



"Investing in Africa's Future"

FACULTY OF AGRICULTURE AND NATURAL RESOURCES

ACP207: GENETICS AND BIOTECHNOLOGY

END OF FIRST SEMESTER EXAMINATIONS

NOVEMBER/DECEMBER 2016

LECTURER: DR. Z. A. CHITEKA

DURATION: (3HRS)

INSTRUCTIONS

1. Do Not Write Your Name On The Answer Sheets.
2. Use Answer Sheets Provided.
3. Begin Your Answer For Each Question On A New Page.
4. Credit Is Given For Neat Presentation Of Answers.



ACP 207 GENETICS AND BIOTECHNOLOGY

Answer four (4) questions from section A and all of Section B.

SECTION A

Answer four questions from this section

1. Describe the process of male gametogenesis in maize until the production of mature pollen grains. In your account, indicate the changes in ploidy level and present the significance of these changes in the maintenance of the integrity of the maize species. [20]
2. Discuss how Mendel's law of segregation and the law of independent assortment can be explained by the Chromosome theory of heredity. [20]
3. Distinguish between the following and give an example of a gene locus in a species to illustrate each case where appropriate. [20]
 - i) Homozygous and heterozygous
 - ii) Sex linked and sex limited genes
 - iii) Autosomal gene and sex linked gene
 - iv) DNA and RNA
 - v) Epistasis and hypostasis
4. The expression of genes is a result of the interaction of genes and the environment. Describe, giving examples the effects of the environment on the expression of genes. [20]
- 5a. Discuss the genetic basis of sex linkage in humans and illustrate the consequences on the occurrence of certain rare traits in the human species. [10]
- 4b. A female insect of *Drosophila melanogaster* has white eyes.. It is mated with a red eyed male with the genotype. The F_1 progeny from this cross are mated among themselves. You are given that R (red eyes) is completely dominant over r (white eye). Show the crosses and give the genotypes and phenotypes of the parents, male and the female progeny in both the F_1 and the F_2 generations. [10]
6. Fruit shape in a certain plant is determined by two gene pairs where there is complete dominance in both cases. At gene pair A disc shaped fruit (A) is dominant over oval shape (a). At gene pair (B) oblong shape is dominant over spherical shape. Gene pair A when homozygous dominant is epistatic to the B gene. Gene pair B when heterozygous is epistatic to the A gene. A cross between AaBb is made.

- a) Derive the gametes and draw up a Punnet square to show the genotypes produced. [7]
- b) Determine the phenotypes and indicate the phenotypic ratios that result from this. [7]
- c) In the four o'clock plant a cross between a pure breeding red flowered line and a pure breeding white flowered line gave pink coloured F_1 progeny. Explain this observation and give the phenotypic ratio of the F_2 progeny from these F_1 plants after selfing. [6]

SECTION B

Answer all questions in this section.

Detach this section and submit it together with the main answer book.

Candidate number _____

7a. Distinguish between a gene and an allele giving examples [2]

7b. What are homologous chromosomes? [2]

7c. What is the difference between DNA and RNA. [1]

7d. The genetic code is triplet and degenerate. Explain. [2]

7e. What are sex influenced genes. Give an example. [2]

7f. What is the difference between a gene and an allele?

[1]

7g. Write down n or $2n$ or $3n$ to show the ploidy level of the following in a maize plant. [2]

i) The stem ____ ii) Pollen grain ____ iii) Endosperm ____ iv) Root hair ____

7h. How many nuclei are found in the following.

[1]

i) Microspore mother cell ____ Pollen grain ____

7i. Explain the difference between a sporophyte and a gametophyte.

[1]

7j. Distinguish between dominant and recessive and give an example.

[1]

7k. Draw the embryo sac of maize and label all its components.

[4]

7l. When gene pair A is homozygous, it is epistatic to the gene pair B. Explain.

[1]
