

**UNIVERSITY OF FORT HARE**

**MOLECULAR BIOLOGY AND GENETIC ENGINEERING**

**MIC 513**

**FINAL ASSESSMENT**

**June 2022**

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**Time: 120 Minutes**

**Subject: MOLECULAR BIOLOGY AND GENETIC ENGINEERING**

**Marks: 100**

**This paper consists of 2 pages including the cover page**

**Internal Examiners**

**Prof UU Nwodo**

**External Examiners**

**Prof E Green**

**INSTRUCTIONS**

**Answer all questions**

- 1a. Genetic engineering has advanced so much that we can edit the genes to give desired traits. Describe how TALEN, ZFN, and CRISPR-Cas9 function in the editing of a trait not desired. [15 marks]
- 1b. Discuss the advantages of CRISPR-Cas9 over the other gene editing technologies. [5 marks]
- 1c. List two (2) ethical issues over gene editing. [5 marks]
- 2a. Describe DNA replication stating the role of the following enzymes;
- i. Topoisomerases
  - ii. Helicases
  - iii. Polymerases
  - iv. DNA primases
  - v. DNA ligase
- [15 marks]
- 2b. What is the role of the following in DNA replication;
- i. Leading strand
  - ii. Okazaki fragment
  - iii. RNA primers
- [10 marks]
- 3a. *E. coli* was grown in a broth with glucose and lactose as the only carbon source. The *E. coli* utilized the glucose completely and switched over to the use of lactose. Describe the mechanism that allowed the *E. coli* to survive on lactose. [15mks]
- 3b Describe how *E. coli* would adjust to synthesizing tryptophan in a tryptophan-deficient media [10mks]
- 4a. Briefly describe the three models of DNA structure [15 marks]
- 4b. What is the name of the nitrogen base present in RNA but not DNA. Draw the structure of the nitrogen base. [10 marks]