Chemistry Level 3: Aqueous

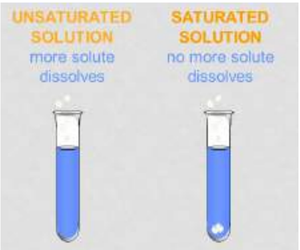
Solubility Equilibria

Summary – what you need to know!
K_c is the **equilibrium constant**
A saturated solution – no more solid will dissolve in the given amount of solvent at a fixed temperature.
K_s is the **solubility product**

$AgCl_{(s)} \leftrightharpoons Ag^{+} + Cl^{-}$
$K_s = [Ag^{+}{}_{(aq)}]\,[Cl^{-}{}_{(aq)}]$

Remember **do not include solids – knowing this we can answer question on calculating solubility or K_s**

Common ion effect
When the ionic solid dissolving and the solution share a common ion, the solubility will be reduced



Video Summaries

Predicting Precipitation

Summary – what you need to know!

IP < K_s	Unsaturated	More solid can dissolve
IP = K_s	Equilibrium	No more solid can dissolve
IP > K_s	Supersaturated	Precipitate will form

Acid-base equilibria

Summary – what you need to know!

$\boxed{pH = -log_{10}[H_3O^+{}_{(aq)}]}$

$\boxed{H_3O^+{}_{(aq)} = inverse\ \log(-pH)}$

$\boxed{K_w = [OH^-{}_{(aq)}]\,[H_3O^+{}_{(aq)}] = 10^{-14}}$

Acid – proton $(H)^+$donor
Base – proton $(H)^+$acceptor
Conjugate acid – substance formed by the donation of a proton $(H)^+$
Conjugate base – substance formed by the acceptance of a proton $(H)^+$

Amphiprotic substances can donate or accept protons. E.g.
$H_2O\ can\ accept\ a\ proton\ to\ become\ H_3O^+{}_{(aq)} or\ donate\ a\ proton\ to\ become\ OH^-{}_{(aq)}$

Strong acids – fully dissociate when in aqueous solution. $HCl_{(aq)} + H_2O_{(l)} \rightarrow H_3O^+{}_{(aq)} + Cl^-_{(aq)}$

Weak acids - partially dissociate in aqueous solution.$CH_3COOH_{(aq)} + H_2O_{(l)} \rightleftarrows CH_3COO^-_{(aq)} + H_3O^+{}_{(aq)}$

> For a **strong acid** the hydrogen ion concentration is the **same** as the concentration of the acid because it **fully dissociates**.

Video Summaries

Weak Acids and Bases

What you need to know

K_a is the **acid dissociation constant**	K_b is the **base dissociation constant**
$pK_a = -log_{10}[K_a]$	$pK_b = -log_{10}[K_b]$
$K_a = inverse \log(-pK_a)$	$K_b = inverse \log(-pK_b)$

Use K_a to calculate the pK_a, a measure of strength of acid.
The lower the pK_a the stronger the acid.

Use K_b to calculate the pK_b, a measure of strength of base.
The lower the pK_b the stronger the base.

$K_a \times K_b = 10^{-14} = K_w = [OH^-]\,[H_3O^+]$

$pOH = -log_{10}[OH^-]$

$14 - pOH = pH$

If there is a high K_a there will be a low K_b and vice versa.

I.e. the stronger the acid, the weaker its conjugate base.

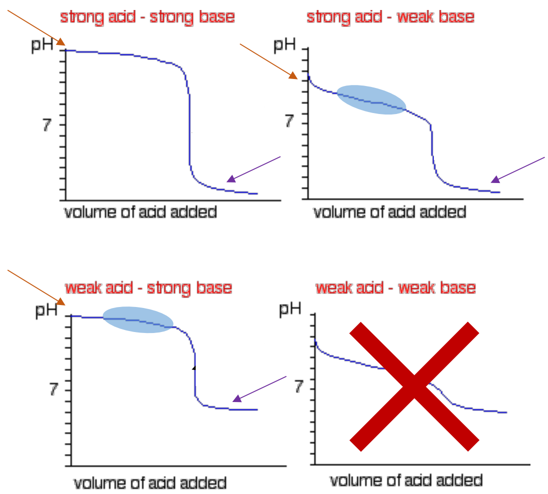
Buffer Solutions

Steps for titration calculations

1. Write the Chemical equation to determine the mole ratio
2. Calculate the amount of the known reactant
3. Calculate the amount of the unknown reactant
4. Calculate the concentration of the second reactant

Titration Curves

What you need to know



4 important pH's on the graph

1. Initial pH
2. pH at the equivalence point
3. pH after the reaction is complete
4. pH at the buffer zone