(i) Printed Pages : 4 Roll No. .....

(ii) Questions : 9 Sub. Code : 1205

Exam. Code : 0067

B.Sc. (Hons.) 1st Semester

1125

BIO-TECHNOLOGY

Paper : BIOT-Sem-I-IV-T : Chemistry

Time Allowed : Three Hours] **[Maximum Marks : 67**

Note :– Attempt **five** questions in all selecting **two** questions from Section A and Section B. Question No. 9 (Section C) is compulsory.

SECTION–A

1. (a) Discuss the Molecular Orbital Theory. On the basis of MO theory explain why N_2 is diamagnetic while O_2 is paramagnetic.

   (b) Explain the term Ionization Energy. How does ionization energy vary when we (I) move down the group (II) across the period ? 7,6

2. (a) Draw molecular orbital diagram of CO. Calculate its bond order.

(b) Discuss quantum theory of Raman Spectroscopy and show how the Stokes and Anti-stokes lines appears in Raman Spectrum of a molecule ? Why are anti-stokes lines less intense than stokes line in Raman Spectroscopy ? 6,7

3. (a) Derive the relation between the freezing point depression of solution and mole fraction of the dissolved solute. How is this expression utilized for determining the molar mass of nonvolatile solute ?

(b) What is meant by Order of Reaction ? How is order of a reaction related to half life period ? 7,6

4. (a) Derive van't Hoff equation for osmotic pressure of a dilute solution. How will you utilize this equation for determining molar mass of a solute ?

(b) What is meant by Energy of Activation ? Explain how energy of activation is determined with the help of Arrhenius Equation. 7,6

SECTION–B

5. (a) Explain Quantum Yield. How is quantum yield of a photochemical reaction determined experimentally ? Explain why some of photochemical reaction have very high or very low quantum yield.

(b) Name the different kinds of isomerism possible in co-ordination complexes. Give one example of each kind. 7,6

6. (a) State and explain Stark-Einstein law of photochemical equivalence. What is meant by molar extinction coefficient?

(b) Explain the basic postulate of Werner's coordination theory. 7,6

7. (a) Discuss two factors influencing the stability of carbocation. Arrange the following carbocations in order of increasing stability (least stable first):

(i) $C_6H_5CH_2^+$

(ii) $CH_3CH_2^+$

(iii) $ClCH_2+$

(iv) $(C_6H_5)_2CH_2^+$

(v) CH_3^+

(b) Briefly account for the stereochemistry of S_N1 and S_N2 reactions. 6,7

8. (a) Explain the effect of substituent on the acidity of carboxylic acid by taking appropriate examples.

(b) How will you account for the fact that acid chlorides are most reactive and acid amides are least reactive towards nucleophilic substitution? 6,7

SECTION–C

(Compulsory Question)

9. (a) Why is the boiling point of NH_3 greater than PH_3 ? 2

(b) What are the basic assumptions of Valence Bond Theory ? 2

(c) Define half-life time of a reaction. 2

(d) Differentiate between Fluorescence and Phosphorescence. 2

(e) Write names of the following according to IUPAC system :

(i) $K_4[Fe(CN)_6]$

(ii) $[Cr(H_2O)_6]Cl_3$. 2

(f) Draw the energy profile diagram of S_N1 reaction. 1

(g) Predict the product of reaction of ethyl alcohol with following reagents :

(i) Conc. $HCl/ZnCl_2$

(ii) Phosphorus Trichloride. 2

(h) Complete the following reactions : 2

$$\xleftarrow[\text{Heat}]{C_2H_5OH/H^+} CH_3CH_3COOH \xrightarrow{Cl_2/P_4 \text{ cat.}}$$