UNIVERSITY OF ESWATINI

DEPARTMENT OF BIOLOGICAL SCIENCES

MAIN EXAMINATION PAPER DECEMBER 2019

TITLE OF PAPER: ECOLOGY

COURSE CODE: BIO 311

TIME ALLOWED: THREE HOURS

INSTRUCTIONS:

1. ANSWER ANY FOUR QUESTIONS IN

THIS PAPER

2. ILLUSTRATE YOUR ANSWERS WITH LARGE AND CLEARLY LABELLED DIAGRAMS WHERE APPROPRIATE

SPECIAL REQUIREMENTS: NONE

THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATORS

**Answer any four questions in this paper**

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**Question 1**

Discuss the different mechanisms through which organisms adapt/acclimatize to variations in temperature in the environment. **[Total marks =25]**

**Question 2**

A mature forest community in Mbuluzi Game Reserve is completely destroyed by fire. Discuss the stages of succession by which this community is restored.

**[Total marks =25]**

**Question 3**

The management of Malolotja Nature Reserve wants to cull some of their animals from their nature reserve. Unfortunately they do not know which factors to consider in order to avoid disturbing the functioning of the ecosystem. Discuss some of the factors that they have to consider in this task. **[Total marks = 25]**

**Question 4**

Discuss the different adaptation strategies used by prey to survive predation.

**[Total marks =25]**

**Question 5**

Discuss the factors that influence the choice of mating partners in animals.

**[Total marks = 25]**

**END OF EXAMINATION PAPER**

UNIVERSITY OF ESWATINI

FINAL EXAMINATION PAPER: NOVEMBER 2019

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|---|---|
| PROGRAMMES: | B.Sc. III |
| | B. Ed Secondary III |
| TITLE OF PAPER: | ADVANCED MOLECULAR BIOLOGY |
| COURSE CODE: | BIO 341 |
| TIME ALLOWED: | THREE HOURS |
| INSTRUCTIONS: | 1. THIS PAPER IS DIVIDED INTO TWO SECTIONS |
| | 2. ANSWER QUESTION 1 (COMPULSORY) FROM SECTION A and ANY TWO QUESTIONS FROM SECTION B |
| | 5. EACH QUESTION CARRIES TWENTY FIVE (25) MARKS |
| | 6. ILLUSTRATE YOUR ANSWERS WITH LARGE AND CLEARLY LABELLED DIAGRAMS WHERE APPROPRIATE. |

SPECIAL REQUIREMENTS: CALCULATOR

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## Section A

## Question 1 (COMPULSORY)

1.1 A circular DNA plasmid, pDA102, has a size of 4.35 kb. When the plasmid DNA digested with combinations of restriction enzymes and the resulting fragments are electrophoresed, the following data is obtained. Using these data, construct a restriction map of plasmid pDA102 for the restriction enzymes SalI and HhaIII. (6 marks)

| Digest Performed | Size of Fragments Obtained |
|---|---|
| SalI | 2.30 kb, 0.25 kb, 1.80 kb |
| HhaIII | 2.10 kb, 1.55 kb, 0.70 kb |
| SalI + HhaIII | 1.20 kb, 1.10 kb, 0.75 kb, 0.70 kb, 0.35 kb, 0.25 kb |

1.2 Briefly explain any five of the different forms of gene mutations. (10 marks)

1.2 Explain the principle of the polymerase chain reaction (PCR) (5 marks)

1.3 Briefly explain the application of the following and indicate the expected results:

a) Y chromosome (5 marks)

b) AMEL marker (5 marks)

c) Mitochondrial DNA markers (5 marks)

1.5 Match the types of DNA damage a) to g) to the most appropriate of the DNA repair mechanisms i) to v) that can be expected to repair the damage. (14 marks)

| Type of DNA damage | DNA repair mechanisms |
|---|---|
| **a).**Disintegration of a sugar residue due to oxidative damage. | **i)** non-homologous end joining |
| **b)** A simple base modification, such as 8- oxoguanine | **ii)** base excision repair 5 |
| **c)** A double-stranded DNA break occurring in G1 phase. | **iii)** nucleotide excision repair |
| **d)** A pyrimidine dimer | **iv)** homologous recombination-mediated DNA repair |
| **e)** A basic site due to depurination | |
| **f)** A double-stranded DNA break occurring in G2 phase. | |
| **g)** A bulky aromatic hydrocarbon adduct that distorts the double helix. | |

**Section B: choose any two (2) questions from this section.**

## Question 2

Genes are naturally transferred between bacteria using the following mechanisms, outline the steps involved in these processes. Clearly drawn and labelled diagrams may be used.

(a) Transformation (5 marks)
(b) Generalized transduction (5 marks)
(c) specialized transduction (5 marks)
(d) $F^+$ conjugation (5 marks)
(e) Resistance plasmid conjugation (5 marks)

**TOTAL= 25 MARKS**

## Question 3

Explain the ideal/ fundamental characteristics of a suitable cloning vector and expression vector. (15 Marks)

Discuss the mechanism of RNAi in eukaryotic gene control. (10 marks)

**TOTAL= 25 MARKS**

## Question 4

Explain how genomic libraries can be constructed. (10 marks)

Tabulate and outline the summery of southern, northern and western blotting techniques. (15 marks)

**TOTAL= 25 MARKS**

**END OF EXAMINATION PAPER**



**PTO**