

Strong and weak acids, bases and pH

AP Chemistry · Test

Name: _____ Date: _____ Class: _____ Mark: ____ / 20

Answer all questions. Show your working and give pH values to two decimal places. A calculator is allowed. Use $K_a(\text{CH}_3\text{COOH}) = 1.8 \times 10^{-5}$ and $K_w = 1.0 \times 10^{-14}$ unless the question gives other data.

Level: AP Chemistry · **Curriculum:** AP Chem Unit 8

Time: 45 minutes · 8 questions · Total: 20 marks · Calculator allowed

Question 1 Brønsted-Lowry base (2 marks)

- Define a Brønsted-Lowry base. (1 mark)
- State the conjugate acid of NH_3 . (1 mark)

Question 2 Strong acid pH (2 marks)

Kofi dissolves hydrogen iodide in water to give $0.0042 \text{ mol/dm}^3 \text{ HI(aq)}$. Determine the pH of the solution. (2 marks)

Question 3 Weak acid calculation (3 marks)

Calculate the pH of $0.250 \text{ mol/dm}^3 \text{ CH}_3\text{COOH}$, $K_a = 1.8 \times 10^{-5}$. (3 marks)

Question 4 Equal neutralisation (2 marks)

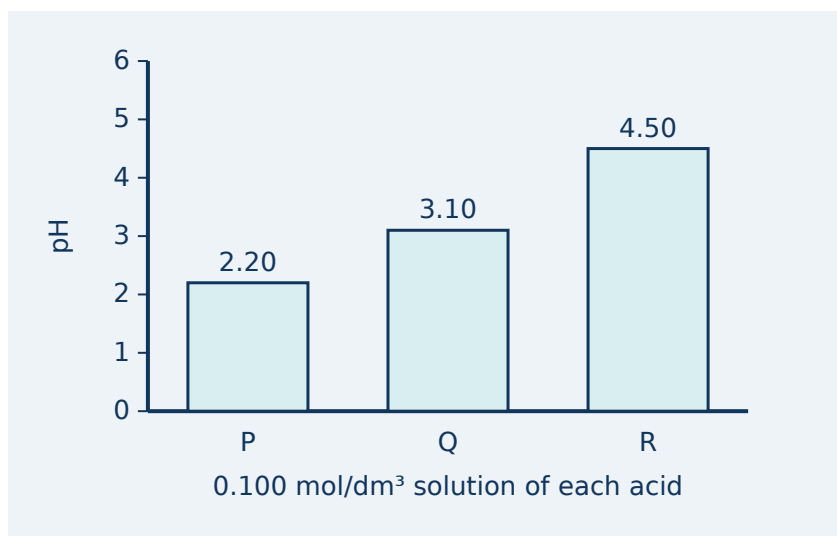
$0.10 \text{ mol/dm}^3 \text{ HCl}$ and $0.10 \text{ mol/dm}^3 \text{ HF}$ have different pH values, yet 20.0 cm^3 of each needs the same volume of NaOH . Explain both observations. (2 marks)

Question 5 Weak base calculation (3 marks)

- Calculate the pH of $0.150 \text{ mol/dm}^3 \text{ NH}_3$, $K_b = 1.8 \times 10^{-5}$. (2 marks)
- Calculate K_a of NH_4^+ . (1 mark)

Question 6 Comparing pH values (2 marks)

Solution A has pH 3 and solution B has pH 5. Calculate how many times larger $[\text{H}_3\text{O}^+]$ is in A and state which is more acidic. (2 marks)

Question 7 Ranking three acids (3 marks)

Measured pH of three weak acids at the same concentration.

- Rank the acids from strongest to weakest. (1 mark)
- Calculate K_a of acid P. (2 marks)

Question 8 Acidic and basic salts (3 marks)

Write ionic equations to explain why a solution of NH_4Cl is acidic and a solution of CH_3COONa is basic. (3 marks)