

Roll No. 19001013032

Total Pages : 4

300105

December, 2019
B.Tech.- I SEMESTER
Chemistry (BSC102)

Time : 3 Hours]

[Max. Marks : 75

Instructions :

- 1. It is compulsory to answer all the questions (1,5 marks each) of Part-A in short.*
- 2. Answer any four questions from Part-B in detail.*
- 3. Different sub-parts of a question are to be attempted adjacent to each other.*

PART - A

1. (a) What is the role of doping on the band structures of solids? (1.5)
(b) Give the structural formula of C_3H_6O which gives one signal in 1H NMR. (1.5)
(c) Give main difference between wet and dry corrosion with example. (1.5)

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- (d) Predict whether cyclopropene, cyclopropenyl cation and cyclobutadiene are aromatic or non-aromatic. (1.5)
- (e) Give two points how scale and sludge formation can be prevented in boilers. (1.5)
- (f) Give the Schrodinger wave equation for a particle in one dimensional box. (1.5)
- (g) Explain how acetic acid acts as acid in aqueous solution according to Bronsted-Lowry acid base concept. (1.5)
- (h) Define entropy and enthalpy of a reaction. (1.5)
- (i) Draw the Fischer projection formula for (2R)-2-Bromobutane. (1.5)
- (j) What do you understand by term cyclization reaction? Give example. (1.5)

PART - B

2. (a) What do you mean by effective nuclear charge? Write Slater's rule to find out effective nuclear charge. (5)
- (b) Explain Fajan's Rule of polarizability and its significance. (5)
- (c) Give the geometries possible for coordination number 4. Using VSEPR theory predict the shape of a AB_3 molecule having 2 lone pair of electrons on central atom A. (5)

3. (a) Give the selection rule for IR spectroscopy. Explain stretching and bending vibrations in AB_2 type nonlinear molecule. (5)
- (b) Write a short note on shielding and de-shielding of protons in NMR spectroscopy. (5)
- (c) Discuss the principle of electronic spectroscopy. Explain with reference to butadiene and carbonyl compounds. (5)
4. (a) Discuss the potential energy surface diagram of H_2F and its trajectories. (7)
- (b) Give a detailed account for any *four* intermolecular forces of attraction existing in molecules. (8)
5. (a) Draw the pi-molecular orbitals for butadiene. (5)
- (b) Give *three* main postulates of CFT. Explain the splitting of d orbitals under octahedral, tetrahedral and square planar ligand field. (10)
6. (a) Discuss taking examples of organic molecules types of structural and stereoisomerism. (5)
- (b) Discuss the synthesis of a commonly used analgesic drug molecule taking a suitable example. (5)

(c) Nucleophilic substitution and elimination reactions often compete with each other. Justify this statement giving the conditions when substitution is preferred over elimination. (5)

7. (a) Explain Ellingham diagram listing its uses and limitations. (7)

(b) Give the equation which relates cell potential and Gibbs free energy at equilibrium. Write three main applications of Nernst equation with examples. (8)
