

B.Sc. Semester - 6 (CBCS) Examination

March/April-2026 (NEW COURSE)

Organic Chemistry and Spectroscopy (Core (New))

Time: 2:30 Hours

Marks: 70

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate marks.

Que.1(A) Answer the following question. (04)

- (1) Explain fundamental modes of vibration in IR.

Que.1(B) Answer the following questions. (Any two) (10)

- (1) Discuss basicity of pyridine and relative basicity of Pyridine, Pyrrole and Piperidine.
- (2) Explain Fermi resonance and Overtone in IR spectroscopy.
- (3) Draw and write symmetry, nodes, HOMO and LUMO in ground and excited states in π -Molecular orbitals of 1,3,5-Hexatriene system.

Que.2(A) Answer the following question. (04)

- (1) Write any four oxidation reactions of Naphthalene and write names of all products.

Que.2(B) Answer the following questions. (Any two) (10)

- (1) Give Synthesis of (I) TNT from Toluene
(II) Musk xylene (Any one Synthesis)
- (2) Give synthesis of α -Terpineol from p-Toluic acid.
- (3) A neutral organic compound with molecular formula $C_8H_8O_2$ shows the following spectral data. Deduce the constitution of the molecule. NMR signals
(a) 3H, s, 3.83 δ , (b) 4H complex signal multiplet 7-8 δ
(c) 1H, s 8.0 δ . IR: 2940-2830, 2700, 1700, 1601, 1515, 1275, 834 cm^{-1} .

Que.3(A) Answer the following question. (04)

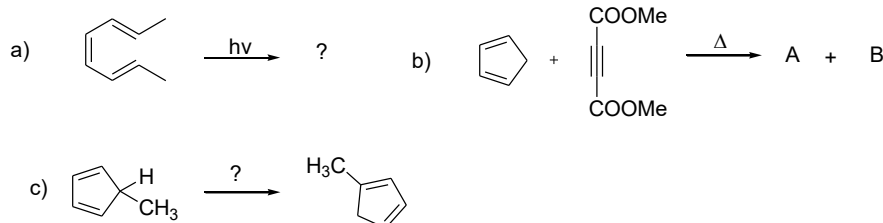
- (1) Prepare carbendazim from o-phenylenediamine and write its use.

Que.3(B) Answer the following questions. (Any two) (10)

- (1) Discuss points which prove that glucose contains a cyclic structure.
- (2) Write short note on osazone formation from glucose and fructose.
- (3) Explain chromophores and auxochromes.

Que.4(A) Answer the following question. (04)

- (1) Write condition/product to complete the pericyclic transformations.



Que.4(B) Answer the following questions. (Any two) (10)

- (1) Write any five chemical reactions of Pyrrole.
- (2) Explain Haworth synthesis for Naphthalene in detail.
- (3) What are epimers? Write reaction and products of Kiliani-Fisher step up reaction of D(-)Arabinose.

Que.5(A) Answer the following question.

(04)

(1) Deduce constitution of a molecule having Molecular formula C_2H_6O and with the following spectral properties NMR:

(a) Quartet-6.43 τ 11.89 sq.

(b) Triplet -8.89 τ 17.86 sq.

(c) singlet 8.0 τ 5.92 sq. IR: Shows strong absorption at 3649 cm^{-1}

Que.5(B) Answer the following questions. (Any two)

(10)

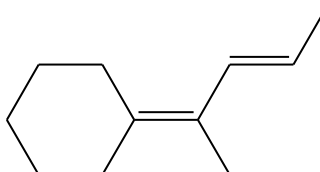
(1) Explain general factors affecting IR absorption frequency (Any four).

(2) Give synthesis of Citral.

(3) Answer the following

a) Write two applications of UV spectroscopy.

b) Calculate λ_{max} for the following molecule.



Spectral Data

NMR: δ values

0.9-1.2 Alkyl groups

1.0-5.5 alcoholic O-H,

3.5-3.7 O-CH₂-R

3.7-3.9 -OCH₃,

7-8 Ar-H

8.0-9.5 -CHO

IR: $\nu\text{ cm}^{-1}$

3650 OH str

3440_(d) NH₂

2940-2830 C-H stretching alkanes

2850-2700 C-H stretching aldehydic

1850-1690 CO str

1650-1500 Aromatic str

1380-1350 C-H stretching

1100-1300- C-O stretching

850-830 p-Di substitution

UV: λ

Base value Enone

Simple Diene = 217

Homo annular diene = 253

Heteroannular diene = 215

Substituen/Ring residue: 05

Exocyclic double bond : 05