

Writing Excellence answers to **Concentration of Species** questions

Concentration of Species QUESTION	
<p>Question: Ethyl ammonium chloride, $\text{CH}_3\text{CH}_2\text{NH}_3\text{Cl}$, is a weak acid that will also react with water. List all the species present in a solution of $\text{CH}_3\text{CH}_2\text{NH}_3\text{Cl}$, in order of decreasing concentration. Do not include water. Justify the order you have given. Include equations, where necessary.</p>	
ANSWER	
1. write the equation for the dissociation of salt	$\text{CH}_3\text{CH}_2\text{NH}_3\text{Cl} \rightarrow \text{CH}_3\text{CH}_2\text{NH}_3^+ + \text{Cl}^-$
2. link to complete dissociation AND formation of an (spectator) ion that does not react further so will be in greatest concentration	$\text{CH}_3\text{CH}_2\text{NH}_3\text{Cl}$ completely dissociates so there will be none remaining. The chloride ion does not react further with water and so will be in the greatest concentration.
3. write the equation for the weak acid (formed from equation above) in water	$\text{CH}_3\text{CH}_2\text{NH}_3^+ + \text{H}_2\text{O} \rightleftharpoons \text{CH}_3\text{CH}_2\text{NH}_2 + \text{H}_3\text{O}^+$
4. link to partial dissociation due to being a weak acid AND most will remain so will be next in concentration	The ethanamine ion ($\text{CH}_3\text{CH}_2\text{NH}_3^+$) will react further with water in an acid-base reaction, but only partially as it is a weak acid, leaving it the next in the series.
5. Explain H_3O^+ ions are formed during reaction in same quantity as conjugate PLUS small contribution from water AND so will be next in concentration	For every mole of $\text{CH}_3\text{CH}_2\text{NH}_3^+$ that reacts with water, 1 mole of $\text{CH}_3\text{CH}_2\text{NH}_2$ and H_3O^+ are formed. However, H_3O^+ is slightly more concentrated than $\text{CH}_3\text{CH}_2\text{NH}_2$, as there is a small contribution from water $\text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$
6. Explain conjugate base are formed during reaction in same quantity as H_3O^+ AND so will be next in concentration (but both H_3O^+ ions and conjugate will be at smaller concentration to acid as only weak acid)	Next in concentration is $\text{CH}_3\text{CH}_2\text{NH}_2$. Both $\text{CH}_3\text{CH}_2\text{NH}_3^+$ and H_3O^+ will be at lower concentration than $\text{CH}_3\text{CH}_2\text{NH}_3^+$ due to it being a weak acid
7. Finally Explain OH^- ions present in small amounts from water dissociation only AND so will be last in concentration	OH^- is present in the lowest concentration as this comes from the dissociation of water only.
8. list species in order	$\text{Cl}^- > \text{CH}_3\text{CH}_2\text{NH}_3^+ > \text{H}_3\text{O}^+ > \text{CH}_3\text{CH}_2\text{NH}_2 > \text{OH}^-$

NOTE: The white column is how your answer would appear on your test paper so make sure you **write out complete sentences**. The grey area is just to help you structure your answer and would not appear in the question.