OLABISI ONABANJO UNIVERSITY, AGO – IWOYE

DEPARTMENT OF MICROBIOLOGY

B. Sc (Microbiology) 2016/2017 HARMATTAN SEMESTER EXAMINATION

Course code and title: MCB204 – Microbial Physiology and Metabolism

Instruction: Attempt question 1 and one question each from Sections B and C.
Time Allowed: 1½ hours

SECTION A

1a. State four importance of studying microbial physiology.

b. Mention eight commonly encountered shapes of bacteria.

c. List seven elements required by microorganisms.

d. What are growth factors? Give three examples of growth factor.

SECTION B

2. The street vended food in Ago – Iwoye was found containing 3 *Escherichia coli* 0157, 5 *Vibrio parahaemolyticus* and 20 *Bacillus cereus* upon inoculation onto appropriate media at 10^2, 10^1 and 10^4 serial dilution respectively using Miles and Misra technique.

a. Calculate the number of *Escherichia coli O157*, *Vibrio parahaemolyticus* and *Bacillus cereus* in colony forming unit per gram of the sample.

b. Categorize the analysed food into any of the following using the table below; satisfactory, borderline and unsatisfactory

c. Comment on the quality of the street vended food using the specified bacterial load as a judgement criterion.

d. If the above street vended food was plated using pour plate method, comment on the difference between the microbial load of the former and latter.

e. What is the implication of your observation in (d)

Criterion	Result (colony forming unit(cfu/g) unless otherwise specified		
	Satisfactory	Borderline	Unsatisfactory
Campylobacter spp.	N.D. in 25g	N/A	Detected in 25g
Escherichia coli O157	N.D. in 25g	N/A	Detected in 25g
Salmonella spp	N.D. in 25g	N/A	Detected in 25g
Vibrio parahaemolyticus	<20	20 - ≤ 1000	>1000
Bacillus cereus	<1000	10^3 - 10^5	$>10^5$

N.D. – not detected; N/A – not applicable

3a. With the aid of a well labelled diagram, explain the structure of a bacterial cell.

b. Write short note on the following
(i) Autotrophs (ii) Heterotrophs (iii) Prototrophs
(iv) Chemotrophs (v) Lithotrophs

SECTION C

4a. Draw a typical bacterial growth curve and label the various phases.

b. In the first phase of bacterial growth curve, the number of bacteria remains constant. Does this mean the cells are dormant and inert? Explain.

c. An inoculum of 10^7 bacterial cells was introduced into a flask of culture medium and growth monitored. No change was seen for 18 minutes (the lag phase), then growth occurred rapidly. After a further 76mins, the population had increased to 4.32×10^8 cells. What is the doubling time?

5a. Define Nutrition. List the two categories of essential nutrient required by microorganisms and give one example of each.

b. Highlight the sources and importance of the following essential nutrients
(i) Nitrogen
(ii) Oxygen
(iii) Hydrogen
(v) Sulfur
(vi) Carbon