1 Identify the Bronsted-Lowry acid in this reaction. $H_2O + HCO_3^- \rightarrow H_3O^+ + CO_3^{2-}$

HCO_3^-

2 Calculate the pH of the solution formed when 50 cm^3 of 0.400 mol dm^{-3} sulfuiric acid is added to 25 cm^3 of 0.500 mol dm^{-3} sodium hydroxide solution

mol H^+ = 2 x 0.400 x $\frac{50}{1000}$ = 0.0400

mol OH^- = 0.500 x $\frac{25}{1000}$ = 0.0125

XS mol H^+ = 0.0400 – 0.0125 = 0.0275

XS $[H^+]$ = $\frac{0.0275}{\frac{75}{1000}}$ = 0.367

pH = –log$[H^+]$ = –log 0.367 = 0.44

3 Calculate the pH of the solution formed when 5.00 g of sodium hydroxide is dissolved in water to form 250 cm^3 of solution.

mol NaOH = 0.500 x $\frac{5.00}{40.0}$ = 0.125

$[OH^-]$ = $\frac{0.125}{\frac{250}{1000}}$ = 0.500

$[H^+]$ = $\frac{Kw}{[OH^-]}$ = $\frac{10^{-14}}{0.500}$ = 2.0×10^{-14}

pH = –log$[H^+]$ = –log 2.0×10^{-14} = 13.70

4 Calculate the pH of water at 40°C given that $K_w = 2.92 \times 10^{-14}$. Explain whether the water is neutral.

$[H^+]$ = $\sqrt{K_w}$ = $\sqrt{2.92 \times 10^{-14}}$ = 1.71×10^{-7}

pH = –log$[H^+]$ = –log 1.71×10^{-7} = 6.77