Meteorites

Overview: A meteoroid is a small rock that zooms around outer space. When the meteoroid zips into the Earth's atmosphere, it's now called a meteor or "shooting star". If the rock doesn't vaporize en route, it's called a meteorite as soon as it whacks into the ground. The word meteor comes from the Greek word for "high in the air."

What to Learn: Meteorites are black, heavy (almost twice the normal rock density), and magnetic. However, there is an Earth-made rock that is also black, heavy, and magnetic (magnetite) that is not a meteorite. To tell the difference, scratch a line from both rocks onto an unglazed tile. Magnetite will leave a mark whereas the real meteorite will not.

Materials

- White paper
- Strong magnet
- Handheld magnifying glass (optional)

Experiment

1. Imagine you are going on a rock hunt. You are to find which rocks are meteorites and which are Earth rocks. If you don't have access to rock samples, just watch the experiment video of the different rock samples. If you'd like to make your own sample collection, here are some ideas:
    a. 8-10 different rocks, including pumice (from a volcano), lodestone (a naturally magnetized piece of magnetite, and often mistaken for meteorites), a fossil, tektite (dry fused glass), pyrite (also known as *fool's gold*), marble (calcite or dolomite), and a couple of different kinds of real meteorites (iron meteorite, stony meteorite, etc.) Also add to your bag an unglazed tile and a magnet.
2. As you watch the experiment video, record your observations on your data sheet.
    a. Since nearly all meteorites have lots of iron, they are usually attracted to a magnet. However, lodestone is an Earth rock that also has a lot of iron. Iron is heavy, and meteorites contain a lot of iron. When looking through the possibilities, remove any lightweight rocks, as they are not usually meteorites.
    b. Meteorites are small. Most never get big enough or hot enough for metal to sink into the core, so the majority are mixed with rock and dust (stony meteorites). The few that do get big and form metal cores are called iron meteorites.
    c. Most meteorites come from the Asteroid Belt. Some meteorites get a dark crust. While others look like splashed metal. They are all dark, at least on the outside. Remove any light-colored rocks.
    d. Rocks that have holes vaporize or explode when they go through the atmosphere, they don't burn up. Only strong space rocks without holes make it to the ground. Remove any porous rocks.
    e. The ones you have left are either meteorites or lodestone. To tell the difference, scratch a line from both rocks onto an unglazed tile. Magnetite (lodestone) will leave a mark whereas the real meteorite will not.

<u>Finding Meteorites</u>

3. Place a sheet of white paper outside on the ground. Do this in the morning when you first start up class.
4. After a few hours (like just before lunchtime), your paper starts to show signs of "dust."

5. Carefully place a magnet underneath the paper, and see if any of the particles move as you wiggle the magnet. If so, you've got yourself a few bits of space dust.
6. Use a magnifying lens to look at your space meteorites up close.

Meteorites Data Table

Rock Sample #	Color?	Heavy or Light?	Large or Small?	Porous or Dense?	Magnetic?	Marks on Tile?

Reading

94% of all meteorites that fall to the Earth are stony meteorites. Stony meteorites will have metal grains mixed with the stone that are clearly visible when you look at a slice.

Iron meteorites make up only 5% of the meteorites that hit the Earth. However, since they are stronger, most of them survive the trip through the atmosphere and are easier to find since they are more resistant to weathering. More than half the meteorites we find are iron meteorites. They are the one of the densest materials on Earth. They stick strongly to magnets and are twice as heavy as most Earth rocks. The Hoba meteorite in Namibia weighs 50 tons.

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Every year, the Earth passes through the debris left behind by comets. Comets are dirty snowballs that leave a trail of particles as they orbit the Sun. When the Earth passes through one of these trails, the tiny particles enter the Earth's atmosphere and burn up, leaving spectacular meteor showers for us to watch on a regular basis. The best meteor showers occur when the moon is new and the sky is very dark.

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If you find a meteorite, head to your nearest geology department at a local university or college and let them know what you've found. In the USA, if you find a meteorite, you get to keep it… but you might want to let the experts in the geology department have a thin slice of it to see what they can figure out about your particular specimen.

Annual Meteor Showers

Jan 3-4	Quadrantids	Oct 21-22	Orionids
Apr 21-22	April Lyrids	Nov 3-13	Taurids
May 4-5	Eta Aquarids	Nov 16-17	Leonids
Jul 28-29	Delta Aquarids	Dec 13-14	Geminids
Aug 12-13	Perseids	Dec 21-22	Ursids

Exercises

1. Are meteors members of the solar system?
2. How big are meteors?
3. Why do we have meteor showers at predictable times of the year?

Answers to Exercises: Meteorites

1. Are meteors members of the solar system? (Yes – they are the smallest members.)

2. How big are meteors? (They range from pebble size to smaller than a grain of sand, usually weighing less than 2 grams.)

3. Why do we have meteor showers at predictable times of the year? (Every year, the Earth passes through the debris left behind by comets. The particles enter our atmosphere and burn up. The ones that make it to the ground are meteorites.)