

Q1.

Which statement about pH is correct?

- A The pH of a weak base is independent of temperature.
- B At temperatures above 298 K, the pH of pure water is less than 7.
- C The pH of 2.0 mol dm⁻³ nitric acid is approximately 0.30
- D The pH of 0.10 mol dm⁻³ sulfuric acid is greater than that of 0.10 mol dm⁻³ hydrochloric acid.

(Total 1 mark)

Q2.

A 0.10 mol dm⁻³ aqueous solution of an acid is added slowly to 25 cm³ of a 0.10 mol dm⁻³ aqueous solution of a base.

Which acid–base pair has the highest pH at the equivalence point?

- A CH₃COOH and NaOH
- B CH₃COOH and NH₃
- C HCl and NaOH
- D HCl and NH₃

(Total 1 mark)

Q3.

Which is the concentration of NaOH(aq), in mol dm⁻³, that has pH = 14.30?

$$K_w = 1.00 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6} \text{ at } 25 \text{ }^\circ\text{C}$$

- A -1.16
- B 5.01×10^{-15}
- C 2.00×10^{14}
- D 2.00

(Total 1 mark)

Q4.

Which indicator should be used in a titration to find the concentration of a solution of methylamine using $0.010 \text{ mol dm}^{-3}$ hydrochloric acid?

- | | | | |
|---|------------------|---------------------|--------------------------|
| A | Thymol blue | (pH range 1.2–2.8) | <input type="checkbox"/> |
| B | Bromophenol blue | (pH range 3.0–4.6) | <input type="checkbox"/> |
| C | Phenol red. | (pH range 6.8–8.4) | <input type="checkbox"/> |
| D | Phenolphthalein | (pH range 8.3–10.0) | <input type="checkbox"/> |

(Total 1 mark)**Q5.**

2,4,6-Trichlorophenol is a weak monoprotic acid, with $K_a = 2.51 \times 10^{-8} \text{ mol dm}^{-3}$ at 298 K.

What is the concentration, in mol dm^{-3} , of hydrogen ions in a $2.00 \times 10^{-3} \text{ mol dm}^{-3}$ solution of 2,4,6-trichlorophenol at 298 K?

- | | | |
|---|------------------------|--------------------------|
| A | 5.02×10^{-11} | <input type="checkbox"/> |
| B | 7.09×10^{-6} | <input type="checkbox"/> |
| C | 1.26×10^{-5} | <input type="checkbox"/> |
| D | 3.54×10^{-3} | <input type="checkbox"/> |

(Total 1 mark)**Q6.**

What is the pH of a 0.46 mol dm^{-3} solution of potassium hydroxide at 298 K?

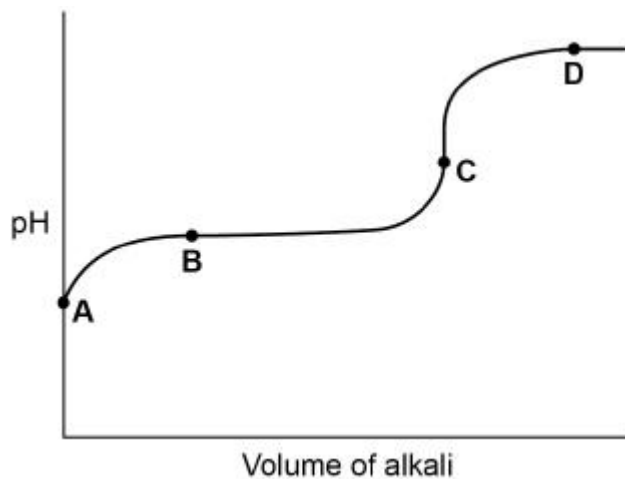
($K_w = 1.0 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$ at 298 K)

- | | | |
|---|-------|--------------------------|
| A | 0.34 | <input type="checkbox"/> |
| B | 13.66 | <input type="checkbox"/> |
| C | 13.96 | <input type="checkbox"/> |
| D | 14.34 | <input type="checkbox"/> |

(Total 1 mark)

Q7.

The diagram shows a pH curve produced by adding a strong alkali to a weak acid.



Which point on the curve represents a solution that can act as a buffer?

- A
- B
- C
- D

(Total 1 mark)

Q8.

The rate equation for the acid-catalysed reaction between iodine and propanone is:

$$\text{rate} = k [\text{H}^+] [\text{C}_3\text{H}_6\text{O}]$$

The rate of reaction was measured for a mixture of iodine, propanone and sulfuric acid at pH = 0.70

In a second mixture the concentration of the sulfuric acid was different but the concentrations of iodine and propanone were unchanged. The new rate of reaction was a quarter of the original rate.

What was the pH of the second mixture?

- A** 1.00
- B** 1.30
- C** 1.40
- D** 2.80

(Total 1 mark)

Q9.

The table shows the $\text{p}K_{\text{a}}$ values for two acids.

Name of acid	$\text{p}K_{\text{a}}$
Propanoic acid	4.87
Butanoic acid	4.82

Which statement is correct?

- A** Propanoic acid is a stronger acid than butanoic acid.
- B** The value of K_{a} for propanoic acid is greater than that for butanoic acid.
- C** The value of K_{a} for propanoic acid is $1.35 \times 10^{-5} \text{ mol dm}^{-3}$
- D** The value of K_{a} for butanoic acid is $6.61 \times 10^4 \text{ mol dm}^{-3}$

(Total 1 mark)

Q10.

What is the pH of a $0.020 \text{ mol dm}^{-3}$ solution of a diprotic acid which is completely dissociated?

- A** 1.00
- B** 1.40
- C** 1.70
- D** 4.00

(Total 1 mark)

Q11.

The acid dissociation constant, K_a , of a weak acid HA has the value $2.56 \times 10^{-4} \text{ mol dm}^{-3}$.

What is the pH of a $4.25 \times 10^{-3} \text{ mol dm}^{-3}$ solution of HA?

- A** 5.96
- B** 3.59
- C** 2.98
- D** 2.37

(Total 1 mark)