

Roll No. 201904009

Total Pages : 4

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**B.Tech. (CE-DS/CSE-ML/ECE/ME/RA/CE/
CSE/IT/CIVIL) - I SEMESTER
Chemistry (BSC-102)**

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) Define Fluorescence and Phosphorescence. (1.5)
 - (b) Draw an energy level diagram for n-type and p-type semiconductors according to Band theory. (1.5)
 - (c) Derive the relation between heat of reaction at constant volume and heat of reaction at constant pressure. (1.5)
 - (d) Explain causes of deviation of gases from ideal behavior. (1.5)
 - (e) Define Chirality and explain how it leads to the phenomenon of optical activity. (1.5)

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- (f) How many fundamental modes of vibration are expected for the following
 (a) CO_2 (Linear) (b) H_2O (Bent). (1.5)
- (g) Explain Bronsted-Lowry concept or protonic concept for acid and base with examples. (1.5)
- (h) Why does benzene undergo electrophilic substitution rather than addition reaction? (1.5)
- (i) What are soft acids and soft bases according to the HSAB concept? (1.5)
- (j) Write the difference between $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ reactions. (1.5)

PART-B

2. (a) (i) Discuss the different types of structural isomers in transition metal complexes with suitable examples. (5)
- (ii) What is ozonolysis? Explain with at least one suitable example. (2)
- (iii) What is diel's Alder cycloaddition reaction? Explain with at least *one* example. (3)
- (b) (i) What is electronegativity? Write the factor affecting the electronegativity. (3)
- (ii) Explain the Allred Rochaw scale of electronegativity. (2)

3. (a) Using the Ellingham diagram explains metal extraction from its oxide. (5)
- (b) Explain the following terms :
- (i) Bathochromic shift.
 - (ii) London forces.
 - (iii) Critical Temperature.
 - (v) Compressibility factor.
 - (vi) Potential Energy Surfaces. (10)
4. (a) What is CFSE? Calculate CFSE for d^5 (H.S.) and d^5 (L.S.) including pairing energy (p) in octahedral complexes. (5)
- (b) On the basis of MOT, explain the molecular orbital energy pattern of O_2 molecule. (5)
- (c) Deduce the expression for total energy and normalized wave function for particle mass (m) in 1-D box with length (L) moving with potential $V(x) = 0$ ($0 < x < L$), otherwise $V(x) = \text{infinite}$. (5)
5. (a) Differentiate between the following pairs with suitable example of each
- (i) Enantiomers and diastereomers.
 - (ii) Racemic mixture and meso compounds. (5)
- (b) (i) What do you mean by corrosion? Explain the factors influencing corrosion. (5)
- (ii) Discuss in brief Wet corrosion and Dry corrosion. (5)

6. (a) Explain basic principle and applications of Rotational spectroscopy. Using the energy level expression and selection rule, draw the spectral transitions of the microwave spectrum of the diatomic molecule as a rigid rotator. (10)
- (b) Explain in brief the term polarizability. How is it different from polarizing power? Describe Fajan's rule for ionic and covalent Characters. (5)
7. (a) Explain the synthesis of Paracetamol and Aspirin. (5)
- (b) What are the assumptions and limitations of CFT? (5)
- (c) Explain the electronic transitions in UV-vis spectroscopy. (5)
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