

## Changes in the Properties of Matter Physical and Chemical



**\*NOTE:** After you scan the QR code, if it says “restricted”, go to the top right of the screen and select “sign in” and choose your school information.

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**MATTER**-anything that takes up space, has mass and has properties that you can observe and describe

**PROPERTY**-something special about an object that makes it what it is

### All About Physical Properties

- can be measured or observed without changing the chemical makeup

All matter has **MASS** - the amount of matter in an object

All matter has **VOLUME**- the amount of space an object takes up

All matter has **DENSITY**- compares the mass to the volume ( $D=M\div V$ )

### Other Examples of Physical Properties:

- One physical property that is found in most matter is that it may be metallic.
  - Most metals are: shiny, solid, malleable and strong.
  - Nonmetals are: not shiny, are brittle
- **CONDUCTIVITY** - the ability to pass energy along from one particle to another. (electrical, heat, and sound)
- Whether or not a substance is **MAGNETIC** is another physical property.

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### All About Chemical Properties

-properties that describe the ability to react, or combine with another matter to form a new substance, a new kind of matter

### Examples of Chemical Properties

- People sometimes use **ACID** to tell gold and pyrite apart. (The way the substance reacts to it is a chemical property).
- **COMBUSTIBILITY**- the ability to burn is another chemical property (also called flammability)

## All About Physical Changes

– change in state, shape or size without forming another substance

### Examples of Physical Changes

- Water changing from ice, liquid and vapor. It's still water!
- Grinding peanuts to make peanut butter - the **SIZE** and shape have changed, but you still have peanuts.
- Mixing together two or more kinds of matter or separating matter into different parts
- **MIXTURE**-two or more parts blended together that keep their own properties and not turn into a new substance (salad, spaghetti, tacos, trail mix, sugar mixed with water, tea) **Mixtures can be made of solids, liquids or gases, can be separated**
- Substances that make up mixtures keep their physical & chemical properties
- **SOLUTION**– mixture in which substances are **completely blended** so that the properties are the same throughout. (sugar water, coffee, tea, fruit juices, soft drinks)
- **Physical changes can sometimes be easily REVERSED, but not always.**
- Melted ice cubes can be reversed by cooling until it freezes.
- Stirring sugar into water can be reversed by letting the water evaporate.
- If a change seems easy to reverse, then it is most likely a **PHYSICAL** change. But not all combinations of matter can be separated physically into their parts.

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## All About Chemical Changes

- Unlike the easy to reverse physical changes, chemical changes don't turn around so easily.
- They occur when **atoms link together in new ways**. These are called Chemical **REACTIONS**.
- During Chemical Reactions, atoms in the substances put together rearrange to form a new substance with different **PROPERTIES**.
- These new substances have properties different from the **ORIGINAL** substances from which they were formed.

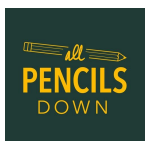
- **Signals that a chemical change occurred: (Listen for non-examples later in the video!)**
    - gas is produced (bubbles)**                      -**temperature change (decrease or increase)**
    - energy (ex: light) is released**                      -**a color change (careful!)**
    - a precipitate forms (precipitate – a solid formed when two liquids combine)**

### Examples of Chemical Changes:

- Vinegar mixed with baking soda - a new substance, carbon dioxide, a **GAS**, is formed
  - Burning candle [combines physical (wax melts) and gas & steam release **HEAT** to make a flame.
  - Rust forms when iron atoms in steel react with oxygen atoms in the air. When iron rusts it turns red or brown, a change in **COLOR**.
  - Space shuttles' engines combine liquid oxygen and liquid hydrogen to make water vapor to release the **ENERGY** needed to take off.
  - Burning is another chemical change. When wood burns, it turns to smoke, heat, and **ASH**.
  - Electricity can also cause chemical changes. If a current is sent through water, **GASES** are produced (oxygen and hydrogen.)
  - When you eat food, chemical changes take place as you **DIGEST** it. All during digestion, chemical reactions produce new substance with the atoms of the **ORIGINAL** substances.
- In general, chemical changes are difficult to REVERSE.**

**“Sometimes it’s hard to tell the difference!”**

- Matter can be changed in size and shape by being cut, folded, stretched, rearranged and crumpled without changing its original properties; it can look very different. It can be melted, frozen, or heated to change its physical state, and although it looks different, it is still the same **SUBSTANCE**.
- Cherry flavored drink powder turns bright red with water. This **COLOR** change is an indicator of a chemical change, but the powder is only dissolved, a physical change.
- When you open a soft drink, **BUBBLES** are produced, but a chemical reaction is NOT taking place. The carbon dioxide is simply coming out of (separating from) the solution.
- Rubbing your hands back and forth they become hot, but the **HEAT** is due to friction, not a chemical reaction.



**DON'T WRITE ANY MORE!** Listen to and focus on the summary; it's a great review of the entire program. We will do the following together.

- **MATTER**- anything that takes up space, has mass, and has properties you can observe and describe
- **PHYSICAL** properties can be seen and measured without changing the matter.
- **CHEMICAL** properties are harder to see because they describe the *ability* of matter to react with *other* matter to form some *different* matter.
- ALL matter has mass, volume, and **DENSITY**.
- Other physical properties: if they are shiny, malleable, magnetic, or conductors.
- **CHEMICAL** changes don't make a new kind of matter; the matter keeps its physical properties.
- When there's a chemical change the **ATOMS** in the matters that are mixed up together hookup in new ways; they change to form a new kind of matter.
- **Signs of chemical change** - color change, gas forms, energy released as light or heat (*and others you have read about and we will discuss.*)
- But you **CAN'T** always count on those signals.

**OH MY GOSH! The substitute is the lady from the store,  
Ms. Molly Mecule!**

