

Name of the Student: _____

Max. Marks : 19 Marks

Time : 19 Minutes

Q1.

This question is about the pH of some solutions containing potassium hydroxide and ethanoic acid.

Give all values of pH to 2 decimal places.

- (a) (i) Write an expression for pH.

(1)

- (ii) Write an expression for the ionic product of water, K_w

(1)

- (iii) At 10 °C, a $0.154 \text{ mol dm}^{-3}$ solution of potassium hydroxide has a pH of 13.72. Calculate the value of K_w at 10 °C.

(2)

- (b) At 25 °C, the acid dissociation constant K_a for ethanoic acid has the value $1.75 \times 10^{-5} \text{ mol dm}^{-3}$.

- (i) Write an expression for K_a for ethanoic acid.

(1)

- (ii) Calculate the pH of a $0.154 \text{ mol dm}^{-3}$ solution of ethanoic acid at 25 °C.

(3)

- (c) At 25 °C, the acid dissociation constant K_a for ethanoic acid has the value $1.75 \times 10^{-5} \text{ mol dm}^{-3}$.

- (i) Calculate the pH of the solution formed when 10.0 cm^3 of $0.154 \text{ mol dm}^{-3}$ potassium hydroxide are added to 20.0 cm^3 of $0.154 \text{ mol dm}^{-3}$ ethanoic acid at 25 °C.

(4)

- (ii) Calculate the pH of the solution formed when 40.0 cm^3 of $0.154 \text{ mol dm}^{-3}$ potassium hydroxide are added to 20.0 cm^3 of $0.154 \text{ mol dm}^{-3}$ ethanoic acid at 25 °C.

At 25 °C, K_w has the value $1.00 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$.

(4)

(Total 16 marks)

Q2.

When iron(II) sulfate is used for killing weeds in lawns, it is often mixed with the fertiliser ammonium sulfate. Ammonium sulfate also makes the soil acidic.

- (a) Write an equation to show how the ammonium ion behaves as a Brønsted–Lowry acid in water.

(1)

- (b) Compounds such as ammonium sulfate react on warming with sodium hydroxide solution as shown in the equation below.



Use this information to describe a simple test, other than smell, to show that ammonia is evolved. State what you would observe.

Test _____

Observation _____

(2)

(Total 3 marks)