



**EMBU UNIVERSITY COLLEGE**  
**(A Constituent College of the University of Nairobi)**

**2015/2016 ACADEMIC YEAR**  
**SECOND SEMESTER EXAMINATION**

**FOURTH YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE**  
**(AGRICULTURE)**

**ACS 412: GENOMICS AND MOLECULAR BREEDING**

**DATE: APRIL 7, 2016**

**TIME: 08:30-10:30AM**

**INSTRUCTIONS:**

**Answer Question ONE and ANY Other TWO Questions**

**QUESTION ONE**

- a) Indicate the number of genomes in the following cells.
- i) Diploid maize somatic cell (1 Mark)
  - ii) Haploid maize pollen cell (1 Mark)
  - iii) Bacteria cell (1 Mark)
- b) Outline three characteristics in plastid genome. (3 Marks)
- c) Indicate the importance of the following during DNA formation.
- i) Phosphate (1 Mark)
  - ii) Bases (1 Mark)
  - iii) Ribose sugar (1 Mark)
- d) Draw a structure of a typical expressed gene sequence and label its components.  
(3 Marks)

- e) Rice has got 12 pairs of chromosomes while maize has got 10 pairs. Explain why pollination between maize and rice will not produce viable seeds. (3 Marks)
- f) Differentiate physical mapping from genetic mapping. (3 Marks)
- g) Describe the relationship between DNA, RNA and protein. (3 Marks)
- h) Name three categories of markers. (3 Marks)
- i) Outline advantages of use of DNA molecular markers in breeding. (3 Marks)
- j) Outline the modifications the protein undergoes after translation. (3 Marks)

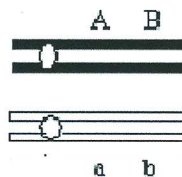
**QUESTION TWO**

- a) You are given a DNA segment which is cleaved using EcoRI into 1kb, 3.5kb, 1.5kb, 0.5kb, 4kb, 2.5 kb, 0.1 kb, 1.7kb, 2.1kb and 0.3 kb. Show how these segments will look after electrophoresis. (10 Marks)
  
- b) Draw a well labelled diagram of Southern hybridization setup / Kit. (10 Marks)

**QUESTION THREE**

You are given homologous chromosomes below containing dominant genes AB and ac that are supposed to undergo meiosis where they undergo a single recombination between genes A and B. Using a diagram, show the appearance of the chromosomes after meiosis.

(13 Marks)



b) Two parents with genes **bb prpr cc** x **b<sup>+</sup>b<sup>+</sup> pr<sup>+</sup>pr<sup>+</sup> c<sup>+</sup>c<sup>+</sup>** were crossed to get individuals in the table below. Indicate the number of recombinants for each genotype

(7 Marks)

Phenotype	Genotype	Number of Progeny	Indicate the number if number of recombinants
Wild type	b <sup>+</sup> b pr <sup>+</sup> pr c <sup>+</sup> c	5701	e.g non-recombinant
Black body, purple eyes, curved wings	bb prpr cc	5617	
Purple body, curved wings	b <sup>+</sup> b prpr cc	388	
Black body	bb pr <sup>+</sup> pr c <sup>+</sup> c	367	
Curved wings	b <sup>+</sup> b pr <sup>+</sup> pr cc	1412	
Black body, purple eyes	bb prpr c <sup>+</sup> c	1383	
Purple eyes	b <sup>+</sup> b prpr c <sup>+</sup> c	60	
Black body, curved wings	bb pr <sup>+</sup> pr cc	72	

#### QUESTION FOUR

You are given mRNA with a poly A tail, 5'-----TTTTTTTTTTTTT 3'

Describe how to make ten possible different primers each with 14 nucleotides as given the following example 5'TTTTTTTTTTTTCA3'. (20 Marks)

#### QUESTION FIVE

a) You are given the two sequences below. Align them using dynamic alignment method to align sequence 1 to 2. Every match is given a score of 1, every mismatch is given a score of 0, and individual gaps are given a penalty score -1. (16 Marks)

1. G A T C T C T A  
 2. G A T C T T A

b) Differentiate Global alignment from local sequence alignment. (4 Marks)

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