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University Examinations 2012/2013

THIRD YEAR, FIRST SEMSTER, EXAMINATIONS FOR DEGREE OF BACHELOR OF SCIENCE IN FOOD SCIENCE AND TECHNOLOGY AND FOOD SCIENCE AND NUTRITION

AFS 2303: INSTRUMENTAL METHODS IN FOOD ANALYSIS

DATE: AUGUST 2013

TIME: 2 HOURS

INSTRUCTIONS: Answer *one* question and any other *two* questions

QUESTION ONE – (30 MARKS)

- a) Distinguish an analytical technique from an analytical method (4 Marks)
- b) Outline five advantages of instrumental methods when compared with classical methods of food analysis. (5 Marks)
- c) Define the following terms in relation to analytical instruments;
 - i. Linear dynamic range (2 Marks)
 - ii. Limit of detection (2 Marks)
- d) What is a “blank” sample and why is it necessary to prepare one during instrument analysis (4 Marks)
- e) What is the purpose of a monochromator in UV-VIS spectroscopy? (2 Marks)
- f) Explain the principle behind electrophoresis (2 Marks)
- g) Distinguish AAS (Atomic Absorption Spectroscopy) from AES (Atomic emission spectroscopy) (4 Marks)
- h) What factors would you consider when choosing an appropriate HPLC (High performance liquid chromatography) detector? (5 Marks)

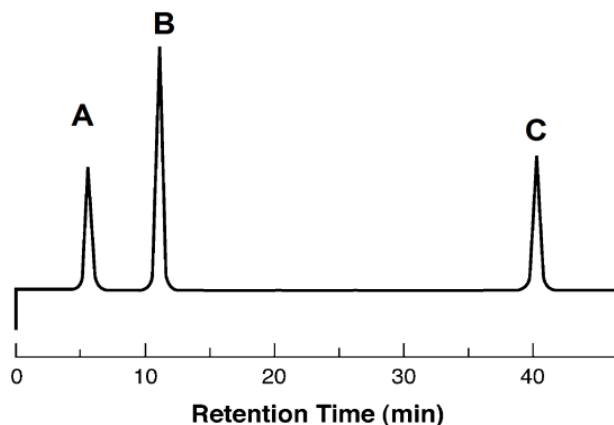
QUESTION TWO– (20 MARKS)

Describe the analytical technique you would choose for detection and quantification of the following components in foods. (20 marks)

- i. Aflatoxins
- ii. Fe (iron)
- iii. K (potassium)
- iv. Caffeine
- v. Amino Acids

QUESTION THREE – (20 MARKS)

- i) A food sample containing compound A, B, and C was analyzed using liquid chromatography, fitted with a column packed with a silica-base C18 bonded phase. A1:5 ethanol: water solution was used as the mobile phase. The following chromatogram was obtained



Assuming that the separation of compounds is based on their polarity.

- i. Is this normal or reversed phase chromatography? Explain your answer. (3 Marks)
- ii. Which compound is the most polar? (1 Mark)
- iii. How would you change the mobile phase so that compound C would elute sooner without changing the relative positions of compound A and B? Explain why this would work (4 Marks)
- iv. What would possibly happen if you maintained an isocratic elution mode at low solvent strength? (2 Marks)
- v. Discuss two common headspace sampling techniques for gas chromatography (10Marks)

QUESTION FOUR – (20 MARKS)

Write short notes on physicochemical principles of separation underlying the use of adsorption, size exclusion, ion-exchange and affinity chromatography. (20 Marks)

QUESTION FIVE – (20 MARKS)

- a) What is a standard/calibration curve in instrumental analysis and how is it prepared? (8 Marks)
- b) Explain the similarities and differences between UV-VIS spectroscopy and fluorescence spectroscopy with regard to instrumentation and principles involved. Give the advantages of using fluorescence spectroscopy. (8 Marks)
- c) Why must sugars and fatty acids be derivatized before gas chromatography analysis, while pesticides and aroma compounds are not? (2 Marks)
- d) In HPLC, what is a guard column and why is it used? (2 Marks)