FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
DEPARTMENT OF PLANT BIOLOGY
FIRST SEMESTER BTECH. EXAMINATION, 2019/2020 SESSION

COURSE CODE: BIO 511
COURSE TITLE: POPULATION GENETICS
COURSE UNIT: 2
TIME ALLOWED: 1½ HOURS

INSTRUCTIONS: ANSWER ANY THREE (3) QUESTIONS

1. a. Describe allele as important factor that influences gene frequency in a population
   b. Assuming in a given population of 500 individuals, two Alleles control a trait that determine skin pigmentation, the number of individuals with these genotypes are presented as follows: AA=180, Aa=240, aa=80. Determine the allelic and genotypic frequencies of the population

   c. Use the information provided in 1 (above) to complete the table below:

Potential Offspring Genotypes	Allele Transmitted by Mother	Allele Transmitted by Father	Probability of Allele is Transmitted by Mother	Probability of Allele is Transmitted by Mother	Probability these alleles are transmitted by Mother and Father
AA	A				0.36
Aa	A		0.60	0.40	
aA	A		0.40		0.24
aa	A		0.40		

2. a. Expatiate on the Classical Model of the gene pool structure
   a. Explain the term polymorphism
   b. Assuming the per capital growth rate of the population of bivalves in Tagwai Lake is 0.5, what will be the population in 10 years time if the initial population is 4,000 (Given that Euler's Constant = 2.71828)
   c. List the different types of dominance relationship.
3. a. Draw an annotated logistic growth curve
   b. Write the logistic Equation
   c. Mention five (5) characteristics that confer high fitness to a population that grows exponentially
   d. In an experiment to determine the genes that code for the enzyme phosphoglucomutase (PGM), three alleles were found at a locus that code for these genes. Study the values obtained for each of the genotypes and use it to determine the genotypic and allelic frequencies. AA = 4, AB = 41, AC = 25, BB = 84, BC = 88 and CC = 32.

4. a. State the Hardy-Weinberg Principle
   b. List ten (10) evolutionary influences that could alter the Hardy-Weinberg equilibrium
   c. From a group of Population Genetics students who tested themselves for tasting ability of Phenyl-thiocarbamide, 105 and 41 are tasters and non-tasters respectively. The genes for taster show complete dominant on the non-taster. Calculate the allelic and genotypic frequencies of the group.

5. a. Mention four factors that can fluctuate the population of a group
   b. Genotypes, but not allelic frequencies change under non-random mating. Discuss!
   c. Mention the five (5) assumptions underlying Hardy-Weinberg equilibrium
   d. Write the binomial expression for Hardy-Weinberg; define each component of the equation