

B.Sc. Semester - 6 (CBCS) Examination

April/May-2022 (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.

Q. 1 (A) Answer the following question. (4)

- (1) Write names only of all the fundamental modes of vibration in IR spectroscopy. Calculate vibrational degree of freedom for CO₂ molecule. Justify fewer number of vibrations observed practically based on IR selection rule.

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

- (1) Write reactions only of Furan.
- (2) Sketch π -Molecular orbitals of 1,3,5-Hexatriene. Depict nodes and symmetry of all the orbitals. Showing HOMO in ground and excited states, write types of induction required for electrocyclozation with name of rotatory process.
- (3) Explain factors affecting band position of Carbonyl group in IR.

Q. 2 (A) Answer the following question. (4)

- (1) Give classification of polynuclear hydrocarbons.

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

- (1) Give Synthesis of (I) TNT from Toluene (II) Musk Ambrette from m-cresol.
- (2) Give synthesis of 3,7-dimethylocta-2,6-dienal from 1,3-dibromo-3-methylbutane.
- (3) Deduce constitution of a organic compound with Mol.Wt 108 gm/mole from the spectral data given:

UV: $\lambda_{\max}$ 250nm No absorption above 220

IR: 3400 cm⁻¹, 3065 cm⁻¹, 2890 cm⁻¹, 1500 cm⁻¹ and 1455 cm⁻¹

NMR: 1) singlet δ =7.26, Singlet δ =4.6, and 3) Singlet δ =3.9

Q. 3 (A) Answer the following question. (4)

- (1) Give synthesis and uses of carbendazim from orthophenylenediamine and write uses of it.

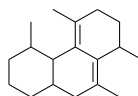
Q. 3 (B) Answer the following questions. (Any two) (10)

- (1) Write reactions only for methylation method to prove the Furanose ring structure of glucose.
- (2) a) Draw and show c-c cleavage in the glucose derivative A which can give the follow Products.



- b) Show the mechanism of mutarotation using structures only of open and cyclic α -D-glucose and β -D-glucose.

- (3) a) Calculate $\lambda_{\max}$ for the following system.

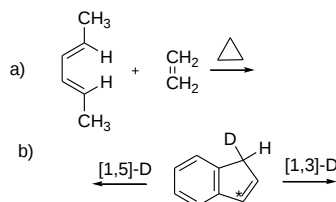


- b) Give one difference between chromophore and auxochrome

Q. 4 (A) Answer the following question.

(4)

(1) Draw structure of the products for the following reactions and show stereochemistry in case of cycloaddition reactions.



Q. 4 (B) Answer the following questions. (Any two)

(10)

- (1) Write any five methods for preparation of pyrrole.
- (2) Give reaction and ketoimine mechanism for the formation of Glucosazone from glucose.
- (3) Write any five chemical properties (reaction) of naphthalene.

Q. 5 (A) Answer the following question.

(4)

- (1) A hydrocarbon contains 85.5% C and 14.5% H and does not absorb above 210nm in UV spectrum. Shows: IR:3020(m), 1675(m) and at 965cm⁻¹ (s). NMR: a) $\delta=1.6$ doublet b) $\delta=5.55$ Quartet, with relative intensity of 3:1. Identify the constitution and isomer of the compound.

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

(10)

- (1) a) Explain overtone very briefly.
b) Write True or False only for the following.
 - I. Intramolecular hydrogen bonded compound does not show any shift in absorption on dilution.
 - II. Trans bond is IR active/have higher frequency than cis.
 - III. CO and Hydrocarbon stretching frequencies detection can be used to check the automobile pollution.
- (2) Explain types of transition in UV-Vis spectroscopy.
- (3) Discuss graded oxidation of α -Terpineol.

Spectral data

• UV: λ_{max}

Diene-Simple-215, Homoannular-253, Heteroannular-215
 Extraconjugated double bond-30 nm
 Exocyclic double bond-10 nm
 Ring residue-20 nm
 Substitution-5 nm

NMR Data

C-CH ₃	=	0.9-1.0
C=CH	=	4.6-5.9
Aromatic C-H	=	7.0-8.0
HC-O	=	3.4-4.4
O-H	=	1.0-5.5

IR

3200-3500 cm ⁻¹ ,	O-H stretching alcohol
3000-3100	C-H stretching aromatic
2900-3000 cm ⁻¹ ,	C-H stretching alkanes
1500-1400 cm ⁻¹	C-H bending alkanes
1500 cm ⁻¹	C=H stretching alkanes
990 cm ⁻¹	C-H bending trans
720 cm ⁻¹	C-H bending cis