

Roll No.

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 S_N1 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.