



Date:

Registration number:

ST. JOSEPH'S UNIVERSITY, BENGALURU-27
M.Sc. ANALYTICAL CHEMISTRY – 4th SEMESTER
SEMESTER EXAMINATION: APRIL 2024
(Examination conducted in February 2024)
CH 0123 – APPLIED ANALYSIS

Time: 2 hours

Max Marks: 50

This question paper contains 2 printed pages, 3 parts and 16 questions.

Part A

Answer any 8 out of 10 questions. Each question carries 2 marks. [8 x 2 = 16]

1. What is meant by Electron spray ionisation technique in Mass spectrometry?
2. List two differences between western and southern blotting techniques.
3. Mention any two precautions that should be taken while designing primers for PCR technique.
4. Liming is a desirable practice to overcome constraints of soil acidity. Give reason.
5. What is caused by deficiency of (i) calcium and (ii) magnesium in the diet?
6. Biopolymers are sustainable alternatives to conventional plastics. List two such examples of biopolymers.
7. Why are sedatives used? Give an example of sedatives.
8. Give the clinical significance of barbiturate drugs.
9. Mention the primary pollutants responsible for the formation of photochemical smog.
10. Explain the principle in adopting flameless atomic absorption spectroscopy for the analysis of mercury in environmental samples.

Part B

Answer any 2 out of 3 questions. Each question carries 12 marks. [2 x 12 = 24]

11. a) Describe the principle of the following estimations of air samples:
(i) Chemiluminescence method for the determination of NO₂.
(ii) West-Gaeke colorimetric method for the determination of SO₂.
b) Write the structure of (i) saccharin (ii) MSG (iii) caffeine. What type of food additives are these?
c) What are radiotracer techniques? Mention any two key prerequisites for selecting suitable radionuclide for radiotracer studies? **(6+3+3)**
12. a) Explain briefly a method used to determine the molecular mass of a protein.
b) Give the principle behind the working of
(i) Optical rotatory dispersion (ii) Flame photometry.
c) During nitrogen estimation of an organic compound by Kjeldahl's method, the ammonia evolved by 0.5 g of the compound neutralised 10 mL of 1 M H₂SO₄. Calculate the percentage of nitrogen in the compound. **(6+4+2)**

13. a) Discuss any two applications of rDNA technology in industry.
 b) What are the causes of abnormal levels of serum protein? Give a brief explanation of the estimation of serum protein by biuret method.
 c) What are the four main types of classification of drugs? Give one example under each category. What class of drugs is Benadryl? **(3+4+5)**

Part C

Answer any 2 out of 3 questions. Each question carries 5 marks. [2 x 5 = 10]

14. a) Two students performed the following set of restriction digests on a newly isolated plasmid pBLA230. The reaction they carried out, along with the fragments obtained in single and double digest reactions, were:

Digest performed	Size of fragment obtained
EcoRI	20 kb
BamHI	2 kb, 6 kb, 12 kb
EcoRI + BamHI	2 kb, 4 kb, 6 kb, 8 kb

Using this information, construct a restriction map of pBLA230.

- b) Complete acid hydrolysis of a tripeptide yielded the amino acids (in no particular order) Isoleucine, glutamic acid and tyrosine. Treatment of the peptide with Edman's reagent yielded PTH –Tyrosine. Treatment of the peptide with Carboxypeptidase A yielded glutamic acid.

Use the data given above and determine the sequence of the tripeptide. **(3+2)**

15. a) Based on the fuel characteristics provided below, identify the fuel/s suitable for (i) spark ignition engines (ii) diesel engines:

Fuel type	Octane number	Cetane number
X	94	5
Y	20	50
Z	15	7

- b) The lactometer calibrated at 30°C read 30 for a sample of milk at 37°C. What would be its specific gravity? **(3+2)**

16. a) Many nutrients, such as calcium and magnesium, are available for plants solely from reserves held in the soil. Others like potassium needed by crops are added regularly to soils in the form of fertilizers.

(i) How many mol_c of K⁺ does it take to replace 8 mol_c of Ca²⁺?

(ii) What weight of K⁺ is required to replace 8 mol_c Ca²⁺?

Given: Atomic mass of K = 39

- b) Suggest a protocol to be followed by a food inspector during routine checks of bakeries to establish the quality of oils and certify that the oil is fit for consumption. Name any three sources of adulterants that are likely to be present in edible oils. **(3+2)**
