KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2010/2011

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE (FOODS, NUTRITION AND DIETETICS)

HFN 317: ANALYTICAL CHEMISTRY

DATE: MONDAY, 4TH APRIL 2011 **TIME: 2.00 P.M. - 4.00 P.M.**

INSTRUCTIONS:

ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS.

QUESTION ONE (30 MARKS)

a) Describe the advantages and disadvantages of

i) automated methods of analysis as compared to manual methods of analysis. (5 marks)

ii) instrumental methods as compared to chemical methods of analysis (4 marks)

b) Describe the various steps in analysis of samples. (10 marks)

c) Explain the principle of operation of hollow cathode lamp, a commonly used source of light in an atomic absorption spectrometer. (5 marks)

d) Give balanced equations of half reactions and overall reaction in each of the following equations.

i) $Cr_2O_7^{2-} + Fe^{2+} \rightarrow Fe^{3+} + Cr^{3+}$ (3 marks)

ii) $CH_3CH_2CH_2OH + MnO^-_4 \rightarrow CH_3CH_2COOH + Mn^{2+}$ (3 marks)

QUESTION TWO (20 MARKS)

a) Explain how you would carry out quantitative analysis of

i) Arsenic in fish sample (6 marks)

ii) Lead in dry tomato sample (5 marks)

iii) Sodium in honey (5 marks)

using suitable instrumental method of analysis.

b) 2.5g of sodium hydroxide pellet was dissolved in 200 ml distilled water

i) Calculate the moles of NaOH in 50 ml of this solution. (2 marks)

ii) Calculate the molarity of the sodium hydroxide solution (2 marks)

GIVEN: RAM: Na = 23, O = 16, H=1

QUESTION THREE (20 MARKS)

a) Distinguish between the following terms as used in Chromatography.

i) retardation factor and retention time. (2 marks)

ii) resdation and efficiency (3 marks)

iii) Isothermal elution and temperature programming. (2 marks)

b) A sample consists of mixture of glucose fructose, hydroxymethyfurfural, sucrose and maltose.

Explain how you would carry out

i) qualitative analysis of this sample

ii) quantitative analysis of sucrose in the sample mixture using gas chromatography (8 marks)

c) i) Draw a block diagram of a gas chromatograph (2 marks)

ii) Describe one of the components of this instrument. (3 marks)

QUESTION FOUR (20 MARKS)

a) Describe how the concentration of sulphuric acid can be determined using titrimetric method involving the use of a pH meter to determine the end point of the neutralisation reaction. (7 marks)

b) Distinguish between molality and molarity. (2 marks)

c) Explain the principle of atomic emission spectroscopy. (4 marks)

(d) Provide <u>two</u> advantages of atomic absorption spectroscopy over atomic emission spectroscopy for the determination of metals. (2 marks)

(e) Explain the chemical interferences encountered in atomic absorption spectroscopy and how these interferences can be solved. (5 marks)

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