NATIONAL OPEN UNIVERSITY OF NIGERIA
14/16 AHMADU BELLO WAY, VICTORIA ISLAND, LAGOS
SCHOOL OF SCIENCE AND TECHNOLOGY
JUNE/JULY EXAMINATION

COURSE CODE: CHM309
COURSE TITLE: ORGANIC SPECTROSCOPY
TIME ALLOWED:2 hrs
INSTRUCTION: Answer any FOUR questions

1. (a) Discuss electronic excitationin UV-Vis radiation in terms of occurrence, types and selection rule.
   (b) State the Beer-Lambert'slaw.
   (c) Calculate the concentration of a solution of compound X with a molar absorptivity of 12500 M^{-1} dm cm^{-1} and absorbance of 2.5 at λ_{max} of 465 nm
   (d) What is the concentration (in mg/mL) of the solution in 1c above, if the molar mass of X is 120g/mol?

2. (a) With the aid of a diagram, highlight the types of vibrational modeas in methylene group.
   (b) The intensities of absorption bands in Infrared Spectroscopy may be expressed as transmittance (T) or absorbance (A);Give the formula for transmittance, and show the relationship between A and T.
   (c) Highlight the application of Infra-red spectroscopy.

3. (a) With the aid of a diagram, give a detailed description of a mass spectrometer.
   (b) List the types of mass analyzers.
   (c) Choose one of the listed analyzers and discuss in details.

4. (a) Discuss the fragmentation pattern of alkanes.
   (b) Highlight the rules used in the interpretation of mass spectra.

5. (a) List the molecular formulae of compounds with relative molar mass of 44.
   Identify the compound if the accurate m/z value for the molecular ion determined by high resolution mass spectrometry is 44.0262. The compound may contain any of the following elements: C, H, N, O.
   (b) Discuss the general approach to interpretation of ^{13}C-NMR Spectra

6. (a) The number of orientations or number of magnetic quantum states is a function of the physical properties of the nuclei. Discuss.
   (b) Write a short note on chemical shift.