

(b) A compound with molecular formula C_8H_8O 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).

(c) An ester with molecular formula $C_4H_8O_2$ and 1H NMR (400 MHz, $CDCl_3$): δ 4.10 (q, 2H, $J = 5.6$ Hz), 2.10 (s, 3H), 1.22 (t, 3H, $J = 5.6$ Hz).
(5,5,5)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 5863

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Unique Paper Code : 2172543601

Name of the Paper : DSC-Instrumental Methods of Analysis-II

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

Semester : VI

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

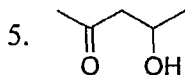
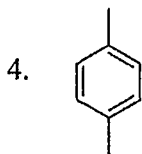
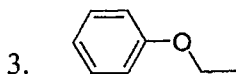
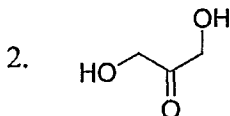
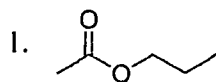
1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **four** questions in all.

1. (a) Explain the differences between atomic absorption spectroscopy and photoelectron spectroscopy.
(b) Describe the Bohr's theory of the hydrogen atom.

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- (c) What is the role of an atomizer in atomic spectroscopy techniques? Give examples. (5,5,5)
2. (a) Predict the number of peaks and splitting patterns (multiplicity) observed in the ^1H NMR spectra of the following compounds. (5×3=15)



3. (a) Explain the working principle of NMR spectroscopy with the help of diagram.
- (b) Describe the effect of magnetic anisotropy on chemical shift in ^1H NMR.

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- (c) What are internal reference compounds in NMR spectroscopy, and why is tetramethylsilane (TMS) commonly used as standards. (5×3=15)
4. Write detailed notes on the following topics
- (a) Coupling constant
- (b) g-factor
- (c) Atomic Emission Spectroscopy (AES) (5,5,5)
5. Explain the ESR (Electron Spin Resonance) spectra of the following radicals with appropriate diagram.
- (a) Methoxy radical ($^*\text{CH}_2\text{OH}$)
- (b) Ethyl radical (CH_3CH_2^*)
- (c) Benzene radical anion ($\text{C}_6\text{H}_6^{*-}$) (5,5,5)
6. Elucidate the structure of the following compounds using the given ^1H NMR data.
- (a) A compound with molecular formula: C_8H_{10} and ^1H NMR (400 MHz, CDCl_3): δ 7.20-7.30 (m, 5H), 2.63 (q, 2H, $J = 5.6$ Hz), 1.22 (t, 3H, $J = 5.6$ Hz).

P.T.O.