Question 21 (3 marks)

A 0.001 mol L\(^{-1}\) solution of hydrochloric acid and a 0.056 mol L\(^{-1}\) solution of ethanoic acid both have a pH of 3.0.

Why do both solutions have the same pH?

Hydrochloric acid is a strong acid, meaning it completely ionises in solution. Ethanoic acid is a weak acid and incompletely ionises in solution. Therefore, the ethanoic acid solution has a higher concentration of \(\text{CH}_3\text{COO}^-\) compared to a 0.001 M HCl due to its incomplete ionisation. It has the same pH as HCl.