 2.

What you need:

- large mixing bowl
- a cup of water
- garden soil with pebbles
- $\frac{1}{4}$ cup dark corn syrup
- $\frac{1}{4}$ cup dilute ammonia
- a pinch of iron filings
- crushed dry ice
- plate
- blow dryer

Here's what you do:

In a large mixing bowl add one cup of water, $\frac{1}{2}$ cup garden soil with pebbles, $\frac{1}{4}$ cup dark corn syrup (for organics), $\frac{1}{4}$ cup dilute ammonia (for gas) and a pinch of iron filings. Stir the mixture well and add 2 cups of crushed, dry ice. **YOU MUST WEAR GLOVES !** As the mixture starts to freeze, squeeze some of it together like you were packing a snowball and presto, you have a comet nucleus. Place the frozen mass on a plate and have the students observe it sublimate. To get a tail, you'll need to create the "solar wind". This can be accomplished by using a standard blow dryer turned on high pointed at the comet.



What you will do

Self-Test 1.1

Direction: Answer the following questions in complete sentences.

- a. How do meteorites differ from meteors and meteoroids?
- b. Why do you think astronomers believed that asteroids came from a planet that may have existed between Mars and Jupiter?



Key to answers on page 23

Lesson 2 Space Technology

Not content to observe asteroids with ever-more sophisticated instruments from earth, scientists have started visiting them. To boldly go where no one can is the mission of automated spacecraft and Landers. This lesson will give you an idea of how our technologies have reached the unreachable places.



Come with me and find yourself a seat in one of these robotic machines... Remember to fasten your seatbelt, we are about to launch! One...two...three...

Hubble Space Telescope is one of the largest and most complex satellites ever built. It was named after American astronomer Edwin P. Hubble, who first discovered that countless island cities of stars and galaxies dwell far beyond the Milky Way.

The Infrared Astronomical Satellite (IRAS) was launched in January 1983. Its mission was to map the entire sky at infrared wavelengths. IRAS was the first satellite to discover a comet.

The Near Earth Asteroid Rendezvous (NEAR) is the first of NASA's discovery missions and the first mission to go into orbit around an asteroid. Studies were made of the asteroids' size, shape, mass, magnetic field, composition, and surface and internal structure. The spacecraft has the shape of an octagonal prism, approximately 1.7 meter on a side, with four solar panels and a fixed 1.5-meter X-band high gain radio antenna. It is equipped with an X-ray/gamma ray spectrometer, a near-infrared imaging spectrograph, a laser altimeter, and a magnetometer.

Vikings 1 and 2 became the first space probes to successfully land on the surface of Mars. It was the first US spacecraft to successfully touch down on any planet other than Earth.

Mariner 10 was the first space probe to visit Mercury and the first to visit two planets – Venus and Mercury.

StarDust was the first space probe sent to intercept and collect contents from a comet's tail.

Galileo spacecraft was the first to fly past an asteroid and the first to discover a moon of an asteroid. It provided the only direct observation of a comet colliding with a planet.

The Voyager probes, launched in the early 1970's, are sending back information about the outer solar system. These probes have given us a close up look at all the planets and asteroids. Some of these probes have gone through the tails of comets.

Our fascination with our neighbor Mars has led to the invention of **Mars Pathfinder, Mars Global Surveyor, Mars Odyssey and Mars Rovers**. These robotic machines were sent to gather data regarding Mars' surface features, atmosphere, and magnetic properties. The objectives of these missions include the search for water and for evidence of life-sustaining environments.

Did you know?

There are over eight thousand artificial objects orbiting Earth. From this figure, over 2,500 are active satellites sending data back to earth, while others are now inoperative. The remaining objects are orbital debris such as lens, hatch covers, rocket bodies, payloads that have disintegrated or exploded, and even objects that "escape" from manned spacecraft during operations.



What you will do

Activity 2.1 Robots: Just Like You!

You have learned that spacecrafts are complex, technological objects that have to function far from Earth in the harsh environment of space. They have a common function, which is to collect scientific data and send them back to Earth. What are the basic parts of a spacecraft? What are the functions of these parts? To help you answer these questions, let us try to compare spacecraft parts with your own body parts.

Take a look at this spacecraft and consider this as a living organism.

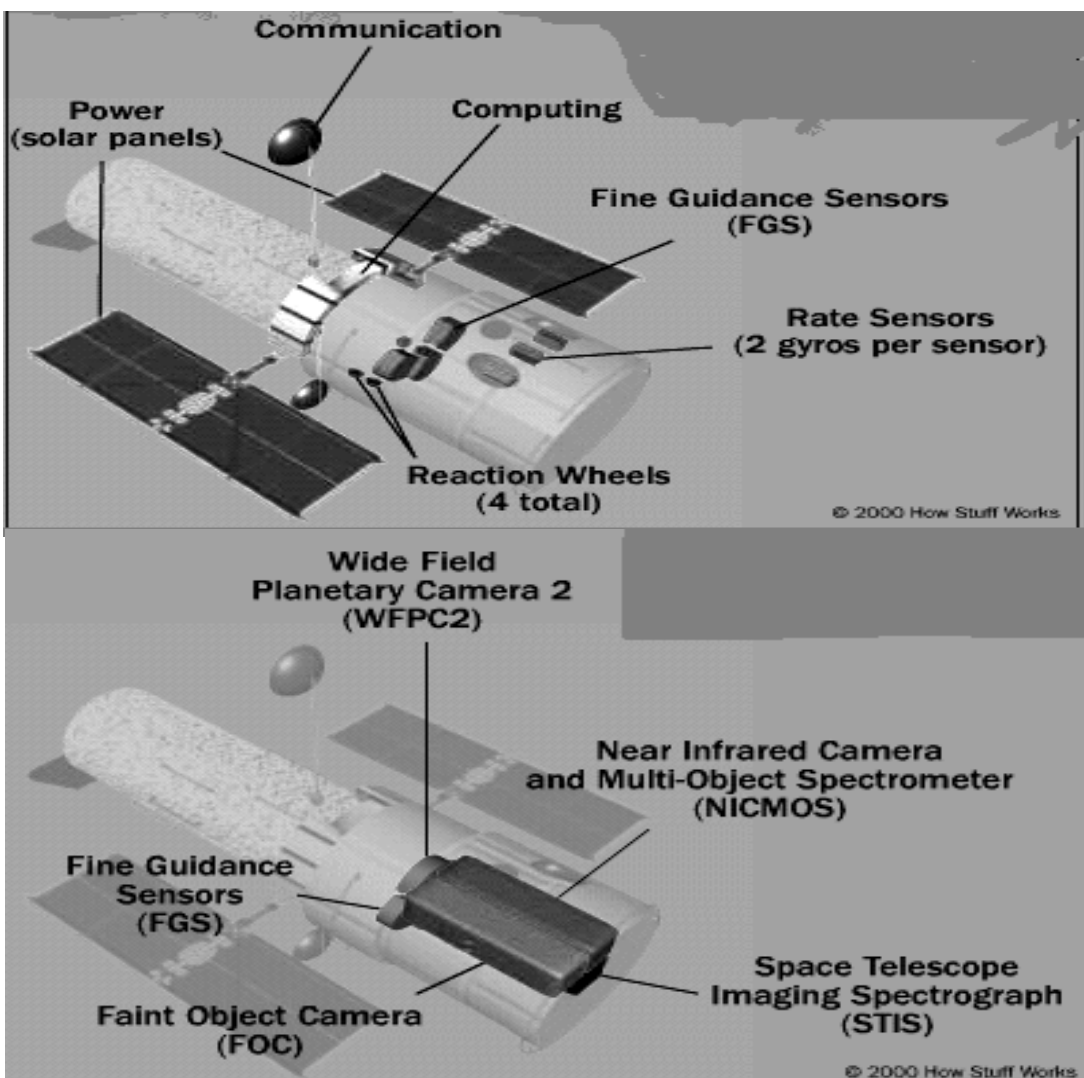


Figure 2.1 Some Parts of the Hubble Space Telescope

Now, match the human body parts in column A with its analogous spacecraft parts in column B. Write the letter of your answer before each number.

Column A: Human Body Parts

1. Mouth and Stomach
2. Body/Torso
3. Brain
4. Nerves
5. Skin
6. Legs
7. Blood vessels
8. Neck
9. Eyes
10. Ears/mouth

Column B: Basic Spacecraft Parts

- a. Rocket motor/thrusters (change their orientation in space)
- b. Fuel lines
- c. Solar panels (sunlight), batteries (stored energy), radioisotopes thermoelectric generators (heat from the decay of radioactive material)
- d. Electrical wiring
- e. Insulator (blanket for temperature control)
- f. Camera, spectrometer, magnetometer
- g. Scan platform (pivots to any direction)
- h. Communication antennae, receivers and transmitters
- i. Spacecraft Bus or housing/casing
- j. Computers



Key to answers on page 23



What you will do

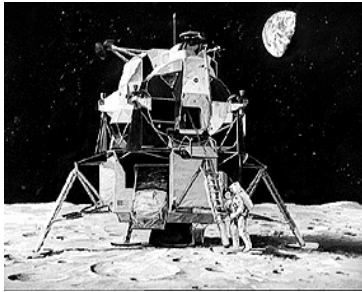
Activity 2.2

Can you identify some technologies used in astronomy? Name each picture below.



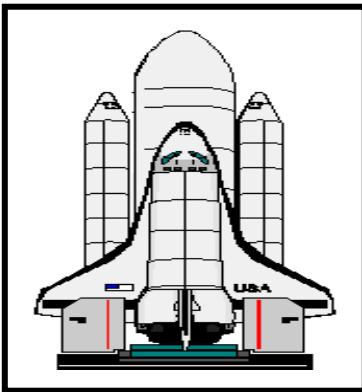
This telescope was launched on the Space Shuttle on April 24, 1990. It is a very special telescope which orbits far above the Earth. It allows scientists to see objects billions of light years away.

What telescope is this?



It is a spacecraft that blasted off on July 16, 1969. Aboard the spacecraft were Neil Armstrong, Edwin (Buzz) Aldrin, and Michael Collins.

Name this spacecraft.



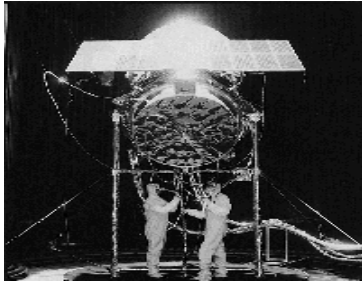
A space vehicle that takes off like a rocket, orbits Earth like a spaceship, and lands like an airplane. It has a huge payload bay in which cargo, such as space probe, is carried into space.

This space vehicle is called



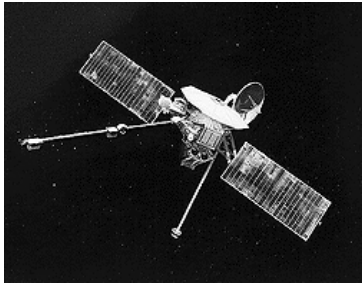
The clothes that today's astronauts wear while on a spacewalk have changeable parts just like a Lego set does. It protects them from the changes in pressure that happen when you come and go from space. This suit has a helmet, gloves, and boots.

What do you call this suit?



This satellite was a joint scientific project sponsored by the United Kingdom, the United States, and the Netherlands. Its mission was to map the entire sky at infrared wavelengths. It was the first satellite to discover a comet.

What satellite is this?



This is the first space probe to visit Mercury. It used the gravitational pull of Venus to swing it into a different orbit so it could continue on to Mercury.

Name this space probe.

Source: http://starchild.gsfc.nasa.gov/docs/StarChild/shadow/space_level1/wardrobe.html



Key to answers on page 23



What you will do Self-Test 2.1

Direction: Answer the following questions completely.

The National Aeronautics and Space Administration, simply called NASA, is a space agency of the United States, which is responsible for all the information we had about space explorations. It continues to send probes and discover the depths of space. Are you in favor of NASA's pursuit for manned space flights? Why? Please give your reason.



Key to answers on page 23



Let's summarize

What are the things that you have learned from this module?

1. Asteroids are rocky or metallic objects that orbit the sun in the same way that planets orbit. Asteroids are hard to see because they reflect little light and they are always on the move. Since they are smaller than planets, they are often called minor planets or planetoids. Many asteroids orbit the sun in a region between Mars and Jupiter. This area is called the asteroid belt. They follow a slightly elliptical path as they orbit the sun in the same direction as the planets.
2. Comets are fuzzy, luminous big dirty snowballs composed of rock dust wrapped around a big ball of ice. Comets do not produce energy and light. The coma envelops and hides the nucleus from our view. The nucleus is the center of the comet made of frozen water. The nucleus and the coma together are called the head of the comet.
3. A meteoroid is a piece of stony or metallic object that travels in space. It results from the collision of asteroids.
4. A meteor is a piece of stony or metallic material that enters the Earth's atmosphere and burns up.
5. A meteorite is a meteor that does not burn up before impacting with the Earth's surface.
6. Spacecrafts are complex, technological objects that have to function far from Earth in the harsh environment of space. They collect scientific data and send them back to Earth.



Posttest

After what you have been through with this module, I am very sure you can now perfectly answer the following questions. For each item encircle the letter of the correct answer.

1. Most of the asteroids orbit the sun in a belt between the orbits of
 - a. Venus and Mars
 - b. Mars and Earth
 - c. Jupiter and Saturn
 - d. Mars and Jupiter

2. The primary chemical constituent of comets is
 - a. water
 - b. nitrogen
 - c. methane
 - d. carbon dioxide

3. A meteorite is
 - a. a rock from space that strikes the ground
 - b. a piece of rock passing through the earth's atmosphere
 - c. the trail left by a rock as it passes through the earth's atmosphere
 - d. all of the above

4. A meteor shower occurs when
 - a. a meteor is about to get married
 - b. the earth passes through the asteroid belt
 - c. the head of a comet hits the earth's atmosphere
 - d. the earth passes through a swarm of dust particles in space, the remnants of a comet, once a year

5. The asteroids are
 - a. miniature planets
 - b. satellites of planets
 - c. pockets of gas in the solar system
 - d. planets orbiting the stars other than the sun

6. Why are meteorites and comets important in studying the origin of the solar system?
 - a. They have recently formed themselves.
 - b. They are recently produced fragments of planets.
 - c. They represent the material which formed the planets.
 - d. none of the above

7. Comet tails are the result of
 - a. interplanetary material streaming into the comet
 - b. melting and evaporation of ice from the comet core
 - c. dust collected by the comet as it moves in its orbit
 - d. solar wind blowing more gases from the central comet core

8. Meteors are
 - a. falling stars
 - b. signals from the other worlds
 - c. solar wind particles captured by the earth's magnetic field
 - d. luminous trails left by small extraterrestrial particles rapidly passing through the air

9. The orbits of most comets, which we see in the inner solar system
 - a. are nearly circular
 - b. are highly elliptical
 - c. never come closer to the sun
 - d. are only slightly inclined to the earth's orbit

10. The first satellite to discover a comet was/were
 - a. Mariner 2
 - b. Vikings 1 and 2
 - c. Hubble Telescopes
 - d. Infrared Astronomical Satellite

11. The first space probes to successfully land on the surface of Mars were
 - a. IRAS and Galileo
 - b. Hubble Telescopes
 - c. Viking 1 and 2
 - d. Galileo and Hubble Telescopes

12. Most meteoroids are formed when
 - a. comets melted
 - b. volcanoes erupted
 - c. asteroids exploded or collided
 - d. satellites exploded or collided

13. The first spacecraft to fly past an asteroid was
 - a. Galileo
 - b. Cassini
 - c. StarDust
 - d. Mariner 10

14. Meteorites are composed of
- a. hydrogen ice
 - b. helium ice
 - c. heavy elements like silicon
 - d. all the above
15. It was the first probe to visit Mercury
- a. IRAS
 - b. StarDust
 - c. Mariner 10
 - d. Vikings 1



Key to answers on page 24



Key to Answers

Pretest

- | | | |
|------|------|------|
| 1. A | 7. C | 12.D |
| 2. D | 8. B | 13.A |
| 3. A | 9. C | 14.C |
| 4. C | 10.D | 15.A |
| 5. A | 11.C | |
| 6. D | | |

Activity 1.1

1. F
2. G
3. F
4. E
5. A
6. C
7. C
8. A
9. C
- 10.B
- 11.B
- 12.B
- 13.B
- 14.E
- 15.A
- 16.D
- 17.A
- 18.B
- 19.B

Activity 1.2 and 1.3 The students have the options which procedure to follow in making model of comet.

Self-test 1.1

- a. Meteoroid is a piece of stony or metallic object, which travels in space. It results from the collision of asteroids. When meteoroids enter the earth's atmosphere and burn up it is called a meteor. A meteor that has reached the earth's surface is called a meteorite.
- b. Astronomers believed that asteroids came from a planet between Mars and Jupiter because asteroids are composed of all rocks, some are all metals, and some are mixed metal and rock – the same composition of crust, mantle and core of a planet like ours.

Activity 2.1

1. C
2. I
3. J
4. D
5. E
6. A
7. B
8. G
9. F
10. H

Activity 2.2

1. Hubble telescope
2. Apollo 11
3. Space shuttle
4. Space suit
5. Infrared Astronomical Satellite (IRAS)
6. Mariner 10

Self-test 2.1

Views of students may vary. Different people value space exploration for different reasons.

Some people are not in favor of manned space flights because according to them there is no evidence that this will do anything to contribute to our understanding of planets outside our own.

Some people believe that it is a waste of billions of dollars sending humans into space, where all they do is add weight and risk to space flights. Anyway, most of our understanding of the cosmos has come from unmanned space flights.

Those who are in favor for manned space flights wish to discover minerals, which are scarce on earth. Some wish to use space as a manufacturing site or a place to hide from tyranny.

Posttest

- | | | |
|------|-------|-------|
| 1. D | 6. C | 11. C |
| 2. A | 7. D | 12. C |
| 3. A | 8. D | 13. A |
| 4. D | 9. B | 14. C |
| 5. A | 10. D | 15. A |

-End of Module-

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