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DEPARTMENT OF PHYSICAL AND CHEMICAL SCIENCES

2019/2020 ACADEMIC SESSION: FIRST SEMESTER EXAMINATIONS

COURSE TITLE: EXPERIMENTAL CHEMISTRY III

Time: 3 Hrs

COURSE CODE: CHM 391

Instruction: Attempt ONE question only

QUESTION ONE

You are provided with 4.85 g of orange juice, 2.040×10^{-3} M sodium thiosulfate, 200 mL of I_2 solution, vitex (starch) reagent and 0.2 M acetic acid. [Take A.wt of C = 12.01, H = 1.00, O = 16]

- A. State the procedure for the standardization of I_2 against sodium thiosulfate [5 Marks]
- B. Write a balanced chemical equation for the standardization of I_2 against sodium thiosulfate [2 Marks]
- C. Determine the average volume of iodine used from your concordant titres [5 Marks]
- D. Calculate the concentration of your I_2 solution [5 Marks]
- E. Outline the procedure for the vitamin C determination from orange juice [5 Marks]
- F. Determine the average volume of iodine used from your concordant titres [4 Marks]
- G. Write a balanced chemical equation for the determination of ascorbic acid against I_2 [2 Marks]
- H. Calculate the mass of vitamin C in mg per g of fruit or mg per mL of fruit juice [6 Marks]
- I. Name the product of oxidation of ascorbic acid when exposed to air or light [1 Mark]

J. Draw the structure of ascorbic acid [2 Marks]

K. Explain how vitamin C acts as an antioxidant in biological system. [3 Marks]

QUESTION TWO [40 MARKS]

You are provided with unknown concentration of glucose labeled sample A, glucose crystals, 1 M sulphuric acid and 0.01 M potassium manganate (VII).

A. State the procedure for the estimation of an unknown glucose concentration in a solution using colour based method. [10 Marks]

B. Describe how you would prepare 10%, 8%, 6%, 4%, and 2% glucose solution from glucose crystal. [5 Marks]

C. Determine the time taken for the loss of colour from a solution of potassium manganate (VII) upon the addition of different concentration of glucose solution. [5 Marks]

D. Write out the equation of the reaction [3 Marks]

E. Plot the graph of glucose concentration against time [5 Marks]

F. From your graph, intrapolate the glucose concentration in sample A [5 Marks]

G. Draw the structure of glucose [2 Marks]

H. Discuss the significance of glucose in human body [3 Marks]

I. How does potassium permanganate and sulphuric acid oxidize glucose? [2 Marks]