



**PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF NATURAL AND APPLIED SCIENCES

QUALIFICATION: BACHELOR OF SCIENCE	
QUALIFICATION CODE: 07BOSC	LEVEL: 6
COURSE NAME: GENETICS	COURSE CODE: GEN602S
SESSION: JANUARY 2020	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

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

INSTRUCTIONS
<ol style="list-style-type: none">1. Answer all questions in Sections A2. Answer any three questions in Section B3. Write clearly and neatly4. Number your answers correctly

PERMISSIBLE MATERIAL

Scientific Calculator

THIS QUESTION PAPER CONSISTS OF 5 PAGES
(Including this front page)

SECTION A (MULTIPLE CHOICE QUESTIONS): ANSWER ALL QUESTIONS

[40]

1. Division of the cytoplasm of a eukaryotic cell during mitosis is called? (2)
 - A. karyokinesis
 - B. plamsokinesis
 - C. diakinesis
 - D. cytokinesis

2. Synapsis of the homologous chromosomes in the eukaryotic cell occurs during which of the following phases of division? (2)
 - A. anaphase I
 - B. telophase I
 - C. prophase I
 - D. prophase II
 - E. metaphase II

3. In peas, a tall, yellow-seeded plant is crossed with a homozygous short, green-seeded plant and yields 203 tall, green-seeded plants, 199 short, green-seeded plants, 207 tall, yellow-seeded plants, and 192 short, yellow-seeded plants. Which of the following genotypes is the most likely genotype of the tall, yellow-seeded parent? (2)
 - A. TtYy
 - B. TTYy
 - C. ttyy
 - D. ttYY

4. Which of the following is the most likely outcome of a cross between a heterozygous tall plant and a heterozygous tall plant? (2)
 - A. 30 tall : 10 short
 - B. 20 tall : 20 short
 - C. 20 tall : 12 medium : 8 short
 - D. 15 tall : 25 short

5. Which of the following structures indicates that crossing-over has occurred during the process of mitosis? (2)
 - A. centromere
 - B. synaptonemal complex
 - C. chiasmata
 - D. kinetochore

6. Which of the following terms best describes the replication of DNA? (2)
 - A. constitutive
 - B. conservative
 - C. semi-conservative
 - D. semi-constitutive

7. In DNA molecule, which of the following bonds is true? (2)
 - A. the [G] = [C]

- B. the $[G+C] = [A+T]$
 C. the $[G] = [A]$
 D. none of the above are true
8. During DNA synthesis, the addition of a new nucleotide to a newly formed DNA strand always proceeds in which direction? (2)
 A. from the promoter
 B. in either direction
 C. in the 3' to 5' direction
 D. in the 5' to 3' direction
9. Which of the following statements is true on the role of the enzyme ligase during the replication of a DNA molecule? (2)
 A. remove the RNA primer
 B. to stabilize the single stranded structure
 C. to link okazaki fragments together
 D. to unwind the original DNA molecule
10. Which of the following statements is not true about transposons during gene recombination? (2)
 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 transcription, RNA polymerase binds at? (2)
 A. a promoter
 B. an operator
 C. the centromere
 D. an enhancer
12. Which of the following statements best describes the Central Dogma theory in genetics? (2)
 A. the pattern of genetic information flow in the cell
 B. the pattern of chromosomal inheritance in populations
 C. the role of mutations in disease
 D. the role of promoters
13. During protein synthesis, how many equivalents of ATP are used for each peptide bond? (2)
 A. 1
 B. 2
 C. 3
 D. 4
14. Which of the following blood genotype belongs to an individual that is regarded as a universal blood recipient? (2)

- A. $I^A I^A$
- B. $I^A I^O$
- C. $I^A I^B$
- D. $I^O I^O$

15. Which of the following autosomal chromosome conditions is for an individual suffering from Edwards Syndrome? (2)

- A. trisomy 18
- B. trisomy 21
- C. X monosomy
- D. Trisomy 15

16. Which of the following is the optimum temperature for thermostable DNA polymerase of Taq polymerase during the PCR experimental step of DNA denaturation? (2)

- A. $94 - 98^{\circ}\text{C}$
- B. $100 - 105^{\circ}\text{C}$
- C. $45 - 50^{\circ}\text{C}$
- D. $75 - 80^{\circ}\text{C}$

17. Which of the following is an assumption for Hardy-Weinberg equilibrium? (2)

- A. no epistasis
- B. no dominance
- C. no crossing-over
- D. no mutation

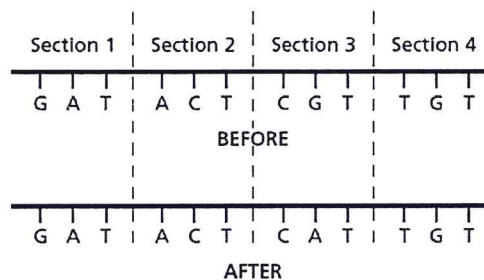
18. Which of the following autosomal chromosome number is a nullisomy? (2)

- A. $2n - 2$
- B. $2n + 2$
- C. $2n - 1$
- D. $2n + 1$

19. A human with Turner's syndrome would represent which of the following chromosomal condition? (2)

- A. diploid condition
- B. euploid condition
- C. aneuploid condition
- D. haploid condition

20. In which section of DNA below is there a mutation? (2)



- A. section 1
- B. section 2
- C. section 3
- D. section 4

SECTION B (ESSAY QUESTIONS): ANSWER ANY THREE QUESTIONS

[60]

21. Using suitable molecular diagram discuss the structure of the DNA double helix, including its subunits and the way in which they are bonded together indicating the antiparallel arrangements of the polynucleotide strands. (20)
22. A. With the aid of suitable diagram, briefly describe the process of mitotic division in a eukaryotic cell with emphasis on the changes taking place on the chromosome? (12)
- B. Briefly differentiate gene mutation from chromosomal mutation. (2)
- C. With the aid of schematic illustration, discuss the process of substitution, insertion and deletion in gene mutation. (6)
23. A. With the aid of a suitable schematic diagram, explain the 'central dogma' of the control of gene expression. (6)
- B. If there are 3×10^9 base pairs in the human genome and the mutation rate per generation per base pair is 10^{-9} , what is the probability that a child will have 4 new mutations? (4)
- C. Describe the structure of the messenger RNA. (10)
24. A. There are four accepted concepts in the evolution of population. State these four concepts and briefly explain Concept 1. (12)
- B. With reference to chromosomal mutation, number of chromosomes, phenotypic expression and treatment, discuss Turner Syndrome genetic disorder. (8)