

Essential Pre-Uni Chemistry J5.1



Sodium dihydrogenphosphate has a $\text{p}K_{\text{a}}$ value of 7.2. Give the pH of a buffer formed by mixing equal amounts of sodium dihydrogenphosphate and disodium hydrogenphosphate in aqueous solution.

Essential Pre-Uni Chemistry J5.2

A Level



Propanoic acid has a pK_a value of 4.9 and is highly soluble in water. If 200 cm^3 of propanoic acid solution at 2.0 mol dm^{-3} is treated with 800 cm^3 of potassium propanoate solution at 1.0 mol dm^{-3} , give the pH of the resulting buffer.

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Essential Pre-Uni Chemistry J5.3

A Level



Given that benzoic acid has a K_a of $6.3 \times 10^{-5} \text{ mol dm}^{-3}$, calculate the pH of a buffer containing equal amounts of benzoic acid and sodium benzoate.

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Essential Pre-Uni Chemistry J5.4

A Level

Part A (a)

Given that methanoic acid has a K_a of $1.6 \times 10^{-4} \text{ mol dm}^{-3}$, calculate the pH of a solution containing 25 mmol of methanoic acid and 40 mmol of potassium methanoate.

Part B (b)

Given that methanoic acid has a K_a of $1.6 \times 10^{-4} \text{ mol dm}^{-3}$, calculate the pH of a solution containing 0.40 mol of methanoic acid and 0.32 mol of magnesium methanoate.

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Essential Pre-Uni Chemistry J5.5

A Level**Part A (a)**

Given that methanoic acid has a K_a of $1.6 \times 10^{-4} \text{ mol dm}^{-3}$, calculate the pH obtained when 100 cm^3 of 0.25 mol dm^{-3} methanoic acid is treated with 10 cm^3 of 0.50 mol dm^{-3} sodium hydroxide.

Part B (b)

Given that methanoic acid has a K_a of $1.6 \times 10^{-4} \text{ mol dm}^{-3}$, calculate the pH of the solution obtained when 1.7 g of sodium methanoate is dissolved in 40 cm^3 of 0.10 mol dm^{-3} hydrochloric acid.

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Essential Pre-Uni Chemistry J5.6

A Level



Calculate the volume of 2.00 mol dm^{-3} KOH that should be added to 60.0 cm^3 of 1.00 mol dm^{-3} H_3PO_4 to make a buffer solution of pH 2.00, given the $\text{p}K_{\text{a}}$ of phosphoric(V) acid is 2.10.

(Hint: work out the quantity in moles of acid used and then alkali required, rather than trying to use concentrations throughout.)

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Essential Pre-Uni Chemistry J5.8



A buffer solution made from "CHES" has a pH of 8.8 and contains $300\ \mu\text{mol}$ of "CHES" and $95\ \mu\text{mol}$ of its conjugate base.

Calculate the $\text{p}K_{\text{a}}$ of CHES.

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Essential Pre-Uni Chemistry J5.9

A Level



A buffer made from "hexamine" containing $0.00250 \text{ mol dm}^{-3}$ of hexamine and $0.00180 \text{ mol dm}^{-3}$ of its conjugate acid has a pH of 5.03. Calculate the pK_b of hexamine.

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Essential Pre-Uni Chemistry J5.10

A Level

A buffer of pH 7.8 is prepared by taking 200 cm^3 of 0.020 mol dm^{-3} "tris" solution and adding dilute hydrochloric acid from a burette until the pH is correct. If this requires 1.35 cm^3 of 2.0 mol dm^{-3} HCl(aq) , calculate the $\text{p}K_{\text{a}}$ of the conjugate acid of "tris".

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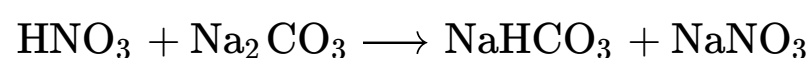
Essential Pre-Uni Chemistry J5.7

A Level

N.B. This question is significantly harder

Calculate the mass of sodium carbonate decahydrate, $\text{Na}_2\text{CO}_3 \cdot 10 \text{H}_2\text{O}$, that should be added to 2.5 dm^3 of 0.40 mol dm^{-3} nitric acid to make a buffer of pH 10.5, given that the $\text{p}K_{\text{a}}$ of hydrogencarbonate is 10.3.

Assume: (1) That no CO_2 is given off in the reaction. (2) That the nitric acid just determines the hydrogencarbonate concentration and does not participate in the buffer, so that the hydrogencarbonate concentration is obtained from the reaction,



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