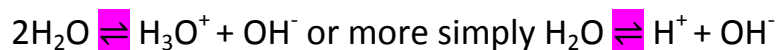


Species in solution

Don't forget the water

(After all these are aqueous solutions.....)



- This is called the self-ionisation of water **AND** $K_w = [\text{H}^+][\text{OH}^-]$
- If the solution is neutral $[\text{H}^+] = [\text{OH}^-]$
- If the solution is acidic $[\text{H}^+] > [\text{OH}^-]$
- If the solution is basic/alkaline $[\text{H}^+] < [\text{OH}^-]$

- Since $[\text{H}^+][\text{OH}^-] = 10^{-14}$ if $[\text{H}^+] \uparrow$ then the $[\text{OH}^-] \downarrow$
- (so that $[\text{H}^+] \times [\text{OH}^-] = 10^{-14}$)

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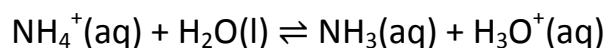
Salts e.g. NaCl, KCl, MgCl₂, MgSO₄, CH₃COONa, NH₄Cl; these dissolve completely in water and ionise completely



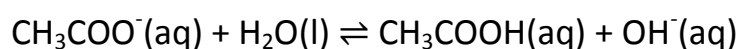
- $[\text{Na}^+] = [\text{Cl}^-] > [\text{H}_3\text{O}^+] = [\text{OH}^-]$
- pH will be 7 ($[\text{H}_3\text{O}^+] = [\text{OH}^-]$)
- will be a good conductor of electricity / good electrolyte as lots of Na⁺ & Cl⁻



- $[\text{Cl}^-] > [\text{Mg}^{2+}] > [\text{H}_3\text{O}^+] = [\text{OH}^-]$
- pH will be 7 ($[\text{H}_3\text{O}^+] = [\text{OH}^-]$)
- will be a good conductor of electricity / good electrolyte



- $\text{Cl}^- > \text{NH}_4^+ > \text{NH}_3 = \text{H}_3\text{O}^+ > \text{OH}^-$ OR
- $\text{Cl}^- \approx \text{NH}_4^+ > \text{NH}_3 = \text{H}_3\text{O}^+ > \text{OH}^-$
- pH will be less than 7 due to $\text{H}_3\text{O}^+ > \text{OH}^-$
- will be a good conductor of electricity / good electrolyte as lots of NH_4^+ & Cl^-



- $\text{Na}^+ > \text{CH}_3\text{COO}^- > \text{CH}_3\text{COOH} = \text{OH}^- > \text{H}_3\text{O}^+$ OR
- $\text{Na}^+ \approx \text{CH}_3\text{COO}^- > \text{CH}_3\text{COOH} = \text{OH}^- > \text{H}_3\text{O}^+$
- pH will be more than 7 due to $\text{OH}^- > \text{H}_3\text{O}^+$
- will be a good conductor of electricity / good electrolyte as lots of CH_3COO^- & Na^+

Strong acids e.g. HCl, HBr, HNO₃, H₂SO₄; react fully with water / fully ionise



- $\text{H}_3\text{O}^+ = \text{Cl}^- > \text{OH}^-$
- pH will be much much less than 7 (it's a strong acid!!)
- will be a good conductor of electricity / good electrolyte



- $\text{H}_3\text{O}^+ > \text{SO}_4^{2-} > \text{OH}^-$ (note: $\text{H}_3\text{O}^+ > \text{SO}_4^{2-}$ since H_2SO_4)
- pH will be much much less than 7 (it's a strong acid!!)
- will be a good conductor of electricity / good electrolyte

Strong bases e.g. NaOH, KOH, Ca(OH)₂ ; fully ionise / dissociate

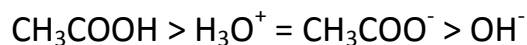


- pH will be much much more than 7 (it's a strong base!!)
- will be a good conductor of electricity / good electrolyte



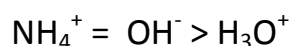
- $\text{OH}^- > \text{Ca}^{2+} > \text{H}_3\text{O}^+$
- pH will be much much more than 7 (it's a strong base!!)
- will be a good conductor of electricity / good electrolyte
- Note: Ca(OH)₂ is only slightly soluble in water but will still be more basic and a better conductor than a weak base.

Weak acids e.g. CH₃COOH, HCOOH, HOBr, HF; incomplete reaction with water



- pH will be less than 7 (it's a weak acid!!)
- will be a poor conductor of electricity / poor electrolyte

Weak bases e.g. NH₃, CH₃NH₂; incomplete reaction with water



- pH will be more than 7 (it's a weak base!!)
- will be a poor conductor of electricity / poor electrolyte