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Total No. of Pages : 03

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**B.Tech. (AE / AI&ML / AI & Data Science / Robotics & AI / FT / CE /
Computer Engg. / CSE / IOT / EE / EEE / IT / ME / (Internet of Things and
Cyber Security including Block Chain Technology)) (Sem.-1,2)**

CHEMISTRY-I

Subject Code : BTCH-101-18

M.Code : 75343

Date of Examination : 02-01-2024

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 atleast TWO** questions from **SECTION - B & C.**

SECTION-A

1. Answer briefly :

- a) The following compounds show only one signal in ¹H NMR. Write their structural formula, (a) C₅H₁₂, (b) C₂H₆O.
- b) Why *d* and *f* orbital show poor shielding effect?
- c) What is the essential condition of molecule to NMR active?
- d) What is the shape of BF₃ molecule?
- e) What do you understand by effective nuclear charge?
- f) How does Vander Waals interaction occur?
- g) What are rocking and wagging vibrations?
- h) What is optical activity?
- i) Define entropy.
- j) Give one example of Hard and soft acid each.

SECTION-B

2.
 - a) Solve the Schrodinger wave equation for particle in one-dimensional box.
 - b) What will happen if the walls of the one dimensional box are suddenly removed?
3. Draw the molecular diagram of O_2 , O_2^{2-} and O_2^{+} . Compare these on the basis of their bond order and magnetic behavior. Also, calculate its bond length and bond dissociation energy.
4.
 - a) Discuss the principle of electron spectroscopy. Explain with reference to $CH_2=CH_2$, 1,3-butadiene and carbonyl compound.
 - b) Describe the working principle and selection rule for NMR.
5. Explain the following terms with example :
 - a) Ionic interaction
 - b) Dipole interaction
 - c) Vander Waals interaction.

SECTION-C

6.
 - a) Derive Nernst Equation and give its application.
 - b) Simultaneous oxidation and reduction, according to the reaction .
$$2 Cu^+ (aq) \longrightarrow Cu^{2+} (aq) + Cu(s)$$
Calculate E° for the reaction? ($E^\circ Cu^{2+} | Cu = 0.34 V$ and $E^\circ Cu^{2+} | Cu^+ = 0.15 V$)
7. Give reason for the following :
 - a) Second ionisation energy of an atom is always greater than the first ionisation energy of an atom.
 - b) Electron affinities of halogen are highest.
 - c) The size of anion is larger than its parent atom.
 - d) Why Na is smaller than Na^+ ?

8. a) Define chirality. What are chiral molecules?
- b) Differentiate between the following :
- i) Structural isomers and Stereoisomer
 - ii) Enantiomers and Diastereomers
 - iii) Configuration and Conformation
9. a) Explain the synthesis of any one commonly used drug molecule.
- b) Explain the mechanism of SN_1 reaction.

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