

The Solar System ▪ *Guided Reading and Study*

Comets, Asteroids, and Meteors

This section describes the other objects in the solar system, including comets, asteroids, and meteors.

Use Target Reading Skills

As you read about comets, asteroids, and meteoroids, fill in the graphic organizer below to compare and contrast their origin, size, and composition.

Feature	Comets	Asteroids	Meteoroids
Origin	Kuiper belt and Oort cloud	a.	b.
Size	c.	d.	Smaller than comets or asteroids
Composition	e.	Rock	f.

Comets

1. What are comets?

2. What are the three main parts of a comet?

a. _____ b. _____

c. _____

3. What forms a comet's tail?

4. Is the following sentence true or false? A comet's tail can be more than 100 million kilometers long. _____

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Comets, Asteroids, and Meteors *(continued)*

5. If the orbit of a comet is 500 times the distance between Pluto and the sun, which region is it in? Explain how you know.

Asteroids

6. Rocky objects revolving around the sun that are too small and too numerous to be called planets are called _____.
7. Where is the asteroid belt?

8. What happened when an asteroid collided with Earth 65 million years ago?

Meteors

Match the term with its definition.

Term	Definition
____ 9. meteoroid	a. A meteoroid that has passed through the atmosphere and hit Earth's surface
____ 10. meteor	b. A chunk of rock or dust in space
____ 11. meteorite	c. A streak of light caused by the burning up of a meteoroid in the atmosphere

12. Where do meteoroids come from?

13. The craters on the moon were caused by the impact of _____.

The Solar System ▪ *Section Summary***Comets, Asteroids, and Meteors****Guide for Reading**

- What are characteristics of comets?
- Where are most asteroids found?
- What are meteoroids, and how do they form?

The sun, planets, and moons are not the only objects in the solar system. There are also millions of smaller objects, most of which are classified as comets, asteroids, and meteoroids.

You can think of a **comet** as a “dirty snowball” about the size of a mountain. **Comets are loose collections of ice, dust, and small rocky particles whose orbits are usually very long, narrow ellipses.** When a comet gets close enough to the sun, the energy in the sunlight turns the ice into gas, releasing gas and dust. Clouds of gas and dust form a fuzzy outer layer called a **coma**. The inner core of the comet is called the **nucleus**. The brightest part of the comet, the comet’s head, is made up of the nucleus and coma. As a comet approaches the sun and heats up, some of its gas and dust stream outward, forming a tail. A comet’s tail is stretched very thinly and can be more than 100 million kilometers long.

Most comets are found in one of two distant regions of the solar system beyond Pluto: the Kuiper belt and the Oort cloud. The **Kuiper belt** is a doughnut-shaped region that extends from beyond Neptune’s orbit to about 100 times Earth’s distance from the sun. The **Oort cloud** is a spherical region of comets that surrounds the solar system out to more than 1,000 times the distance between Pluto and the sun.

In the 1800s, astronomers discovered more than 300 objects between Mars and Jupiter. These objects, called **asteroids**, are too small and too numerous to be considered planets. **Most asteroids revolve around the sun between the orbits of Mars and Jupiter.** This region of the solar system is known as the **asteroid belt**.

One or more large asteroids hit Earth about 65 million years ago, filling the atmosphere with dust and smoke and blocking out sunlight around the world. Scientists hypothesize that many species of organisms, including the dinosaurs, became extinct as a result.

A **meteoroid** is a chunk of rock or dust in space. **Meteoroids come from comets or asteroids.** When a meteoroid enters Earth’s atmosphere, friction with the air creates heat and produces a streak of light that you can see in the sky—a **meteor**. Meteoroids that pass through the atmosphere and hit Earth’s surface are called **meteorites**. The craters on the moon were formed by meteoroids.

The Solar System ▪ *Review and Reinforce*

Comets, Asteroids, and Meteors

Understanding Main Ideas

Complete the following table.

Object	Description	Location/Movement
Asteroid		
Comet		
Meteoroid		

Answer questions 1 through 3 on a separate sheet of paper.

1. Explain what causes a meteoroid to become a meteorite.
2. Describe these parts of a comet: head, nucleus, coma, tail.
3. How can you tell a meteor from a comet?

Building Vocabulary

From the list below, choose the term that best completes each sentence.

- | | | |
|---------------|-------------|------------|
| asteroid | comet | meteoroid |
| asteroid belt | Kuiper belt | meteorite |
| coma | meteor | Oort cloud |

4. When a meteoroid enters Earth's atmosphere, friction causes it to burn up and produce a streak of light called a(n) _____.
5. A chunk of ice and dust whose orbit is usually a long, narrow ellipse is a(n) _____.
6. If a meteoroid hits Earth's surface, it is called a(n) _____.
7. A rocky object that revolves around the sun, but is too small to be considered a planet, is a(n) _____.
8. A chunk of rock or dust in space that usually comes from a comet or an asteroid is called a(n) _____.
9. The region of the solar system between the orbits of Mars and Jupiter is known as the _____.
10. Clouds of gas and dust on a comet form a fuzzy outer layer called a _____.
11. A spherical region of comets is the _____.
12. A doughnut-shaped region of comets that begins near Neptune's orbit is the _____.

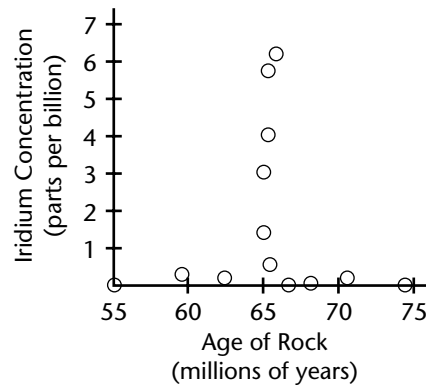
The Solar System ▪ *Enrich***Evidence of a Large Meteorite**

Meteoroids frequently hit Earth's atmosphere. If you were to get away from city lights on a clear night and patiently look at the sky for an hour or two, you would probably see several meteors, visual evidence that meteoroids are burning up due to air friction as they pass through Earth's atmosphere.

If Earth didn't have an atmosphere, its surface would probably look like the surface of the moon. Earth's atmosphere not only prevents many meteoroids from hitting the surface, but also tends to erase and cover up craters over time through the action of wind and rain. Scientists must look for other evidence that large meteorites have hit Earth. One place they look is in rocks.

When a large meteorite hits Earth, the result is similar to a huge bomb's exploding. Some of the material from the meteor turns to dust that goes high into the atmosphere, where winds carry it over the entire surface of Earth. Over millions of years, mud, sand, and dust (including dust from meteors) can build up and eventually turn into layers of rock.

Iridium is an element that is very rare in rocks on Earth, except those rocks that are very deep below the surface. Iridium is much more common in rocks from space. The graph below shows the amount of iridium present in some rocks at a site in Italy.



Study the graph, and answer the following questions on a separate sheet of paper.

1. How are the moon's craters evidence that large meteoroids probably hit Earth?
2. Why is evidence of meteoroid impact rare on Earth, despite the fact that meteoroids often pass into Earth's atmosphere?
3. About what age are the rocks that show the highest level of iridium?
4. What are two possible sources for the high iridium level shown in the graph?
5. In several other parts of the world, rocks of the same age have similar levels of iridium. What can you infer from this information?