1411E1170

Candidate's Seat No :_____

M.Sc. Sem.-3 Examination

502

Life Science

November-2025

Time : 2-30 Hours] **[Max. Marks : 70**

Instructions:

All questions are compulsory.

Illustrate your answers with neat diagrams wherevernecessary.

Question - 1 **Write the following**

i) Describe the composition, mechanism, and biological importance of buffer systems. Give examples of acidic and basic buffers. **[07]**

ii) Explain the principle of Circular Dichroism (CD) spectroscopy and its use in determining protein secondary structure. **[07]**

OR

i) Explain the concept of pH, measurement techniques, and the importance of pH control during experiments. **[07]**

ii) Discuss the principle, process, and uses of fluorescence spectroscopy in studying biomolecular interactions. **[07]**

Question - 2 **Write the following**

i) Explain the principle and method of Thin layer chromatography (TLC) and also discuss the importance of the Rf value. **[07]**

ii) Describe the working and applications of ion exchange chromatography in biomolecule purification. **[07]**

OR

i) Discuss HPTLC as an advanced version of TLC and list its major advantages. **[07]**

ii) Elaborate on the principle of adsorption chromatography. **[07]**

Question - 3 **Write the following**

i) Explain in detail about the Southern and Northern blotting. **[07]**

ii) Explain mass spectrometry with definition, principle and applications. **[07]**

OR

i) Design and explain the cell viability assay. **[07]**

ii) Write an essay on Sanger Sequencing. **[07]**

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Question - 4 **Write the following**

i) Explain the principle of Radioimmunoassay (RIA) and discuss why it is considered a sensitive technique for detecting hormones and antigens. **[07]**

ii) List at least five radioisotopes commonly used in biochemical experiments. For each, mention the molecule type they are primarily used to label and the rationale behind their choice. **[07]**

OR

i) Write an essay on the applications of radioisotopes in molecular biology and biotechnology. Discuss their roles in DNA sequencing, hybridization assays, metabolic labelling, and mutation studies. **[07]**

ii) Discuss the biological hazards of radiation exposure in biochemical laboratories. What are the radiation safety measures, waste disposal protocols, and regulatory guidelines to be followed while working with radioisotopes? **[07]**

Question - 5 **Attempt any seven out of twelve** **[14]**

i) State Beer-Lambert's law and its relevance.

ii) In the RT PCR process higher Ct value represents what?

iii) Define a radioisotope and explain its general use in biochemical studies.

iv) What is the biological application ofthe MTT assay?

v) Name two common adsorbents used in chromatography.

vi) What is the role of a radiolabeled antigen in radioimmunoassay?

vii) Calculate the molarity of 10 g NaOH (M = 40) in a 500 mL solution.

viii) State two factors that affect the migration of molecules in electrophoresis.

ix) Mass-to-charge ratio is used for protein biomolecule identification in mass spectrometry, true or false?

x) Mention any three isotopes used in biochemical studies. What type of isotope is ^{32}P?

xi) What is the normal 260/280 ratio for DNA, and what does a lower and higher than normal range ratio represent?

xii) What type of stationary phase is used in gel filtration chromatography?

—X—