**Candidate Number……**

"*Investing in Africa's Future*"

# COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

## DEPARTMENT OF BIOMEDICAL AND LABORATORY SCIENCES

### NSLS 105: GENETICS AND MOLECULAR BIOLOGY

### END OF SECOND SEMESTER FINAL EXAMINATIONS

### APRIL/MAY 2022

### LECTURER: Mr Z CHIWODZA

### DURATION: 3HRS

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## *INSTRUCTIONS*

Write your Student Number on the top of every page of this question paper

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**Section A:** Ten (10) Multiple Choice Questions
State whether each statement is True (T) or False (F)
Answer **ALL** questions onto this question paper

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**Section B:** Answer **ALL** questions on the separate answer sheet provided
Write your Student Number on every page that you use

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**Section C:** Answer any **THREE (3)** out of **FIVE (5)** questions on the separate answer sheet provided
Write your Student Number on every page that you use

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**Section A:** Answer **ALL** questions **[40 marks]**

Circle True (T) or False (F) onto this question paper.

1. Differences between RNA and DNA include

T F (a) use of Uracil in RNA and Thymine in DNA
T F (b) absence of an Oxygen in DNA on carbon number 2 in the sugar ring
T F (c) absence of an Oxygen in RNA on carbon number 2 in the sugar ring
T F (d) DNA is more stable in alkaline conditions than RNA

2. What is the correct statement to describe the difference between mitosis and meiosis

T F (a) Mitosis is division of sex cells, meiosis is division of somatic cells
T F (b) division occurs once in meiosis and twice in mitosis
T F (c) Sex cells are produced by meiosis
T F (d) mitosis produces haploid cells

3. Which of the processes are NOT linked to post translational modifications

T F (a) addition of other macromolecules
T F (b) trimming of the polypeptide chain
T F (c) splicing of Exons
T F (d) splicing of Introns

4. In DNA: -

T F (a) the molecule is double stranded in most cases
T F (b) it is helical in structure
T F (d) it is wound on histones and found as chromosomes in prokaryotes
T F (e) the two strands are stabilized by hydrogen bonds between bases

5. If Dakalo has Klinefelter's syndrome, how many total chromosomes does she have?

T F (a) 46
T F (b) 47
T F (c) 45
T F (d) 24

6. Which of these molecules is useful in transcription?

T F (a) Topoisomerase
T F (b) Polymerase
T F (c) Ligase
T F (d) Helicase

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7. Dineo is said to be suffering from Huntington's disease which is an autosomal dominant related disease, which of the following could be his genotype?

T F (a) Ss
T F (b) ss
T F (c) sq
T F (d) SS

8. Which of the following techniques is the most suitable laboratory diagnostic technique for identifying an amplicon after the Polymerase Chain Reaction

T F (a) MALDI-TOF
T F (b) Real Time PCR
T F (c) Western Blotting
T F (d) Gel Electrophoresis

9. Which is the order of events in production of Insulin in an *E.coli* vector system:

T F (a) cut human DNA, add gene section to plasmid, insert plasmid to vector
T F (b) add human DNA to vector, insert plasmid to human DNA, cut the DNA
T F (c) add plasmid to vector, insert DNA, cut DNA
T F (c) cut plasmid, insert DNA, add DNA to vector

10. The genetic code is:

T F (a) redundant
T F (b) universal without any exceptions
T F (c) punctuated with Start and Stop codons
T F (d) specific

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**Section B:** Answer **ALL** questions on the separate answer sheet provided **[20 marks].** Answer each question on a fresh page.

1. Write short notes on the following
   a) Translation [5]
   b) Reverse transcription [5]
   c) Natural selection [5]
   d) Plasmids [5]

2. State components needed in the following processes

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a) Transcription [5]
b) Isothermal Amplification Reaction [5]
c) Sanger Sequencing [5]
d) Northern Blotting [5]

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**Section C:** Essay type questions **[75 marks]**

Answer any THREE **(3)** questions on the separate answer sheet provided. Each question carries **25 marks**

1. Using a machine of your choice describe how Mycobacterium Tuberculosis (TB) can be identified in the laboratory using molecular techniques **[25].**
2. Discuss control of gene expression using the systems observed in *Escherichia coli*. **[25].**
3. Describe how you would use blotting techniques to identify known genotypes of the Human Papilloma Virus **[25].**
4. Describe how you would produce insulin using recombinant biotechnological tools **[25].**
5. Describe the laboratory test you would do to test the blood of a suspect in a murder case against that found at the crime scene. **[25].**

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