Lesson 1

HOW CAN WE SEE MATTER?

WORDS TO KNOW

matter

atom

molecule

particle

WHAT I WILL LEARN

- Matter is made of particles too small for the human eye to see, but we can observe it in other ways.
- A model can explain how gases consist of matter particles that are too small to see and move freely in space.

THINK ABOUT IT

Light has particles called photons, but light is not matter. Why is that?

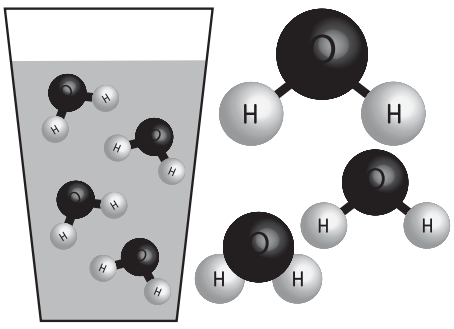
WHAT I NEED TO KNOW

Matter is all around us—in fact, we are matter! Matter is anything that has mass and takes up space.

You can make observations about matter. For example, you can bounce a ball and feel if it is soft or hard. You can even make changes to matter–such as tearing a piece of paper into smaller and smaller pieces. You can also measure its mass or volume.

While there are many examples of matter, the human eye cannot see the building blocks of all matter: atoms.

Individual atoms and molecules are not visible to the eye, but they make up everything around us. This includes matter that is or is not visible to the eye. Think for a moment: how can you observe matter if its tiny particles are not visible?



TURN AND TALK

Discuss with a partner. What is another example of matter you cannot see? How are you able to observe matter?

Air is an example of matter you cannot see, but you can observe it. We can observe air by looking at some of the ways air behaves. For example, think of a balloon. When you blow into a balloon, you can observe the air inflating the balloon and stretching the rubber until the balloon is fully inflated. If you let go, you can observe the air leaving the balloon. Can you think of another example of a way you can observe the way matter behaves, even if you cannot observe the matter particles?

WHAT I HAVE LEARNED

1. **Which is the best definition of matter?**

   (A) Anything that is visible

   (B) Anything that has a mass and takes up space

   (C) Things that can change from visible to invisible

   (D) Things thatcannot be seen but its behavior can be observed

   [DOK 1]

2. **Wind is air that moves from areas of high air pressure to areas of low air pressure. What is one way you observe the wind?**

   (A) Watch for particles of air.

   (B) Watch for indiviual air atoms.

   (C) Watch for air that moves tree branches.

   (D) Watch for air molecules that become visible.

   [DOK 2]

3. A student places several ice cubes in 100 milliliters of water. She leaves for several minutes. When she comes back, there is no ice in the glass, just water. How can she observe that the matter in the ice did not disappear but only changed?

Ⓐ She can feel the water.

Ⓑ She can look carefully for small particles of ice.

Ⓒ She can ask if anyone saw the ice melt while she was away.

Ⓓ She can measure the volume of the water to see if it has increased.

[DOK 3]

HINT, HINT

Think about a property that can be observed and measured to show the water is still there, but in a different form.

4. A student has made a simple model. It involves a capped syringe and a plunger (there is no needle). The plunger is depressed halfway down the syringe before it can no longer move. What idea is this simple model illustrating?

Ⓐ The matter in the syringe increases with pressure.

Ⓑ The matter in the syringe decreases with pressure.

Ⓒ The matter in the air expands when pressure is added.

Ⓓ The matter in the air compresses when pressure is added.

[DOK 3]

5. Which of the following is not matter?

Ⓐ An idea

Ⓑ An atom

Ⓒ A building

Ⓓ A molecule

[DOK 1]

SKETCH IT

Sketch the carbon and oxygen atoms for each of the 7 carbon dioxide molecules the student needs to draw. There are 2 oxygen atoms and 1 carbon atom in each molecule.

6. Carbon dioxide molecules are composed of one carbon atom and two oxygen atoms. If a student wants to draw a model of seven carbon dioxide molecules, how many individual atoms does he need to draw?

   (A) 7
   (B) 10
   (C) 14
   (D) 21

   [DOK 1]

7. Pete measures the mass of a wooden log. After he burns the log in a fireplace, he measures the mass of the ash. He finds that the ash has a much smaller mass than the log. What should Pete conclude?

   (A) Mass was lost during the reaction.
   (B) His measurements were incorrect.
   (C) Gases were released when the wood burned.
   (D) Energy was released as the wood burned.

   [DOK 2]

HINT, HINT

Notice that the particles are not visible. You are looking for an example that would allow you to see the particles.

8. Which of the following examples describes an investigation that would allow a student to see particles that at one time were not visible?

   (A) Blow up an empty basketball with air.
   (B) Tear apart a slice of bread into tiny pieces.
   (C) Dissolve a spoonful of sugar into a glass of water.
   (D) Evaporate the water from a glass of salt water.

   [DOK 3]

TEACHER NOTES

STANDARDS 5-PS1-1

Performance Expectation

Develop a model to describe that matter is made of particles too small to be seen.

Displinary Core Idea

PS1.A: Structure and Properties of Matter - Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon and the effects of air on larger particles or objects.

Science and Engineering Practices

Developing and Using Models - Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions. - Develop a model to describe phenomena.

Cross Cutting Concepts

Scale, Proportion, and Quantity. Natural objects exist from the very small to the immensely large.

Prerequisite Knowledge & Standards

2.PS1.A Structure and Properties of Matter. Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties. Different properties are suited to different purposes. A great variety of objects can be built up from a small set of pieces.

Misconceptions

- Particles possess the same properties as the materials they compose. For example, atoms of copper are “orange and shiny”, gas molecules are transparent, and solid molecules are hard.
- Particles are often misrepresented in sketches. No differentiation is made between atoms and molecules.
- Particles are viewed as mini-versions of the substances they comprise.

TEACHER NOTES

REAL-WORLD GOALS FOR STUDENTS

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TIPS FOR THE STRUGGLING LEARNER

- placeholder

TIPS FOR THE ENGLISH LANGUAGE LEARNER

- placeholder

ACTIVITIES FOR THE ADVANCED LEARNER

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