

Writing Excellence answers to **Conductivity and Ions** questions

Conductivity and Ions QUESTION

Question: The table shows the pH and electrical conductivity of three solutions. The concentrations of the solutions are the same. Compare and contrast the pH and electrical conductivity of these three solutions. Include appropriate equations in your answer.

Solution	NaOH	CH ₃ NH ₂	CH ₃ COONa
pH	13.2	11.9	8.98
Electrical conductivity	good	poor	good

ANSWER

1. Identify each solution as either being a weak or strong acid or base (or salt) linked to the pH (and presence of ions)	<p>NaOH is an ionic solid that is a strong base (pH 13.2) CH₃NH₂ is a weak base (pH 11.9) CH₃COONa is an ionic solid that dissociates completely in H₂O. The CH₃COO⁻ ion is a weak base (pH 8.98)</p>
2. State requirements for conductivity	In order to conduct electricity there needs to be the presence of free moving charged particles . The more charged particles there are available the better conductivity there will be. Ions in solution provide the charged particle.
3. Solution NaOH (pH 13.2) <u>Write equation</u> AND link ions formed to conductivity and level of dissociation	<p>NaOH → Na⁺ + OH⁻ NaOH is an ionic solid that is a strong base and dissociates completely to produce a high OH⁻ concentration (low [H₃O⁺]).</p>
4. pH Solution NaOH (pH 13.2) Link amounts of H ₃ O ⁺ / OH ⁻ ions to pH	Since [OH ⁻] is high / [H ₃ O ⁺] is low, the pH is high (pH 13.2)
5. Solution CH₃NH₂ (pH 11.9) <u>Write equation</u> AND link ions formed to conductivity and level of dissociation	<p>CH₃NH₂ + H₂O ⇌ CH₃NH₃⁺ + OH⁻ CH₃NH₂ is a weak base that partially reacts / dissociates / ionises with H₂O producing a lower concentration of OH⁻,</p>
6. pH Solution CH₃NH₂ (pH 11.9) Link amounts of H ₃ O ⁺ / OH ⁻ ions to pH (compared to previous solution)	Since [OH ⁻] is higher than [H ₃ O ⁺] the pH is above 7 (pH 11.9) but it still has a lower pH than NaOH:
7. Solution CH₃COONa (pH 8.98) Equation 1. [salt dissociation] <u>Write equation</u> AND link ions formed to conductivity and level of dissociation	<p>CH₃COONa ⇌ CH₃COO⁻ + Na⁺ The CH₃COONa is an ionic solid that dissociates completely in H₂O. with a high ion concentration</p>
8. Solution CH₃COONa (pH 8.98) Equation 2. [acid reaction] <u>Write equation</u> AND link ions formed to conductivity and level of dissociation	<p>CH₃COO⁻ + H₂O ⇌ CH₃COOH + OH⁻ The CH₃COO⁻ ion is a weak base that partially reacts / dissociates / ionises with H₂O producing a lower concentration of OH⁻.</p>
9. pH Solution H₃COONa (pH 8.98) Link amounts of H ₃ O ⁺ / OH ⁻ ions to pH (compared to previous solution)	There are slightly more [OH ⁻] ions than [H ₃ O ⁺] The pH is closer to 7, (pH 8.98) showing it is the weakest base. Therefore it has a lowest pH

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.