Chapter 1 The Solar System

May 18 - May 22

8th Grade | Science
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Klinger & Sherman

Key Content/Modeling
Assignment 1: Use Packet #3 for May to complete Lessons 1.1, 1.2, 1.3, and 1.4 in the Science section, pages 98-111.

Assignment 2: Read the probe Asteroid, Comet, or Meteor and follow the directions to complete the table.

Assignment 3: Complete a Frayer model for each of the vocabulary words by following the instructions in the You Try section below.

Assignment 4: Read the selection Asteroids, Comets, and Meteors, (attached below) take Cornell notes or Mark the Text and answer the questions.

You Try: Create a Frayer model for each of the following words. Identify some of the characteristics and attributes of the word, give some examples, illustrate the word, and use the word correctly in a sentence.

exoplanet transit habitable zone asteroid asteroid belt near-earth asteroid comet Kuiper belt meteor meteoroid meteorite

Show me what you know (Proof of learning)
Email your teacher your completed work in whatever format you are comfortable with. We are counting students that are engaged in doing their work or not.

Self-Assessment: Which object poses the greatest risk to life on Earth, an asteroid, comet, or meteor? Explain why the object you chose is dangerous.

Extra Learning Opportunities: Go to the PBS website and watch the NOVA special about the extinction of dinosaurs “The Day the Dinosaurs Died”.

https://www.pbs.org/wgbh/nova/video/day-the-dinosaurs-died/

SCIENCE STANDARD: DCI ESS1.B The solar system consists of the sun and a collection of objects, the planets, their moons, and asteroids that are held in orbit around the sun because of its gravitational pull on them. (MS-ESS1.2), (MS-ESS1.3)

What am I learning?
What is an exoplanet?
What catastrophic effect do asteroids have on Earth?
How does a comet’s orbit compare to a planet’s orbit?
What is the difference between a meteor, meteoroid, and a meteorite?

How do I know I learned?
Describe what an exoplanet is.
Explain how an asteroid can drastically affect Earth.
Describe how a comet’s orbit is different than a planet’s orbit.
Explain the difference between a meteor, meteoroid, and a meteorite.
# Asteroid, Comet, or Meteor?

Asteroids, comets, and meteors are all celestial objects that appear in our solar system. They have features or characteristics which can be unique to them or shared with others. Follow the procedure below to identify which features belong to asteroids, which belong to comets, and which belong to meteors.

**Procedure:** Place an X in all the boxes that you think might match a feature of an asteroid, comet, or meteor.

<table>
<thead>
<tr>
<th>FEATURE</th>
<th>ASTEROID</th>
<th>COMET</th>
<th>METEOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appears as a streak in the sky</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frozen ball of dust</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visible in our sky</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Made up of rock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orbits the sun</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orbits between Jupiter and Mars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Also called ‘Shooting Stars’</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usually burns up in earth’s atmosphere</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Comets, Asteroids, and Meteors

Read the passage below and answer the questions that follow:

Asteroids, meteors, and meteorites … It might be fair to say these rocks from space inspire both wonder and fear among us Earthlings. But knowing a bit more about each of them and how they differ may eliminate some potential misgivings. While all these rocks originate from space, they have different names depending their location — i.e. whether they are hurtling through space or hurtling through the atmosphere and impacting Earth’s surface.

In simplest terms here are the definitions:

**Comet:** large rock, ice and gaseous body in orbit around the sun.

**Asteroid:** a large rocky body in space, in orbit around the Sun.

**Meteoroid:** much smaller rocks or particles in orbit around the Sun.

**Meteor:** If a meteoroid enters the Earth’s atmosphere and vaporizes, it becomes a meteor, which is often called a shooting star.

**Meteorite:** If a small asteroid or large meteoroid survives its fiery passage through the Earth’s atmosphere and lands on Earth’s surface, it is then called a meteorite.

Another related term is bolide, which is a very bright meteor that often explodes in the atmosphere. This can also be called a fireball.

Let’s look at each in more detail:

**Comets**

Comets are much like asteroids, but might have more ice, methane, ammonia, and other compounds that develop a fuzzy, cloud-like shell called a coma – as well as a tail — when it gets closer to the Sun. Comets are thought to originate from two different sources: Long-period comets (those which take more than 200 years to complete an orbit around the Sun) originate from the Oort Cloud. Short-period comets (those which take less than 200 years to complete an orbit around the Sun) originate from the Kuiper Belt.

**Asteroids**

Asteroids are found mainly in the asteroid belt, between Mars and Jupiter. Sometimes their orbits get perturbed or altered and some asteroids end up coming closer to the Sun, and therefore closer to Earth. In addition to the asteroid belt, however, there have been recent discussions among astronomers about the potential existence of many asteroids in the Kuiper Belt and Oort Cloud.

Asteroids are sometimes referred to as minor planets or planetoids, but in general, they are rocky bodies that do not have an atmosphere. However, a few have their own moons. Our Solar System contains millions of asteroids, many of which are thought to be the shattered remnants of planetesimals – bodies within the young Sun’s solar nebula that never grew large enough to become planets.

The size of what classifies as an asteroid is not extremely well defined, as an asteroid can range from a few meters wide – like a boulder — to objects that are hundreds of kilometers in diameter. The largest asteroid is asteroid Ceres at about 952 km (592 miles) in diameter, and Ceres is so large that it is also categorized as a dwarf planet.

Most asteroids are made of rock, but as we explore and learn more about them we know that some are composed of metal, mostly nickel and iron. According to NASA, a small portion of the
asteroid population may be burned-out comets whose ices have evaporated away and been blown off into space. Recently, astronomers have discovered some asteroids that mimic comets because gas and dust are emanating from them, and as we mentioned earlier, there appears to be many bodies with asteroid-like compositions but comet-like orbits.

**How Often Do Asteroids Hit Earth?**

While we know that some asteroids pass very close to Earth’s orbit around the Sun, we’ve been lucky in the history of humanity that we haven’t had a large asteroid hit Earth in the past several thousand years. It wasn’t until satellite imagery of Earth became widely available that scientists were able to see evidence of past asteroid impacts.

**Meteors, Meteoroids and Bolides**

Space debris smaller than an asteroid are called meteoroids. A meteoroid is a piece of interplanetary matter that is smaller than an asteroid and frequently are only millimeters in size. Most meteoroids that enter the Earth’s atmosphere are so small that they vaporize completely and never reach the planet’s surface. When they burn up during their descent, they create a beautiful trail of light known as a meteor, sometimes called a shooting star.

Mostly these are harmless, but larger meteors that explode in the atmosphere – sometimes called bolides — can create shockwaves, which can cause problems. In February 2013 a meteor that exploded over Chelyabinsk, Russia shattered windows with its air blast. This meteoroid or bolide was estimated to be 18 meters (59 feet) in diameter. In 1908, a rocky meteoroid less than 100 meters in diameter is believed to have entered the atmosphere over the Tunguska region of Siberia and the resulting shockwave knocked down trees for hundreds of square kilometers.

**How often is Earth hit by meteoroids?**

Estimates vary of how much cosmic dust and meteors enter Earth’s atmosphere each day, but range anywhere from 5 to 300 metric tons. Satellite observations suggest that 100-300 metric tons of cosmic dust enter the atmosphere each day. This figure comes from the rate of accumulation in polar ice cores and deep-sea sediments of rare elements linked to cosmic dust, such as iridium and osmium.

**Meteorite**

If any part of a meteoroid survives the fall through the atmosphere and lands on Earth, it is called a meteorite. Although most meteorites are very small, their size can range from about a fraction of a gram (the size of a pebble) to 100 kilograms (220 lbs.) or more (the size of a huge, life-destroying boulder). Meteorites smaller than 2mm are classified as micrometeorites.

Meteorites have traditionally been divided into three broad categories, depending on their structure, chemical and isotopic composition and mineralogy. Stony meteorites are rocks, mainly composed of silicate minerals; iron meteorites that are largely composed of metallic iron-nickel; and, stony-iron meteorites that contain large amounts of both metallic and rocky material.

**How Often Do Meteorites Hit Earth?**

According to the Planetary Science Institute, it is estimated that probably 500 meteorites reach the surface of the Earth each year, but less than 10 are recovered. This is because most fall into water (oceans, seas or lakes) or land in remote areas of the Earth that are not accessible or are just not seen to fall.
In short, the difference between asteroids and meteors all comes down to a question of location. Asteroids are always found in space. Once it enters an atmosphere, it becomes a meteor, and then a meteorite after it hits the ground. Each are made of the same basic materials, minerals and rock, and each originated in space. The main difference is where they are when they are being observed.

Answer the following questions:

1. How does a meteor compare to a meteorite?
   a) meteor is moving through the Earth’s atmosphere and the meteorite lands on Earth
   b) A meteorite is moving through the Earth’s atmosphere and the meteor lands on Earth
   c) Meteors are made up of Carbon and meteorites are made of ice
   d) They are the same thing

2. Describe an asteroids origin and orbit.
   a) Between Mars and Jupiter, long-elliptical orbit
   b) Oort cloud or Kuiper belt, circular orbit like a planet
   c) Another galaxy, long-elliptical orbit
   d) Oort cloud or Kuiper belt, long-elliptical orbit

3. Describe a comets origin and orbit.
   a) Between Mars and Jupiter, long-elliptical orbit
   b) Oort cloud or Kuiper belt, circular orbit like a planet
   c) Another galaxy, long-elliptical orbit
   d) Oort cloud or Kuiper belt, long-elliptical orbit

4. What is the composition of most comets?
   a) rock, ice, salt, carbon
   b) rock, ice, magma, frozen gases
   c) Ice, dust, rock, frozen gases
   d) Ice, dust, rock, soil