



HOD

FACULTY OF ALLIED HEALTH SCIENCES, UNIVERSITY OF RUHUNA
Department of Medical Laboratory Science
Third End-Semester Examination – 2021/2022 Batch – April 2025
MLS 2133 Basic Genetics and Molecular Biology – SEQ

Date: 3rd April 2025

Time: 10.15 a.m. - 12.15 p.m.

Duration: 02 hours

Answer all questions

Index Number:

1. 1.1 Describe the role of complementary base pairing in DNA replication, transcription and translation. (30 marks)
- 1.2 List five types of proteins involved in packaging DNA. (15 marks)
- 1.3 Describe the hierarchical steps of packaging DNA into chromosomes. (30 marks)
- 1.4 Draw the different types of chromosomes and mention how they are categorized into those types. (25 marks)

2. 2.1 Explain the role of three major steps in a Polymerase Chain Reaction (PCR). (15 marks)
- 2.2 State how these three major steps can be automated in order to develop a quantitative PCR assay (qPCR / RT-PCR). (15 marks)
- 2.3 “A prophylactic double mastectomy procedure could minimize the genetic risk factors pre-disposing for breast cancer of a famous Hollywood star, Angelina Jolly.”
Validate this statement scientifically based on your knowledge in terms of hereditary cancer syndromes. (30marks)
- 2.4 As per the haematology referral findings, a 63-year-old patient was diagnosed as having Chronic Granulocytic Leukaemia by the bone-marrow morphology examination & flow-cytometry. The haemato-oncologist needs to further investigate this patient for ‘Philadelphia chromosome translocation’ to initiate the therapeutic regimens.
Suggest a reliable molecular cytogenetic investigation to confirm the prognosis and treatment, and describe the steps involved in. (40 marks)

3. A normal man (Joseph) marries a woman (Rebecca) who is heterozygous for Huntington's disease (HD) and they have four children. Two of their sons (Adam and Charles) are born healthy without HD. Charles marries a woman without HD and they have a normal daughter. Joseph and Rebecca's daughter Tasha and their last son (James) both have HD. James marries a non-HD woman whose parents also do not suffer from HD. James and his wife have three children - a normal boy, a normal girl, and a son with HD.

3.1 Construct a pedigree chart using the above data using standard symbols. (30 marks)

3.2 State the most likely mode of inheritance of the Huntington's disease in this family. (10 marks)

3.3 In pedigrees, the pattern of inheritance for a particular disease can provide clues about whether the disease is either autosomal or sex-linked. List three key features that help to identify whether the mode of inheritance is autosomal or sex linked. (30 marks)

3.4 List two responsibilities of a genetic counselor. (10 marks)

3.5 The National Society of Genetic Counselors has created a code of ethics to guide genetic counselors in caring for people. Briefly describe six major aspects of this code of ethics. (20 marks)

4. 4.1 Write short notes on the following topics.

- a. Sickle- cell disease/ anemia (35 marks)
- b. DNA profiling/finger printing (30 marks)
- c. Human genome project (35 marks)

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