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Register Number:

DATE:10-04-2018 ( 1 PM )

**ST. JOSEPH’S COLLEGE (AUTONOMOUS), BANGALORE-27**

**M.Sc. CHEMISTRY – IV SEMESTER**

**SEMESTER EXAMINATION: APRIL 2018**

**CH 0115: Applied Analysis**

Time- 2 ½ hrs Max Marks-70

**This paper contains two printed pages and three parts**

**PART A**

Answer any **six** of the following questions. **6 × 2 = 12**

1. What parameters of a biopolymer can be determined using hydrodynamic methods?
2. How is the mixture of the following proteins separated into their pure form: Ovalbumin (MW 45,000 pI 4.54); Bovine serum albumin (MW 66,000 pI 5.4) and M20 peptidase (MW 45,000 pI 8.2)?
3. Name and draw the structure of an expectorant?
4. What are isoenzymes? Give an example.
5. To which biomolecules do heavy metals normally bind to? How can they be removed?
6. How are radioactive pollutants detected?
7. What is the disease caused due to the deficiency of (a) Fe (b) Cu in the diet?
8. What is photochemical smog?

**PART B**

Answer any **four** of the following questions. **4 ×12 = 48**

1. (a) If a centrifuge rotor is spun at 50,000 rpm, calculate the centrifugal force experienced by a particle at radius 5 cm as a multiple of the gravitational force (= m. g, where g = G. me/re 2 = 9.807 x 102 cm sec-2).

(b) What are the different methods used for the disposal of radioactive waste?

(c) How would you distinguish between salinity and alkalinity of a soil sample (describe all the tests you would have to carry out)? (3+3+6)

1. (a) What is the difference between food additives and food preservatives? Give an example for each and draw the structure?

(b) What is the principle behind the working of the microarray? What are its applications (6+6)

1. (a)What are the different methods by which proteins are sequenced? Which of these is the best method? Describe it briefly. Why does one need to do an N and C terminus determination irrespective of which method is used? Give one reaction that identifies the amino acid residue at N terminus and another at C terminus?
2. (a)What is genomic library? Which are the vectors used for storing this genetic data? How was this achieved?

(b) At a crime scene what are the tests carried out that can be used as evidence? (6+6)

1. How are the following estimated (a) carbon monoxide and oxides of nitrogen in the air and (b) chromium and mercury in water? (6+6)
2. (a) What is cation exchange capacity of soil? How is it determined?

(b) How are the following estimated in food products

(i) Dichlorodiphenyltrichloroethane (ii) malathion (6+6)

**PART C**

Answer any **two** of the following questions. **2 × 5 = 10**

15. An analysis of the polypeptide Shawi isolated from the bacteria *Chretientus negativii*, yields the following results :

a) acid hydrolysis: (Ala4 , Val, Lys2 , Arg, Gly, Asp, Met, Pro, Trp)

b) carboxypeptidase digestion: Lys

c) dinitrofluorobenzene treatment: Val

d) cyanogen bromide treatment: generates two polypeptides:

**peptide A**: (Gly, Arg, Trp, Asp, Lys, Ala); Treatment of this peptide with DNBF and

carboxypeptidase yields : DNFB: Gly Carboxypeptidase: Lys

**peptide B**: (Ala3 , Lys, Val, Met, Pro); Treatment of this peptide with DNFB and

carboxypeptidase yields: DNFB: Val Carboxypeptidase: Met

e) trypsine digestion: yields three peptides

**peptide C**: (Lys, Trp, Ala); Treatment of this peptide with DNFB and carboxypeptidase

yields : DNFB: Trp

**peptide D**: (Ala3 , Val, Lys, Pro)

**peptide E:** (Met, Asp, Gly, Arg); Treatment of this peptide with DNFB and

carboxypeptidase yields : DNFB: Met

Finally, treating peptide D with thermolysine (cuts after hydrophobic amino acids) yields the following:

Val

Ala

Ala

(Ala, Lys, Pro)

What is the primary structure of this peptide?

16. Three restriction endonucleases are used to cut a piece of **DNA**, singly and in pairwise combination. Sizes of fragments are listed in order of size, *not* in linear order.   
Determine the correct order of restriction sites, and draw the map, with the intervals between sites labelled.

**A**)  14, 1  
**B**) 9, 6  
**C**) 7, 5, 3   
**A** x **B**) 9, 5, 1  
**A** x **C**) 7, 5, 2, 1  
**B** x **C**) 5, 4, 3, 3

17. Recently, an interesting case of murder involving a young married woman was unraveled by the crime scene team. The collection of evidence and laboratory examination of exhibits provided the corroborative evidence necessary to prove the victim’s in-laws were trying to mislead the Investigating Officer by fabricating a story of looting and murder. Imagine you are the officer. Describe how they could be fabricating the evidence and how you managed to solve the case (please be logical in your description).