



NATIONAL OPEN UNIVERSITY OF NIGERIA
14-16 AHMADU BELLO WAY, VICTORIA ISLAND LAGOS
SEPTEMBER/OCTOBER 2015 EXAMINATION
SCHOOL OF SCIENCE AND TECHNOLOGY

COURSE CODE: BIO 403

COURSE TITLE: POPULATION CYTOGENETICS

TIME ALLOWED: 2 Hours

INSTRUCTION: ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER THREE QUESTIONS

1. (a) Define genetic drift.(3 marks)
(b) In a population of 100,000 people carrying the recessive allele, a for albinism, there are 100 aa albinos, 98,100 AA and 1,800 Aa heterozygous carriers.
(i) Compute the allelic frequencies in the parent population,
(ii) Using Hardy-Weinberg equation, predict the number of individuals of each Genotype in the next generation. (10 marks)
(c) Give a detailed description of any **three** forms of genetic drift. (4 x 3 = 12 marks)
2. (a) Account for how allelic frequencies at an X-linked locus can be determined from the genotypic frequencies?(3 marks)
(b) A locus that code for transferring a blood protein in *Clethrionomys gapperis*, three genotypes are found at the transferring locus: MM, MJ and JJ in a population of *C. gapperis* trapped in North America in 2010, 12 MM, 53 MJ, 12 JJ individuals are found. Calculate the expected number of individuals with each of the observed genotypes. (12 marks)
3. (a) Enumerate the significance of a Chi square test in population genetics studies? (3 marks)
(b) In a population of 200,000 people carrying the recessive allele, a for albinism, there are 200 aa albinos, 196,200 AA and 3,600 Aa heterozygous carriers. (12 marks)
(i) Compute the allelic frequencies in the parent population,
(ii) Using Hardy-Weinberg equation, predict the number of individuals of each genotype in the next generation
4. (a) It takes over several generations to approach equilibrium frequencies if the alleles are sex-linked and the sexes differ in allelic frequency. Discuss (8 marks)
(b) The number of individuals living in a town is 300. A study showed that the number of individuals in the town with different M-N blood group phenotypes are as follows:

Phenotype	No. of individuals
M	90
MN	150
N	60

Calculate:

- i. the genotypic frequency
- ii. the allelic frequency. (7 marks)

5. (a) What do you understand by sex-linked traits? (3 marks)

(b) Write **short notes** on the following:

- (i) Selective mating (4 marks)
- (ii) Adaptation (4 marks)
- (iii) Migration (4 marks)

6. (a) Give a detailed description of founder effect. (3 marks)

(b) Calculate the genotypic and allelic frequencies for hemoglobin variants among Australians where multiple alleles are present. (15 marks)

Hemoglobin genotypes:

AA	AS	SS	AC	SC	CC	Total
4,034	1566	8	356	28	22	6,004