

UNIVERSITY OF EMBU

2016/2017 ACADEMIC YEAR

SECOND SEMESTER EXAMINATION

**FOURTH YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE
OF BACHELOR OF SCIENCE IN AGRICULTURE**

ACS 412: GENOMICS AND MOLECULAR BREEDING

DATE: APRIL 7, 2017

TIME: 11:00AM-1:00PM

INSTRUCTIONS:

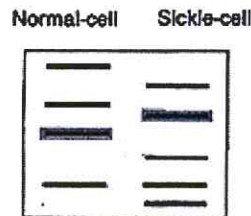
Answer Question ONE and ANY other TWO Questions

QUESTION ONE

- a) Differentiate genomics from functional genomics. [3 Marks]
- b) Indicate the number of genomes in the following cells
- i) Somatic cell at G1 stage [1 mark]
 - ii) Somatic cell at prophase stage [1 mark]
 - iii) Mature germ cell [1 mark]
- c) Outline three (3) characteristics of mitochondrion genome. [3 Marks]
- d) An entrepreneur intends to start a factory to produce DNA based products. Name three of the possible products that can be produced. [3 Marks]
- e) Maize is crossed to get hybrid. Explain how to use this to create jobs. [3 Marks]
- f) A factory produces enzyme trypsin in bacteria cells. Explain the importance of DNA transcription in the process of the enzyme production. [3 Marks]
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g) Simple sequence repeat (SSR) is a DNA marker. Describe how it can be used to differentiate two maize varieties. [3 Marks]

h) You are given the diagram below that is composed of RFLP fragment after a DNA digestion. Describe the informativeness of the of method in identifying normal individuals and those with sickle cell anaemia. [3 Marks]



i) Outline advantages of use of DNA molecular markers in breeding. [3 Marks]

j) Describe the relationship between DNA, RNA and protein. [3 Marks]

QUESTION TWO

a) You are given a DNA segment which is cleaved using BamHI restriction enzyme into
 b) 3.5kb, 1kb, 1.5kb, 5kb, 0.5kb, 2.5 kb, 0.1 kb, 1.7kb, 0.3 kb and 2.1kb. Using a diagram illustrate how to separate the fragments using electrophoresis method. [10 Marks]

c) If the DNA fragments produced in 2a above are to be transferred onto nitrocellulose membrane using Southern hybridization. Draw a well labelled diagram to illustrate the Southern hybridization setup. [10 Marks]

QUESTION THREE

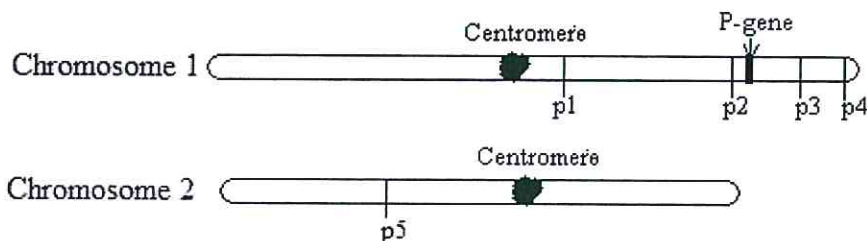
A factory producing enzymes realizes that to increase yield of genes products it is required to function efficiently so as to increase factory output. Describe the effects of the following elements on gene-product yield.

- a) Weak promoter sequence [5 Marks]
- b) Coding sequence with stop codons [5 Marks]
- c) Defective DNA and RNA polymerase enzymes [5 Marks]
- d) Immature termination or non termination [5 Marks]

QUESTION FOUR

a) Explain how dot hybridization method can be used to verify that the rust disease resistance gene is present in a maize plant. [10 Marks]

b) In the diagram below p stand for probe. Explain the degree of linkage of each probe to P-gene. [5 Marks]



c) If genes on diagram below have a single crossover at region I and II and a double crossover involving both regions I and II, use a diagram to show the possible ways how these genes will look like on the chromosome map after cross over) [5 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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