InkChemistry

QUESTION WORKBOOK

Buffer solutions and buffer calculations

Acids and bases · Unit C11

AQA 3.1.12.6 · OCR A 5.1.3

14 questions · 48 marks

PRINT EDITION

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SECTION B · Standard, 3 to 5 marks

B1 BS-Q16

Calculate the solubility of lead(II) iodide, PbI_2, in water at 298 K, in mol dm^{-3}, given that Ksp = 9.80×10^{-9} mol^3 dm^{-9}, and give the expression for its Ksp with its units. [5]

B2 BS-Q7

Explain, with equations, how a solution of ammonia and ammonium chloride acts as a buffer. [4]

B3 BS-Q1

State what is meant by a buffer solution, and give two different ways of making an acidic buffer from ethanoic acid. [3]

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B4 BS-Q3 Identify which of these mixtures is a buffer: (A) hydrochloric acid with sodium chloride; (B) ammonia with ammonium chloride. Give reasons for your choice. [3]

B5 BS-Q4 Calculate the ratio $[CH_3COO^-]/[CH_3COOH]$ needed to make an ethanoic acid buffer of pH 4.50, and state the pH of the buffer when the ratio is 1. $K_a = 1.74 \times 10^{-5}$ mol dm^{-3}. [3]

B6 BS-Q8 Explain why diluting a buffer with water changes its pH very little, and why the diluted buffer is less useful. [3]

B7 BS-Q9 Calculate the pH of a buffer that is 0.200 mol dm^{-3} in propanoic acid and 0.100 mol dm^{-3} in sodium propanoate. $K_a = 1.35 \times 10^{-5}$ mol dm^{-3}. [3]

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B8
BS-Q13

Suggest how the carbonic acid–hydrogencarbonate buffer keeps the pH of blood close to 7.4 when muscles release lactic acid during hard exercise, and what the body does with the product. [3]

B9
BS-Q14

Suggest why a buffer of 0.00100 mol dm^{-3} ethanoic acid and 0.00100 mol dm^{-3} sodium ethanoate would be of little use for holding the pH of a reaction that releases 0.0100 mol dm^{-3} of H^+, and how the buffer should be changed. [3]

B10
BS-Q15

Evaluate the statement: 'A buffer keeps the pH of a solution constant, whatever is added to it.' [3]

B11
BS-Q17

Deduce whether a precipitate of silver chloride forms when equal volumes of 2.0×10^{-4} mol dm^{-3} silver nitrate and 2.0×10^{-4} mol dm^{-3} sodium chloride are mixed at 298 K. $K_{sp}(AgCl) = 1.80 \times 10^{-10}$ mol^2 dm^{-6}. [3]

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B12 BS-Q18 Explain why silver chloride is much less soluble in 0.100 mol dm^{-3} sodium chloride than in pure water. [3]

B13 BS-Q19 Suggest why a suspension of barium sulfate, Ksp = 1.1 × 10^{-10} mol^2 dm^{-6}, can be swallowed before an X-ray of the gut although barium ions are toxic, and why adding a little sodium sulfate to the suspension would make it safer still. [3]

SECTION C · Long, 6 marks or more

C1 BS-Q2 Explain, with equations, how a solution of propanoic acid and sodium propanoate resists a change in pH when a small amount of acid or of alkali is added, and why it stops working when a large amount is added. [6]

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