



SOLUBILITY

Saturated and unsaturated solutions



Would it be possible to dissolve a limitless amount of bicarbonate of soda in a cup of water?

Solutions are made when at least one solute dissolves in a solvent and creates a homogeneous mixture. However, when we have a given amount of a solvent, there is a point where no more solute can be dissolved in it. There is a certain amount of a solute that can be dissolved in a certain amount of solvent. The maximum amount of a solute that can be dissolved in a solvent, for a given temperature and amount of solvent, is called the **solubility** of this solute in this solvent. At this point, the solution is **saturated** and if more solute is added, it will stay at the bottom of the container as a precipitate. However, if more solute can be dissolved in the solution, then the solution is **unsaturated**.



Unsaturated solution:
More solute can be dissolved in the solvent.



Saturated solution:
No more solute can be dissolved in the solvent.



Solution with a precipitate:
The solute added forms a precipitate.



Sodium nitrate is a white solid that is very soluble in water. Its solubility in 100 g of water at 20 °C is 88.3 g.

- In 200 g of water is twice 100 g of water. In 100 g of water at 20°C 88.3 g of sodium nitrate can dissolve.
- In 200 g of water: $88.3 \text{ g} \times 2 = 176.6 \text{ g}$ of sodium nitrate can dissolve.
- 50 g of water is half the amount of 100 g of water. $88.3 / 2 = 44.15 \text{ g}$ sodium nitrate can dissolve.
- Solubility is the maximum amount of a solute that can be dissolved for a solvent at this temperature and amount of solvent.
- We can tell that a solution of a solid in a liquid is saturated if we see that the solid stops dissolving.
- Salt has a solubility of 36 g at 25°C. Calcium sulphate has a solubility of 0.26 g at the same temperature.
- Since both of the solubilities for the substances are given for the same amount of water, at the same temperature, it can be said that the substance with the solubility of 910 g is more soluble in 100 g of water at 20°C.
- We will see it completely dissolve in the water since the solution will be unsaturated.
- We will see it completely dissolve in the water since the solution will be saturated.
- We will see a precipitate of potassium bromide that will not be able to dissolve at the bottom of the container since the amount of potassium bromide is greater than the maximum amount that can be dissolved.
- The type of solvent matters when it comes to solubility.
- Different substance have different solubilities in water.
- Solubility isn't affected only by temperature.
- When temperature rises, the solubility of gases doesn't rise.
- When temperature rises, the solubility of most solids also rises.
- The solubility of sodium chloride (salt) in water is the same at 0°C and at 50°C.