



KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2008/2009

SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN FOOD NUTRITION AND DIETETICS

HFN 317: ANALYTICAL CHEMISTRY

DATE: Friday 18th September, 2009

TIME: 11.00 a.m. – 1.00 p.m.

INSTRUCTIONS

Answer QUESTION ONE and any other TWO questions.

QUESTION ONE - (30 MARKS)

- (a) Discuss the importance of the following steps in the analysis of samples:
- (i) Plan of analysis [3 marks]
 - (ii) Sampling [3 marks]
 - (iii) Removal of interference [3 marks]
 - (iv) Drying [2 marks]
- (b) Explain the principle of atomic emission spectroscopy for the determination of metals. [3 marks]
- (c) Stable compound formation is one of the chemical interferences encountered in atomic spectroscopy. Explain how the problem of stable compound formation can be tackled. [4 marks]
- (d) Distinguish between the following terms as used in photoluminescence methods:
- (i) fluorescence and phosphorescence [2 marks]
 - (ii) internal conversion and intersystem crossing. [2 marks]
- (e) (i) Explain the principle of x-ray fluorescence spectroscopy. [1 mark]
- (f) Explain the following terms as used in chromatography:
- (i) retardation factor [1 mark]
 - (ii) retention time [1 mark]

(iii) resolution of peaks

[2 marks]

QUESTION TWO - (20 MARKS)

- (a) Describe the environmental and structural factors that affect fluorescence intensity of a fluorescent compound. [7 marks]
- (b) Spectrofluorimetric method cannot be directly used for non-fluorescent compounds
- (i) Provide the general name of reagent that must be used to react with non-fluorescent compound before fluorimetric method is used. [1 mark]
- (ii) Describe the characteristics of the ideal reagent that is used for reacting with non-fluorescent sample prior to analysis by fluorimetric method. [5 marks]
- (c) The concentration of quinine in a drug was determined by fluorescence method. The following results were obtained:

Concentration of Quinine Standard (ppb)	0	10	20	30	40	45	SAMPLE
	0	20	38	58	78	88	45

- (i) Draw the calibration graph of fluorescence intensity versus concentration of quinine standard. [2 marks]
- (ii) Calculate the concentration of quinine in the drug sample. [2 marks]
- (d) Distinguish between dynamic and static quenching. [1 mark]
- (e) Explain why lasers are not preferred as light source in fluorimetric method. [2 marks]

QUESTION THREE – (20 MARKS)

- (a) (i) Draw a block diagram of atomic absorption spectrometer in which deuterium lamp is incorporated. [2 marks]
- (ii) Explain the role of deuterium lamp in the instrument drawn in part (i) and how this role is achieved. [3 marks]
- (b) Describe how you would determine the concentration of
EITHER
Lead in a tomato fruit
OR
Mercury in fish
using atomic absorption spectroscopy. [6 marks]

- (c) Explain the principle of operation of the commonly used light source in an atomic absorption spectrometer. [5 marks]
- (d) Explain the following as used in atomic absorption spectroscopy
- (i) Self absorption [2 marks]
 - (ii) Modulation of light source [2 marks]

QUESTION FOUR – (20 MARKS)

- (a) Using suitable analytical method, explain how you would carry out qualitative analysis of a sample containing several amino acids. [5 marks]
- (b) (i) Draw a block diagram of a Gas chromatograph. [2 marks]
- (ii) Describe briefly the various components of a Gas chromatograph. [7 marks]
- (c) Explain how you would determine quantitatively the concentration of glucose in a sample mixture containing fructose, sucrose, glucose and maltose by gas chromatography. [6 marks]

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