Practice Question Set For A-Level
Subject : Chemistry
Paper-1 Topic: Physical 1_Acids And Bases

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Name of the Student:_____
Max. Marks : 26 Marks **Time : 26 Minutes**

Q1.

This question concerns the weak acid, ethanoic acid, for which the acid dissociation constant, K_a, has a value of 1.74×10^{-5} mol dm^{-3} at 25 °C.

$$K_a = \frac{[H^+][CH_3COO^-]}{[CH_3COOH]}$$

In each of the calculations below, give your answer to 2 decimal places.

(a) Write an expression for the term *pH*. Calculate the pH of a 0.150 mol dm^{-3} solution of ethanoic acid.

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(4)

(b) A buffer solution is prepared by mixing a solution of ethanoic acid with a solution of sodium ethanoate.

(i) Explain what is meant by the term *buffer solution*.

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(2)

(ii) Write an equation for the reaction which occurs when a small amount of hydrochloric acid is added to this buffer solution.

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(1)

(c) In a buffer solution, the concentration of ethanoic acid is 0.150 mol dm^{-3} and the concentration of sodium ethanoate is 0.100 mol dm^{-3}.

(i) Calculate the pH of this buffer solution.

(3)

(ii) A 10.0 cm^3 portion of 1.00 mol dm^{-3} hydrochloric acid is added to 1000 cm^3 of this buffer solution.
Calculate the number of moles of ethanoic acid and the number of moles of sodium ethanoate in the solution after addition of the hydrochloric acid. Hence, find the pH of this new solution.

(5)

(Total 15 marks)

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Q2.

The value of the acid dissociation constant, K_a, for the weak acid HA, at 298 K, is 1.45×10^{-4} mol dm^{-3}.

(a) Write an expression for the term K_a for the weak acid HA.

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(1)

(b) Calculate the pH of a 0.250 mol dm^{-3} solution of HA at 298 K.

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(4)

(c) A mixture of the acid HA and the sodium salt of this acid, NaA, can be used to prepare a buffer solution.

(i) State and explain the effect on the pH of this buffer solution when a small amount of hydrochloric acid is added.

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(ii) The concentration of HA in a buffer solution is 0.250 mol dm^{-3}. Calculate the concentration of A^- in this buffer solution when the pH is 3.59

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(6)

(Total 11 marks)

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