

**BOTA 111**



**THARAKA**

**UNIVERSITY**

**COLLEGE**

**UNIVERSITY EXAMINATIONS**

**FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE  
OF BACHELOR OF SCIENCE**

**BOTA 111: GENERAL GENETICS**

**STREAMS: BSC (BOTA)**

**TIME: 2 HOURS**

**DAY/DATE: WEDNESDAY 15/04/2020**

**8.30 A.M. – 10.30 A.M.**

**INSTRUCTIONS: Answer ALL questions in section A and any other TWO in section B**

**SECTION A**

1. Define the following terms:
  - (a) Okazaki fragments [1 mark]
  - (b) RNA splicing [1 mark]
  - (c) Cross over [1 mark]
  - (d) Non disjunction [1 mark]
  - (e) Transfer RNA (tRNA) [1 mark]
2. Explain the semi conservative model of the DNA replication [4 marks]
3. Explain the phenotypic effects of the following gene mutations:
  - (a) Deletion [2 marks]
  - (b) Substitution [2 marks]
  - (c) Insertion [2 marks]
4. A student with information on Mendelian genetics crossed a Heterozygous tall plant and a homozygous dwarf plant. Predict the most likely outcome using a punnet square. Use symbols “T” and “t” for dominant and recessive genes respectively.[5marks]
5. Illustrate how to derive the degrees of freedom when using chi-square test to evaluate results of dihybrid cross [2 marks]

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6. List the important components involved in the gene translation process [5 marks]
7. The genetic code is degenerate, explain the statement using amino acids of choice. [3 marks]

### SECTION B

8. (a) Describe process of gene transcription in bacteria [12 marks]
- (b) State the work of Griffith and Watson and Crick to development of the field of genetics [4 marks]
- (c) Describe Mendel's law of gene segregation [4 marks]
9. (a) A pea plant is heterozygote for both seed colour and seed shape. 'D' is the allele for the dominant spherical shape characteristic while 'd' is the allele for wrinkled recessive shape. W is the allele for the dominant yellow colour characteristics, w is the allele for the recessive green colour characteristic. Using a punnet square predict the F<sub>2</sub> phenotypic ratio and the F<sub>2</sub> genotypes [10 marks]
- (b) You have sampled a population in which you know the percentage of the homozygous recessive genotype (aa) is 36%. Using the information calculate the following:
- (i) The frequency of the recessive allele [2 marks]
- (ii) The frequency of the dominant allele [3 marks]
- (iii) The genotype frequency of the dominant genotypes [3 marks]
- (iv) Genotype frequency of the heterozygotes [2 marks]
10. Discuss the phenotypic effects of the following chromosomal mutations
- (a) Deletions – deficiency (or deletions) [10 marks]
- (b) Duplications [7 marks]
- (c) Translocations [3 marks]
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