- In a standard acid-base titration, 25.00 mL of 0.1043 M NaOH solution was found to react exactly with 28.45 mL of an HCl solution of unknown concentration. What is the pH of the unknown HCl solution at 25 °C?

The reaction follows the equation $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$ so that the number of moles of H^+ that reacts is equal to the number of moles of OH^-.

For OH^-:

   number of moles = concentration × volume
   = 0.1043 mol L^{-1} × 0.02500 L = 0.002608 mol

This is equal to the number of moles of $H^+(aq)$ in 28.45 mL, so:

   concentration of $H^+(aq)$ = number of moles / volume
   = 0.002608 mol / 0.02845 L = 0.9165 mol L^{-1}

Using pH = $-\log_{10}[H^+(aq)]$:

   pH = $-\log_{10}(0.9165)$ = 1.04

pH = **1.04**