
HL Paper 1

Which mixtures act as buffer solutions?

- I. 100 cm³ 0.1 mol dm⁻³ ethanoic acid and 100 cm³ 0.1 mol dm⁻³ sodium ethanoate
 - II. 100 cm³ 0.1 mol dm⁻³ ethanoic acid and 50 cm³ 0.1 mol dm⁻³ sodium hydroxide
 - III. 100 cm³ 0.1 mol dm⁻³ ethanoic acid and 100 cm³ 0.5 mol dm⁻³ sodium hydroxide
- A. I and II only
 - B. I and III only
 - C. II and III only
 - D. I, II and III

Markscheme

A

Examiners report

[N/A]

A buffer solution is formed by mixing equal volumes of 1.00 mol dm⁻³ propanoic acid and 0.500 mol dm⁻³ potassium propanoate.

What is the concentration, in mol dm⁻³, of [H⁺(aq)] in this buffer solution? (*K*_a for propanoic acid is 1.30 × 10⁻⁵.)

- A. 2.60 × 10⁻⁵
- B. 1.95 × 10⁻⁵
- C. 1.30 × 10⁻⁵
- D. 0.650 × 10⁻⁵

Markscheme

A

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This proved to be answered correctly by fewest candidates (37.59%) with many choosing option D, reversing [HA] and [A⁻].

The pK_a of ethanoic acid is 4.8 at 298 K. Which combination will produce a buffer solution with a pH of 4.8 at 298 K?

- A. 20.0 cm³ of 1.0 mol dm⁻³ CH₃COOH and 10.0 cm³ of 1.0 mol dm⁻³ NaOH
- B. 20.0 cm³ of 1.0 mol dm⁻³ CH₃COOH and 20.0 cm³ of 1.0 mol dm⁻³ NaOH
- C. 10.0 cm³ of 1.0 mol dm⁻³ CH₃COOH and 20.0 cm³ of 1.0 mol dm⁻³ NaOH
- D. 14.8 cm³ of 1.0 mol dm⁻³ CH₃COOH and 10.0 cm³ of 1.0 mol dm⁻³ NaOH

Markscheme

A

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[N/A]

Which mixture will form a buffer in aqueous solution?

- A. 0.10 mol NH₃ + 0.20 mol HCl
- B. 0.10 mol NH₃ + 0.20 mol NaOH
- C. 0.10 mol NaOH + 0.20 mol KCl
- D. 0.20 mol NH₃ + 0.10 mol HCl

Markscheme

D

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[N/A]
