EMBU UNIVERSITY COLLEGE

(A Constituent College of the University of Nairobi)

2015/2016 ACADEMIC YEAR

TRIMESTER EXAMINATION

FIRST YEAR EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE IN PLANT BREEDING AND BIOTECHNOLOGY

ACB 601: MOLECULAR GENETICS AND BIOINFORMATICS

DATE: AUGUST 17, 2016   TIME: 10:00AM-1:00PM

INSTRUCTIONS:

Answer ANY FOUR Questions

QUESTION ONE (25 MARKS)

a) Describe the functions of the ingredient /elements needed for in vivo prokaryotic DNA replication.

(21 marks)

b) Explain why Eukaryotes have multiple replicons during DNA replication.   (4 marks)

QUESTION TWO (25 MARKS)

a) Using DNA sequence given below illustrates that DNA, RNA and protein are all linear sequences.

Use RNA code attached.   (14 marks)

DNA	T	C	A	C	C	T	C	T	A	C	G	G	T	A	G	G	C	G	A	T	C
mRNA																					
Protein																					

b) In the DNA sequence below lower case letters indicate areas of introns and the rest are exons. Use the DNA sequence starting from 5' to 3'end to predict possible amino acids it codes. (RNA code is attached). (11 marks)

$^{5'}$GAT CTC *ggggg*TTA TAC TAG TAT*aaaaa* CCT TCA TCA TTT *ccccc*TTA TTG CCA $^{3'}$

QUESTION THREE (25 MARKS)

a) Explain how to use a binary vector from disarmed Tumor inducing plasmid to transform a plant tissue. Use illustration where possible. (15 marks)

b) Describe how to transfer penicillin-synthesis gene into a tomato plant (transgenic) using disarmed Tumor inducing (Ti) plasmid. (10 marks)

QUESTION FOUR (25 MARKS)

a) Discuss activities in meiosis one that enable breeding of new plant lines. Illustrate where possible. (15 marks)

b) You are given a gene that has been cleaved using a ECoRI restriction enzyme. Describe how to use the plasmid below to transfer the gene into a plant cell. (10 marks)
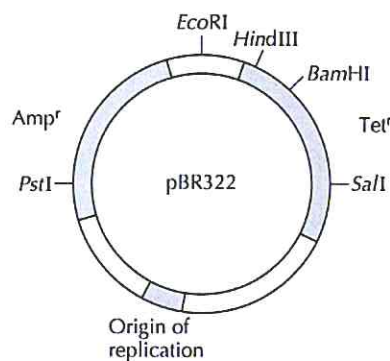
QUESTION FIVE (25 MARKS)

a) Two parent with genes bb **prpr cc** x **b$^+$b$^+$ pr$^+$pr$^+$ c$^+$c$^+$** were crossed to get individuals in the table below. Indicate the number of recombinants (single or double) for each genotype.

(7 marks)

Phenotype	Genotype	Number of Progeny	Indicate the number of recombinants
wild type	b$^+$b pr$^+$pr c$^+$c	5701	
black body, purple eyes, curved wings	bb prpr cc	5617	
purple body, curved wings	b$^+$b prpr cc	388	
black body	bb pr$^+$pr c$^+$c	367	
curved wings	b$^+$b pr$^+$pr cc	1412	
black body, purple eyes	bb prpr c$^+$c	1383	
purple eyes	b$^+$b prpr c$^+$c	60	
black body, curved wings	bb pr$^+$pr cc	72	

b) Use single and double crossovers to calculate the genetic distance between genes bb and prpr, and prpr and cc.

(14 marks)

The Genetic Code (mRNA)

1st position (5' end)	2nd position (middle)				3rd position (3' end)
	U	C	A	G	
U	Phe F	Ser S	Tyr Y	Cys C	U
	Phe F	Ser S	Tyr Y	Cys C	C
	Leu L	Ser S	STOP	STOP	A
	Leu L	Ser S	STOP	**Trp W**	G
C	Leu L	Pro P	His H	Arg R	U
	Leu L	Pro P	His H	Arg R	C
	Leu L	Pro P	Gln Q	Arg R	A
	Leu L	Pro P	Gln Q	Arg R	G

A	Ile I	Thr T	Asn N	Ser S	U
	Ile I	Thr T	Asn N	Ser S	C
	Ile I	Thr T	Lys K	Arg R	A
	Met M	Thr T	Lys K	Arg R	G
G	Val V	Ala A	Asp D	Gly G	U
	Val V	Ala A	Asp D	Gly G	C
	Val V	Ala A	Glu E	Gly G	A
	Val V	Ala A	Glu E	Gly G	G

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