THE OPEN UNIVERSITY OF SRI LANKA

FACULTY OF HEALTH SCIENCES

DEPARTMENT OF MEDICAL LABORATORY SCIENCES

ACADEMIC YEAR 2023/2024 – SEMESTER II

BACHELOR OF MEDICAL LABORATORY SCIENCES HONOURS

MDU5209 – ADVANCED TECHNIQUES IN MEDICAL LABORATORY SCIENCES

FINAL EXAMINATION **DURATION: 2 HOURS**

DATE: 18th October 2024 TIME: 2.00 PM – 4.00 PM

Part B: Structured Essay Questions (60 marks)

Q1. Figures A and B illustrate the 2D SDS-PAGE process, where proteins are separated by isoelectric point (pI) and molecular weight, with each spot representing a distinct protein.

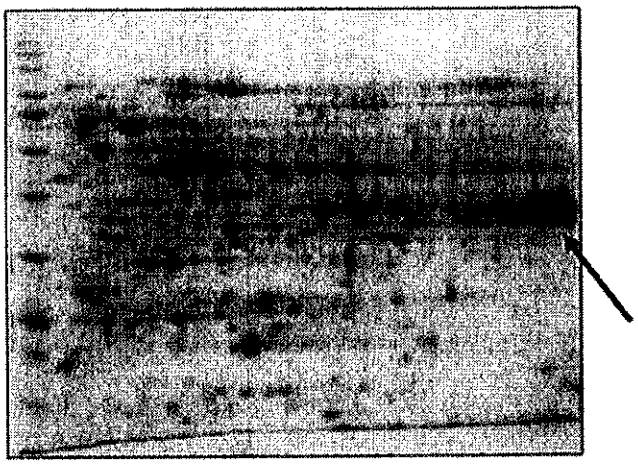

Figure A

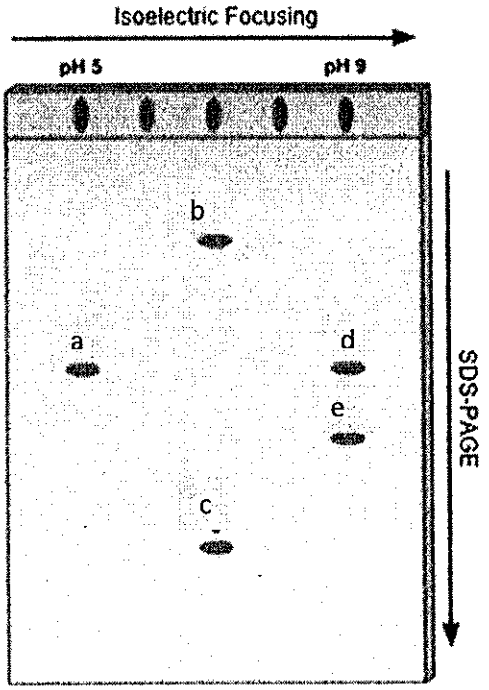

Figure B

1.1 State the distinguishing factors used to separate proteins in the first and second dimensions of 2D SDS-PAGE. (04 marks)

Dimension	Factor
First Dimension	
Second Dimension	

1.2 State three (03) roles of SDS in the second dimension of 2D SDS-PAGE (03 marks)

i.....

ii.....

iii.....

1.3 State two (02) methods of protein visualization after 2D SDS-PAGE. (02 marks)

i. .....

ii. .....

1.4 Refer to Figure B, assign the labels a, b, c, d, and e to the corresponding protein types based on the given descriptions. (07 marks)

Descriptions	Corresponding protein type/s
Highest isoelectric point	
Highest molecular weight	
Identical molecular weight	
Highest isoelectric point	

1.5 With reference to Figure A, state what the appearance of a single spot and multiple spots on a 2D SDS-PAGE gel indicate. (04 marks)

i. Single spot -

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.....

ii. Multiple spots -

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(Total 20 marks)

Q2. Maya is developing a self-cleaning water filter that utilizes biodegradable nanoparticles derived from orange peels. This innovative approach, known as green nanotechnology, aims to capture contaminants efficiently while minimizing environmental impact compared to standard filtration methods.

2.1 State the term "green nanotechnology" refers to. (04 marks)

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2.2 State how nanoparticles differ from bulk materials in terms of their properties. (02 marks)

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2.3 Mention two (02) environmental benefits of using green nanotechnology in material synthesis. (04 marks)

i. .....

ii. .....

2.4 State two (02) types of natural sources often used in green nanotechnology for nanoparticle synthesis. (04 marks)

i. .....

ii. .....

2.5 Mention three (03) applications of nanotechnology in medicine. (06 marks)

i. .....

.....

ii. .....

.....

iii. .....

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(Total 20 marks)

Q3. You are preparing to conduct a research study involving the handling and care of laboratory mice to investigate effects of a new treatment on cardiovascular health.

3.1 List three (03) appropriate methods to handle and restrain laboratory mice during your study. (03 marks)

i. .....

ii. .....

iii. .....

3.2 Mention three (03) essential factors to consider when housing laboratory mice to ensure their comfort and health during the study. (03 marks)

i. .....

ii. .....

iii. .....

3.3 Outline the recommended method for feeding and watering laboratory mice in this study. (04 marks)

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3.4 State two (02) methods used for effectively collecting blood samples from mice that do not require anesthesia. (04 marks)

i. .....

ii. .....

3.5 State the three (03) key ethical principles you must follow to reduce negative impacts of research on animals. (06 marks)

i. .....

ii. .....

iii. .....

(Total 20 marks)

Part C: Essay Question. (20 marks)

Q1. Using suitable diagrams, briefly explain the following with regard to Ion Exchange Chromatography.

- The basic concept of how Ion Exchange Chromatography works.
- Different types of Ion Exchange Chromatography.
- The process of using Ion Exchange Chromatography for protein purification.

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