

What's the Matter?

Matter is anything that takes up space and has mass. **Mass** is the *stuff* that matter is made of, or the amount of particles in a substance or object. Matter has physical and chemical properties and can undergo physical and chemical changes.

What are some examples of matter? Well, just look around you and everything you see, touch, smell, and breathe are examples of matter.

What is a **property**?

A property describes how an object looks, feels, or acts. Properties can be physical or chemical. Properties can also be quantitative or qualitative. A **qualitative** property of matter is observed and generally can't be measured with a numerical result. A **quantitative** property of matter is one that can be measured numerically, such as height, length, or weight.

What are examples of **physical properties**?

Physical properties can be observed. Examples of physical properties can be color, weight, volume, size, shape, density, boiling point, or freezing point.

What are examples of **chemical properties**?

A chemical property is usually one that can only be seen when a substance undergoes a chemical change. These properties cannot be observed by touching or looking. Chemical properties become apparent when the structure of the substance is altered chemically.

An example of this would be adding baking soda and vinegar and watching it bubble and give off a gas. The bubbling is an indicator that the properties of the two initial ingredients have recombined to form a new substance or substances.

substance AB + substance CD \longrightarrow new substance AD + new substance BC

A simple equation of what happens when you add baking soda to vinegar:

baking soda (solid) + vinegar (liquid) \longrightarrow carbon dioxide (gas) + water (liquid)

What is a **chemical change**?

A **chemical change** is a change that results in a new substance (or substances) being formed. The important word to remember is **new**. A chemical change involves the making or breaking of bonds between atoms. A chemical change makes a new substance that wasn't there before.

What are examples of chemical changes?

Some examples of chemical changes are nails rusting over time, batter turning into a cake in the oven, wood or paper burning to ashes, the digestion of food, and the baking soda and vinegar example above.

Vocabulary	
matter	quantitative
mass	qualitative
physical properties	chemical properties
property	

What is a **physical change**?

A **physical change** is a change in a state of matter. For example, when ice melts, the H_2O molecule is going from a solid (ice) state to a liquid (water) state of matter. The actual molecule or the arrangement of the atoms has not changed—just its state of matter. A physical change can also be a change in appearance of matter. For example, a piece of paper is made of paper molecules, and when you tear the piece of paper in half, both halves are still made of paper molecules. The atoms and molecules that make up the substance are not physically changed.

Physical or Chemical Change?

Put a check to indicate whether you think the item is a physical change or a chemical change.

	Physical Change	Chemical Change
1. ice melting		
2. cutting a pineapple into pieces		
3. adding vinegar to baking soda		
4. a piece of rusting metal		
5. a campfire		
6. crumbling a piece of paper		
7. sour milk		
8. shattering a drinking glass		
9. dissolving sugar in water		
10. burning paper		
11. boiling water		
12. burning a match		



Try This Experiment

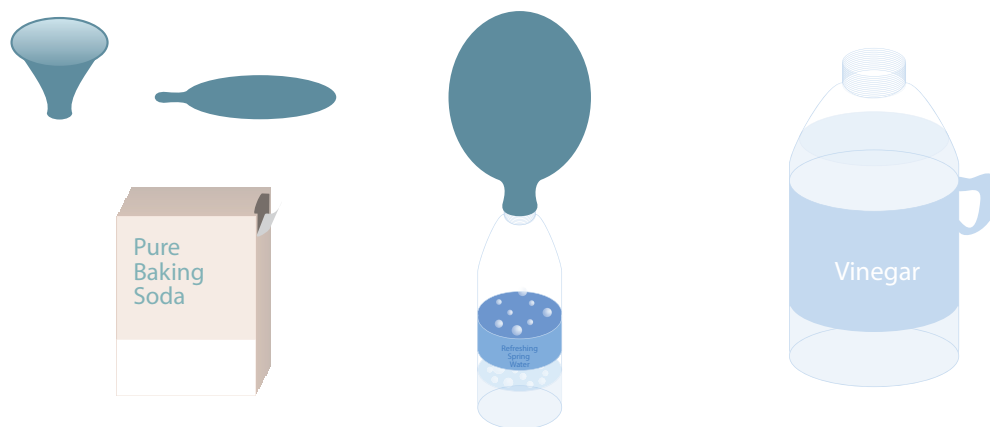
How do you know that a gas is produced as a result of mixing baking soda and vinegar?

Materials

- $\frac{1}{4}$ cup (56 grams) of baking soda
- $\frac{1}{4}$ cup (60 milliliters) of vinegar
- 1 small, empty water bottle
- 1 balloon
- 1 funnel

Procedure

1. Stretch the balloon out before using it.
2. Using the funnel, fill the balloon with the baking soda.
3. Pour the vinegar into the empty water bottle.
4. Attach the opening of the balloon to the mouth of the water bottle—be careful not to get any baking soda into the bottle.
5. Count to three and lift up the part of the balloon that contains the baking soda so that the baking soda falls into the bottle.



Questions

1. What are the physical properties of the baking soda?
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2. What are the physical properties of the vinegar?
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3. What happened inside the water bottle when you added the baking soda to the vinegar? What did you see in the bottle?

4. Did anything happen to the balloon? If so, what do you think caused it?

5. What type of change occurred inside the bottle when you added the baking soda to the vinegar?

6. Fill in the definitions in the vocabulary box below.

Vocabulary	
matter	
mass	
property	
qualitative	
quantitative	
physical change	
chemical change	