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Total No. of Pages : 02

Total No. of Questions : 09

**B.Tech. (AI&OS/AI&ML/Block Chain/Internet of Things and Cyber
Security including Block Chain Technology/
CE/CSE/CS/IOT/CSD/EEE/ECE/EE/ETE/ME/ECS/IT/Food
Technology/Robotics & AI/ Block Chain Technology) (Sem.–1,2)**

CHEMISTRY-I

Subject Code : BTCH101-23

M.Code : 93800

Date of Examination : 20-05-2025

Time : 3 Hrs.

Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.
2. SECTION - B & C have FOUR questions each.
3. Attempt any FIVE questions from SECTION B & C carrying EIGHT marks each.
4. Select at least TWO questions from SECTION - B & C.

SECTION-A

I. Write briefly :

- a) Define aromaticity and give one example of an aromatic molecule.
- b) Draw the pi-molecular orbital's of buta-diene.
- c) What is spin-spin coupling in NMR?
- d) In ^1H NMR spectroscopy, what is meant by chemical shift?
- e) What are Van der Waals interactions, and how do they differ from ionic and dipolar interactions?
- f) List any three factors that affect the rate of corrosion.
- g) How do atomic and ionic sizes change across a period and down a group in the periodic table?
- h) Why do noble gases have positive electron gain enthalpies?
- i) What is the difference between enantiomers and diastereomers?
- j) What is the difference between electrophilic and nucleophilic, substitution reactions?

SECTION - B

2.
 - a) What is the effect of doping on the band structure of semiconductors and how does it influence their electrical conductivity?
 - b) Explain how d-orbitals split in a tetrahedral crystal field. Why is crystal field splitting in a tetrahedral environment lower than in an octahedral environment?
3.
 - a) Derive the Schrodinger wave equation and explain the physical significance of Ψ and Ψ^2 .
 - b) What is the principle behind electronic spectroscopy, and what types of electronic transitions can occur in molecules?
4.
 - a) What factors influence the value of λ_{max} and the intensity of spectral lines?
 - b) What is the principle of NMR spectroscopy? Explain.
5.
 - a) Define the critical point of a substance and explain the relationship between critical constants and the van der Waals constants.
 - b) How does the behavior of real gases deviate from ideal gas behavior at high pressure or low temperature?

SECTION - C

6.
 - a) What are the various problems associated with hard water and how does it affect daily life?
 - b) State the Nernst equation and explain its application in calculating cell potentials.
7.
 - a) What is the effective nuclear charge, and how does it affect the behavior of electrons in an atom?
 - b) How does electronegativity influence the polarity of chemical bonds?
8.
 - a) Give the conformational analysis of Propane by drawing the potential energy diagram for various conformations of it.
 - b) **Explain :**
 - i. Chirality
 - ii. Optical activity
9. What is an electrophilic addition reaction, and how does it differ from nucleophilic addition? Explain by giving suitable examples.

NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.