



# OLABISI ONABANJO UNIVERSITY

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## DEPARTMENT OF MICROBIOLOGY

2012/2013 RAIN SEMESTER EXAMINATION

MCB 204: MICROBIAL PHYSIOLOGY AND METABOLISM

INSTRUCTION: Attempt TWO questions from each section

TIME: 1hr 30mins.

### SECTION A

1. Briefly describe any three techniques by which microbial population numbers may be determined and give their advantages and disadvantages.
- 2a. Calculate the growth rate and generation time of a culture that increases in the exponential phase from  $10^3$  to  $1 \times 10^9$  in 10 hours.
- b. Give the meaning of the following terms:
  - (i) Plasmids
  - (ii) Episomes
  - (iii) Curing
- c. List the types of plasmid found in bacteria.
  - Conjugative plasmid
  - Degradative plasmid
  - Toxinogenic plasmid
  - Col plasmid
  - Virulence plasmid
- 3a. Highlight four importance of the following:
  - i. Bacterial cell wall
  - ii. Plasma membrane
  - iii. Capsules
- b. Why would a lag phase prior to the start of a cell division necessary?

### SECTION B

- 4a. What are the functions of four (4) named macronutrients and three (3) named micronutrients found in microbial cells?
- b. Explain why an element such as Co is considered a micronutrient whereas C is considered a macronutrient.
  - Macronutrients: C, H, N, O, P, S
  - Micronutrients: Fe, Zn, Cu, Mn, Co, Mo, B, Se, V, Ni, K, Mg, Ca
- 5a. Define growth factors and state three (3) classes of them.
  - Mineral salts
  - Vitamins
  - Growth factors
- b. Compare autotrophs and heterotrophs with respect to the form of carbon-based nutrients they require.
- c. What two (2) classes of macromolecules contain the bulk of Nitrogen in a cell.
6. Explain the following nutritional classes of microorganisms giving two (2) examples of microorganisms in each case.
  - (a) photolithotrophic autotrophs - Cyanobacteria & Chlorobacteria
  - (b) chemoorganotrophic heterotrophs
  - (c) photoorganotrophic heterotrophs

Photolithotrophic autotrophs: are also called photoautotrophs or photolithoautotrophs. They obtain energy from light, use  $\text{CO}_2$  as their carbon source & use reduced substances as their electron source.

Chemoorganotrophic heterotrophs: