NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF NATURAL AND APPLIED SCIENCES

QUALIFICATION: BACHELLOR OF SCIENCE	
QUALIFICATION CODE: 07BOSC	**LEVEL:** 6
COURSE CODE: GEN602S	**COURSE NAME:** GENETICS
SESSION: JANUARY 2019	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

SUPPLEMENTARY / SECOND OPPORTUNITY EXAMINATION PAPER	
EXAMINER (S):	**Prof. Edosa Omoregie**
MODERATOR:	**Prof. Sylvester Rodgers Moyo**

INSTRUCTIONS
1. Answer all questions in Sections A and B 2. Answer any three (3) questions in Section C 3. You may use a calculator 4. Write clearly and neatly 5. Number your answers correctly

THIS QUESTION PAPER CONSISTS OF 4 PAGES
(Including this front page)

SECTION A (MULTIPLE CHOICE QUESTIONS): ANSWER ALL QUESTIONS **[15]**

1. The sequence of mitosis will take place in which of the following orders? (1)
   (a). anaphase, telophase, metaphase, prometaphase, prophase
   (b). prophase, prometaphase, metaphase, anaphase, telophase
   (c). prometaphase, telophase, anaphase, metaphase, prophase
   (d). prometaphase, metaphase, anaphase, telophase, prophase

2. In tobacco, if the diploid number of chromosomes is 48, how many chromosomes will be found in a pollen grain? (1)
   (a). 96
   (b). 4
   (c). 24
   (d). 12

3. Haemophilia is a sex-linked recessive trait in humans. If a father is a carrier, and their son is haemophiliac, but the mother is normal, her genotype must be? (1)
   (a) X^hX^h
   (b) X^HX^h
   (c) X^HX^H
   (d) All of the above

4. How many chromosomes are contained in a human male gamete cell? (1)
   (a). 46
   (b). 23
   (c). 48
   (d). 26

5. Which of the following is an autosomal recessive trait (1)
   a) Duchenne muscular dystrophy
   b) Lesch-Nyhan syndrome
   c) Marfan syndrome
   d) Cystic Fibrosis

6. Which of the following sequences will a strand of DNA with the sequence of base AACTTG have a complimentary strand? (1)
   (a). CCAGGT
   (b). AACTTG
   (c). TTCAAG
   (d). TTGAAC

7. What is the name of the fragments of the lagging strand during DNA replication? (1)
   (a). Binding proteins
   (b). Fragmenting lagging strand
   (c). Okazaki segments
   (d). Coding strands

8. Which of the following enzymes unwind the DNA double helix strand during the process of DNA replication? (1)
   (a). Helicase
   (b). Primase

(c). Polymerase
(d). Ligase

9. In chromosomal mutation, which of the following chromosome numbers is referred to as Nullisomy. (1)
(a). $2n-1$
(b). $2n-2$
(c). $2n+1$
(d). $2n+2$

10. Which of the following statements is not true about transposases during gene recombination? (1)
(a). During transposition a short sequence of target DNA is duplicated, and the transposon is inserted between the directly repeated target sequences.
(b). Some transposons insert into almost any target DNA sequence.
(c). The actions of transposases go on indefinitely without interruption.
(d). Transposons are important genetic elements because they cause mediate genomic rearrangement

11. In the control of gene expression, the Pribnow Box acts as a? (1)
(a). Attenuator
(b). Enhancer
(c). Operator
(d). Promotor

12. The Central Dogma in genetics describes: (1)
(a). The pattern of information flow in the from DNA to proteins
(b). The pattern of chromosomal inheritance in populations
(c). The role of mutations in disease
(d). The role of promoters

13. Which of the following is an assumption for Hardy-Weinberg equilibrium? (1)
(a). No epistasis
(b). No dominance
(c). No crossing-over
(d). No mutation

14. Which reaction in DNA replication is catalysed by DNA ligase? (1)
(a). Addition of new nucleotides to the lagging strand
(b). Addition of new nucleotides to the leading strand
(c). Base pairing of the template and the newly formed DNA strand
(d). Formation of a phosphodiester bond between the 3'-OH of one Okazaki fragment and the 5'-phosphate of the next on the lagging strand

15. In a gene pool of wildflower population that is incompletely dominant for colour, the following coloured wildflowers were observed with the indicated genotypes: 320 red flowers (C^RC^R), 160 pink flowers (C^RC^W) and 20 white flowers (C^WC^W). Which of the following ratios is the correct frequencies of the alleles in the population? (1)
(a). $C^R : C^W = 0.8 : 0.2$
(b). $C^R : C^W = 0.2 : 0.8$
(c). $C^R : C^W = 0.5 : 0.5$
(d). $C^R : C^W = 0.6 : 0.4$

SECTION B (SHORT EXPLANATION QUESTIONS): ANSWER ALL QUESTIONS **[40]**

16. a). State the five conditions of a nonevolving population as describe by the Hardy-Weinberg Equilibrium. (5)

    b). Describe the inheritance of ABO blood groups including an example of the possible outcomes of a homozygous blood group A mother having a child with a blood group O father. (7)

17. Briefly explain the molecular structure of mRNA and highlight the main structural differences between RNA and DNA molecules. (8)

18. a). Using suitable example, describe the phenomenon of polygenic inheritance. (6)

    b). In a tabular form, highlight the differences between mutations and polymorphism? (6)

19. a). What is the complementary DNA strand for the following DNA sequence?
    5' ATCGGCTACGTTCAC 3' (2)

    b). Explain the roles of the various enzymes involved in the synthesis of new DNA strands from the parent DNA strand. (6)

SECTION C (DISCUSSION QUESTIONS): ANSWER ANY THREE QUESTIONS **[45]**

20. a). With the use of suitable diagrams, discuss the process of gene substitution, insertion and deletion in point mutations. (8)
    b). With reference to chromosomal mutation, number of chromosomes and phenotypic expression, discuss Klinefelter Syndrome genetic disorder. (7)

21. With reference to types and actions of the various enzymes involved, discuss the process of transcription and translation in gene expression. (15)

22. Discuss how the process of natural selection, genetic drift and gene flow alter the frequencies of alleles in a population. (15)

23. Discuss genetic engineering with emphasis on cloning and the benefits of cloning. (15)