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**Solid solutions**

If the solvent is a [solid](https://en.wikipedia.org/wiki/Solid), then gases, liquids and solids can be dissolved.

* Gas in solids:

[Hydrogen](https://en.wikipedia.org/wiki/Hydrogen) dissolves rather well in metals, especially in [palladium](https://en.wikipedia.org/wiki/Palladium); this is studied as a means of [hydrogen storage](https://en.wikipedia.org/wiki/Hydrogen_storage).

* Liquid in solid:

[Mercury](https://en.wikipedia.org/wiki/Mercury_%28element%29) in [gold](https://en.wikipedia.org/wiki/Gold), forming an [amalgam](https://en.wikipedia.org/wiki/Amalgam_%28chemistry%29)

Water in solid salt or [sugar](https://en.wikipedia.org/wiki/Sugar), forming moist solids

[Hexane](https://en.wikipedia.org/wiki/Hexane) in [paraffin wax](https://en.wikipedia.org/wiki/Paraffin_wax)

* Solid in solid:

[Steel](https://en.wikipedia.org/wiki/Steel), basically a solution of carbon atoms in a crystalline matrix of iron atoms

[Alloys](https://en.wikipedia.org/wiki/Alloy) like [bronze](https://en.wikipedia.org/wiki/Bronze) and many others

[Polymers](https://en.wikipedia.org/wiki/Polymer) containing [plasticizers](https://en.wikipedia.org/wiki/Plasticizer)

**Solution of gases in liquids**

Solution of a gas in a liquid is the volume of the gas in ml which will dissolve in 1 ml of the liquid to form a saturated solution,the volume of the gas being measured at the temperature and pressure at which the measurement of the solubility is made .

 The following factors affect the solution:

1. Nature of gas and solvent: Gases like hydrogen,oxygen ,nitrogen etc,dissolved in water only to a small extent whereas gases like CO2,HCl,NH3 etc,are highly soluble.The greater solubility of the latter gases is due to their reaction with the solvent.

2. Effect of temperature : The solubility of gas decreases with increases in temperature .This is expected because on heating the solution of a gas ,some gas is usually expelled out of the solution .

3.Effect of Pressure : This is the most important factor influencing the solubility of a gas in a liquid at a particular temperature .It is governed by Henry’s law according to which the solubility increases with the increase of pressure .

**Henerys law**

Henry's law is one of the gas laws formulated by "At a constant temperature, the amount of a given gas that dissolves in a given type and volume of liquid is directly proportional to the partial pressure of that gas in equilibrium with that liquid." An equivalent way of stating the law is that the solubility of a gas in a liquid is directly proportional to the partial pressure of the gas above the liquid:

C=kPgas

where

* C is the solubility of a gas at a fixed temperature in a particular solvent (in units of M or mL gas/L)
* k is Henry's law constant (often in units of M/atm)
* Pgas is the partial pressure of the gas (often in units of atm)

**Limitation of Henry law:**

Henry’s law is applicable only if the following conditions are satisfied:

1. The pressure should be low and the temperature should be high i.e. the gas should be have like an ideal gas .

2. The gas should be not undergo compound formation with the solvent or association or dissociation in the solvent.