NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES

SCHOOL OF NATURAL AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGY, CHEMISTRY AND PHYSICS

QUALIFICATION : BACHELOR OF SCIENCE HONOURS	
QUALIFICATION CODE: 08BOSH	**LEVEL:** 8
COURSE CODE: MRT811S	**COURSE NAME:** METHODS IN RECOMBINANT DNA TECHNOLOGY
SESSION: JUNE 2023	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

FIRST OPPORTUNITY QUESTION PAPER	
EXAMINER	DR LAMECH MWAPAGHA
MODERATOR	DR RONNIE BOCK

INSTRUCTIONS

1. Answer ALL the questions.
2. Write clearly and neatly.
3. Number the answers clearly.
4. All written work **MUST** be done in **BLUE** or **BLACK** ink.

PERMISSIBLE MATERIALS

None

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

Question 1 **[15]**

a) Give **SIX (6)** Similarities between the Ti and Ri Plasmids (6)

b) Mention **THREE (3)** Limitations to the particle bombardment method, compared to Agrobacterium-mediated transformation (3)

c) What are the steps followed in plant transformation using particle bombardment? (6)

Question 2 **[11]**

a) Discuss the mode of action of small interfering RNAs (siRNAs) (3)

b) Mention **THREE (3)** demerits of the Retrovirus-mediated Gene Transfer (3)

c) Discuss in detail the mechanism behind the CRISPR/Cas9 technique. (5)

Question 3 **[15]**

a) The genetic code is a set of three-letter combinations of nucleotides called codons, each of which corresponds to a specific amino acid or stop signal. Discuss **THREE (3)** characteristics of the genetic code (6)

b) Briefly describe the following mutations; (4)

I. Nonsense Mutation:

II. Frame shift Mutation:

III. Silent Mutation:

IV. Misense Mutation:

c) State **FIVE (5)** applications of DNA fingerprinting (5)

Question 4 [18]

a) Delineate the following medical applications of transgenic animals. (9)

I. Xenotransplanters:

II. Tools in the study of immunoglobulin genes:

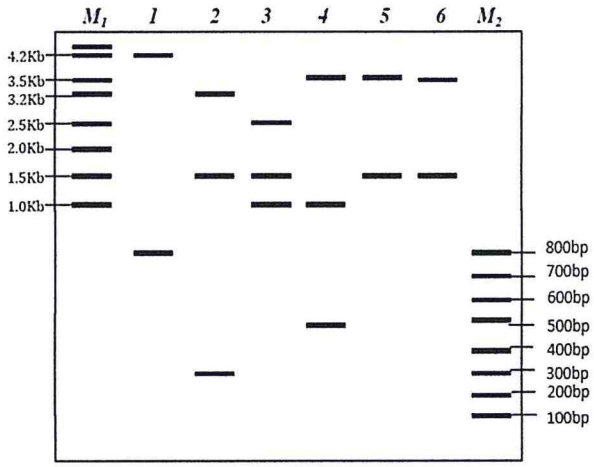
III. Chemical Safety Testing:

b) There are several approaches scientific researchers may use in correcting faulty genes. Briefly describe **FOUR (4)** of these approaches (4)

c) Gene therapy is a medical approach that treats or prevents disease by correcting the underlying genetic problem. What are some of the risks envisioned in Gene Therapy? (5)

Question 5 [13]

You are given a plasmid. In order to map this plasmid you set up a series of restriction digests and obtain the following results using agarose gel electrophoresis.

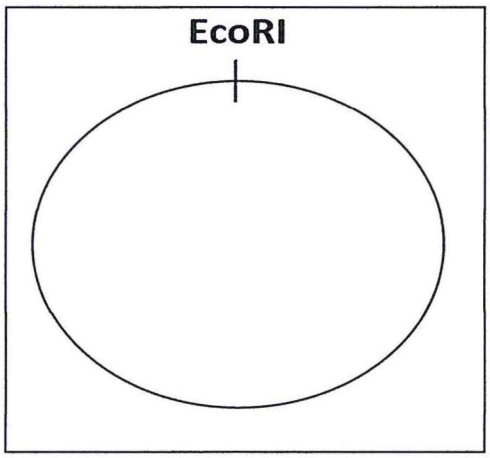


*M1 and M2 are DNA markers.

Lane	Digest	Size of fragments in bp
1	EcoRI and NotI	4200, 800
2	NotI and HindIII	3200, 1500, 300
3	HindIII and XbaI	2500, 1500, 1000
4	EcoRI and HindIII	3500, 1000, 500
5	HindIII	3500, 1500
6	XbaI and EcoRI	3500, 1500

a) What is the approximate size of the plasmid? (2)

b) Add the NotI, HindIII, XbaI restriction sites onto the plasmid map shown below. On your map give the distances between each of the restriction sites. (7)



c) Mention **FOUR (4)** factors that make a Vector ideal for cloning. (4)

Question 6 **[10]**

a) State **FOUR (4)** factors affecting migration of nucleic acid in gel electrophoresis (4)

b) Discuss **THREE (3)** analytical applications of gel electrophoresis? (3)

c) Discuss the one-Channel DNA microarray hybridisation approach. (3)

Question 7 **[18]**

a) Briefly describe the functions of the following RNA's: (10)

I. Messenger RNA (mRNA)

II. Ribosomal RNA (rRNA):

III. Transfer RNA (tRNA)

IV. Small nuclear RNA (snRNA)

V. microRNA (miRNA)

b) Briefly delineate the **Four (4)** levels of the Protein Structure (4)

c) Describe **FOUR (4)** applications of Proteomics (4)

THE END