OFFICE OF THE DEPUTY VICE CHANCELLOR

ACADEMICS, STUDENT AFFAIRS AND RESEARCH

UNIVERSITY EXAMINATIONS

2022/2023 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER REGULAR

EXAMINATION

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

COURSE CODE: CHE 201

COURSE TITLE: CHEMICAL ANALYSIS AND STRUCTURAL DETERMINATION

DATE: 21/12/2022   **TIME: 9 A.M.-12 NOON**

INSTRUCTION TO CANDIDATES

- SEE INSIDE

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CHE 201: CHEMICAL ANALYSIS AND STRUCTURAL DETERMINATION

STREAM: BED (Science)   **DURATION: 3 Hours**

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INSTRUCTIONS TO CANDIDATES

*Answer **ALL** questions.*

Question One (12 Marks)

a. Define the following terms:

   i. Spectroscopy   (1 Mark)

   ii. Spectrophotometer   (1 Mark)

   iii. Grab sample   (1 Mark)

   iv. Composite sample   (1 Mark)

b. Give two differences between atomic absorption and atomic emission

   spectroscopy   (4 Marks)

c. Differentiate between judgemental and systematic sampling   (2 Marks)

d. What is the significance of each of the following?

   i.   Random sampling   (1 Mark)

   ii. Judgemental sampling   (1 Mark)

Question Two   (18 Marks)

a. Explain the effect of each of the following on the observed signal in atomic

   spectroscopy:

   i. Fuel rich flame   (2 Marks)

   ii. Lean flame   (2 Marks)

b. Distinguish between:

   i. Hyperchromic and hypochromic effects   (2 Marks)

   ii. Homoanular and heteroanular dienes   (2 Marks)

c. Using illustrations, explain the various types of bending vibration

   modes in IR spectroscopy   (4 Marks)

d. A solution of UTP of 29.3 mgL^{-1} has an extinction coefficient of 0.25 at 260 nm. If the light path is 1 cm and the molecular weight of UTP is 586, Calculate:

   i.   The molar extinction coefficient   (2 Marks)

   ii. The transmittance of 10 μmol L^{-1} of the solution   (2 Marks)

e. Name any two detectors used is spectroscopy   (2 Marks)

Question Three (13 Marks)

a. What is interference?   (1 Mark)

b. Clearly explain the following types of interferences in atomic spectroscopy:

   i. Chemical interference   (2 Marks)

   ii. Spectral interference   (2 Marks)

   iii.Ionization interference   (2 Marks)

c. Explain how each of the above forms of interference can be corrected   (6 Marks)

Question Four (12 Marks)

a. Draw a bock diagram of a spectrophotometer and name all the components present in it   (2 Marks)

b. Briefly explain the principles of Electron impact (EI) mass spectrometer   (5 Marks)

c. Explain how a solid sample can be prepared for IR analysis   (4 Marks)

d. List any two sources of light in IR spectrophotometers   (1 Mark)

Question Five (15 Marks)

a. Explain how the molecule 1-bromo-2,2-dimethylpropane produces the H-NMR spectra using a number of signals, position of the signals and the integration of the signals   (5 Marks)

b. The following is a spectrum recorded in chloroform. Assign the major absorptions in the spectrum   (6 Marks)

100

% T (a)

0

4000   2000   1500   1000 $v\ cm^{-1}$
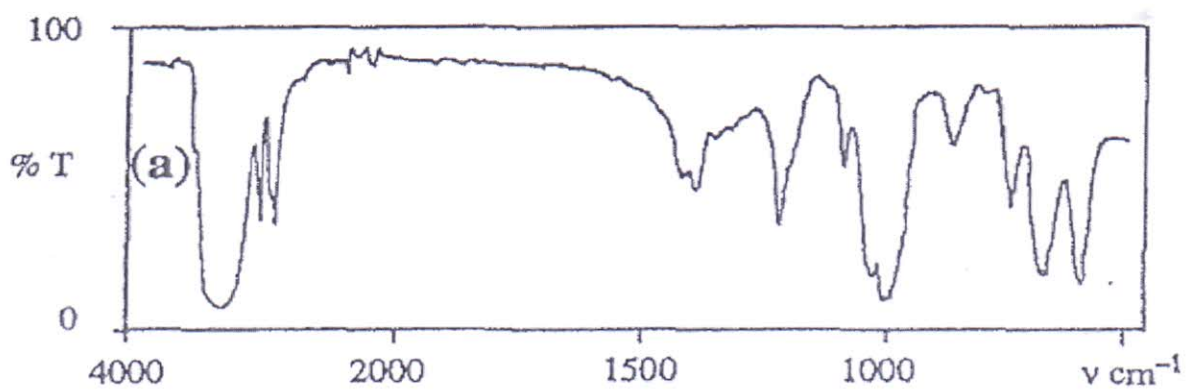
c. Give any four examples of hyphenated techniques   (4 Marks)

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4