

LESSON 3

What Must Happen to Matter so I Can Smell It?

ACTIVITY 3.1 – INVESTIGATING MATTER

What Will We Do?

We will investigate what happens to menthol as it heats and cools.

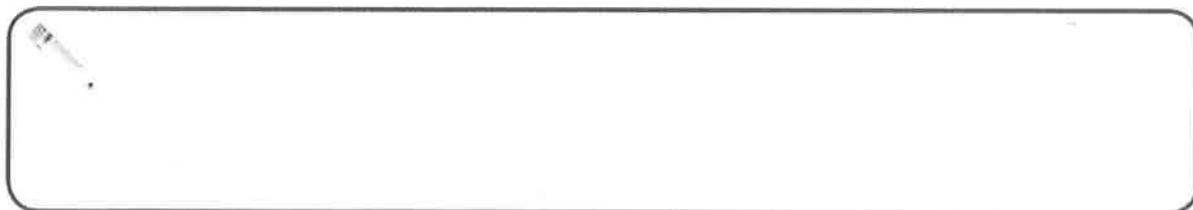
Safety

- Never taste any object in the science lab. Even if the substance is familiar and edible, the science equipment and surfaces may be contaminated.
- You will work with glass and with a hot plate in this activity. Both are safe if handled properly. Both can be dangerous if not handled properly. Keep hair and sleeves away from hot plates.
- Wear safety goggles during this activity.



Procedure

1. Describe your observations of the menthol in the flask.
2. Predict: What do you think will happen to the menthol as you heat it on the hot plate?



3. Place 5g of menthol in the 125mL flask.
4. Place the flask on the hot plate.

2. Look at the watch glass covering the flask. What do you think the material on it and on the flask is?
How did the material get there?

3. Can menthol exist in more than one form? Use observations from this activity as evidence to support your response.



Reading 3.1 – Three Forms of Matter—Solid, Liquid, and Gas

Getting Ready

Think about eating a bowl of cold cereal for breakfast. What types of matter would be part of your breakfast? Are there any solids? Are there any liquids? Are there any gases? List the type of matter and the state of matter it is in.



As you read, think about how you can tell which state of matter a material is in and underline ideas that can help you decide. In class, you observed materials in three forms—solid, liquid, and gas. Scientists call each form a state of matter. A state is the physical form in which a material can exist.

What Determines the State of Matter a Material Is In?

You live in a world of solids, liquids, and gases. You breathe in a gas, and you breathe out a gas. You eat solid matter. You drink liquid matter. As you have been thinking about matter, you have been considering the state in which you usually find each material. You usually find materials at room temperature. Room temperature is not when you cook something on the stove. It is not when you leave something in the refrigerator overnight. It is probably helpful for you to just think about room temperature as the temperature around you as you sit in your classroom.

Characteristics of a Solid: Can You Grab It, Hold It, or Poke It with Your Fingers?

You can determine what state a material is in based on its characteristics. A fork is a solid. An apple is a solid. A rock is a solid. You can hold each of these solids in your hand. A large rock may be too big for you to hold. If you had a sample of rock, you could hold it in your hand. You can grab a piece of each of these things. You cannot grab and hold a piece of the air. You cannot grab and hold a piece of milk. You can grab and hold a piece of wood. Apples, rocks, and wood are matter in a solid form.

Here is another test. If you had a big glass bowl and you put a solid into the bowl, the solid would stay in its original shape. A rock would sit in the bowl and look like the same rock. Solids have a fixed shape. Fixed shape means that they stay the same until you do something like break or crush them. Another way to think about solids is that you cannot poke your finger into them. Push your finger against your desk or tabletop. It is a solid. Your finger will not go through it. Floors and walls are solids. A glass bottle, a plastic bottle, and a soda pop

can be solids. Sidewalks, driveways, and roads are solids. Poking your finger into something is not a perfect test, but it can help you with the idea of many solids. You will be learning more in this unit about why you cannot poke your finger into solids but can poke your finger into liquids and gases.

Characteristics of a Liquid: Does It Change Shape When You Pour It?

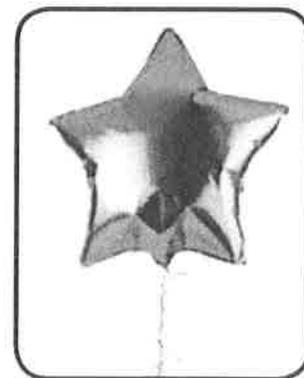
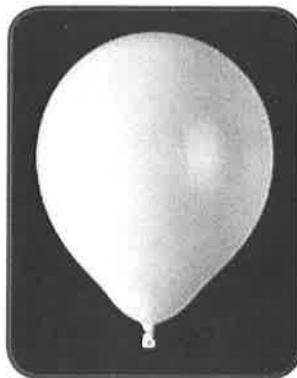
Liquids do not have a fixed shape. That means they do not hold the shape they are in. In the picture, you can see that the milk is in one shape as it pours out of the jug and a different shape in the glass. You could do this at home. Measure one cup of liquid water (or milk) and pour it into a tall glass. Then measure another one cup, and pour it into a short glass. You will notice that the liquid in the two glasses is in the shape of the glass. Someone might be fooled and think that there is more liquid in the tall glass. However, what really is happening is that the liquid water takes the shape of the glass and fits into it. It spreads out more in the wide, short glass, so it might seem like less liquid. Liquids take the shape of the container they are in. They do not hold the same shape when you pour them.



Characteristics of Gases

Gases can be difficult to study because you cannot see most of them. However, gases are all around you. Gases do some of the same things that liquids do. You have already learned that air has volume; it takes up space. When air takes up space, it also takes the shape of its container. A room is like a big container. The air in the room you are in right now is taking the shape of the room. It is filling every corner. If you are reading outdoors or in a car, air is filling that space too. Everywhere you look there is air, even though you cannot see it.

All types of gases take up the space of their containers. When gases fill the space of a container, gases also take the shape of the container. If you had a balloon in the shape of a star and you filled it with air, the air would spread into the star shape and fill it to each point. When a material is in the gas phase, it has characteristics that are similar to air. The same thing would happen if you filled the balloon with a different gas, such as helium gas. You have probably seen helium-filled balloons in many shapes. Gases fill the volume of their container.



Compare the States of Matter

In the box, compare the three states of matter. Be sure to tell what is alike and what is different about them. You can make a chart, a web, a drawing, or you can write sentences.

