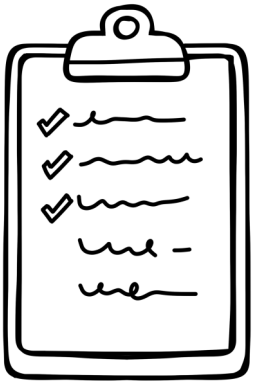
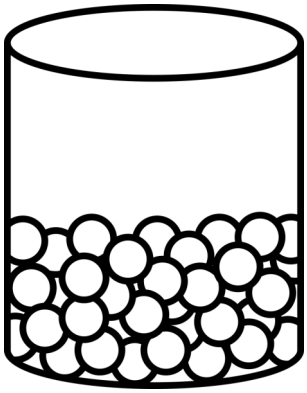
Properties and Behavior of Matter

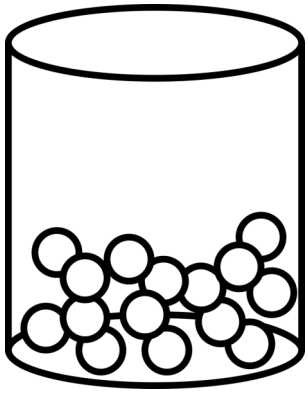


You can probably guess from the title of this unit that we are going to look at both the **properties** of matter and its behavior. But what does that mean? Properties are simply characteristics. We're going to look at ways we can describe matter—whether or not it floats, whether or not it's magnetic, and many other characteristics. We'll also look at how matter behaves in different states and what can make it change from one state to another. Are you ready? Let's get started.

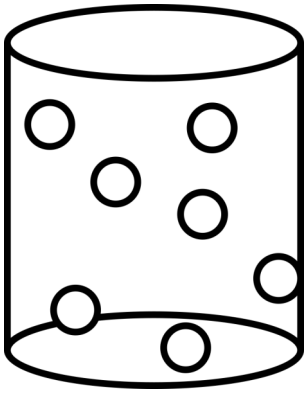
Matter makes up everything we can see or touch. It's made of molecules, which are made of smaller components called atoms. You know there are three main states of matter—solid, liquid, and gas. What makes those three states different?



In a solid, molecules are packed so tightly together that they cannot move around or change shape. They are also not easily compressed. The molecules in a piece of wood, for example, will never suddenly change from one shape into another. If they could, wood wouldn't be very useful for building anything with, would it?

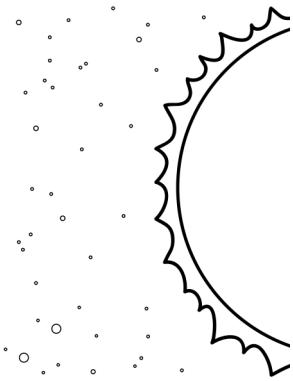


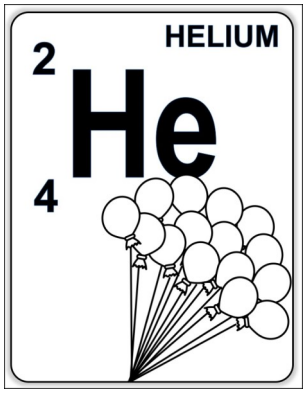
In a liquid, the molecules are still confined to a shape, but the shape is defined by the container the liquid is in. The molecules can slip and slide past each other, so if you pour water out of a large pitcher and into a small bottle, the water changes shape to fill the bottle. But the water can't change how much space it takes. If you have one glass of water and pour it into a pitcher, it will not spread out and fill the pitcher.



In a gas, the molecules are free to move in any direction. A gas fills all available space. If you could pour gas into the pitcher like you poured the water, the gas would expand and fill the pitcher.

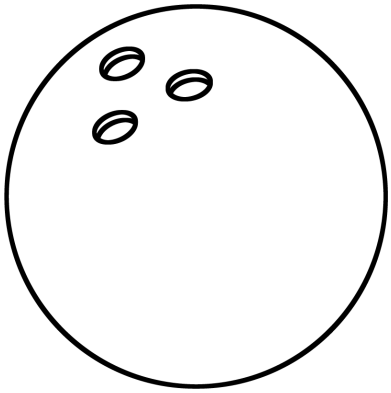
There are several other states of matter, but most are not very common. **Plasma** is a substance where some or all of the atoms have lost at least one electron. It is similar to a gas, and it needs temperatures in the tens of thousands of degrees or higher, or you need electric current, to form plasma. Plasma is found in the sun and stars, lightning discharges, and types of fluorescent and neon signs.





A **superfluid** is a liquid that has no viscosity so it moves without resistance. It has only been observed with helium. If you cool helium molecules to extraordinarily low temperatures to the superfluid state, it behaves similarly to a gas in some ways. For example, if you had helium in a superfluid state in a container, it could work its way up the side of the container and "crawl" out of the container. Helium is unique in another way, too. It's the only element that can never be made into a solid at normal atmospheric pressure. All other elements can be turned into a solid if you get it cold enough. But helium cannot be made solid unless it is put under extremely high pressure and low temperature.

Now that we know a little bit more about how matter behaves, let's look at some of its many properties. There are numerous ways you can describe an object. Think of a sneaker, for example. What color is it? How big is it? How much does it weigh? Is it firm or flexible? How does it smell? (That could be scary to find out about a sneaker!) All these things describe the sneaker. There are many properties of matter, such as size, shape, color, and texture, that you can tell just by looking at an object, but there are many other properties that you have to think more about because you can't always see these characteristics.



Mass is one way we describe matter. There are actually two different ways to describe mass. Mass is the amount of matter an object has. But mass is also a way to measure **inertia**. Inertia is also a property of matter. It's the property that explains why objects at rest tend to stay at rest unless they are acted on by an outside force. Matter doesn't just move itself. Something needs to act on it. The more mass something has, the more force is needed to overcome its inertia. Think about a bowling ball and a baseball. It takes a lot less force to move a baseball than it does a bowling ball.

Terminology

Using what you learned, define these words in the best way you can. Use the back of the page if you need more room.

Properties: _____

Plasma: _____

_____

Superfluid: _____

Mass: _____

Inertia: _____

_____

Volume: _____

Density: _____

Buoyancy: _____

_____

Transparent: _____

Translucent: _____

Opaque: _____

Conductor: _____

_____

Ductile: _____

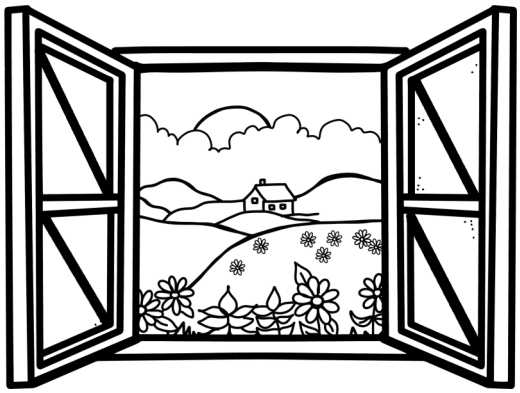
Insulator: _____

Recyclable: _____

Review

Using what you've learned about the properties of matter, look at the following terms. For each type of material, write at least one thing you could use matter with that property to create and why that characteristic makes it a good choice. (Try not to use the object in the picture for your answer.)

Transparency:



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Conductor:

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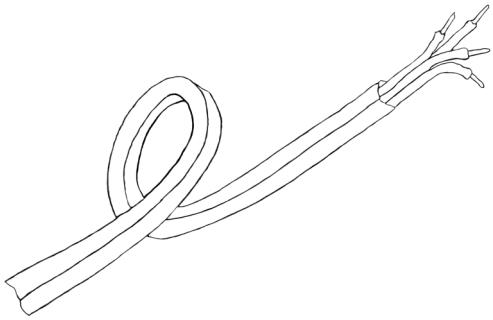
Ductile:



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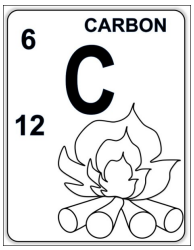
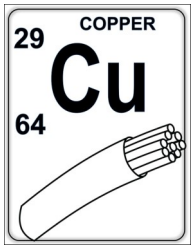
Which of the following elements is a metal? Draw a circle around it.

Oxygen

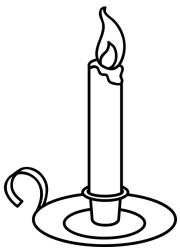


Carbon

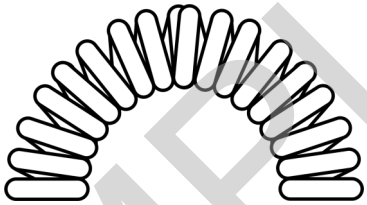


Copper

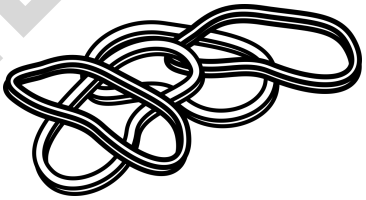
Which of the following materials is not elastic? Draw an X through it.



Wax



Spring



Rubber band

List six properties of matter.

Name the five states of matter discussed in this unit.

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