Q1.

Values of the ionic product of water (K_w) at different temperatures are given.

$K_w = 6.40 \times 10^{-15}$ mol^2 dm^{-6} at 18 °C
$K_w = 1.00 \times 10^{-14}$ mol^2 dm^{-6} at 25 °C

Which statement is correct?

A The concentration of hydroxide ions in water at 18 °C is 8.00×10^{-8} mol dm^{-3} ⬭

B The dissociation of water into ions is an exothermic process. ⬭

C The pH of water is the same at 25 °C and at 18 °C ⬭

D Water becomes less acidic as the temperature is raised. ⬭

(Total 1 mark)

Q2.

Which species can behave as a Brønsted–Lowry acid in aqueous solution?

A SO_4^{2-} ⬭

B HCO_3^- ⬭

C BF_3 ⬭

D NH_3 ⬭

(Total 1 mark)

Q3.

Which change causes the pH of 10 cm^3 of 1.0 mol dm^{-3} NaOH to be halved at 298 K?

$K_w = 1.0 \times 10^{-14}$ at 298 K

A adding 10 cm^3 of water ⬭

B adding 10 dm^3 of water ⬭

C adding 5 cm^3 of 1.0 mol dm^{-3} HCl ⬭

D adding 10 cm^3 of 1.0 mol dm^{-3} HCl ⬭

(Total 1 mark)

Q4.

A 0.100 mol dm^{-3} solution of a weak acid has pH = 2.50

What is the value of K_a for this acid, in mol dm^{-3}?

A 3.16×10^{-2} ○

B 3.16×10^{-3} ○

C 1.00×10^{-4} ○

D 1.00×10^{-5} ○

(Total 1 mark)

Q5.

Equal volumes of pairs of solutions are mixed.

Which pair forms a buffer solution?

A ammonia and ammonium chloride ○

B ammonia and methylamine ○

C ethanoic acid and methanoic acid ○

D hydrochloric acid and sodium hydroxide ○

(Total 1 mark)

Q6.

Which can **not** function as a Brønsted-Lowry acid?

A CH_3COO^- ○

B HCO_3^- ○

C H_3O^+ ○

D NH_4^+ ○

(Total 1 mark)

Q7.

A strong acid H_2X dissociates in aqueous solution.

$$H_2X(aq) \rightarrow 2\ H^+(aq) + X^{2-}\ (aq)$$

What is the pH of a 0.020 mol dm^{-3} solution of this acid?

A 1.00 ○

B 1.40 ○

C 1.70 ○

D 2.00 ○

(Total 1 mark)

Q8.

Equal volumes of two solutions, each with the same concentration, are mixed together at 298 K

Which two solutions, when mixed, form a solution with a pH >7?

A HCOOH and HCOOK ○

B KOH and CH_3COOH ○

C NH_3 and HCl ○

D NH_4Cl and KCl ○

(Total 1 mark)