

5.1.2 The Properties of Matter

Matter is anything that has *mass*.

Mass: the property of a body that causes it to have weight in a gravitational field (mass = the *amount of matter* in an object).

Volume: the amount of *3-dimensional space* that an object takes up.

Energy: the ability to do work (chemical, light, heat, nuclear ...)

There are two types of matter

1. Living Matter: (Plants, Animals, Bacteria ...)
2. Non -Living Matter: (Rocks, Plastic, Water ...)

Qualitative Property: is a characteristic of a substance that can be described but not measured.

Taste



Smell

Hearing



Sight

Touch



You use your five senses to make *qualitative* observations.

You can describe matter using the following terms. Since qualitative properties are not specific or characteristic to any type of matter, the more terms you use to describe a substance the better.

To describe all substances:

- clarity - transparent (clear), translucent (cloudy), opaque
- colour - colourless, red, orange, blue, white, etc
- odour - odourless, sweet, sour, burnt, aromatic, fragrant, nauseating, sharp, acrid, choking

To describe solids only:

- texture - crystalline, granular, waxy, flaky
- lustre - shiny, dull, metallic, greasy, glassy
- hardness - hard, soft, flexible, brittle

To describe liquids only: viscosity

Quantitative Property: is a characteristic of a substance that can be measured numerically.

A measurement *always* consists of:

- a number or value
- an estimate of the last digit
- a unit of measure



Physical and Chemical Properties

A. Physical Properties: are the properties that do not involve the making of new substances.

Physical Properties are things like ...

- Colour
- Texture
- Shape
- Hardness
- Odour
- Melting point
- Boiling Point
- Lustre
- Density
- Transmission of Light
- Clarity (transparent/opaque)
- Taste
- State (solid/liquid/gas)

Describing Matter

Hardness: the measure of the resistance of a solid to being scratched or dented

Brittleness : The ability of an object to break apart or shatter easily. Glass, china, and chalk are brittle substances that cannot be bent.

Ductility: The ability of a substance to be stretched out into a long wire-like shape. Copper, gold and silver are ductile.

Flexibility: The ability of a substance to bend without breaking. Rubber, some plastics and metals are flexible.

Form: Substances with a regular shape, such as cube-shaped grains of salt, are said to be crystalline. Substances with an irregular form, such as starch, are said to be amorphous.

Lustre: the ability of an object to reflect light. Chrome faucets are said to have a high lustre because they are bright and shiny. A flat paint, on the other hand, has a low lustre.

Malleability: The ability of a substance to be hammered into a sheet. Because gold and aluminum can be made into very thin sheets or foils, they are malleable substances.

Odour: A substance can be described as odourless, burnt, flowery, putrid, spicy, sharp, choking, nauseating and suffocating.

Physical State: The condition of being a solid, a liquid or a gas.

Taste: There are four tastes: sweet, like sugar; sour like vinegar, salty, like table salt; and bitter, like coffee. All flavours are either combinations of these four tastes, or combinations of tastes and odours.

Texture: The feel of a substance to the fingers: fine, coarse, smooth, gritty, silky, fluffy, waxy, etc.

Viscosity: The measure of how easily a liquid flows. Liquids may be thin, thick, runny, syrupy, etc. The thicker the liquid, the more viscous it is. Tar or molasses are viscous, water is not.

Solubility : the ability of a substance to dissolve in a solvent like water

Characteristic Physical Properties:

The physical properties of a substance that make that substance different from most other substances are called the characteristic physical properties of that substance. Things boiling point, melting point and density are all characteristic physical properties.

Melting Point : temperature which the solid form of a substance becomes liquid

Boiling Point : temperature which the liquid form of a substance becomes a gas

Density : the amount of Mass per unit Volume (how tightly packed particles are)

B. Chemical Properties: are the properties that involve the formation of a new substance. (example: when iron rusts or propane burns)

Chemical Properties are things like ...

- Combustibility: the ability of a substance to burn (requires oxygen)
- Flammable: the ability of a substance to burn when exposed to a flame
- Light Sensitivity: the ability of a substance to change to a new substance in the presence of visible light

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