THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

AUGUST – DECEMBER 2017 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF BIOLOGY

REGULAR PROGRAMME

BIO 200: GENERAL GENETICS

Date: DECEMBER 2017	Duration: 2 Hours

INSTRUCTIONS: Answer Question ONE and any other TWO Questions

Q1. a) Make a distinction between the following:
- i) Translocation and inversion chromosome mutations **(2 marks)**
- ii) Linkage and crossing over **(2 marks)**
- iii) Transformation and transduction **(2 marks)**
- iv) Mendel's First and Second laws **(2 marks)**

b) Assume that you have just determined the percentage of adenine in the DNA of *Bacillus hypotheticus* to be 17%. What is the percentage of each of the other bases? **(4 marks)**

c) If you assume parents to be AAXX and AAXY, how could you account in humans for children with each of the following types?
- i) AAXYY
- ii) AAXXY
- iii) AAXO **(6 marks)**

Take one of the conditions in 1c above, give the name and indicate the characteristics of the affected individual. **(2 marks)**

d) In humans the condition for normal blood clotting dominates the condition for non-clotting (haemophilia). Both genes are linked to the X-Chromosome. A male haemophiliac marries a woman who is a carrier for this condition. What type of offspring would they get in relation to blood clotting? **(4 marks)**

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e) Using examples explain the following sex determining mechanisms
    i) Haplodiploidy **(3 marks)**
    ii) External environment **(3 marks)**
    iii) Episomes **(3 marks)**

Q2. a) Briefly describe the conditions required for the Hardy- Weinberg equilibrium to be maintained. **(10 marks)**

b) A group of 100 people splits away from a larger population and establishes a separate society. With respect to the MN blood types, the emigrants number: type M = 41, type MN = 38, type N = 21
    i) What are the allelic frequencies? **(5 marks)**

    ii) If this group and their descendants meet the condition of the Hardy- Weinberg Law, what are the expected frequencies of the MN phenotypes in the subsequent generations? (Because the group is fairly small, assume the genetic drift is negligible) **(5 marks)**

Q3. a) What is epistasis? **(2 marks)**

b) In certain breeds of dog the genotype C- produces a pigmented coat, whereas cc gives rise to a white coat (not albino). Another pair of alleles (B and b) determines the colour of the coat in C- dogs such that C-B- animals are black and C-bb animals are brown. Assume two animals of the genotype CcBb are crossed. What phenotypic ratio results in the pups of a large number of such mating? **(18 marks)**

Q4. a) Briefly describe the process of protein synthesis **(10 marks)**

b) Discuss any four agents of micro-evolution **(10 marks)**

Q5. a) The father of a certain family belongs to blood group AB, and the mother to blood group O. They have four children, one belonging to blood group AB, one to A, one to B and one to O. One of these children is adopted and another is a child from an earlier marriage of the mother. State which is the adopted child and which is the child from an earlier marriage of the mother and why. **(10 marks)**

b) i) Briefly describe steps/stages involved in a typical gene cloning procedure **(6 marks)**

    ii) Discuss any four ethical concerns of cloning **(4 marks)**

END

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