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## Supersaturated solution definition chemistry example

Solubility is defined as the maximum quantity of a substance that can be dissolved in another. It is the maximum amount of solute that can be dissolved in a solvent at equilibrium, which produces a saturated solution. When certain conditions are met, additional solute can be dissolved beyond the equilibrium solubility point, which produces a supersaturated solution. Beyond saturation or supersaturation, adding more solute does not increase the concentration of the solution. Instead, the excess solute starts to precipitate out of the solution. The process of dissolving is termed dissolution. Solubility is not the same property of matter as the rate of solution, which describes how quickly a solute dissolves in a solvent. Neither is solubility the same as the ability of a substance to dissolve another as a result of a chemical reaction. For example, zinc metal “dissolves” in hydrochloric acid through a displacement reaction that results in zinc ions in solution and the release of hydrogen gas. Zinc ions are soluble in acid. The reaction is not a matter of the solubility of zinc. In familiar cases, a solute is a solid (e.g., sugar; salt) and a solvent is a liquid (e.g., water, chloroform), but the solute or solvent might be a gas, liquid, or solid. The solvent can either be a pure substance or a mixture. The term insoluble implies a solute is poorly soluble in a solvent. In very few cases is it true that no solute dissolves. Generally, an insoluble solute still dissolves a little. While there is no hard-and-fast limit that defines a substance as insoluble, it’s common to apply a threshold where a solute is insoluble if less than 0.1 gram dissolves per 100 milliliters of solvent. If a substance is soluble at all proportions in a specific solvent, it is called miscible in it or possesses the property called miscibility. For example, ethanol and water are completely miscible with each other. On the other hand, oil and water do not mix or dissolve in each other. Oil and water are considered to be immiscible. How a solute dissolves depends on the types of chemical bonds in the solute and solvent. For example, when ethanol dissolves in water, it maintains its molecular identity as ethanol, but new hydrogen bonds form between ethanol and water molecules. For this reason, mixing ethanol and water produces a solution with a smaller volume than you would get from adding together the starting volumes of ethanol and water. When sodium chloride (NaCl) or another ionic compound dissolves in water, the compound dissociates into its ions. The ions become solvated, or surrounded by a layer of water molecules. Solubility involves dynamic equilibrium, involving opposing processes of precipitation and dissolution. Equilibrium is reached when these processes occur at a constant rate. Solubility charts and tables list the solubility of various compounds, solvents, temperature, and other conditions. The International Union of Pure and Applied Chemistry (IUPAC) defines solubility in terms of a proportion of solute to solvent. Allowable units of concentration include molarity, molality, mass per volume, mole fraction, and so on. Solubility can be influenced by the presence of other chemical species in a solution, the phases of the solute and solvent, temperature, pressure, solute particle size, and polarity. Solubility curve is basically a data-based curve that is going to inform you about the amount of solute that will dissolve in a given amount of solvent at different temperatures. The most typical graphs or solubility curves are the ones that are based on the solid and gaseous solutes that are particularly dissolved in 100 grams of water.What is Solubility?Solubility is known as the maximum amount of solute which will dissolve in a given amount of solvent at a specific given temperature and pressure. There are three different kinds of solutions which will result depending on how much of a particular solute is dissolved in the solvent.As explained above, the solubility curve is the comparison of the amount of solute dissolved in a given amount of solvent at different temperatures. Here in this article,you will learn about the solubility curve in detail, which will provide you with all the basic information, including solubility rules chart, definition of solubility curve, graph of solubility, some problems of solubility curve and the main that is the importance if this solubility curve.Solubility Curve DefinitionThe solubility curve definition chemistry is given as below:The variation in the solubility of a given substance with the change of temperature is presented by the solubility curve. The solubility curve is the curved line that is drawn on the graph that shows the relationship between the temperature and the solubility of the substance at varying temperatures.The graphical relationship between the solubility and the temperature is known as the solubility curve. The solubility curve determines the changes of the solubility of a solid at variable temperatures in a solvent. On the graph, the variations in temperature are to be plotted on the x-axis and the solubility is plotted on the y-axis. Temperature plays an important role in solubility since the solubility of a given substance is different at varying temperatures.Solubility GraphLet us now look at how the solubility graph looks. The solubility graph is shown as follows:(Image to be Uploaded soon)How to read the Solubility Curve?The solubility curve line shows you with a saturated solution. Saturated solution is basically the one with a full dissolved volume of solute in 100 grams of water. Any sim below this line is going to indicate the unsaturated solution. And all the solutions above this line shows you about the supersaturated solution. Unsaturated Solution: An Unsaturated solution is the one that contains less amount of solute as compared to the maximum amount of solute that is capable of being dissolved for forming a solution. If more solute is added and it does not dissolve then the original solute is saturated and if more solution is added and it is dissolved then the original solution is considered to be an unsaturated one that is going to be shown below the line of solubility curve.Supersaturated Solution: A chemical solution is considered as the supersaturated one only when the concentration of the solute in the solution exceeds the concentrations that is specified by the value equilibrium solubility. A supersaturated solution is basically in the metastable state. Any supersaturated solution can be brought back to its normal equilibrium state by forcing the excess solution to remove or separate from the solution.Solubility Rules ChartThe general rules of solubility are given below. Let us look at each one of them and what they are.Most of the chloride salts are soluble. However, there are some exceptions like  $\text{PbCl}_2$ ,  $\text{Hg}_2\text{Cl}_2$  and  $\text{AgCl}$ .The salts of  $\text{Na}^+$ ,  $\text{K}^+$  and  $\text{NH}_4^+$  are all soluble.All the sulfate salts are soluble. However, there are some exceptions which include  $\text{BaSO}_4$ ,  $\text{CaSO}_4$  and  $\text{PbSO}_4$ .Almost all the nitrate ( $\text{NO}_3^-$ ) salts are soluble.Almost all the hydroxide compounds are hardly soluble. The important exceptions in this category are NaOH and KOH. Barium hydroxide and calcium hydroxide, however, are moderately soluble.All the salts of sulfide, phosphate and carbonate are hardly soluble.Importance of Solubility Curve The solubility curve is used for determining the amount of substance that is deposited when the solution is cooled. Solubilities of different substances at a given temperature can be determined. The importance of solubility curves is discussed as follows.Firstly, the solubility curve will help you to predict which substance crystallizes first from the solutions containing two or more solutes. Depending upon their solubility in the solution.If you are given a substance whose solubility you need to find at a particular temperature then this solubility curve helps you.There is a particular solubility process for every substance at different temperatures and this curve is going to help you to find the solubility process of a substance at a given temperature. At a particular temperature if you are provided with a different number of substances then this solubility curve will help you to find the solubility at the same temperature.This solution will not only provide you information about the saturation of a given substance but beside this it also provides with the information of supersaturated and unsaturated solution.It gives you a clear idea of the fact that the solubility of a given substance changes with the temperature.Solubility Curve ProblemsLet us now look at some of the solubility curve problems in detail and how to solve them.Example:A solution with a precipitate of AgCl in equilibrium consists of  $1.0 \times 10^{-3}$  mol of  $[\text{Ag}^+]/\text{L}$  and  $1.3 \times 10^{-5}$  mol of  $[\text{Cl}^-]/\text{L}$ , determine the solubility product of  $[\text{AgCl}]$ .Solution: The solubility product as per the definition is the product of the concentrations of the ions that are in equilibrium with the precipitate of a sparingly soluble substance.For  $[\text{AgCl}]$ , $K_{\text{sp}} = [\text{Ag}^+][\text{Cl}^-] = (1.0 \times 10^{-3}) (1.3 \times 10^{-5}) = 1.3 \times 10^{-8}$ ConclusionVedantu has covered all the aspects of solubility curve with examples. You can practice these examples to understand practically.

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