Practice Question Set For A-Level
Subject : Chemistry
Paper-2 Topic: Physical

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Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Q1.

Ethanedioic acid is a weak acid.
Ethanedioic acid acts, initially, as a monoprotic acid.



(a) Use the concept of electronegativity to justify why the acid strengths of ethanedioic acid and ethanoic acid are different.

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(6)

(b) A buffer solution is made by adding 6.00×10^{-2} mol of sodium hydroxide to a solution containing 1.00×10^{-1} mol of ethanedioic acid ($H_2C_2O_4$).
Assume that the sodium hydroxide reacts as shown in the following equation and that in this buffer solution, the ethanedioic acid behaves as a monoprotic acid.

$$H_2C_2O_4(aq) + OH^-(aq) \longrightarrow HC_2O_4^-(aq) + H_2O(l)$$

The dissociation constant K_a for ethanedioic acid is 5.89×10^{-2} mol dm^{-3}.

Calculate a value for the pH of the buffer solution.
Give your answer to the appropriate number of significant figures.

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pH = _____

(5)

(c) In a titration, the end point was reached when 25.0 cm^3 of an acidified solution containing ethanedioic acid reacted with 20.20 cm^3 of 2.00 $\times 10^{-2}$ mol dm^{-3} potassium manganate(VII) solution.

Deduce an equation for the reaction that occurs and use it to calculate the original concentration of the ethanedioic acid solution.

Equation _____

Calculation

Original concentration = _____ mol dm^{-3}

(4)

(Total 15 marks)

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Q2.

Sodium bromate(V) is a primary standard. This means that its solution can be used to check the concentration of other solutions.

(a) The half-equations for the reaction between bromate(V) ions and thiosulfate ions in the presence of acid are

$$2S_2O_3^{2-} \longrightarrow S_4O_6^{2-} + 2e^-$$

$$BrO_3^- + 6H^+ + 6e^- \longrightarrow Br^- + 3H_2O$$

Use these half-equations to deduce an overall equation for this reaction.

_____

_____

(1)

(b) A laboratory technician decided to use a 5.00×10^{-3} mol dm^{-3} solution of sodium bromate(V) to check the concentration of a sodium thiosulfate solution that was labelled as 1.00×10^{-3} mol dm^{-3}. The sodium bromate(V) solution was placed in the burette and 25.0 cm^3 of the sodium thiosulfate solution was pipetted into a conical flask.

Use the concentration of the sodium thiosulfate solution to calculate the expected titre value in this experiment.
Show your working.

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(2)

(c) Consider the titre value that you have calculated in part **(b)**.

Suggest one change to the experimental procedure in part **(b)** that would enable you to calculate a more accurate value for the concentration of the sodium thiosulfate solution.

_____

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(1)

(Total 4 marks)

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