

647510

BSCInoCC6010

Seat No : _____

B.Sc. Semester - 6 (CBCS) Examination

March/April -2019

INORGANIC AND INDUSTRIAL CHEMISTRY(CORE)

Marks: 70

Time: 2:30 Hours

Instructions:

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

Q. 1 (A) Answer the following question.

(4)

- (1) Explain Hund's rule for determination of ground state spectral term.

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

(10)

- (1) Derive spectral terms for p^2 electronic configuration and decide ground state spectral term.
- (2) Calculate the microstates for d^2 electronic configuration.
- (3) Explain Hole pegen diagram for d^1 electronic configuration.

Q. 2 (A) Answer the following question.

(4)

- (1) Draw the splitting diagram of d-orbital in various crystal fields.

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

(10)

- (1) Discuss Jahn-Teller theorem.
- (2) Explain splitting of d-orbital in square planar complex with example.
- (3) Discuss the absorption spectra of $[Ti(H_2O)_6]Cl_3$.

Q. 3 (A) Answer the following question.

(4)

- (1) Explain the effect of temperature on magnetic susceptibility of the various substances.

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

(10)

- (1) Discuss Guoy's balance method.
- (2) Explain the dry process for hydrogenation of oil.
- (3) Discuss (I) Saponification value (II) Iodine value

Q. 4 (A) Answer the following question.

(4)

- (1) Write note on Alfol process.

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

(10)

- (1) Discuss Batch process for manufacturing of soap.
- (2) Give the classification of surface active agents.
- (3) Explain the raw materials used for manufacturing of soap.

Q. 5 (A) Answer the following question.

(4)

- (1) Differentiate Biological oxygen demand (BOD) and chemically oxygen demand (COD).

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

(10)

- (1) Discuss Green House Effect.
- (2) Discuss the source of water pollution.
- (3) Write note on Acid rain.

B.Sc. Semester - 6 (CBCS) Examination

March/April -2020

INORGANIC AND INDUSTRIAL CHEMISTRY (CORE)

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) Calculate Microstates in detail for p^2 -orbital.

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

(10)

- (1) Explain Hole-pigeon diagram for p^2 -orbital.
- (2) Calculate the microstates and find Term Symbol for $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$.
- (3) Determine the allowed spectral terms for d^2 -electronic configuration.

Q. 2 (A) Answer the following question.

(4)

- (1) Explain the splitting of d-orbitals in $[\text{Ni}(\text{CN})_4]^{2-}$.

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

(10)

- (1) Discuss the absorption spectrum of aqueous solution of Cu^{2+} ion.
- (2) Discuss the Orgel diagram for d^2 and d^8 system in tetrahedral and octahedral ligand field.
- (3) What is Jahn Teller effect? Discuss in detail Jahn Teller in octahedral ligand field.

Q. 3 (A) Answer the following question.

(4)

- (1) Derive equation for diamagnetic moment.

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

(10)

- (1) Explain manufacturing of cottonseed oil by solvent extraction method.
- (2) Explain Guoy's balance method with its limitations.
- (3) Explain Hydrogenation oil by wet process.

Q. 4 (A) Answer the following question.

(4)

- (1) Explain classification of surfactants.

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

(10)

- (1) Give the name of methods for manufacturing of soap and explain continuous process in detail.
- (2) What is anionic detergent? Name methods of preparation of anionic detergent and discuss Welsh process in detail.
- (3) Discuss in detail various types of soap.

Q. 5 (A) Answer the following question.

(4)

- (1) Explain chemically oxygen demand (COD) in detail with procedure.

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

(10)

- (1) Write note on Green House Effect.
- (2) Explain water pollution.
- (3) Explain BOD in detail with procedure involved in it.

B.Sc. Semester - 6 (CBCS) Examination
May/June-2021 (NEW COURSE)
Inorganic and Industrial Chemistry(Core)

Time: 1:30 Hours

Marks: 42

Instructions:

1. Figures to the right indicate marks.
2. There are five questions in the question paper.
3. Answer any three of the following questions.

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

(1) Calculate Microstates and find term symbols for following molecules.

a) $[\text{Co}(\text{H}_2\text{O})_6]^{+2}$ b) $[\text{Mn}(\text{H}_2\text{O})_6]^{+2}$ c) $[\text{Cr}(\text{H}_2\text{O})_6]^{+3}$ d) $[\text{NiCl}_4]^{-2}$

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

- (1) Explain Hole-pigeon diagram for p^2 -orbital.
- (2) Determine allowed term symbol for d^2 case with stability order.
- (3) Explain Gouy's balance method with its limitations.

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

(1) Explain types of soap.

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

- (1) Explain Greenhouse effect.
- (2) Explain any two methods for manufacture of anionic detergents.
- (3) Explain CFC and ozone depletion.

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

(1) What is Jahn Teller effect? Explain tetragonal distortion in octahedral and Square planar complexes in detail.

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

- (1) Discuss the absorption spectrum of $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$.
- (2) Give the synthesis, properties & use of (a) Bakelite and (b) Nylon-6.
- (3) Give the classification of polymers based on stereochemistry (tacticity).

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

(1) Derive equation for diamagnetic moment.

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

- (1) Calculate detail microstate for d^2 orbital.
- (2) Explain chemically oxygen demand (COD) in detail with procedure.
- (3) Explain Addition and Condensation polymerization and explain in details about Free radical polymerization with mechanism.

Q. 5 (A) Answer the following question. (04)

(1) Discuss the Orgel diagram for d^3 and d^7 system in tetrahedral and octahedral ligand field.

Q. 5 (B) Answer the following questions. (Any two) (10)

- (1) Explain splitting of spectral terms in P^2 case with energy diagram
- (2) Give the name of methods for manufacturing of soap and explain batch process in detail.
- (3) Give the synthesis, properties & use of (a) Teflon and (b) Nylon-6,6.

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BSCorgCC6020

Seat No : _____

B.Sc. Semester - 6 (CBCS) Examination

May/June-2021 (OLD COURSE)

ORGANIC CHEMISTRY AND SPECTROSCOPY(CORE)

Time: 1:30 Hours

Marks: 42

Instructions:

1. Figures to the right indicate marks.
2. There are five questions in the question paper.
3. Answer any three of the following questions.

- Q. 1 (A) Answer the following question. (04)
(1) Explain hydantoin method with chemical reaction.
- Q.1 (B) Answer the following questions. (Any two) (10)
(1) Explain Erlenmeyer Azlactone synthesis in detail.
(2) Give classification of amino acid.
(3) Explain Fischer's method for synthesis of peptide.
- Q. 2 (A) Answer the following question. (04)
(1) Give classification of terpenoids.
- Q. 2 (B) Answer the following questions. (Any two) (10)
(1) Write synthesis of Citral from 1,3-dibromo-3-methylbutane.
(2) Give synthesis of (I) TNT and (II) Baygon.
(3) Give synthesis of (I) PETN and (II) Musk Ambrette.
- Q. 3 (A) Answer the following question. (04)
(1) Write four chemical reactions of Naphthalene.
- Q. 3 (B) Answer the following questions. (Any two) (10)
(1) Write any five method for synthesis of biphenyl.
(2) Explain Fischer Indole synthesis with mechanism.
(3) Explain Skrup synthesis in detail.
- Q. 4 (A) Answer the following question. (04)
(1) Give difference between enantiotopic and diastereotopic hydrogens in NMR.
- Q. 4 (B) Answer the following questions. (Any two) (10)
(1) Write a note on factors affecting chemical shift in NMR.
(2) Explain difference between chemical shift δ and coupling constant j .
(3) Answer the following.
a) Give two important properties of TMS.
b) Deduce the constitution of a compound with mol formula C_2H_6O giving three signals.
(Vapour density is 23)
a) 3H Triplet 1.1 b) 2H Quartet 3.7 c) 1H singlet 2.6
- Q. 5 (A) Answer the following question. (04)
(1) Explain Homolytic and Heterolytic fission, Base peak, molecular ion.
- Q. 5 (B) Answer the following questions. (Any two) (10)
(1) Write a note on conformations of cyclohexane.
(2) Explain importance of mass spectra.
(3) Answer the following
a) Write name of factors affecting conformations of molecule.
b) Deduce constitution of a compound with molecular formula C_3H_6O giving following spectral properties

UV: No absorption above 220, NMR: Strong singlet $\delta=2.1$, IR: 1720 sharp**Spectral data**

| | | |
|------|-------------------------|---------------------|
| NMR: | O-H | 4.0, |
| | C-CH ₃ | 0.9 to 2.0 δ |
| | O-CH ₃ | 3.9-3.9 δ |
| | CO-CH ₃ | 2.4-2.7 δ |
| IR: | Carbonyl C=O stretching | 1650-1750 |

647510

BSc6CheC602x

Seat No : _____

B.Sc. Semester - 6 (CBCS) Examination
May/June-2021 (NEW COURSE)
Organic Chemistry and Spectroscopy (Core)

Time: 1:30 Hours

Marks: 42

Instructions:

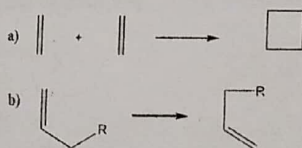
1. Figures to the right indicate marks.
2. There are five questions in the question paper.
3. Answer any three of the following questions.

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

- (1) How many vibrations are possible for CO₂ molecule? Draw each and justify number of vibrations observed practically based on IR selection rule.

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

- (1) Explain relative basicity of pyridine, pyrrole and aliphatic amines.
- (2) Answer the following.
 - I. Sketch π -Molecular orbitals of butadiene. Define nodes and symmetry of all the orbitals and identify HOMO and LUMO orbitals in ground and excited states.
 - II. Identify and give full name with induction only of the type of pericyclic reaction/rearrangement based on σ -bonds.



- (3) Write application of IR in chemical analysis, chemical reactions, H-bonding, tautomerism, and stereochemistry In General.

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

- (1) Write only reaction of Haworth reaction for preparation of Naphthalene.

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

- (1) Give Synthesis of (I) PETN from Acetaldehyde (II) Musk xylene from m-xylene
- (2) Explain constitution of Citral in detail.
- (3) Deduce constitution of a Nitrogen containing organic compound having Mol.Wt 87 gm/mole from the spectral data given.

UV: No absorption above 220

IR: 3400(s), 3325(s), 2955-2870(m), 1625(s), 1005, 815 cm⁻¹

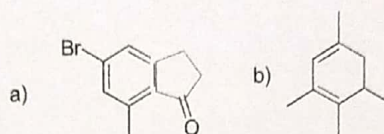
NMR: 1) singlet $\delta=0.87$ (9H), 2) Singlet $\delta=1.0$ (2H), 3) Singlet $\delta=2.38$ (2H)

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

- (1) Give synthesis and use of carbendazim.

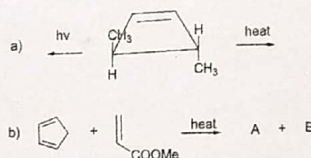
Q. 3 (B) Answer the following questions. (Any two)

- (1) Write reactions only for the methylation method for the determination of pyranose ring of glucose.
- (2) a) Write reaction steps of kiliani synthesis of D-Glucose from D-Arabinose.
b) Write reduction reaction of Fructose and name the obtained products.
- (3) Calculate λ_{max} for the following system.



Q. 4 (A) Answer the following question.

- (1) Draw constitution of the products for the following reactions and write name and stereochemical feature if any.



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

- (1) Write any five methods for preparation of pyrrole.
- (2) Write any five chemical properties (reaction) of anthracene.
- (3) Write reactions for the Osazone formation from Glucose and Fructose.

Q. 5 (A) Answer the following question.

- (1) Deduce constitution of the compound with Mol. Formula $\text{C}_9\text{H}_{12}\text{O}_2$:

IR: 3335, 2960, 1615, 1498, 1455, 1057, 1026, 743, 697 cm^{-1}

NMR: a) Quintet $\delta=1.88$ (2H), b) Triplet $\delta=2.56$ (2H), c) Triplet $\delta=2.75$ (2H), d) Singlet $\delta=3.35$ (1H), e) Singlet $\delta=7.15$ (5H)

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

- (1) a) Explain Chromophore and auxochrome giving example of Nitroaniline.
b) Give difference between Bathochromic and Hypsochromic shifts.
- (2) Give synthesis of Terpenylic acid from ethyl aceto acetate.
- (3) Explain factors affecting band position of Carbonyl group in IR.

SPECTRAL DATA

U.V.

Empirical rules for Dienes:

(A) homoannular $\lambda = 253$ nm

(B) heteroannular $\lambda = 253$ nm

Exocyclic double bond
Alkyl substitution or ring
residue
Polar Groups:
-Cl, -Br

5

5

5

5

5

5

(C) Simple Diene:

Parent $\lambda = 217$ nm

Polar Groups
Alkyl substitution or ring
residue
-Cl, Br
-OR

5

17

5

(D) Empirical rules for Enone and Dienones:

(a) Z=C

(1) 6 membered ring or acyclic

(2) 5 membered ring

215

202

(e) Empirical rules for Benzoyl derivatives:

Parent Chromophor:

mm

Z= Alkyl or ring residue

246

Z= H

250

Z = -OH or OR

230

Increment for each substituent:

Q

M

R

Alkyl or ring residue

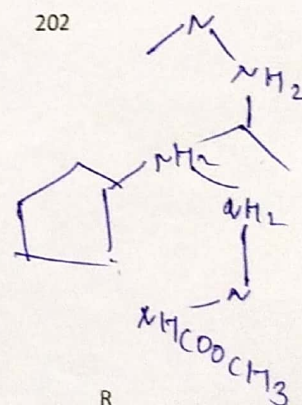
3

3

10

Br

15



Infra Red Data

Alkane (stretching)

-C-H

2960-2850

Alkene

=C-H

3200-3100

Aromatic

Ar-C-H

3100-3010

Aromatic Ring

C=C

1600-1500

Alkane (bending)

-C-H

1380-1385

Aldehyde

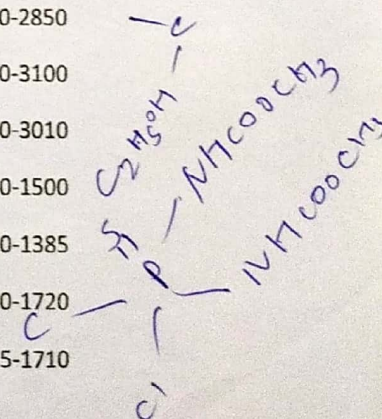
>C=O

1740-1720

Ketone

>C=O

1725-1710



| | | |
|---|------|-----------|
| Alcohols, ethers, esters, carboxylic acids, anhydride | C-O | 1300-1000 |
| Alcohols, Phenols: | | |
| Free | -OH | 3650-3600 |
| H-bonded | -OH | 3500-3200 |
| Carboxylic acid | | |
| Free | -OH | 3500-3650 |
| H-bonded | -OH | 2500-3200 |
| Amines | | |
| stretching | -N-H | 3330-3500 |
| bending | -N-H | 1640-1550 |
| Nitrile | -C≡N | 2280-2210 |
| Ether | -O- | 1150-1070 |
| Alkene bending | | |
| disubstituted cis | | 690 |
| disubstituted trans | | 960-970 |
| Aromatic substitution: C-H out of plane bending | | 2000-1650 |

NMR

| Type | Type of proton | Chemical shifts (approximate) in δ ppm |
|--------------------|---------------------------------|--|
| Primary | R-CH ₃ | 0.9-1.0 |
| Secondary | R ₂ -CH ₂ | 1.3-1.5 |
| Tertiary | R ₃ -CH | 1.5-1.8 |
| Vinyl | C=C-H | 4.6-5.9 |
| Alcohols | HC-OH | 3.4-4.0 |
| Ethers | HC-OR | 3.3-4.0 |
| Esters | R-COO-CH ₃ | 3.7-4.1 |
| Acids | HC-COOH | 2.6-3.0 |
| Carbonyl Compounds | HC-C=O | 2.0-2.7 |
| Carboxylic acid | R-COOH | 10.0-12.0 |
| Aldehyde | R-CHO | 9.0-10.0 |
| Hydroxylic | R-OH | 1.0-5.5 |
| Phenolic | Ar-OH | 4.0-12.0 |
| Enolic | C=C-OH | 15.0-17.0 |
| Amino | R-NH ₂ | 1.0-5.0 |
| Cyano | HC-CN | 2.6-2.8 |

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BSCorgCC6020

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B.Sc. Semester - 6 (CBCS) Examination

May/June-2021 (OLD COURSE)

ORGANIC CHEMISTRY AND SPECTROSCOPY(CORE)

Time: 1:30 Hours

Marks: 42

Instructions:

1. Figures to the right indicate marks.
2. There are five questions in the question paper.
3. Answer any three of the following questions.

- Q. 1 (A) Answer the following question. (04)
(1) Explain hydantoin method with chemical reaction.
- Q.1 (B) Answer the following questions. (Any two) (10)
(1) Explain Erlenmeyer Azlactone synthesis in detail.
(2) Give classification of amino acid.
(3) Explain Fischer's method for synthesis of peptide.
- Q. 2 (A) Answer the following question. (04)
(1) Give classification of terpenoids.
- Q. 2 (B) Answer the following questions. (Any two) (10)
(1) Write synthesis of Citral from 1,3-dibromo-3-methylbutane.
(2) Give synthesis of (I) TNT and (II) Baygon.
(3) Give synthesis of (I) PETN and (II) Musk Ambrette.
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(1) Write four chemical reactions of Naphthalene.
- Q. 3 (B) Answer the following questions. (Any two) (10)
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- Q. 4 (A) Answer the following question. (04)
(1) Give difference between enantiotopic and diastereotopic hydrogens in NMR.
- Q. 4 (B) Answer the following questions. (Any two) (10)
(1) Write a note on factors affecting chemical shift in NMR.
(2) Explain difference between chemical shift δ and coupling constant j .
(3) Answer the following.
a) Give two important properties of TMS.
b) Deduce the constitution of a compound with mol formula C_2H_6O giving three signals. (Vapour density is 23)
a) 3H Triplet 1.1 b) 2H Quartet 3.7 c) 1H singlet 2.6
- Q. 5 (A) Answer the following question. (04)
(1) Explain Homolytic and Heterolytic fission, Base peak, molecular ion.
- Q. 5 (B) Answer the following questions. (Any two) (10)
(1) Write a note on conformations of cyclohexane.
(2) Explain importance of mass spectra.
(3) Answer the following
a) Write name of factors affecting conformations of molecule.
b) Deduce constitution of a compound with molecular formula C_3H_6O giving following spectral properties

UV: No absorption above 220, NMR: Strong singlet $\delta=2.1$, IR: 1720 sharpSpectral data

NMR: O-H 4.0,
C-CH₃ 0.9 to 2.0 δ
O-CH₃ 3.9-3.9 δ
CO-CH₃ 2.4-2.7 δ

IR: Carbonyl C=O stretching 1650-1750

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BSCorgCC6020

Seat No : _____

B.Sc. Semester - 6 (CBCS) Examination

March/April -2020

ORGANIC CHEMISTRY AND SPECTROSCOPY (CORE)

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) Explain Gabriel phthalimide synthesis for preparation of amino acids. — (10)

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

(1) Write any five chemical properties of amino acid due to amino group. ✓

(2) What are amino acids? Classify them in detail. ✓

(3) Synthesize alanylglycine dipeptide by Fischer's method. (4)

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

(1) Write synthesis of PETN from acetaldehyde and give its uses. — (10)

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

(1) Write synthesis of (I) Musk Ambrette from m-cresol and (II) Baygon from catechol.

(2) Write synthesis of Citral from 1,3-dibromo-3-methylbutane.

(3) Explain constitution of α -Terpineol in detail. — (4)

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

(1) Explain Fischer Indole Synthesis in detail. — (10)

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

(1) Explain Friedlander's Synthesis in detail. —

(2) Write any five substitution reactions of Anthracene.

(3) Conversion: Anthracene from Naphthalene. — (4)

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

(1) NMR spectra of an organic compound in 60 MHz instrument requires 330 Hz secondary magnetic field. What value of secondary field will be required if the NMR of the compound is taken in 100 MHz

(2) A molecule with molecular formula $C_4H_{12}Si$ gives the following signal in NMR. Deduce the constitution. a) 12H s 10 τ . (10)

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

(1) Give difference between Chemical shift δ and coupling constant j.

(2) Explain anisotropic effect in ethene, acetylene and 18-Annulene.

(3) A molecule contains C%=54.5, H%=2.28, and F. The Vapour Density is 66 and gives a singlet at 7.8 δ . Deduce its constitution. (Mol.wt=2 Vapour Density) (4)

Q. 5 (A) Answer the following question. (4)

(1) Explain factors affecting stability of conformations. (10)

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

(1) Discuss conformations of cyclohexane.

(2) Discuss important features of mass spectra of alkanes.

(3) A compound has the following spectral properties. Deduce its structure.

M.F. $C_8H_8Br_2$, Gives UV band above 220 nm, IR: 3080, 1640, 1510, 1405, 1215, 930, 760 and 710 cm^{-1} , NMR:a) 5H s 7.4 δ b) 1H d 4.1 δ c) 1H d 4.1 δ d) dd 1H 5.1 δ

Spectral Data

U.V.

Empirical rules for Dienes:

(A) homoannular $\lambda = 253$ nm

(B) heteroannular $\lambda = 253$ nm

Increments for double bond

extending conjugation

30

30

Exocyclic double bond

5

5

Alkyl substitution or ring
residue

5

5

Homocyclic Diene
components

39

39

Polar Groups:

-OCOCH₃

0

0

-OR

6

6

-Cl, -Br

5

5

-NR₂

60

60

(C) Simple Diene:

Parent $\lambda = 217$ nm

Polar Groups

Alkyl substitution or ring
residue

5 nm

-Cl, Br

17

-OH

5

-OR

5

-NR₂

60

-SR

30

(D) Empirical rules for Enone and Dienones:

λ

(a) Z=C

(1) 6 membered ring or acyclic

215

(2) 5 membered ring

202

(b) Z=H

207

(c) Z= OH or OR

193

(d) Acyclic dienone

245

Increment for:

double bond extending conjugation

30

alkyl group or ring residue

α 10

β 12

γ or higher 18

Exocyclic double bond position

5

Homocyclic diene component

39

| Polar Groups | α | B | γ | δ' other |
|---------------------|----------|----|----------|--------------------|
| -Cl | 15 | 12 | - | - |
| -OH | 35 | 30 | 50 | 50 |
| -OR | 35 | 30 | 17 | 31 |
| -NR ₂ | - | 93 | - | - |
| -O | - | 75 | - | - |
| -NHCOR | - | 95 | - | - |
| -OCOCH ₂ | 6 | 6 | - | 6 |

| | | | | |
|------------------|----|----|---|---|
| -SR | - | 85 | - | - |
| -Br | 25 | 30 | - | - |
| -NO ₂ | - | 95 | - | - |

(e) Empirical rules for Benzoyl derivatives:

Parent Chromophor:

| | |
|--------------------------|-----|
| Z= Alkyl or ring residue | mm |
| Z= H | 246 |
| Z = -OH or OR | 250 |
| | 230 |

Increment for each substituent:
Alkyl or ring residue

| Q | M | R |
|----|----|----|
| 3 | 3 | 10 |
| 7 | 7 | 25 |
| 11 | 20 | 78 |
| 0 | 0 | 10 |
| 2 | 2 | 15 |
| 13 | 13 | 58 |
| 20 | 20 | 45 |
| - | - | 73 |
| 20 | 20 | 85 |

Infra Red Data

| | | |
|---|---|-------------|
| Alkane (stretching) | -C-H | 2960-2850 |
| Alkene | =C-H | 3200-3100 |
| Alkyne | ≡C-H | 3300-3200 |
| Aromatic | Ar-C-H | 3100-3010 |
| Aromatic Ring | C=C | 1600-1500 |
| Alkene | >C=C< | 1680-1610 |
| Alkyne | -C≡C- | 2260-2100 |
| Alkene (Bending) | -C-H | 1340 |
| | -C(C ₂ H ₃) ₃ | 1470-1430 |
| | | 1380-1385 |
| | -C(CH ₂) ₃ | 1365 |
| Aldehyde | -C-H | 2820-2720 |
| Aldehyde | >C=O | 1740-1720 |
| Ketone | >C=O | 1725-1710 |
| Carboxylic acid | >C=O | 1725-1705 |
| Ester | >C=O | 1750-1730 |
| Amide | >C=O | 1670-1640 |
| | | 1860-1810 & |
| Anhydride | >C=O | 1790-1740 |
| Alcohols, ethers, esters, carboxylic acids, anhydride | C-O | 1300-1000 |
| Alcohols, Phenols: | | |
| Free | -OH | 3650-3600 |
| H-bonded | -OH | 3500-3200 |
| Carboxylic acid | | |
| Free | -OH | 3500-3650 |
| H-bonded | -OH | 2500-3200 |
| Amines | | |
| stretching | -N-H | 3330-3500 |
| bending | -N-H | 1640-1550 |

| | | |
|--------------------------|------|------------|
| Nitrile | -C≡N | 2280-2210 |
| Ether | -O- | 1150-1070 |
| Alkene bending | | |
| disubstituted cis | | 690 |
| disubstituted trans | | 960-970 |
| Aromatic substitution: | | |
| C-H out of plane bending | | |
| No. of adjacent H atom | | Range (cm) |
| | | 750 |
| | | & |
| 5 | | 700 |
| 4 | | 750 |
| 3 | | 780 |
| 2 | | 830 |
| 1 | | 850 |

NMR

| Type | Type of proton | Chemical shifts (approximate) in δ ppm |
|--------------------|---------------------------------|--|
| Primary | R-CH ₃ | 0.9-1.0 |
| Secondary | R ₂ -CH ₂ | 1.3-1.5 |
| Tertiary | R ₃ -CH | 1.5-1.8 |
| Vinyllic | C=C-H | 4.6-5.9 |
| Acetylinic | C≡C-H | 2.0-3.0 |
| Aromatic | Ar-H | 7.0-8.0 |
| Benzylic | Ar-C-H | 2.2-3.0 |
| Allylic | C=C-CH ₃ | 1.7-1.8 |
| Flourides | HC-F | 4.0-4.5 |
| Chlorides | HC-Cl | 3.0-4.0 |
| Bromides | HC-Br | 2.5-4.0 |
| Iodides | HC-I | 2.0-4.0 |
| Alcohols | HC-OH | 3.4-4.0 |
| Ethers | HC-OR | 3.3-4.0 |
| Esters | R-COO-CH ₃ | 3.7-4.1 |
| Acids | HC-COOH | 2.6-3.0 |
| Carbonyl Compounds | HC-C=O | 2.0-2.7 |
| Carboxylic acid | R-COOH | 10.0-12.0 |
| Aldehyde | R-CHO | 9.0-10.0 |
| Hyroxylic | R-OH | 1.0-5.5 |
| Phenolic | Ar-OH | 4.0-12.0 |
| Enolic | C=C-OH | 15.0-17.0 |
| Amino | R-NH ₂ | 1.0-5.0 |
| Cyano | HC-CN | 2.6-2.8 |

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.

[04]

- (1) Draw the full structure of two acidic and two basic amino acids.

Q. 1 (B) Answer any two questions out of three.

[10]

- (1) Prove the structure of Thyroxine.
- (2) Give any two synthetic methods for poly peptide.
- (3) (a) Explain Isoelectric point.
(b) Explain Gabriel-phthalamide method.

Q. 2 (A) Answer the following question.

[04]

- (1) Give the synthesis and uses of PETN.

Q. 2 (B) Answer any two questions out of three.

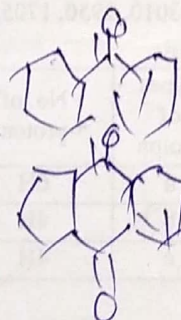
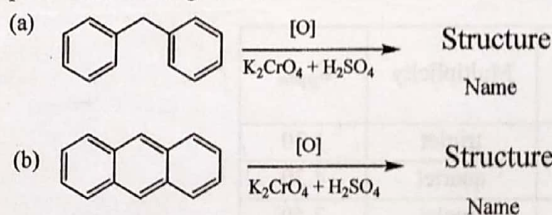
[10]

- (1) Discuss constitution of Citral.
- (2) Give the synthesis and use of musk xylene, RDX and parathion.
- (3) Write any two synthesis of α - Terpineol

Q. 3 (A) Answer the following question.

[04]

- (1) Complete the following reactions:



Q. 3 (B) Answer any two questions out of three.

[10]

- (1) Explain Fischer Indole synthesis with full mechanism.
- (2) Give any two syntheses for each of biphenyl and naphthalene.
- (3) Explain Skraup synthesis with full mechanism.

Q. 4 (A) Answer the following question.

[04]

- (1) Calculate $^1\text{H-NMR}$ signals with notification for following molecules:

- 1,2-dibromo propane
- 1-propene
- trans - 1,3-dimethyl cyclobutane
- cis - 1,3-dimethyl cyclobutane

Q. 4 (B) Answer any two questions out of three.

[10]

- (1) Explain shielding and deshielding effect with example of ethyne and ethene.
- (2) Determine the structure from following NMR data:

Molecular Weight = 264 gm/mole

C = 36.30%, H = 3.10%, Br = 60.60% [atomic mass Br = 80 gm/mole]

| Types of proton | Multiplicity | τ_{ppm} | proton ratio |
|-----------------|--------------|---------------------|--------------|
| a | singlet | 5.35 | 1:1 |
| b | singlet | 2.76 | |

(3) (a) Why TMS is used as reference compound in NMR spectroscopy?

(b) Determine the structure from following NMR data:

M. F. = $C_9H_{11}NO$

| Types of proton | No. of proton | Multiplicity | δ_{ppm} |
|-----------------|---------------|--------------|----------------|
| a | 6H | singlet | 2.89 |
| b | 2H | doublet | 7.24 |
| c | 2H | doublet | 7.66 |
| d | 1H | singlet | 9.38 |

Q. 5 (A) Answer the following question.

[04]

(1) Determine the structure from following spectral data:

M. F. = C_4H_5NO

IR: 2282, 1722 cm^{-1} ,

NMR:

| Types of proton | No. of proton | Multiplicity | δ_{ppm} |
|-----------------|---------------|--------------|----------------|
| a | 3H | singlet | 2.52 |
| b | 2H | singlet | 3.82 |

Q. 5 (B) Answer any two questions out of three.

[10]

(1) Determine the structure from following spectral data:

Molecular Weight = 222 gm/mole

C = 64.86%, H = 6.31%

U.V. = λ_{max} = 278 nm

IR: 3010, 2950, 1705, 1570, 1450, 1280, 1030, 830 cm^{-1}

NMR:

| Types of proton | No. of proton | Multiplicity | δ_{ppm} |
|-----------------|---------------|--------------|----------------|
| a | 6H | triplet | 1.30 |
| b | 4H | quartet | 4.30 |
| c | 4H | singlet | 7.50 |

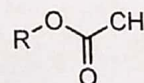
(2) Write a note on "General Fragmentation Modes" in mass spectroscopy.

(3) Discuss conformational analysis of cyclohexane with potential energy diagram.

U. V.

IR:

NMR:

$$\text{R}-\overset{\text{O}}{\underset{\text{O}}{\parallel}}-\text{O}-\text{CH}$$
 $2.1 - 2.9 \delta_{ppm}$  $4.0 - 4.5 \delta_{ppm}$

Antey CR lock

Aspartic acid
-COOH -CH₂-CH(COOH)
-CH₂-CH₂-NH₂
Glycine

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) Explain the Third law of thermodynamics and Calculate Ionic strength of 0.01 M KI + 0.20 M KBr solution.

Q. 1 (b) Answer any two questions out of three.

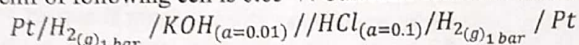
(10)

- (1) Describe the method of determination of activity co-efficient by solubility method.
- (2) Derive the equation to determine the absolute entropy of solids, liquids and gases by Third law of Thermodynamic.
- (3) Derive the equation : $\log f_{\pm} = -0.509 |Z_+ Z_-| \sqrt{\mu}$.

Q. 2 (a) Answer the following question.

(4)

- (1) At 298 K, emf of following cell is 0.65 V. Calculate Ionic Product of water (K_w).



Q. 2 (b) Answer any two questions out of three.

(10)

- (1) Derive the equation: $E_{w.t.} = t_- \times \frac{RT}{F} \ln \frac{a_2}{a_1}$.
- (2) Discuss the method of determination the Dissociation Constant (K_a) of weak acid (CH_3COOH) by using emf.
- (3) Write reactions of $\text{Zn} - \text{Hg}_{(C_1)} / \text{ZnSO}_4 (sol.) / \text{Zn} - \text{Hg}_{(C_2)}$ and How valency of Mercurous ion is determined by using emf measurement.

Q. 3 (a) Answer the following question.

(4)

- (1) Derive the equation of Raoult's law with reference to chemical potential.

Q. 3 (b) Answer any two questions out of three.

(10)

- (1) Derive Gibbs-Duhem equation.
- (2) (a) Explain Student T-test with example.
(b) Identify the significant figure in (i) 500.0 (ii) 0.008940
- (3) The amount of element X in XY compound in different experiments obtained as 40.22%, 40.26%, 40.13%, 40.01% and 40.28%. Then, calculate Median value, Mean Value, Average deviation, Relative average deviation and Standard deviation.

Q. 4 (a) Answer the following question.

(4)

- (1) Give detailed information of R_f and R_x value and Write factors affecting on R_f value.

Q. 4 (b) Answer any two questions out of three.

(10)

- (1) Discuss the classification of Chromatography in detail.
- (2) Explain Principle and working method of Ion-exchange Chromatography.
- (3) Describe general techniques of Circular Paper Chromatography in detail.

Q. 5 (a) Answer the following question.

(4)

- (1) Discuss in detail: Borax bead test with principle.

Q. 5 (b) Answer any two questions out of three.

(10)

- (1) Discuss the Separation of NO_2^- , NO_3^- and Br^- ions in presence of each other.
- (2) Explain: Redox titration of $\text{FeSO}_4 \rightarrow \text{KMnO}_4$ potentiometrically.
- (3) Define: P^H metry. Derive the equation for P^H of unknown solution by using H_2 - electrode as an indicator electrode and Calomel electrode as a reference electrode.

647510

BSCphyCC6030

Seat No : _____

B.Sc. Semester - 6 (CBCS) Examination

March/April -2019

PHYSICAL AND ANALYTICAL CHEMISTRY(CORE)

Marks: 70

Time: 2:30 Hours

Instructions:

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

Que-1(A) What is ionic strength? Calculate ionic strength of 0.1M lanthanum nitrate solution. (4)
(10)

Que-1(B) Answer any two questions

- (1) Discuss Nernst heat theorem.
- (2) Write the equation of Debye Huckel limiting law and explain its corrections.
- (3) Calculate mean activity, mean concentration and activity (a_2) of 0.2 m solution of chromium nitrate if mean activity coefficient of the ions is 0.285.

Que-2(A) Write the cell reaction of Zn(Hg) (0.04 M) / ZnSO₄ (0.1 M) / Zn(Hg) (0.02 M) cell and calculate emf of the cell at 25° C. (F = 96500 coulomb, R = 8.14 Joule/mole) (04)
(10)

Que-2(B) Answer any two questions

- (1) Derive the equation for emf of electrolyte concentration without transference.
- (2) Explain liquid junction potential and methods to eliminate it.
- (3) Describe the determination of dissociation constant of weak acid by emf method.

Que-3(A) Define significant figure. Write 3.58 kg in mg and gm according to significant figure rule. (04)
(10)

Que-3(B) Answer any two questions

- (1) Describe the methods to eliminate the errors.
- (2) Derive Gibbs Duhem equation and state its conclusion.
- (3) Analysis of a sample found 41.61%, 41.27%, 41.70% and 41.64% silver. Find whether the value 41.27% can be rejected or retained. (Q – Table value is 0.829)

Que-4(A) Name the detectors of gas chromatography and explain any one of them. (04)
(10)

Que-4(B) Answer any two questions

- (1) Name the stationary phase of paper chromatography. Explain ascending, descending, two dimensional and circular paper chromatography.
- (2) Describe column chromatography.
- (3) State the properties of resin and factors affecting ion exchange.

Que-5(A) Explain the principle of charcoal cavity test with chemical reactions. (04)
(10)

Que-5(B) Answer any two questions

- (1) Explain glass electrode. Write its advantages and disadvantages.
- (2) Describe argentometric titration by potentiometry.
- (3) Explain pH- metry titration of weak acid against strong base and determination of dissociation constant of weak base.

4.10.11
U. C. S.
M. C. S.
g = 9
log 1/2