MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF BIOLOGICAL SCIENCES

FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN POPULATION HEALTH

PPH 200: POPULATION GENETICS

DATE: 8/8/2016 **TIME: 2.00-4.00 PM**

INSTRUCTIONS

(a) Answer ALL the Questions in Section A

(b) Answer ANY TWO Questions in Section B

(c) Illustrate your answers with well labeled diagrams where appropriate

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SECTION A (30 MARKS)

1. a) Define the following terms as used in population genetics:

   i) Gene pool (1 mark)

   ii) Wild type allele (1 mark)

   iii) Polymorphism (1 mark)

   b) i) State the law of Hardy Weinberg Equilibrium (1 mark)

   ii) Outline three processes that may offset the Hardy Weinberg Equilibrium (3 marks)

   c) Giving appropriate examples in each case, differentiate between transient and balanced polymorphisms (4 marks)

   d) Explain the advantages of mitochondrial DNA markers over nuclear DNA markers in populations genetics (3 marks)

e) Giving an appropriate example for each case, differentiate between macro- and microevolution (3 marks)

f) Name three sources of genetic variation in natural populations (3 marks)

g) Discuss three effects of inbreeding in natural populations. (3 marks)

h) Outline three advantages of DNA based markers over other molecular markers in population genetic studies. (3 marks)

i) i) Define the term mutation (1 mark)

ii) List three types of chromosomal mutations found in animals (3 marks)#

SECTION B (40 Marks)

2. Discuss the factors that may lead a population to deviate from Hardy Weinberg Equilibrium. (20 marks)
3. Discuss the applications of population genetics in the modern world. (20 marks)
4. A population geneticist sampled 100 individuals and found that for a particular gene called *Mar*, there were 25 *Mar-1/Mar-1* homozygotes, 5 *Mar-2/Mar-2* homozygotes and 70 *Mar-1/Mar-2*

   a) Calculate the proportions (frequencies) of the two alleles, Mar-1 and Mar-2 in this population. (4 marks)

   b) Calculate the numbers of the three genotypes that would be expected in this sample if this locus were in Hardy Weinberg Equilibrium. (9 marks)

   c) How can you test that the population under study is in Hardy Weinberg Equilibrium? (4 marks)

   d) Suggest a possible reason for the difference between the observed and the expected genotypic frequencies. (3 marks)
5. Discuss 5 attributes that make mitochondrial DNA an ideal genetic marker in population genetic studies. (20 marks)