

CHUKA



UNIVERSITY

## UNIVERSITY EXAMINATION

## RESIT/SPECIAL EXAMINATION

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN  
**BOTA 413: MOLECULAR AND MICROBIAL GENETICS**

STREAMS:

TIME: 2 HOURS

DAY/DATE: MONDAY 01/11/2021

8.30 A.M – 10.30 A.M

## INSTRUCTIONS:

**Instructions: Answer all questions in section A and any two in section B**

**SECTION A (30 marks)**

1. Describe the structure of of DNA (5 marks)
  
- 2 (a) Explain the concept of the central dogma of molecular biology (4 Marks)
  - (a) Use the figure below to answer the questions that follow

|                    |   | Second letter  |  |  |  |                  |
|--------------------|---|--|--|--|--|------------------|
|                    |   | U  | C  | A  | G  |                  |
| First ('5') letter | U | UUU } Phe (F)<br>UUC }<br>UUA } Leu (L)<br>UUG }           | UCU }<br>UCC } Ser (S)<br>UCA }<br>UCG } | UAU } Tyr (Y)<br>UAC }<br>UAA Stop (terminator)<br>UAG Stop (terminator) | UGU } Cys (C)<br>UGC }<br>UGA Stop (terminator)<br>UGG Trp (W) | U<br>C<br>A<br>G |
|                    | C | CUU }<br>CUC } Leu (L)<br>CUA }<br>CUG }                   | CCU }<br>CCC } Pro (P)<br>CCA }<br>CCG } | CAU } His (H)<br>CAC }<br>CAA } Gln (Q)<br>CAG }                         | CGU }<br>CGC } Arg (R)<br>CGA }<br>CGG }                       | U<br>C<br>A<br>G |
|                    | A | AUU }<br>AUC } Ile (I)<br>AUA }<br>AUG Met (M) (initiator) | ACU }<br>ACC } Thr (T)<br>ACA }<br>ACG } | AAU } Asn (N)<br>AAC }<br>AAA } Lys (K)<br>AAG }                         | AGU } Ser (S)<br>AGC }<br>AGA } Arg (R)<br>AGG }               | U<br>C<br>A<br>G |
|                    | G | GUU }<br>GUC } Val (V)<br>GUA }<br>GUG }                   | GCU }<br>GCC } Ala (A)<br>GCA }<br>GCG } | GAU } Asp (D)<br>GAC }<br>GAA } Glu (E)<br>GAG }                         | GGU }<br>GGC } Gly (G)<br>GGA }<br>GGG }                       | U<br>C<br>A<br>G |
|                    |   | Third ('3') letter   |  |  |  |                  |

(b) Give two examples from the figure to show that the genetic code is degenerate. (2 marks)

(c) What is the nucleotide sequence of the sense strand of the DNA coding for the amino acid sequence: Alanine-Lysine-Leucine-methionine? (2 marks)

3. Describe the steps followed during cloning of DNA (5 marks)

1. Explain why *E. coli* uses lactose only when there is no glucose or sucrose available (6 Marks)

2. Explain why DNA replication is described as being semi conservative (2 mark)

3. Describe the types of mutations (6 Marks)

### SECTION B (40 MARKS)

8. a. Discuss the process of protein biosynthesis in prokaryotic cells (10 Marks)

b. Describe the structure of an eukaryotic gene

9. (a) Describe the types of plasmids that occur in bacteria (10 Marks)

(b) Describe the polymerase chain reaction (10 Marks)

10. (a) Explain why genetic engineering of micro-organisms is much easier than of plants and animals (10 Marks)

(b) Describe the general protocol for isolation of DNA (10 Marks)

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