

2022  
B.Sc. (Hons.) Biotechnology  
First Semester  
BIOT-104 T : Chemistry

Time allowed: 3 Hours

Max. Marks: 67

**NOTE:** Attempt five questions in all, including Question No. IX (Unit-V) which is compulsory and selecting one question each from Unit I-IV.

X-X-X

**UNIT – I**

- I. a) Discuss various Slater rules. Calculate effective nuclear charge for one of the 4s electron of Zinc atom.  
b) Draw molecular orbital energy level diagram of NO molecule. Calculate its bond order with help of electronic configuration and write about magnetic behaviour. (7,6)
- II. a) Explain quantum theory of Raman spectroscopy. Show how the Stokes and Anti Stokes lines appear in Raman spectrum of a molecule.  
b) Differentiate between absorption and emission spectrum.  
c) What is importance of mass spectroscopy in chemistry? (6,3,4)

**UNIT - II**

- III. a) Discuss in detail ideal and non-ideal solutions.  
b) Derive Van't Hoff equation for Osmotic pressure of a dilute solution. How this equation is useful in determining molar mass of a solute. (7,6)
- IV. a) Derive expression for rate constant for first order reaction.  
b) Differentiate Order and Molecularity.  
c) What is meant by activation energy? Discuss how it is determined with the help of Arrhenius equation? (4,4,5)

**UNIT – III**

- V. a) What is Stark-Einstein law of photochemical equivalence? Describe it in detail.  
b) Discuss in detail about phosphorescence and fluorescence. (5,8)

P.T.O.

(2)

- VI. a) Explain Geometrical isomerism in complexes having coordination number four and six with help of examples
- b) Write IUPAC names of the following:-
- $\text{Li [Al(H)}_4\text{]}$
  - $[\text{Cr (NH}_3\text{)}_6]^{3+}$
  - $[\text{Co (en)}_2\text{Cl}_2]\text{ClO}_4$
  - $\text{K}_2 [\text{Pt (Cl)}_4]$
- c) Define linkage isomerism with example. (8,4,1)

UNIT - IV

- VII. a) Explain and compare  $\text{SN}^1$  and  $\text{SN}^2$  reactions with help of energy diagrams and mechanisms.
- b) Write a complete note on resonance and hyper-conjugation. (8,5)
- VIII. a) Discuss the following reactions with the help of mechanisms:-
- HVZ reaction
  - Esterification reaction
- b) What is effect of substitution on acidic strength of carboxylic acids? Explain with help of examples. (7,6)

UNIT - V

- IX. Attempt the following:-
- Explain the term activity and activity coefficients. (2)
  - What do you mean by multicentre bond? Give example. (2)
  - Explain zero point energy. (2)
  - Discuss Lambert-Beer Law. (2)
  - Differentiate inductive and electromeric effect. (2)
  - Discuss in brief about carbenes. (2)
  - Define hydrogen bonding with example. (2)
  - Define Ionization isomerism with example. (1)