Essential Pre-Uni Chemistry J2.4

A Level

Part A (a)

Calculate the pH of a $0.012\,\mathrm{mol\,dm^{-3}}$ solution of HCl.

Part B (b)

Calculate the pH of a $0.030\,\mathrm{mol\,dm^{-3}}$ solution of sulfuric acid. (For the purpose of this question, assume that sulfuric acid dissociates fully.)

Part C (c)

Calculate the concentration of a solution of nitric acid with $\mathrm{pH} = 2.1$.

Part D **(d)**

Calculate the concentration of a solution of sulfuric acid with a pH of 4.7. (For the purpose of this question, assume that sulfuric acid dissociates fully.)

Essential Pre-Uni Chemistry J2.5

A Level

Part A **(a)**

Calculate the concentration of a solution of barium hydroxide with a pH of 9.5.

Part B **(b)**

Calculate the pH of a $0.0800\,\mathrm{mol\,dm^{-3}}$ solution of KOH.

Essential Pre-Uni Chemistry J2.9

A Level

$50.0\,\mathrm{cm}^3$ of a solution of $0.200\,\mathrm{mol\,dm}^{-3}$ nitric acid is mixed with $200\,\mathrm{cm}^3$ of a solution of $0.160\,\mathrm{mol\,dm}^{-3}$ potassium hydroxide. Calculate the pH of the resulting mixture.

Essential Pre-Uni Chemistry J3.2

A Level

Species	$K_a \,/\, \mathrm{mol\,dm^{-3}}$
Benzoic acid	6.3×10^{-5}
Hydrogen sulfide	8.9×10^{-8}
Iron(III)	6.0×10^{-3}
Methanoic acid	1.6×10^{-4}
Sulfuric(IV) acid	1.5×10^{-2}
Boric acid	5.8×10^{-10}

Calculate the concentration of a solution of benzoic acid with a pH of 3.2.

Essential Pre-Uni Chemistry J3.6

A Level

Calculate the K_a of an acid, HA, with a pH of 5.0 when its concentration is $0.20\,\mathrm{mol\,dm^{-3}}$.

Essential Pre-Uni Chemistry J3.9

A Level

Species	$K_a \,/\, \mathrm{mol\,dm^{-3}}$
Benzoic acid	6.3×10^{-5}
Hydrogen sulfide	8.9×10^{-8}
Iron(III)	6.0×10^{-3}
Methanoic acid	1.6×10^{-4}
Sulfuric(IV) acid	1.5×10^{-2}
Boric acid	5.8×10^{-10}

Sulfur dioxide dissolves in water to give sulfuric(IV) acid: $\mathrm{SO_2\,(g) + H_2O\,(l) \rightleftharpoons H_2SO_3\,(aq)}$. Calculate the RTP volume of sulfur dioxide required to reduce the pH of a lake of volume $0.40\,\mathrm{km^3}$ from 7.0 to 6.0.

Essential Pre-Uni Chemistry J5.2

A Level

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

Essential Pre-Uni Chemistry J5.4

A Level

Part A (a)

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

Part B (b)

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

Essential Pre-Uni Chemistry J5.5

A Level

Part A (a)

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

Part B (b)

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

Essential Pre-Uni Chemistry J5.10

A Level

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