

4.13 Salts and Hydrolysis

- ① Salts dissociate 100% in water
- ② The ions from the salt will either:
 - Undergo “Hydrolysis”
 - Be Spectator Ions

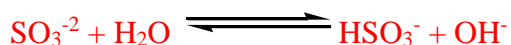
a) What is “Hydrolysis”?

- i) Reaction between an ion from the salt with water.
- ii) **The ion will react with water to form a basic solution if the ion is on the base (right) side of the Table of Relative Strengths p.334.**



Na^+ is not on the table. It is a spectator ion.

SO_3^{-2} is found on the base side



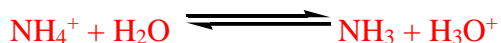
Therefore, Na_2SO_3 added to water will form a basic solution.

- iii) **The ion will react with water to form an acidic solution if the ion is on the acid (left) side of the Table of Relative Strengths p.334.**



Br^- is not on the table. It is a spectator ion.

NH_4^+ is found on the acid side



Therefore, NH_4Br added to water will form an acidic solution.

b) Spectator Ions

i) Ions that do not react with water (*not* found on Table of Relative Strengths)

ii) Most common spectator ions:

- alkali and alkaline earth metals
- Cl^- , Br^- , I^- , NO_3^- , ClO_4^-

iii) KI salt in water:



Solution is neutral because no hydrolysis occurs

c) Will the Following Salts be Acidic, Basic or Neutral in Water?

i) KF



K^+ is a spectator; F^- is found on the base side

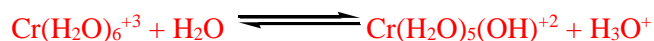


Solution is **basic**

iii) $\text{Cr}(\text{H}_2\text{O})_6\text{Br}_3$



Br^- is spectator; $\text{Cr}(\text{H}_2\text{O})_6^{+3}$ is on acid side

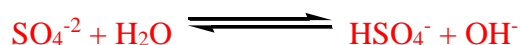


Solution is **acidic**.

ii) MgSO_4



Mg^{+2} is a spectator; SO_4^{-2} is on base side



Solution is **basic**

iv) $(\text{NH}_4)_2\text{SO}_4$



NH_4^+ is on acid side; SO_4^{-2} is on base side

Must compare whether NH_4^+ produces more H_3O^+ than SO_4^{-2} produces OH^- . (Compare K_a and K_b)

$$K_a(\text{NH}_4^+) = 5.6 \times 10^{-10}$$

$$K_b(\text{SO}_4^{-2}) = K_w / K_a(\text{HSO}_4^-)$$

$$K_b(\text{SO}_4^{-2}) = 1.0 \times 10^{-14} / 1.2 \times 10^{-2} = 8.3 \times 10^{-13}$$

$K_a > K_b$ so solution is **acidic**.