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UNIVERSITY OF RUHUNA – FACULTY OF ALLIED HEALTH SCIENCES

DEPARTMENT OF PHARMACY

FOURTH BPHARM PART II EXAMINATION –MAY 2024

PH 4231 MOLECULAR GENETICS – SEQ PAPER

TIME: TWO HOURS

INSTRUCTIONS

- There are **four** questions in **Part A** and **B** in this SEQ paper.
- Answer all questions.
- No paper should be removed from the examination hall.
- Do not use any correction fluid.
- Use illustrations where necessary.

PART A

1.

1.1. List three differences between the mRNAs of eukaryotes and prokaryotes. ***(15 marks)***

1.2. State the role of the promoter region in transcription initiation in prokaryotes. ***(15 marks)***

1.3. Transcription and translation are coupled in prokaryotes. Mention why this is not the case in eukaryotes. ***(15 marks)***

1.4. Briefly describe the elongation phase of transcription in prokaryotes. ***(25 marks)***

1.5. Explain the process of translation in eukaryotes. ***(30 marks)***

2.

2.1. A woman has a rare abnormality of the eyelids called ptosis, which prevents her from opening her eyes completely. This condition is caused by a dominant allele, P. The woman's father had ptosis, but her mother had normal eyelids. Her father's mother had normal eyelids.

2.1.1. State the genotypes of the woman, her father, and her mother. ***(15 marks)***

2.1.2. What proportion of the woman's children will have ptosis if she marries a man with normal eyelids? ***(10 marks)***

2.2. A woman with type AB blood gave birth to a baby with type B blood. Two different men claim to be the father. One has type A blood, the other has type B blood. Can the genetic evidence decide in favor of either? Briefly explain. ***(15 marks)***

2.3. Differentiate the events occur during interphase and M phase in the eukaryotic cell cycle, with a focus on the chromosomes. ***(10 marks)***

PART B

2.4. DNA replication and mutations play crucial roles in ensuring the survival of species.

2.4.1. Name three key similarities between prokaryotic and eukaryotic DNA replication. *(05 marks)*

2.4.2. Briefly describe the basic steps of DNA replication in prokaryotes, including the roles of key enzymes. *(20 marks)*

2.4.3. A novel bacterial species is discovered with a mutation in its DNA helicase gene. This mutation slows down the unwinding of the DNA double helix during replication. Briefly explain how this mutation might affect the overall process of DNA replication, cell division, and the organism's survival. *(25 marks)*

3. Various health issues emerge from disruptions in an individual's genetic blueprint.

3.1. Define "genetic disorder". *(10 marks)*

3.2. Briefly explain how genetic disorders differ from acquired disorders. *(20 marks)*

3.3. Briefly describe the differences between numerical and structural chromosomal disorders, giving an example of each. *(20 marks)*

3.4. Write what is genetic testing, and its primary purpose. *(20 marks)*

3.5. Describe the genetic basis of Down syndrome, including the chromosomal abnormality and symptoms. *(30 marks)*

4. As a researcher in a biotechnology lab, you are tasked with developing a PCR-based diagnostic test for a new infectious disease. Using your knowledge of PCR, infectious disease identification, and recombinant DNA technology, address the following practical applications.

4.1. Briefly describe two potential challenges in implementing this PCR-based diagnostic test in a clinical setting. *(20 marks)*

4.2. Name four nucleic acid detection methods that can be used in the diagnosis of infectious diseases other than PCR. *(20 marks)*

4.3. Outline the steps you would take to develop a PCR assay for detecting the pathogen in patient samples. *(30 marks)*

4.4. Describe how you would generate a positive control using recombinant DNA technology to ensure the assay's accuracy. *(30 marks)*

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