



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES**

**DEPARTMENT OF NATURAL AND APPLIED SCIENCES**

<b>QUALIFICATION:</b> BACHELOR OF SCIENCE	
<b>QUALIFICATION CODE:</b> 07BOSC	<b>LEVEL:</b> 6
<b>COURSE CODE:</b> GEN602S	<b>COURSE NAME:</b> GENETICS
<b>SESSION:</b> NOVEMBER 2022	<b>PAPER:</b> THEORY
<b>DURATION:</b> 3 HOURS	<b>MARKS:</b> 100

<b>FIRST OPPORTUNITY EXAMINATION PAPER</b>	
<b>EXAMINER (S):</b>	<b>Dr. Edosa Omoregie</b>
<b>MODERATOR:</b>	<b>Dr. Jeya Kennedy</b>

<b>INSTRUCTIONS</b>	
<ol style="list-style-type: none"><li>1. Answer all questions in Sections A and B</li><li>2. You may use a calculator</li><li>3. Write clearly and neatly</li><li>4. Number your answers correctly</li><li>5. Draw diagrams wherever necessary</li></ol>	

**PERMISSIBLE MATERIALS**

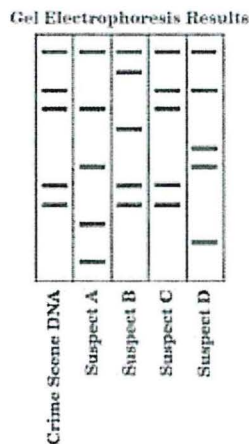
Calculator

**THIS QUESTION PAPER CONSISTS OF 4 PAGES**  
(Including this front page)

**SECTION A (MULTIPLE CHOICE QUESTIONS, 2 MARKS FOR EACH QUESTION)**

**[30]**

1. The sequence of mitosis will take place in which of the following orders?
  - a) Anaphase, telophase, metaphase, prometaphase, prophase
  - b) Prophase, prometaphase, metaphase, anaphase, telophase
  - c) Prometaphase, telophase, anaphase, metaphase, prophase
  - d) Prometaphase, metaphase, anaphase, telophase, prophase
  
2. In a plant, if the diploid number of chromosomes is 26, how many chromosomes will be found in its pollen grain?
  - a) 52
  - b) 4
  - c) 26
  - d) 13
  
3. Cystic fibrosis is a recessive hereditary disease that affects the respiratory and digestive systems. If a mother is a carrier of the disease and the father is homozygous dominant, what is the probability that any of their children will be a carrier of cystic fibrosis?
  - a) 0.00
  - b) 0.25
  - c) 0.50
  - d) 0.75
  
4. The diagram below represents DNA fingerprints which are the result of gel electrophoresis done on several DNA samples found at a crime scene. Which suspect is linked to the crime scene by this DNA analysis?



5. Long radishes crossed with round radishes result in all oval radishes. This type of inheritance is?
  - a) Multiple alleles
  - b) Complete dominance
  - c) Co-dominance
  - d) Incomplete dominance

6. Which of the following is not true about gene crossing over?
- It involves a physical exchange of genetic material between chromatids
  - It occurs after meiotic division
  - It leads to a recombination of genetic traits
  - It occasionally regenerates the extreme phenotype
7. What is the name of the fragments of the lagging strand during DNA replication?
- Binding proteins
  - Fragmenting lagging strand
  - Okazaki segments
  - Coding strands
8. Removal of introns from RNA in gene expression is by the following molecules?
- Primosomes
  - Peptidases
  - Galactosidases
  - Spliceosomes
9. In chromosomal mutation, which of the following chromosome numbers is referred to as Nullisomy.
- $2n - 1$
  - $2n - 2$
  - $2n + 1$
  - $2n + 2$
10. Which of the following statements is not true about transposases during gene recombination?
- During transposition a short sequence of target DNA is duplicated, and the transposon is inserted between the directly repeated target sequences.
  - Some transposons insert into almost any target DNA sequence.
  - The actions of transposases go on indefinitely without interruption.
  - Transposons are important genetic elements because they cause mediate genomic rearrangement
11. In the control of gene expression, the Pribnow Box acts as a?
- Attenuator
  - Enhancer
  - Operator
  - Promotor
12. The Central Dogma in genetics describes:
- The pattern of information flow in the from DNA to proteins
  - The pattern of chromosomal inheritance in populations
  - The role of mutations in disease
  - The role of promoters

13. Which of the following is an assumption for Hardy-Weinberg equilibrium?
- No epistasis
  - No dominance
  - No crossing-over
  - No mutation
14. Which reaction in DNA replication is catalysed by DNA ligase?
- Addition of new nucleotides to the lagging strand
  - Addition of new nucleotides to the leading strand
  - Base pairing of the template and the newly formed DNA strand
  - Formation of a phosphodiester bond between the 3'-OH of one Okazaki fragment and the 5'-phosphate of the next on the lagging strand
15. Which of the following is the optimum temperature for thermostable DNA polymerase of Taq polymerase during the PCR experimental step of DNA extension?
- 15 – 20°C
  - 20 – 25°C
  - 45 – 50°C
  - 72 – 74°C

## SECTION B

[70]

16. a). Briefly explain the molecular structure of mRNA and highlight the main structural differences between RNA and DNA molecules. (8)
- b). Explain the roles of the various enzymes involved in the synthesis of new DNA strands from the parent DNA strand. (6)
17. a). Using suitable example, describe the phenomenon of polygenic inheritance. (6)
- b). In a tabular form, highlight the differences between mutations and polymorphism? (6)
18. a). With the use of suitable diagrams, discuss the process of gene substitution, insertion and deletion in point mutations. (8)
- b). Discuss Klinefelter Syndrome genetic disorder with reference to chromosomal mutation, number of chromosomes and phenotypic expression. (7)
19. With reference to types and actions of the various enzymes involved, discuss the process of transcription and translation in gene expression. (15)
20. Discuss how the process of natural selection, genetic drift and gene flow alter the frequencies of alleles in a population. (15)