

Physical & Chemical Changes

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Main Ideas About Matter

- * Matter is: the "stuff" of which everything is made up of.
- * Properties are: features that help you describe and identify people, animals, objects, and any other kind of matter
- * Main Ideas About Matter:
 1. Anything that has mass and takes up space
 2. Two characteristics: mass and volume
 3. Classified as a solid, liquid, or a gas
 4. Identified by observing its properties

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Characteristics of Matter

Matter is anything that has mass and takes up space. Solids, liquids and gases are examples of matter. All forms of matter can be described or identified by unique properties or characteristics.

The term characteristics refers to a feature of the substance itself, such as colour, mass, hardness, flexibility, strength, or texture.

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Vocabulary

Matter

Definition: anything that has mass/weight and takes up space

Synonym/Example: marker, desk, water, air

Mass

Definition: measurement of the amount of matter in an object. An object with a small amount of matter has a small mass.

Measured in grams, kilograms, tonnes.
Synonym/Example: g, kg, tonnes

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Vocabulary

Characteristic

Definition: a quality typical of an object
Synonym/Example: property

Substance

Definition: the stuff of which matter is made up
Synonym/Example: H_2O (water) is made up of hydrogen and oxygen

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Vocabulary

Property

Definition: features that help you describe and identify kinds of matter, such as people, animals, objects, etc.

Synonym/Example: colour, texture, size, state

Volume

Definition: measurement of the amount of space an object takes up. Measured in millilitres or litres or centimetres cubed.

Synonym/Example: mL, L, cm^3

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Properties of Matter Example

Name of Matter	
Gummy Candy	Water
Properties of Matter	
1. Flexible, soft, spongy	1. Liquid
2. Sour, sweet	2. Clear, colourless,
3. Sticky, rough	3. Tasteless
4. Fruity	4. Wet
5. Colourful	5. Smooth

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Gummy Candy and water illustrate an important idea. Each kind of matter has its own set of properties.

However, all matter does have two characteristics in common: mass and volume.

Mass: Measurement of the amount of matter in an object. An object with a small amount of matter will have a small mass.

** Measured in g/kg/T

Volume: Measurement of the amount of space an object takes up.

** Measured in mL/L.

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Vocabulary

Solubility

Definition: the capability of a substance to dissolve in a solvent

Synonym/Example: grape drink mix will dissolve in water, coffee grounds will not dissolve in water

Dissolve

Definition: to pass (melt) into a solution.

Synonym/Example: salt dissolves in water

Properties of Matter: Solubility

The term Property deals with how a substance changes when it interacts with another substance. Solubility is the ability of the substance to dissolve in water.



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Vocabulary

Buoyancy

Definition: the ability of an object to float or rise in a fluid.

Synonym/Example: a rock will sink in water, a piece of cedar wood will float

Properties of Matter: Buoyancy

The term buoyancy refers to how much or how little an object floats in water.

1. Why do you think some objects float and some sink?

Objects float when they are less dense than water

2. Do you think a large, heavy log floats in water?

The particles in a log are less dense than water so it floats

3. How would something float if it is heavy?

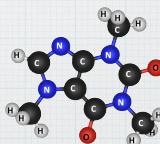
If it is less dense than water

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Interactions of Materials

All substances are made of atoms. Each substance has a unique structure that has different properties and characteristics. When atoms of different substances interact, their properties or characteristics can change.



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Vocabulary

Interaction

Definition: the situation of different types of matter acting on each other.

Synonym/Example: mixing vinegar and baking soda causes bubbles to form

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Interactions of Substances that Produce Gases

We have discussed that each substance has its own unique properties and characteristics. When substances combine, their characteristics and properties can change. Changes in substances fall into two categories. They are either physical changes or chemical changes.

A physical change occurs when something changes in shape or form.

Example: wire hanger being bent, or ice melting.



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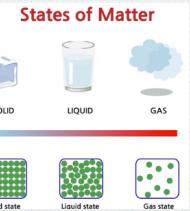
A chemical change is when original materials are used up or are modified into a new substance. The new substance will have different characteristics and properties from the old substance.

Example: mixing baking soda and vinegar; both substances change form, creating a new substance. The gas that is produced has different characteristics and properties.



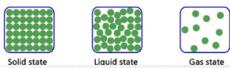
Three States of Matter

Matter exists as a solid, liquid, or a gas.



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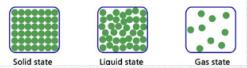
Properties of Solids:

- * **definite volume**
- * **definite shape**
- * **molecules are close together and move slowly**

Properties of Liquids:

- * **definite volume**
- * **no definite shape
(takes the shape of the container)**
- * **molecules are farther apart and move faster**

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Properties of Gas:

- * **no definite volume or shape**
- * **completely fills any container it occupies**
- * **molecules move faster and are farther apart**

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When heat is added to matter, the molecules move faster and the matter expands.



When heat is removed from matter, the molecules move more slowly and matter contracts.

Volume changes but mass remains the same.

Water boils at 100°C. Water freezes at 0°C.

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Vocabulary

State

Definition: condition or arrangement of matter
Synonym/Example: solid, liquid, gas

Solid

Definition: material with a definite volume and shape, molecules are close together and move slowly.
Synonym/Example: ice

Liquid

Definition: material with a definite volume, but no definite shape; it has the ability to flow; molecules are further apart and move more quickly.
Synonym/Example: water

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Vocabulary

Gas

Definition: material with no fixed volume or shape; fills any container it occupies; molecules move faster and further apart

Synonym/Example: water vapour (steam)

Freezing, Melting, Evaporating, Condensation

Changes in state are reversible. We can reverse a change of state by adding or removing heat. Changes of state are physical changes because no new material is created.

Example: Water. Water can be a solid: ice a liquid: water a gas: steam and it can change back to a solid.

When you add heat, the molecules in the ice start to move faster and stretch farther apart. This makes the ice become water. Then, if you keep adding heat, the molecules will keep vibrating and the water becomes a gas.

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If adding heat can change the state of matter, how can we reverse the process?

We can reverse the process by removing the heat (energy)

Define the following terms:

Freezing:

A liquid that becomes a solid by removing heat energy

Melting:

A solid that becomes a liquid by adding heat energy

Evaporation:

The result of adding heat energy to a liquid

Condensation:

The result of steam or gas meeting with cold air

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Vocabulary

Change of State

Definition: when a substance changes from one state to another

Synonym/Example: gas to liquid, solid to liquid, liquid to solid, liquid to gas

Evaporation

Definition: the change of state from a liquid to a gas

Synonym/Example: a puddle disappearing on a sunny day

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Condensation

Definition: the change of state from a gas to a liquid

Synonym/Example: shower steam on a cold mirror

Solidification

Definition: the change of state from a liquid to a solid

Synonym/Example: freezie (liquid to solid)

Melting

Definition: the change of state from a solid to a liquid

Synonym/Example: melting ice

Physical & Chemical Changes

Matter can be changed in two ways: physical and chemical.

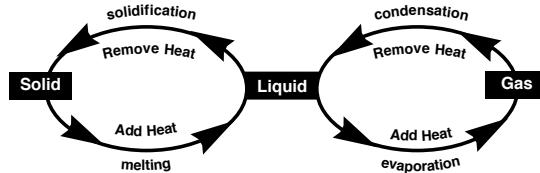
A chemical change occurs when a new substance is formed with a new set of properties. For example: baking a cake or boiling an egg.

A physical change refers to changes in matter where no new substance is formed. These can be changes in appearance (hardness, structure, density), but its composition does not change. For example: melting ice, dissolving sugar in water, or breaking glass.

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Some physical matter can undergo physical change and then return back to its original state (reversible). For example: freezing water into ice cubes and melting it back to liquid water. Some, however, are nonreversible. For example: sawing a piece of wood into sawdust.



Complete the following statements using the words in the diagram above:

1. Water changes from a liquid to a gas through the addition of heat. This process is called evaporation.

2. Water changes from a gas to a liquid through the removal of heat. This process is called condensation.

3. Water changes from a liquid to a solid through the removal of heat. This process is called solidification.

4. Water changes from a solid to a liquid through the addition of heat. This process is called melting.

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Vocabulary

Reversible Change

Definition: a reaction in which a change from one condition to another can occur in either direction

Synonym/Example: water freezing, melting, or evaporating

Non-Reversible Change

Definition: a reaction in which a change can occur in only one direction

Synonym/Example: oranges into orange juice

Physical Change

Definition: alters the characteristics of a substance without producing a new substance

Synonym/Example: ripping paper

Chemical Change

Definition: produces a new substance with distinct characteristics and properties

Synonym/Example: vinegar and baking soda