



NATIONAL OPEN UNIVERSITY OF NIGERIA
DEPARTMENT OF PURE AND APPLIED SCIENCES
2021_1 EXAMINATIONS

COURSE CODE: CHM309

CREDIT UNIT: 3

COURSE TITLE: Applied Spectroscopy

TIME: 3 HRS

INSTRUCTION: Answer question 1 and any other 4 questions

Question 1

- (a) Explain the [3] types of internal energy that are quantized:(7marks)
- (b) Explain the absorption by conjugated chromophores in UV- Visible spectra (4marks)
- (c) Explain the principles behind infrared absorption and molecular structure. (3 Marks)
- (d) Make a schematic diagram of an atomic absorption instrument. (3.5 Marks)
- (e) Explain the relationship between the applied magnetic field and the frequency in Nuclear magnetic resonance (4 .5marks)

Question 2

- (a)(i) Explain the spin-spin coupling (or splitting) of dichloroethanal in H-NMR (5 marks)
- (ii) Show the proton that will indicate a doublet in dichloroethanal(5 marks)
- (b) Predict the signal and relative intensities of methylene group in CH₃CH₂Br. (2marks)

Question 3

- (a) Sketch a schematic diagram of a UV/Visible spectrophotometer. (4marks)
- (b) Discuss the instrumentation in UV/Visible spectrophotometry. (8marks)

Question 4

- (a) Discuss the application of IR in Quantitative Analysis (5 marks).
- (b) Explain the instrumentation of IR spectroscopy. (7marks)

Question 5

- (a) Sketch a schematic diagram of mass spectrometer. (4 marks)
- (b) Explain the detection and recording of sample ions in mass spectrometry (8 marks)

Question 6

- (a) Discuss the general approach that can be adopted in the interpretation of ^{13}C -NMR spectra. (9 marks)
- (b) State three (3) deuterated solvents used in ^1H -NMR (3 marks)