

II) Solubility

What is a **saturated solution**?

a solution has the max amount of solute dissolved for that solvent.

How can you **recognize a saturated solution** visibly? often (most likely) there will be excess salt (precipitate) undissolved at the bottom of the container.

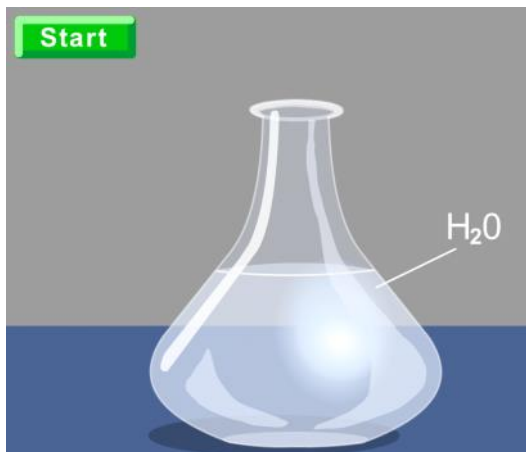
*If the **excess undissolved solute is filtered off**, you can **still have a saturated solution** with no visible undissolved solute on the bottom

What kind of system is a saturated solution? **an equilibrium system**: the rate of dissolving of the solute (s) is equal to the rate of recrystallization of the dissolved solute (aq).

Is a saturated solution static or dynamic?

dynamic: there is continuous FWD and RVS rxns occurring.

http://www.dlt.ncssm.edu/core/Chapter14-Gas_Phase-Solubility-Complex_Ion_Equilibria/Chapter14-Animations/Solubility_of_AgCl.html



<http://www.norton.com/college/chemistry/chem4/chemtours.aspx>

Chapter 4 SATURATED SOLUTIONS Introduction

A **saturated solution** is one that contains the maximum concentration of solute.

A **solution** is created when a substance (such as a sugar or a salt) is dissolved in a **solvent** (such as water). A solvent is not limitless in its ability to dissolve compounds. When it has reached capacity and can dissolve no additional solute, it is said to be saturated. Although it appears static, a saturated solution is actually a dynamic situation where molecules continually dissolve into solution and precipitate out of solution.

Real-World Connections
The dynamics of saturated solutions contribute to geological processes, such as the wearing away of rock and the formation of sediments by ocean waters. Closer to home, carbon dioxide bubbles out of soda pop because the liquid is saturated with CO₂ gas, and we encounter hard-water deposits on our faucets because minerals precipitate out of tapwater as it starts to evaporate.

Therefore, **does the amount of undissolved salt at the bottom of the solution change?**

No, because it is being dissolved as fast as it is recrystallizing. (equal rate @ equilibrium)

Write a **saturated solution** equation for KBr:

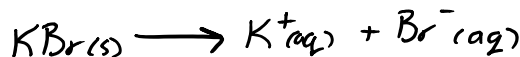
@ equilibrium



Explain the difference between the rate of dissolving and the rate of precipitation for an **unsaturated** solution: The rate of dissolving is much higher than the rate of precipitation. ∴ all solute will dissolve in solution

Write an **unsaturated equation** for KBr:

not @ equilibrium
→ more dissociation



What's another name for the equation above?

dissociation equation.

How do the **saturated** and **unsaturated** equations differ?

@ equilibrium dissociation (only)

Solubility: the solubility of a substance is a quantitative value.

What is it?

@ equilibrium dissociation

Solubility: the solubility of a substance is a quantitative value.

What is it?

The concentration of a solution, at saturation
(max. solute dissolved)

Therefore, solubility can only be measured for what types of solutions?

saturated solutions.

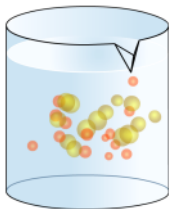
What is 'concentration' in chemical terms?

The amount of solute per unit volume of a solution

Concentration is most commonly measured using what unit?

$$\hookrightarrow \text{molarity} = \frac{\text{moles of solute}}{\text{volume (L) of solvent}} = \frac{\text{mol}}{\text{L}} \quad C = \frac{n}{V}$$

MOLARITY
Introduction



When most people think of chemistry they conjure up images of liquids being mixed together, causing some observable change.

Understanding the chemistry occurring in liquid mixtures requires knowledge of the amount, or concentration, of the compounds in the solution. This is important for understanding chemical concepts such as pH, osmotic pressure, thermodynamics, and kinetics.

https://cdn.wwnorton.com/college/chemistry/chematours/chapter_08/molarity/Interface.swf

Concentration can also be measured using mass of solute per volume of solution, as you'll see in some examples.

g/L = concentration

Every salt dissociates to some extent in water, but every salt has a different solubility in water. What does this mean?

all salts will dissolve, but each salt will have a unique concentration at saturation.

→ (good at dissolving)

Some salts can dissociate to a larger extent in water before becoming saturated. These salts are called SOLUBLE salts. Some salts dissociate only very little in water before saturating. These salts are called LOW SOLUBILITY salts.

solubility table

↳ not good at dissolving

Solubility is also temperature dependent. A general rule for solid/liquid solutions is that solubility increases with increasing temperature.

Assignment 1: Read Hebden pages 73-76 (check out the comic on p.76) and do Questions #1-5