WI-2-60-1-6

JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY
UNIVERSITY EXAMINATIONS 2025/2026
YEAR 1 SEMESTER 1 SPECIAL/SUPPLEMENTARY EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE IN MOLECULAR MEDICINE
TIM 3110: CELL ORGANIZATION, STRUCTURE AND FUNCTION

DATE: JUNE 2026 **TIME: 3 HOURS**

INSTRUCTIONS: ANSWER ANY FOUR QUESTIONS

1. The flow of genetic information from DNA to functional protein is a highly regulated process. Describe the key steps of the Central Dogma in a eukaryotic cell and the major control points that ensure its fidelity and adaptability. (25 marks)
2. Compare and contrast the techniques used to analyze the localization, identity, and function of a specific protein within a cell. In your answer, propose an integrated experimental workflow to characterize a novel mitochondrial protein. (25 marks)
3. Gene expression can be regulated after the initial transcription of DNA into RNA. Discuss the major mechanisms of post-transcriptional and translational regulation, and explain their significance for cellular function. (25 marks)
4. The Nuclear Pore Complex (NPC) is a masterpiece of cellular engineering. Discuss how integrative structural biology approaches have been essential for understanding its structure and function, overcoming the limitations of X-ray crystallography. (25 marks)
5. The cytoskeleton is a dynamic framework essential for cell shape, division, and transport. Analyze how atomic-level structures of cytoskeletal components have revealed the mechanisms of their polymerization and interaction with motor proteins and drugs. (25 marks)
6. Modern cell biology relies on the integration of multiple analytical techniques. Propose a research strategy to determine the role of an uncharacterized enzyme found in the peroxisome, from initial localization to functional analysis. (25 marks)

END.