

Mixtures, solutions and dissolving

Grade 6 science (Year 7 · Class 6) · Lesson

Quick answer: A mixture is two or more substances combined without a chemical change. A solution is a uniform mixture in which a solute dissolves in a solvent, such as salt in water. When no more solute will dissolve at a given temperature, the solution is saturated.

Level: Grade 6 science (Year 7 · Class 6) · **Curriculum:** MS-PS1-2

What is a mixture?

Most things around you are not pure. Sea water, air, soil and a glass of lemonade are all mixtures. In a mixture, two or more substances are mixed together but have not joined chemically, so each keeps its own properties and can be separated again by physical means.

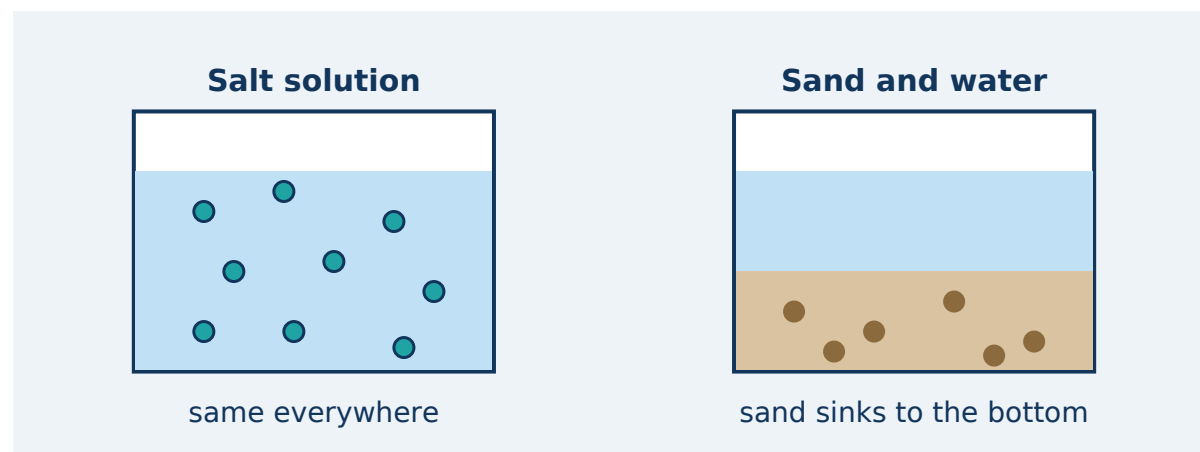
Definition

A **mixture** is two or more substances physically combined, with no new substance formed. The amounts of each substance can vary.

What is the difference between homogeneous and heterogeneous mixtures?

In a **homogeneous mixture** the substances are mixed so evenly that it looks the same everywhere, even under a magnifying glass. In a **heterogeneous mixture** you can see different parts, and the sample is not the same everywhere.

Type	What you see	Examples
Homogeneous	One uniform material	sugar in tea, air, vinegar, brass
Heterogeneous	Separate parts or layers	sand in water, salad, soil, oil on water



A solution is uniform; a mixture of sand and water is not.

What is a solution?

A solution is a homogeneous mixture formed when one substance dissolves in another. The substance that dissolves is the **solute**. The substance that does the dissolving is the **solvent**. In salt water, salt is the solute and water is the solvent. Water is the solvent in most solutions you meet, but not all: nail varnish dissolves in acetone, not in water.

Definition

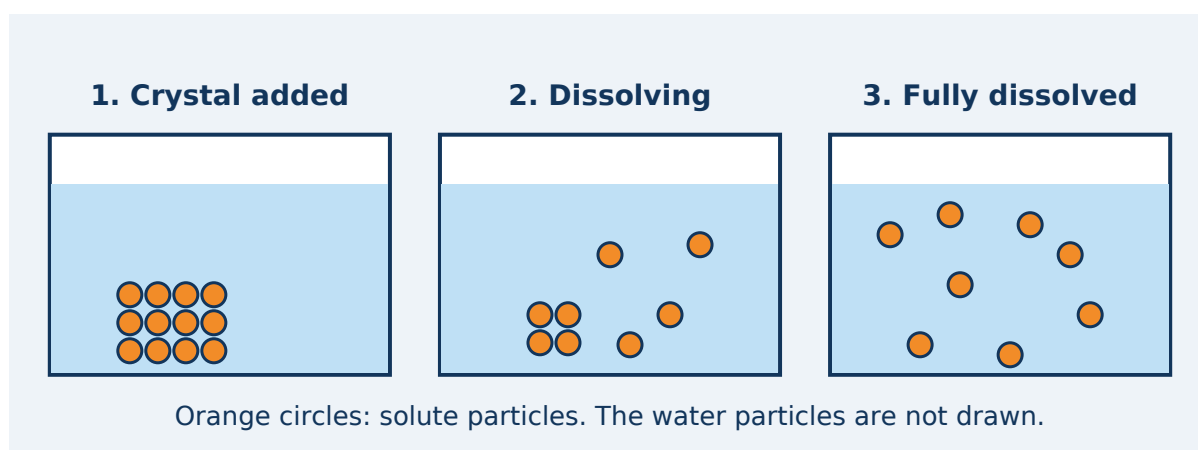
A **solution** is a homogeneous mixture of a solute dissolved in a solvent. It is usually transparent, though it may be coloured.

Formula

mass of solution = mass of solute + mass of solvent

All masses are in grams (g).

When a solid dissolves, its particles break away from each other and spread out among the water particles. The solid has not vanished: the mass is the same before and after.



A solute dissolves when its particles spread out among the solvent particles.

Worked example

Kavya in Chennai dissolves 25 g of sugar in 200 g of water. Find the mass of the solution.

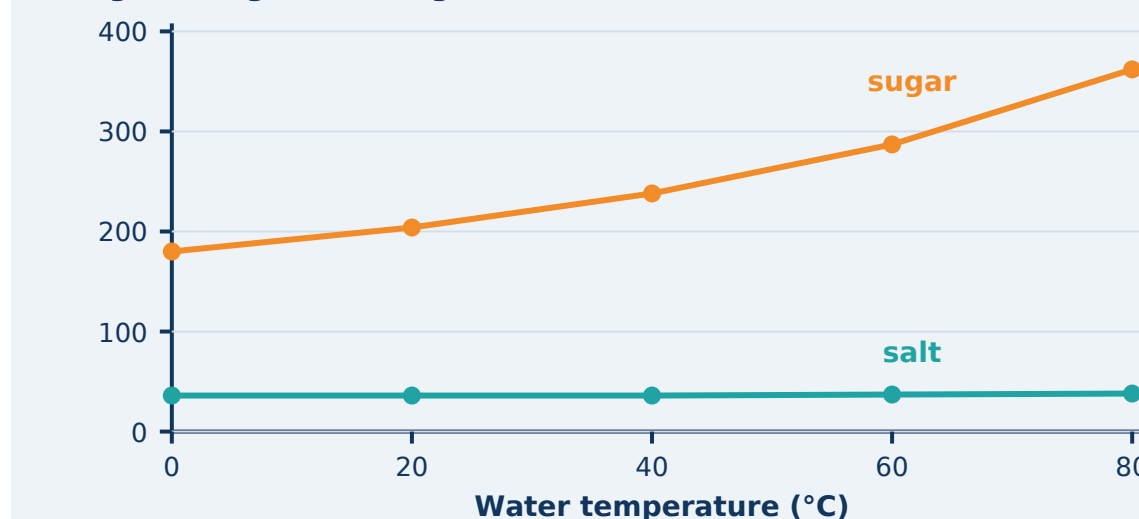
Mass of solution = 25 g + 200 g.

The solution has a mass of 225 g.

What does saturated mean?

A solvent can dissolve only a limited amount of a solute at a given temperature. When no more will dissolve, the solution is **saturated**. Any extra solute stays as undissolved solid at the bottom. The most that dissolves in 100 g of water is called the solubility. Salt barely changes with temperature, but sugar dissolves far more in hot water.

Dissolving in 100 g of water (g)



Solubility of sugar and salt in water. Values are rounded.

Worked example

At 20 °C, 100 g of water can dissolve at most 36 g of salt. Tobi adds 45 g of salt to 100 g of water at 20 °C and stirs well.

Dissolved = 36 g, so undissolved = $45\text{ g} - 36\text{ g} = 9\text{ g}$.

Mass of solution = $100\text{ g} + 36\text{ g} = 136\text{ g}$.

The solution is saturated and 9 g of salt stays undissolved.

Common mistake

Dissolving is not melting, and the solute does not disappear. Also, a solution that is clear is not always colourless: copper sulfate solution is clear and blue. Clear means you can see through it.

How can you make a solid dissolve faster?

Stirring, warming the solvent and crushing the solid into small pieces all make dissolving faster, because particles of the solvent reach the solid more often and with more energy. These changes affect the speed, not the amount in a saturated solution at the same temperature. Only temperature changes how much dissolves.

Lina's tip

If you can see through it and it looks the same everywhere, it is probably a solution. Then name the solute (the thing that dissolved) and the solvent (the liquid doing the dissolving).

Key points to remember

- Mixture: substances physically combined, each keeping its own properties.
- Homogeneous mixtures look the same throughout; heterogeneous mixtures show separate parts.
- Solution = solute dissolved in solvent; mass of solution = mass of solute + mass of

solvent.

- A saturated solution cannot dissolve any more solute at that temperature.
- Stirring, heating and crushing make dissolving faster.

Mixtures, solutions and dissolving: frequently asked questions

What is the difference between a mixture and a solution?

A mixture is any physical combination of substances. A solution is one kind of mixture in which a solute is dissolved so evenly in a solvent that the result looks uniform.

What are solute and solvent?

The solute is the substance that dissolves, such as sugar. The solvent is the substance that does the dissolving, such as water. Together they form the solution.

What does saturated mean?

A saturated solution holds as much solute as it can at that temperature. If you add more, the extra stays undissolved at the bottom of the container.

Does a dissolved solid disappear?

No. Its particles are spread out among the solvent particles, so you cannot see them, but the mass is still there. The mass of the solution equals the mass of solute plus solvent.

Is muddy water a solution?

No. Muddy water is a heterogeneous mixture because the soil particles are visible and settle at the bottom. In a solution nothing settles, and it looks the same everywhere.