

(i) Printed Pages : 4]

Roll No. ....

(ii) Questions : 9]

Sub. Code : 

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Exam. Code : 

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## B.Sc. (Hons.) 1st Semester Examination

# 1127

### BIOTECHNOLOGY

(Chemistry)

Paper : BIOT-Sem-I-IV-T

Time : 3 Hours]

[Max. Marks : 67

**Note** :— Attempt *five* questions in all, choosing any *two* questions from Section A and B each. Section C is compulsory. All questions carry equal marks in Section A and B.

#### Section-A

1. (a) Define H-bonding. Discuss different types of H-bonding and conditions for forming H-bonds.
- (b) Using VSEPR theory show that  $\text{ICl}_2^-$  is linear while  $\text{ClF}_3$  is T-shaped.
- (c) Which of the following pairs is expected to have a larger size and why ?
  - (i) O,  $\text{O}^{-2}$
  - (ii)  $\text{Li}^+$ ,  $\text{Be}^{2+}$

5,6,4

NA-293

( 1 )

Turn Over

2. (a) Differentiate between the following with examples :
- (i) Absorption and emission spectroscopy.
  - (ii) NMR and mass spectra.
- (b) Explain the principle of IR spectroscopy. How will you differentiate between  $\text{CH}_3\text{OCH}_3$  and  $\text{CH}_3\text{CH}_2\text{OH}$  on the basis of their absorption signals ? 8,7
3. (a) The vapour pressure of 2% of an aqueous solution of a non-electrolyte at  $100^\circ\text{C}$  is 755 mm. Calculate the molar mass of the solute.
- (b) What are ideal and non-ideal solutions ? Explain with examples as to why some solutions show positive and negative deviations ? 7,8
4. (a) The rate constant of a particular reaction increases 4 times when the temperature changes from 293 K to 313 K. Calculate the energy of activation of such a reaction.
- (b) What are the advantages of transition state theory over collision theory ? 8,7

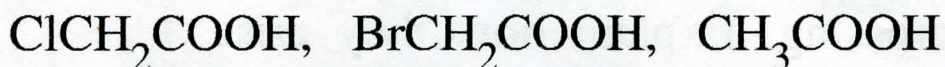
### Section-B

5. (a) Explain in detail why the quantum efficiency for the photosynthesis of HBr is very low, i.e., 0.01.



- (b) Draw a well labelled Jablonski diagram showing all the internal conversions and intersystem crossing. Explain how they arise ? 8,7
6. (a) Define the following terms with examples :
- (i) Denticity
  - (ii) Coordination number
  - (iii) Ligand
- (b) What are Chelates ? Discuss the factors affecting their stability.
- (c) A coordination compound  $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$  gives precipitates of  $\text{AgCl}$  with  $\text{AgNO}_3$  solution. The molar conductance of the resultant solution corresponds to total of three ions. Write the structure and IUPAC name of the compound. 6,5,4
7. (a) Discuss the mechanism of  $\text{S}_{\text{N}}2$  reaction and draw the energy profile diagram.
- (b) Explain the different types and structure of carbenes.
- (c) What are rearrangement reactions ? Give one example each for [1,2]-hydride and [1,2]-methyl shift reactions. 6,4,5

8. (a) Explain the order of acidity of the following carboxylic acids :



- (b) Give the mechanistic details for Hell-Volhard-Zelinsky reaction.

6,9

### Section-C

9. (a) Why do some reactions take place higher temperature and not at room temperature ?

- (b) State and explain Raoult's law.

- (c) How does the addition of a catalyst affect the rate of the equilibrium constant ?

- (d) Define Lambert-Beer law.

- (e) Arrange the following in order of decreasing stability :



- (f) Explain the importance of stability of the carboxylate anion on the acidic strength of carboxylic acids.

- (g) Give the IUPAC name for  $[\text{Cu}(\text{NH}_3)_4][\text{Cr}(\text{Cl})_4]$ .

1×7=7