FEDERAL UNIVERSITY OF TECHNOLOGY OWERRI
SCHOOL OF PHYSICAL SCIENCES
DEPARTMENT OF SCIENCE LABORATORY TECHNOLOGY
STC 306: GENETICS
RAIN SEMESTER EXAMINATION 2015 / 2016 ACADEMIC SESSION

Instructions: *Answer five questions, choosing at least two questions from each section*

Date: *22/09/2016* ***Time:*** *9:00am* ***Time allowed:*** *3 hours*

SECTION A

1a. What are nucleotides?
b. Discuss in brief the structure of DNA and compare it with that of RNA.
c. How does an RNA nucleotide differ from a DNA nucleotide?

2. Assume the following base sequence was found in a 20 base DNA strand;
3' ATT CGA CCT TAT TAC TGC AC 5'
(a) What would be the first five bases in the 3' end of the complementary strand?
(b) What would be the ten bases of the 5' end of the complementary strand?
(c) Assuming the presence of the complementary strand; what is the percentage composition of the polymer with respect to AT base pairing and GC base pairing.

3a. What are the basic requirements that must be met by genetic material?
b. Write short notes on the following variants of DNA double helix; (i) Z-DNA and (ii) B-DNA.

4a. Define genetic code
b. Generate the 64 codons of the genetic code and identify the initiation and the termination codons.
c. Explain the meaning of the following characteristics of the genetic code;
(i) Degeneracy of the code (ii) Universality of the code

SECTION B

5. Describe the following genetic terms:
(a) Genotype (b) Phenotype (c) Mutation (d) Transcription (e) Heterozygous
(f) Chromosome (g) Heredity

6a. What is dominance?
b. Differentiate between the following variations in dominance relationship;
(i) Complete / Simple dominance (ii) Incomplete dominance (iii) Codominance
c. What do you understand by the term "Lethal Gene (Allele)"?

7a. What does gene interaction mean?
b. Give a brief explanation of gene interaction with epistasis.
c. At a locus that determines the feather pattern of mallard ducks, one allele, M, produces the wild-type *mallard* pattern and a second allele, M^R, produces a different pattern called *restricted*, while a third allele, m^d, produces a pattern termed *dusky*. In the allelic series, restricted is dominant over mallard and dusky, and mallard is dominant over dusky: Thus, $M^R > M > m^d$.
(i) What is the possible number of genotypes with these three alleles?
(ii) Write out the genotypes and their corresponding phenotypes.