

LESSON 1

mass density displacement melting point boiling point
volume buoyant force physical change freezing point chemical change

Look at all the types of matter around you. What are some properties that make one type of matter different from another? How does matter change? Read this selection to learn more about matter.

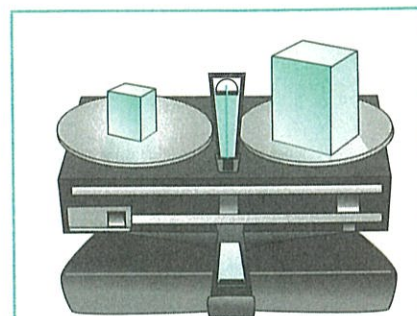
Properties and Changes of Matter

Mass, Volume, and Density

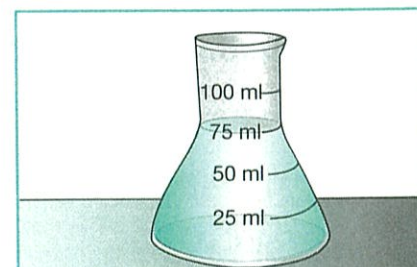
All matter has mass and takes up space. **Mass** is the amount of matter. Mass is measured in grams and is often mistaken for weight. An object's weight, though, depends on the force of gravity acting on it. If an object is moved, its weight can change, but its mass stays the same.

The amount of space that matter takes up is its **volume**. The volume of a liquid is often measured in liters or milliliters. A regularly shaped solid is often measured in cubic centimeters. One milliliter equals one cubic centimeter.

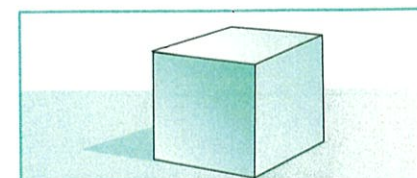
Different types of matter have different densities. **Density** is the amount of matter packed into a certain volume. You can find the density of an object by dividing its mass by its volume.



This balance scale measures mass in grams.



This graduated beaker measures liquid volume in milliliters.



This solid has a mass of 9 grams and a volume of 3 cubic centimeters.

$$\text{density} = \frac{9 \text{ g}}{3 \text{ cm}^3} = \frac{3 \text{ g}}{\text{cm}^3}$$

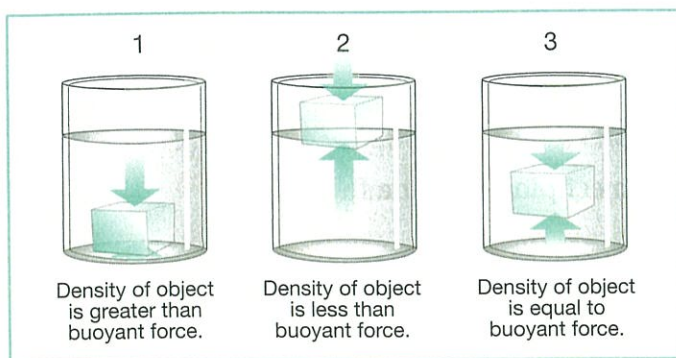


Sinking and Floating

A fluid applies an upward force on objects called the **buoyant force**. The buoyant force pushes up on an object placed in the fluid and makes the object seem lighter.

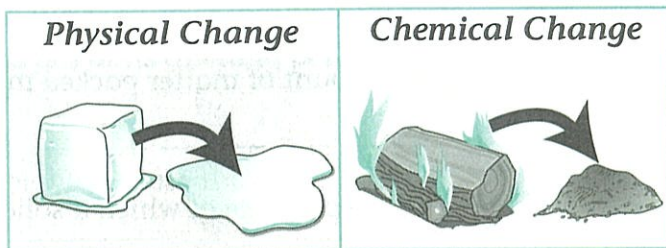
An object placed in a fluid causes the fluid to rise. That happens because the object pushes aside a volume of fluid equal to the object's own volume. The volume of fluid pushed aside is the **displacement**. An object floats if its weight is equal to or less than the weight of its displacement. An object sinks if its weight is greater than the weight of its displacement.

Whether an object floats or sinks also depends on its density and the density of the fluid. If the density of an object is greater than the density of the fluid, the object will overcome the buoyant force acting on it and sink. If its density is less than or equal to the fluid's density, the object will float.



Physical and Chemical Changes

A **physical change** is a change in the size, shape, or state of matter, with no new matter being formed. Adding or taking heat away from a solid, liquid, or gas, for example, changes its state. The temperature at which a particular solid turns to a liquid is its **melting point**. The **freezing point** is the temperature at which the liquid changes to a solid. The melting and freezing points of one type of matter are the same. The temperature at which a liquid changes to a gas is its **boiling point**.



A **chemical change** is a change in matter that creates one or more new substances. The particles that make up the matter break apart and regroup to form a different kind of matter. Energy is always gained or lost during a chemical change.

My Science Vocabulary

Go to page 94 to list other words you have learned about properties and changes of matter.



mass

density

displacement

melting point

boiling point

volume

buoyant force

physical change

freezing point

chemical change

Fill in the blanks with the correct vocabulary word.

1. the upward force applied by a fluid on objects placed in the fluid

2. a change in the size, shape, or state of matter

3. the amount of matter in an object

4. the amount of matter packed into a certain volume

5. the temperature at which a solid changes to a liquid

6. a change in matter that results in different substances

7. the temperature at which a liquid changes to a gas

8. the amount of space matter takes up

9. the volume of fluid pushed aside by an object placed in the fluid

10. the temperature at which a liquid changes to a solid

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Circle the word that makes sense in each sentence. Then write the word.

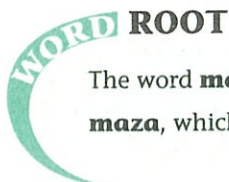
1. A change in which one kind of matter changes to one or more new substances is a (chemical change, physical change). _____
2. To learn how tightly packed matter is, you can find its (melting point, density).

3. The volume of fluid pushed aside by an object is the object's (buoyant force, displacement). _____
4. When you heat a liquid, it changes to a gas at its (melting point, boiling point).

5. Objects placed in water seem to lose weight because the water has a (mass, buoyant force). _____
6. Liters are often used to measure the (volume, freezing point) of a liquid.

7. A solid changes to a liquid at its (melting point, displacement).

8. During one type of (volume, physical change), heat causes a liquid to change to a gas. _____
9. Unlike weight, the (mass, chemical change) of an object does not change when it is moved. _____
10. When a liquid reaches its (freezing point, boiling point), the temperature is low enough for it to change to a solid. _____



The word **mass** comes from the Greek word **maza**, which means "barley cake" or "lump."

mass	density	displacement	melting point	boiling point
volume	buoyant force	physical change	freezing point	chemical change

C. Choose the correct vocabulary word to complete each sentence.

1. During a _____, the particles of matter break apart and form different substances.
2. At its _____, a liquid becomes a solid.
3. A change from a solid to a liquid or a liquid to a gas is a _____.
4. Grams are used to measure the _____ of an object.
5. If you divide the mass of an object by its volume, you get the _____ of that object.
6. If you place an ice cube in a glass of water, the ice cube's _____ will be equal to its own volume.
7. If you heat a solid to its _____, it turns into a liquid.
8. A fluid has a _____ that causes an object placed in the fluid to seem lighter.
9. To measure the _____ of matter, you need to determine how much space the matter takes up.
10. Heating a liquid will cause it to change to a gas if the liquid reaches its _____.

