JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF AGRICULTURAL AND FOOD SCIENCES

THIRD YEAR SECOND SEMESTER UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE ANIMAL SCIENCE

2020/2021 ACADEMIC YEAR

REGULAR

COURSE CODE: AAS 3326

COURSE TITLE: Principles of Molecular Genetics

EXAM VENUE: **STREAM: BSc. Animal Science**

DATE: **EXAM SESSION:**

TIME: 2 HOURS

Instructions:

1. **Answer ALL questions in section A and ANY other 2 Questions in section B.**
2. **Candidates are advised not to write on question paper.**
3. **Candidates must hand in their answer booklets to the invigilator while in the examination room.**

SECTION A [30 MARKS]

Answer ALL questions from this Section

1. Choose the phrase from the right column that best fits the term in the left column.

[5 MARKS]

a. genetic code	1. a mutation that cause a novel mutant allele to revert back to wild type
b. epigenetic phenomenon	2. structures at ends of eukaryotic chromosomes
c. complementarity	3. a method of discovering whether two mutations are in the same or separate genes
d. transposon	4. part of a gene that can contain protein coding information
e. point mutation	5. G–C and A–T base pairing in DNA through hydrogen bonds
f. exon	6. DNA sequence required for initiation of transcription
g. gene editing	7. a heritable alteration in gene expression not due to mutation in base pair sequence
h. telomeres	8. a mutation that changes one or a few base pairs
i. promoter	9. sequence of nucleotides, coded in triplets (codons) along the mRNA, that determines the sequence of amino acids in proteins.
j. complementation test	10. Technologies that allows the creation of knock-out and knock-in animals and plants
	11. segments of DNA that move from place to place within the genome without an RNA intermediate, sometimes causing a change in gene function when they insert in a new chromosomal location.

2. Distinguish the following terminologies:
   (a) transcriptome *vs* genome **[2 MARKS]**
   (b) transcription *vs* translation **[2 MARKS]**
   (c) reverse genetics *vs* forward genetics **[2 MARKS]**
   (d) DNA *vs* cDNA **[2 MARKS]**
   (e) purine *vs* pyrimidine **[2 MARKS]**

3. Describe the major chemical differences distinguishing RNA from DNA **[5 MARKS]**

4. Using the mutagen EMS, a researcher created three independent mutants of a gene for resistance to a viral disease. Given the sequences of the three mutants which is shown below (5′ ends are at left), what is the sequence of the original gene (i.e. non-mutated) in this region?

   mutant 1 ACCGTAATCGACTGGTAAACTTTGCGCG
   mutant 2 ACCGTAGTCGACCGGTAAACTTTGCGCG
   mutant 3 ACCGTAGTCGACTGGTTAACTTTG - - - - **[5 MARKS]**

5. Using examples, explain why gene regulation is important in eukaryotes. **[5 MARKS]**

SECTION B (40 MARKS)

Answer ANY TWO questions in this section

6a. Describe the key steps in the semiconservative replication of DNA. **[10 MARKS]**

6b. Explain why molecular geneticists use model organisms to study development **[10 MARKS]**

7a. Describe the three stages of transcription: initiation, elongation, and termination

[10 MARKS]

7b. Describe FOUR mechanisms by which cells can repair DNA with altered or damaged nucleotides. **[10 MARKS]**

8a. Explain how organisms ensure the informational fidelity of its DNA **[10 MARKS]**

8b. Describe the key steps of translation, indicating how each depends on the ribosome.

[10 MARKS]