

[This question paper contains 2 printed pages.]

Your Roll No.....
आपका अनुक्रमांक.....

Sr. No. of Question Paper : 2922

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Unique Paper Code : 2172543601

Name of the Paper : Instrumental Methods of Analysis - II

Name of the Course : DSC- B.Sc. (Prog.) Analytical Chemistry

Semester : VI

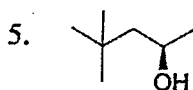
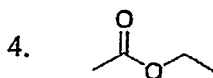
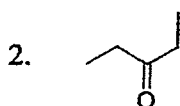
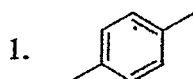
Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **Any Four** questions in all.

1. (a) Predict the number of signals and splitting patterns (multiplicity) observed in the ^1H NMR spectra of the following compounds.



(5×3=15)

2. Elucidate the structure of the following compounds using the given ^1H NMR data.
 - (a) A compound with molecular formula: $\text{C}_{10}\text{H}_{14}$ and ^1H NMR (400 MHz, CDCl_3): δ 7.20-7.35 (m, 5H), 1.20 (s, 9H)
 - (b) A compound with molecular formula $\text{C}_8\text{H}_8\text{O}$ and ^1H NMR (400 MHz, CDCl_3): δ 9.80 (s, 1H), 7.80 (d, 2H, $J = 8.8$ Hz), 7.20 (d, 2H, $J = 8.8$ Hz), 2.41 (s, 3H)

P.T.O.

(c) A ketone with molecular formula $C_5H_{10}O$ and 1H NMR (400 MHz, $CDCl_3$): δ 2.41 (t, 2H, $J = 5.6$ Hz), 2.10 (s, 3H), 1.61 (m, 2H) 0.97 (t, 3H, $J = 6.2$ Hz)

(5, 5, 5)

3. (a) Sketch a comprehensively labeled schematic diagram of a Nuclear Magnetic Resonance (NMR) spectrometer. Outline the specific operational function of each major component.
(b) Describe the effect of electronegativity on chemical shift in 1H NMR with suitable examples.

(c) Discuss the importance of internal and external reference compounds in NMR spectroscopy.

(5, 5, 5)

4. (a) Explain the differences between atomic absorption spectroscopy and photoelectron spectroscopy.
(b) Outline the key postulates of Bohr's atomic model as applied to the hydrogen atom.
(c) What is the role of an atomizer in atomic spectroscopy techniques? Give examples.

(5, 5, 5)

5. Write detailed explanatory notes on the following:

(a) Spin-spin coupling in 1H NMR spectroscopy

(b) Atomic Emission Spectroscopy (AES)

(c) g-factor

(5, 5, 5)

6. Explain the ESR (Electron Spin Resonance) spectra of the following radicals with appropriate diagram.

(a) Methyl radical ($CH_3^\bullet$)

(b) Cyclopentadienyl radical ($C_5H_5^\bullet$)

(c) Ethyl radical ($CH_3CH_2^\bullet$)

(5, 5, 5)