



Paper Code : CHEHCT 31

M.Sc. III Semester (CBCS) Degree Examination, June/July 2023

Subject : CHEMISTRY

Paper : Organic Chemistry – III (Spectroscopy)

Time : 3 Hours

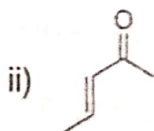
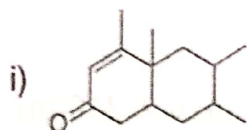
Max. Marks : 80

1. Answer any 8 of the following : (8×2=16)

- a) State and explain Beer-Lambert's law.
- b) Anti-stokes lines are less intense than the corresponding stokes line – Justify.
- c) An NMR signal for a compound appeared as 180 Hz downward from TMS peak if operating frequency is 60 MHz. Calculate the chemical shift in ppm.
- d) What is base peak ? How does it differ from molecular ion peak ? Give examples.
- e) Define the terms : Shielding and deshielding.
- f) Explain the significance of nitrogen rule in mass spectra.
- g) What is proton noise decoupled spectra ?
- h) What is meant by off resonance decoupling ?
- i) What is Stevenson rule ?
- j) State and explain principle of IR Spectroscopy.

Answer the following questions :

2. a) Summarise the Woodward-Fieser rules for calculation of absorption maxima of α, β -unsaturated compounds. Predict the λ_{\max} of the following examples.



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- b) Briefly explain Overtones and Fermi resonance.
c) Write note i) Bending and stretching vibrations.
ii) Applications of IR spectroscopy to alkanes, alkenes and alkynes.
OR
c) Discuss the various types of electronic transitions encountered in electronic spectra. (5+5+6=16)
3. a) What are first order spectra ? Give example. Explain any two techniques which can be used for reducing the complex spectra into first order spectra.
b) Write short notes on : i) Spin-spin coupling
ii) Use of lanthanide as shift reagents.
c) How can you distinguish the m-dichloro-benzoic acid and p-dichloro-benzoic acid by ^1H NMR ?
OR
c) Write notes on : i) Karplus curves and Karplus equations.
ii) CIDNP. (5+5+6=16)
4. a) Write a note on COSY spectra.
b) Compare and contrast ^1H NMR with ^{13}C NMR spectroscopy.
c) Account on correlation NMR spectroscopy.
OR
c) Account on ^{19}F spectroscopy. (5+5+6=16)
5. a) With a neat sketch, explain the working of mass spectrophotometer.
b) Differentiates EI and SI ionization methods.
c) Write notes on : i) McLafferty rearrangement ii) Isotopic peaks
OR
c) An organic compound (Mol. Formula : $\text{C}_8\text{H}_7\text{Br}$) yields a primary alcohol on hydroboration and gives the following spectral data.
UV : λ_{max} 282 nm (ϵ_{max} = 450)
IR(ν_{max} , cm^{-1}) : 3033(w), 1602(m), 1582(w), 870(s), 770(s) and 710(m).
 ^1H NMR (δ ppm) : 5.14 (1H, dd), 5.70 (1H, dd), 6.70 (1H, dd) and 7.26-738 (4H, s). Deduce the structure of the compound. (5+5+6=16)



Paper Code : CHEHCT 32

M.Sc. III Semester (CBCS) Degree Examination, June/July 2023

Subject : CHEMISTRY

Paper : Physical Chemistry – III

Time : 3 Hours

Max. Marks : 80

1. Answer **any eight** of the following : **(8×2=16)**

- a) Differentiate between phase space and ensembles.
- b) Define partition function. Give its equation.
- c) Mention the limitations of Valance Band Theory (VBT).
- d) What is harmonic oscillator ? Give the condition for harmonicity.
- e) What are semiconductors ? How they are usefull ?
- f) Define the term magnetoresistance.
- g) Mention the applications of zeolites.
- h) What are soft and hard magnetic materials ? Explain briefly.
- i) Define partial molar quantities.
- j) What are colloids ? Mention its characteristics.

Answer the following questions. **(4×16=64)**

2. a) Discuss the Maxwell-Boltzmann distribution law for ideal gases.
- b) Derive Bose-Einstein statistical equation.
- c) Derive the translation partition function for monoatomic gaseous molecule.

OR

- c) Compare between Fermi-Dirac and Bose-Einsteins statistics. **(5+5+6=16)**

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3. a) Discuss the wave equation for H-atom and find the solutions for R and ϕ equations.
b) With neat diagram, explain the Molecular Orbital Theory (MOT).
c) Write a note on VB theory for H_2 molecule.

OR

- c) Compare and contrast between MOT and VBT. (5+5+6=16)

4. a) Write a note on principles and classification of solid state reactions.
b) Explain the principle and applications of thermo gravimetric analysis.
c) Write a note on determination of Fermi energy levels for semiconductors.

OR

- c) Write a note on different types of magnetic materials. (5+5+6=16)

5. a) Derive Gibbs-Duhems equation for chemical potential.
b) Discuss the electrokinetic phenomenon of colloids.
c) Explain the determination of Surface Tension.

OR

- c) Write a note on Onsager reciprocity equation. (5+5+6=16)



Paper Code : CHESCT 32

M.Sc. III Semester Degree Examination, June/July 2023

Subject : CHEMISTRY (CBCS Scheme)

Paper : Inorganic Chemistry – III

Time : 3 Hours

Max. Marks : 80

Answer any eight of the following questions.

(8×2=16)

1. a) How energy is dissipated during non-radiative process ?
b) What is the role of Ceruloplasmin in the biological process ?
c) Give the functions of Ferritin.
d) How magnesium help in photosynthesis ?
e) What type of disease are caused by Copper and Iron overload ?
f) What are Electron transfer proteins ? Mention their significance.
g) How is the functioning of haemoglobin inhibited by the ligands and metal ions ?
h) What is photosensitisation ? Give example.
i) State the laws of photochemistry.
j) Give any two biochemical effects of As and Cd.
2. a) What are essential and trace elements ? Describe the role of essential elements.
b) Give the structural features and biological functions of transferrin.
c) Write briefly on the drug action of cisplatin in cancer therapy.

OR

- c) Describe the structure and functions of haemoglobin and myoglobin.

(5+5+6)

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3. a) What are photooxidation and photoreduction reactions ? Explain with suitable examples.
- b) Discuss the photolysis of water using colloidal suspension.
- c) Give the Potential energy diagram of excited species and compare with organic molecules.

OR

- c) Describe the mechanism of photo isomerisation and photo recimization reactions. (5+5+6)
4. a) Illustrate on the parent-daughter decay-growth relationships.
- b) Write a note on the theory of α , β -decay.
- c) Mention the advantages and disadvantages of nuclear reactors.

OR

- c) Describe the method of Nuclear waste management and disposal procedures. (5+5+6)
5. a) Illustrate on the physical and chemical properties of ceramics. Give its types and uses.
- b) Discuss the industrial pollution from cement industries and mention the methods of disposal of industrial effluent.
- c) Describe the biochemical effects of As, Cd and Pb on enzymes. Give its mechanism.

OR

- c) What are pesticides and carcinogens ? Discuss the adverse effects on the environment. (5+5+6)
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