

Describing Matter

Understanding matter begins with observations and describing what is observed.

Take a couple of minutes to describe some observations to the objects being passed around.

Particle Theory

- all matter is made up of tiny, fast moving particles

The Four Particles of Matter

atom

- Particle of an element. It has no charge.

molecule

- particle of a molecular compound. It has no charge.
- made up of atoms that are bonded together with covalent/molecular bonds (sharing electrons)

formula unit

- neutral particle of an ionic compound; no charge.
- made up of a cation (+ve) and an anion (-ve) bonded together with ionic bonds

ion

- charged particles (ex Na^+ , Al^{3+} , O^{2-} (monoatomic); OH^- , NO_3^- , SO_4^{2-} (polyatomic))
- monoatomic ion (ions from a single atom) is formed when an atom loses or gains electrons
- polyatomic ion is formed when two or more atoms combine with an overall charge
- they only exist inside a formula unit of an ionic compound, in combination with its oppositely charged partner.
- cation - positively charged ion
- anion - negatively charged ion

Properties used to describe matter can be classified as **extensive** or **intensive**

Extensive properties are properties that depend on the amount of something (ex - mass, volume, size)

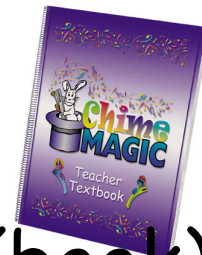
Intensive properties depend on the type of matter in a sample, describing how it feels or what it looks like.

A **physical property** is a condition or quality of a substance that can be observed or measured without changing the substances composition. Examples of physical properties are (but not limited to):

- Hardness
- Color
- Conductivity
- Malleability
- State (solid, liquid, and gas)
- Melting point ($^{\circ}\text{C}$)
- Boiling point ($^{\circ}\text{C}$)

Solid - definite shape

- definite volume (book)



Liquid - indefinite shape

- definite volume (water)



Gas - indefinite shape

- indefinite volume (oxygen)

The other property of matter is a chemical property.

Chemical property - any property that describes how a substance reacts with another substance when forming something new.

Examples of a chemical property:

- Combustability
- Reacting with acids
- Reacting with air
- Reacting with water

Physical changes

In a physical change, some properties of a material change, but the composition of the material does not change.

Key words such as *boil*, *freeze*, *melt*, and *condense* are used to describe physical changes. So are *break*, *split*, *grind*, *cut*, and *crush*.

Some of these are reversible changes while others are irreversible.

Questions to try

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