SECTION 1
Use a separate answer book for this section.

Answer both questions. Each question has internal choices.

Total Marks Allocated for this Section is 50

Question 1. Answer any ten (10) from the following questions in one or two sentences (2.5 marks each, 25 marks total)

1. Distinguish between chemoheterotroph and chemoautotroph.
2. What is the glycocalyx?
3. What is the difference between an obligate and facultative anaerobe? Cite an example of each.
4. What is the nucleoid?
5. What causes translation to terminate and give an example?
6. Define fermentation.
7. Define photoautotroph and give an example of an organism with this type of metabolism.
8. What are oligotrophs?
9. In this diagram of the process of DNA replication at a replication fork, the strand labelled B is the:

A template strand
B lagging strand
C leading strand
D Okazaki fragment
E RNA primer
10. With what mRNA codon would the tRNA in the diagram be able to form a codon-anticodon base pairing interaction?

A. 3'-AUG-5'
B. 3'-GUA-5'
C. 3'-CAU-5'
D. 3'-UAC-5'
E. 3'-UAG-5'

11. What is the difference in cell wall phospholipid structure of Bacteria and Archaea?

12. What types of molecules does a chemoautotroph use as an energy source? As a carbon source?

13. Why do mutations in bacterial genes have a more immediate effect than mutations in eukaryotic system?

14. What three components make up the process of aerobic respiration?

**Question 2. Answer any five (5) of the following questions in one paragraph**
(5 marks each, 25 marks total)

1. Using suitable diagrams, compare the general structure of Gram-positive and Gram-negative bacterial cell walls.
2. Describe two mechanisms of transcription termination.
3. What is the structure of a typical E. coli promoter?
4. What is the structure of the RNA polymerase core enzyme? The holoenzyme?
5. What types of interactions and chemical bonds maintain protein structure?
6. What subunits make up the ribosome? What is each subunit composed of?
7. Provide an overview of the general metabolic regulation strategies available to a bacterial cell.
8. What is the proton motive force and how is it generated?

**END OF SECTION 1**
SECTION 2
Use a separate answer book for this section.

Answer both questions. Each question has internal choices.

Total Marks Allocated for this Section is 50

Question 3: Write briefly on any two (2) of the following questions.

(12.5 marks each, 25 marks total)

1: Describe the structure of composite transposons, and briefly describe the roles of transposable elements in microbes.

2: Compare and contrast specialized and generalized transduction, including the impact these differences have on the packaging of host DNA.

3: Transformation, transduction and conjugation are mechanisms for gene exchange in bacteria.
   a) Describe how these processes differ from each other.
   b) Discuss how the recipient cell protects against foreign DNA.

Question 4: Write briefly on any two (2) of the following questions.

(12.5 marks, 25 marks total)

1: Compare and contrast regulation of the lac operon to that of the trp operon.

2: Explain the molecular mechanisms controlling expression of the lac operon structural genes under all possible combinations of lactose and glucose levels.

3: Describe the regulation of biosynthesis of the aspartate amino acid family in E. coli.

END OF EXAM