

Concentration of species in solution

We need to think about the relative concentrations of species in solution for acids and bases and salts.

For example: KNO_3

What species are present in solution excluding water?

K^+ , NO_3^- , H_3O^+ , OH^-



$\text{K}^+ = \text{NO}_3^- > \text{H}_3\text{O}^+ = \text{OH}^-$



For example:

$\text{Ca}(\text{NO}_3)_2$

What species are present in solution excluding water?

Ca^{2+} , NO_3^- , H_3O^+ , OH^-



$\text{NO}_3^- > \text{Ca}^{2+} > \text{H}_3\text{O}^+ = \text{OH}^-$



Concentration of species in solution

Neutral species have the same concentration of H_3O^+ and OH^- in solution (1×10^{-7}). Weak acids and bases have different concentrations of H_3O^+ and OH^- in solution.

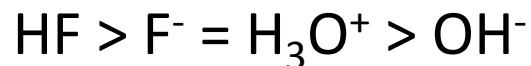
For example: HF

What species are present in solution excluding water?



HF, F^- , H_3O^+ , OH^-

What are the relative concentrations of these species?



Try: CH_3COOH , CH_3NH_2

Concentration of species in solution

Acidic and basic salts (conjugate base of a weak acid or the conjugate acid of a weak base) change the ratio of H_3O^+ and OH^- in solution because of their reaction with water after they dissolve in water.

Try: Na_2CO_3

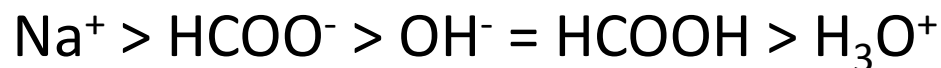
For example: HCOONa

What species are present in solution excluding water?



HCOO^- , Na^+ , OH^- , HCOOH , H_3O^+

What are the relative concentrations of these species?



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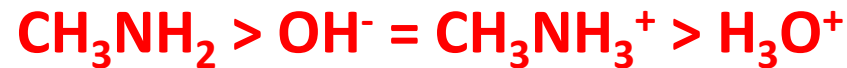
- (b) For each of the following 0.100 mol L^{-1} solutions, list all species in order of **decreasing** concentration.

Do not include water.

- (i) HCl



- (ii) CH_3NH_2



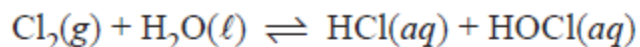
- (iii) NH_4Cl



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QUESTION ONE

When chlorine gas is added to water, the equation for the reaction is:



- (a) (i) Write an equation for the reaction of the weak acid, hypochlorous acid, HOCl, with water.

- (ii) List all the species present when HOCl reacts with water, in order of decreasing concentration.

Order of decreasing concentration:

Justify your order.

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Q	Evidence		
(Achievement	Achievement with Merit	Achievement with Excellence
(<ul style="list-style-type: none">Equation correct. OR FOUR species correctly identified.Recognises HOCl partially dissociates. OR One correct justification.	<ul style="list-style-type: none">ALL species and order correct AND partial explanation to support the order of the species.	<ul style="list-style-type: none">ALL species and order correct AND complete justification.