

Raising a thought-provoking question is a good way to assess the overall depth of understanding. A couple of suggestions are listed below:

1. Explain why this statement is true: if your body weighs 60 pounds on Earth, you would weigh 10 pounds on the moon.
2. Use properties of "shape" to describe water as a solid, as a liquid, and as a gas.
3. Use any five properties you can think of to describe an object of your choice.

### Follow-up Activities

- Have children repeat the investigation in which ice cubes are placed in oil. Use colored water to make ice cubes and place them in different liquids, like alcohol and salt water to observe what happens. Have students try other combinations of liquids and solids to compare and describe densities.
- Have students create a multi-column bulletin board describing the properties of objects collected from the local environment, categorizing them according to uses, similarities, or differences.
- In small groups, have children observe a number of different minerals and categorize them in a chart according to their similar properties. When they are finished, have them choose two minerals that are the least alike and ask a representative from each group to share the properties of their chosen minerals with the rest of the class.
- In a creative writing activity, ask students to brainstorm about a world in which some familiar properties of matter are different — for example, what would life be like if water was not found in liquid form? What if cars were made of liquid? What if objects did not have any weight? Have each student write a paragraph describing a day in this strange world.

### Internet Resources

Periodically, Internet Resources are updated on our Web site at [www.libraryvideo.com](http://www.libraryvideo.com).

- [www.acs.org/wondernet/activities/past/matter/coolit.html](http://www.acs.org/wondernet/activities/past/matter/coolit.html)  
This WonderNet activity from the American Chemical Society gives students an opportunity to see if making water vapor colder can change its state from a gas to a liquid.

(Continued)

- [www.nyu.edu/pages/mathmol/textbook/whatismatter.html](http://www.nyu.edu/pages/mathmol/textbook/whatismatter.html)  
This MathMol site is a hypermedia science textbook for elementary students. Matter lessons are geared towards fourth graders and give great descriptions of matter and the different physical and chemical properties that can be observed.

### Suggested Print Resources

- Gardner, Robert. *Heavy Duty Science Projects: How Much Does It Weigh?* Enslow Publishers, Berkeley Heights, NJ; 2003.
- Oxlade, Chris. *Atoms*. Heinemann Library, Chicago, IL; 2002.

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### TITLES

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# Physical Science

## for Children™



## All About Properties Of Matter

Grades K-4

This guide is a supplement, designed for educators to use when presenting this program in an instructional setting.

**Before Viewing:** Research in learning suggests that it is important for the teacher to discover what the students know — or think they know — about a topic, at the start of a new unit, so that their accurate conceptions can be validated and reinforced, and their misconceptions identified and corrected. Therefore, after reviewing the pre-viewing discussion questions provided for your class, create an "Everything We Know About..." list. Preview key vocabulary words and have students raise additional questions they hope will be answered by this program. Most importantly, students should be told that as "science detectives" they must listen closely, so that after viewing the program, they will be able to tell whether or not the facts/beliefs they put on their list were scientifically accurate.

**After Viewing:** After a brief discussion about the program, challenge your "science detectives" to prove or disprove the accuracy of the facts they put on their "Everything We Know About..." list. Discuss what else they learned and use the follow-up questions and activities to inspire further discussion. Encourage students to research the topic further with the Internet and reading resources provided.



## Program Summary

We use our five senses to observe the special characteristics, or properties, of objects. Knowing the properties of matter helps us understand our world and all the things in it! If you wanted to go for a swim, would you dive into a pool of water or a pool of rocks? We use our sense of sight to describe an object's color and its shape. We use our sense of hearing to learn what kinds of sounds objects make. We use our sense of smell to see if things have a particular odor. We use our sense of touch to see how the surface of an object feels. Finally, we can use our sense of taste to learn how things taste. However, not everything has a taste, or should be tasted. Not everything has an odor, or makes a sound. Because of that, scientists use four basic properties to describe everything: mass, weight, volume and density.

Mass is the amount of matter that something has. The mass of an object does not change, even if its shape changes. A potter takes a specific amount of clay to make a pot. The clay is pushed and pulled into a different shape, but the final pot has the same mass as the original ball of clay. It just looks different. An object's weight is how heavy it is. Weight is really the pull of gravity on the mass of an object. Gravity's pull on a heavier object is more than on a light object. That's why objects with more mass weigh more! Imagine if you went into outer space and became weightless, as the astronauts do. You would weigh almost nothing because the force of gravity would be weak, but your mass — the matter you are made of — would remain the same. The third property of matter is volume. Volume is the amount of space something takes up. You can put a golf ball into your pocket because it doesn't take up much space; however, the volume of a bowling ball is too large to fit in your pocket. Another property of matter is density. Density describes how tightly packed matter is. The amount of mass that is packed into a given volume tells us whether it is very dense like a bowling ball, or not as dense, like a balloon. In an investigation, we learn that liquids with different densities separate into layers, and that a hard-boiled egg will float in salt water, but not in plain water.

Another way to describe matter is to observe whether it is a solid that keeps its shape, or a liquid, which has no real shape, but keeps the same volume, or a gas, which has no distinct shape or volume.

## Vocabulary

The following words are included for teacher reference or for use with students. They are listed in the order in which they appear in the show. *(Continued)*

**matter** — Any substance that takes up space. Matter is made up of small particles called atoms.

**properties** — The characteristics of a given object, such as color, smell, hardness, shape and texture.

**senses** — Mechanisms used by organisms to react to their surroundings. Our human senses are sight, touch, hearing, taste and smell.

**mass** — The amount of matter that is contained in an object. The more mass an object has, the greater its weight.

**weight** — A measurement of the force of gravity pulling down on an object.

**gravity** — The fundamental force of attraction between all objects. The more mass an object has, the greater the force of its gravity.

**volume** — The amount of space something takes up.

**density** — The amount of matter in a given space; a measure of how compact particles are in a medium.

**solid** — A state of matter with a specific shape and volume.

**liquid** — A state of matter with a specific volume but no shape.

**gas** — A state of matter with no shape or volume.

## Pre-viewing Discussion

Before students generate their list of "Everything We Know About..." this topic, stimulate and focus their thinking by raising these questions so that their list will better reflect the key ideas in this show:

1. How do we describe all the things in our world?
2. If you wanted to go swimming, would you dive into a pool filled with rocks or a pool filled with water? Explain.

After the class has completed their "Everything We Know About..." list, and before watching the show, ask them what other questions they have that they hope will be answered during this program. Have students listen closely to learn if everything on their class list is accurate and to hear if any of their own questions are answered.

## Focus Questions

You may wish to ask your class the following questions to assess their comprehension of key points presented in the program:

1. What is "matter"?
2. If everything is made up of matter, how can we tell things apart?
3. How do we describe things? *(Continued)*

4. What is a solid?
5. What is the difference between liquids and gases?
6. How many different "properties" of chocolate ice cream can you name?
7. What properties of objects can we discover using our sense of sight?
8. If you could only touch an object and not see it, what properties could you discover about that object?
9. What other senses could we use to discover different properties of things?
10. Which one of your senses do you think is the most helpful in discovering properties of objects? Why?
11. What are four properties that scientists use to describe things?
12. What is the difference between mass and weight?
13. Would your body have the same mass on Earth and on Mars? Explain.
14. On Earth, what causes us to have weight?
15. What is the relationship between volume and density?
16. What are some objects that have large volume, but very small mass and weight?
17. Which object has greater density: a balloon or a bowling ball? Explain.
18. Can you think of any objects that have a high density but a small volume?
19. After you shake it and let it sit, why does salad dressing with oil and vinegar separate out into two layers?
20. Why is it helpful for scientists to know about different properties of objects?

## Follow-up Discussion

The most important part of this segment is to examine both the facts and beliefs generated by the class in their "Everything We Know About..." list. Research indicates that students will retain their previous misconceptions — in preference to the new information — until they actively recognize and correct their own errors. Because of this, it is important to lead students to the correct ideas while identifying and correcting any misconceptions from the class list. After reviewing the list, encourage students to share the answers they got to the questions raised before viewing the program. *(Continued)*