The questions are as follows:
Questions 1 and 2: Module 1
Question 3: Module 2
Question 4: Module 3
Question 5: Module 4
Question 6: Module 5

All questions are worth equal marks.

Question 1
a) Answer, using one or two sentences, five (5) of the following:
   (i) Distinguish between chemoheterotroph and chemoautotroph.
   (ii) What is the glycocalyx?
   (iii) What are the three (3) basic functions of the genetic material?
   (iv) Distinguish between moderate and extreme thermophiles.
   (v) What structures are associated with motility in bacteria?
   (vi) What is the nucleoid?
   (vii) What causes translation to terminate and give an example?

b) Describe *Escherichia coli* and why it is used to study microbial physiology.

(10 marks)

Question 2
a) Answer, in a paragraph, two (2) of the following:
   (i) Tabulate the differences between the A, B and Z forms of DNA. Which is most commonly formed?
   (ii) Describe two mechanisms of transcription termination.
   (iii) What kind of chemical interactions can contribute towards the formation of tertiary structure?
   (iv) Describe, in some detail, the requirements and activities of DNA polymerase I.

b) Show, with the aid of diagrams, how chemotaxis occurs in bacteria.

(10 marks)
Question 3

a) Answer, using one or two sentences, five (5) of the following:
   (i)  What is balanced growth?
   (ii) What is batch culturing?
   (iii) What are the genetic controls for the Ntr system?
   (iv) What are oligotrophs?
   (v)  Describe the mechanism through which bacteria reproduce.
   (vi) Describe the temperature growth range for a mesophilic bacterium.
   (vii) Distinguish between halophilic and halotolerant bacteria.

(10 marks)

b) Describe the stringent response.

(10 marks)

Question 4

a) Answer two (2) of the following:
   (i)  The following sequence shows a small segment of mRNA.
        5'- AAC UGU GGG CCA –3'
        Make the following mutations changing only the wobble position of
        the cysteine (UGU) codon and describe the type of mutation.
        (a) silent mutation
        (b) missense mutation
        (c) nonsense mutation

   (ii) Briefly discuss lethal and conditionally lethal mutations

   (iii) How does transposition result in target site duplication?

   (iv) What is photoreactivation?

(10 marks)
b) Compare and contrast the mechanisms of generalised and specialised transduction.  

(10 marks)

**Question 5**

a) Answer, in a paragraph, two (2) of the following:

(i) Describe the processes involved in catalysis of a substrate by an enzyme and how competitive inhibition and allosteric inhibition affect this catalysis.

(ii) Compare the mechanisms of induction and repression of operon structural genes.

(iii) What is catabolite repression and how does it work?

(iv) Does trpL encode a functional protein? If so, what is its function? If not, what does it do?  

(10 marks)

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

(10 marks)

**Question 6**

a) Answer, using one or two sentences, five (5) of the following:

(i) What is the significance of ATP in bacterial metabolism?

(ii) Explain the process of biological REDOX reactions and give an example.

(iii) What is substrate-level phosphorylation?

(iv) Name the two general processes that are used to catabolise glucose. Which one produces more energy?

(v) Write the overall reaction for the catabolism of glucose

(vi) Define fermentation

(vii) Define photoautotroph and give an example of an organism with this type of metabolism.  

(10 marks)

b) The initial steps of ATP generation involve the consumption of ATP. True or false and explain the overall process of ATP generation.  

(10 marks)