S4 Chemistry Quiz

1. The following table shows some information about solutions A and B.

	Solution A	Solution B
Acid present	Hydrochloric acid	Ethanoic acid
рН	2.0	2.0
Concentration of the acid	x mol dm ⁻³	y mol dm⁻³

- (a) Equal volumes of 0.01 mol dm⁻³ sodium carbonate solution are added to two test tubes containing equal volumes of solutions A and B separately.
 - (i) Write an ionic equation for the reaction involved.
 - (ii) Compare the rates of reaction in the two test tubes. Explain your answer.
- (b) Calculate the value of x for solution A.
- (c) Is the value of y larger, the same or smaller than that of x? Explain your answer with the aid of the equation for the ionization of ethanoic acid.
- 2. Excess magnesium ribbon was dropped into a conical flask containing 25.0 cm³ of 0.50 M hydrochloric acid and 25.0 cm³ of 0.50 M ethanoic acid respectively.
 - (a) Write chemical equation for the reactions involved.
 - (b) Calculate the volume of gas produced at R.T.P. in each case.

[Molar volume of gas = 24.0 dm³ mol⁻¹]

Suggested Answer

- 1. (a) (i) $2H^+(aq) + CO_3^{2-}(aq) \longrightarrow CO_2(g) + H_2O(I)$
 - (ii) The rates of reactions are the same.
 The two solutions have the same concentration of H⁺(aq).
 - (b) $2.0 = -\log x$ x = 0.010
 - (c) The value of y is larger than that of x. $CH_3COOH(aq) \rightleftharpoons CH_3COO^-(aq) + H^+(aq)$ The concentration of H⁺(aq) (and that of CH₃COO⁻(aq)) in solution B is 0.01 mol dm⁻³. As ethanoic acid ionizes only slightly in water, the concentration of CH₃COOH(aq) must be higher than that of H⁺(aq).
- 2. Excess magnesium ribbon was dropped into a conical flask containing 25.0 cm³ of 0.50 M hydrochloric acid and 25.0 cm³ of 0.50 M ethanoic acid respectively.
 - (a) Write chemical equation for the reactions involved.
 - (b) Calculate the volume of gas produced at R.T.P. in each case.
 - [Molar volume of gas = 24.0 dm³ mol⁻¹]
 - (a) $Mg(s) + 2HCI(aq) \longrightarrow MgCI_2(aq) + H_2(g)$ $Mg(s) + 2CH_3COOH(aq) \longrightarrow (CH_3COO^-)_2Mg^{2+}(aq) + H_2(g)$
 - (b) For HCI(aq) No. of mole of HCI = $0.5 \times 0.025 = 0.0125$ No. of mole of H₂ = $0.0125 / 2 = 6.25 \times 10^{-3}$ Volume of H₂ = $6.25 \times 10^{-3} \times 24 = 0.15$ dm³

For CH₃COOH(aq) No. of mole of CH₃COOH = $0.5 \times 0.025 = 0.0125$ No. of mole of H₂ = $0.0125 / 2 = 6.25 \times 10^{-3}$ Volume of H₂ = $6.25 \times 10^{-3} \times 24 = 0.15$ dm³

Remark: No matter strong or weak acid / alkali, they produce the same amount of products.