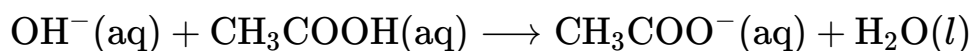


Identifying the Incorrect Statement

<https://gemini.google.com/app/b540354f910e94ce>

Response: To determine which statement is **incorrect**, let's analyze each option step-by-step:

- **Statement (1):** $\text{NH}_3(\text{aq})/\text{NH}_4\text{Cl}(\text{aq})$ is a basic buffer solution. Buffer solutions resist changes in pH upon the addition of a small amount of a strong acid or base. Therefore, adding a small amount of $0.10 \text{ mol dm}^{-3} \text{HCl}(\text{aq})$ will only cause a negligible change in pH, retaining it close to its initial basic pH (~ 9). A drop from pH 9 to pH 1 implies complete destruction of the buffer and a massive shift to a highly acidic solution, which does not happen with a small amount of acid. **Thus, statement (1) is incorrect.**
- **Statement (2):** Pure water ($\text{H}_2\text{O}(\text{l})$) has no buffering capacity and an initial pH of around 7. Dropwise addition of $0.10 \text{ mol dm}^{-3} \text{NaOH}(\text{aq})$ introduces strong hydroxide ions (OH^-), rapidly driving up the pH towards 12. **This statement is correct.**
- **Statement (3):** $\text{CH}_3\text{COOH}(\text{aq})/\text{CH}_3\text{COONa}(\text{aq})$ is an acidic buffer solution. Adding a small amount of strong base ($0.10 \text{ mol dm}^{-3} \text{NaOH}$) results in an insignificant change in pH. **This statement is correct.**
- **Statement (4):** When $\text{NaOH}(\text{aq})$ is added to an acidic buffer, the added $\text{OH}^-(\text{aq})$ ions are neutralized by the weak acid component (CH_3COOH) according to the reaction:



This statement is correct.

- **Statement (5):** $0.10 \text{ mol dm}^{-3} \text{NH}_3(\text{aq})$ is a weak base with an initial pH around 11. Titrating or adding $0.10 \text{ mol dm}^{-3} \text{HCl}(\text{aq})$ past the equivalence point until an excess of strong acid is present lowers the pH to around 2. **This statement is correct.**

Incorrect statement: (1)
