OBAFEMI AWOLOWO UNIVERSITY, ILE – IFE, NIGERIA.
FACULTY OF SCIENCE
DEPARTMENT OF MICROBIOLOGY

B.Sc. (Microbiology) Degree Examination.
SEMESTER: Harmattan 201012011 Session **Date: July 27,2011**
COURSE CODE: **MCB 403** **Time allowed: 3** Hrs.
COURSE TITLE: Pharmaceutical Microbiology
INSTRUCTION: Answer all questions with each section in a separate booklet.

SECTION A

1a. Why is *Penicillium chrysogenum* an organism of choice for the production of penicillin as against *Penicillium notatum?*

b. What are the consequences of under-inoculating a fermenter tank with microorganism for antibiotic production?

2a. Differentiate between broad-spectrum and narrow-spectrum antibiotics. Why are Gram-negative bacteria less susceptible to antibiotics than Gram-positive ones?

b. What are the ideal qualities of antibiotics?

SECTION B

1a. Using annotated sketches, discuss the typical growth pattern of a microorganism used in the industrial manufacture of products. Include in your illustrations the following

i. relationship between substrate utilization and biomass/product formation;
ii. "tropho" and "idio" phases of growth in respect of population growth;
iii. "batch" and "continuous" culture systems;
iv. The nature of "starter culture" in relation to the early phase of growth.

(20 marks)

(b) Why should an industrial concern be interested in the evaluation of the choice of substrate for industrial microbial processes? (5 Marks)

2. Heat, particularly wet (moist) heat, has been very useful in the control of microorganisms in industrial products.

a. Define the following tenns:

i. Thermal Death Time ii. Thermal Death Point
iii. Decimal Reduction Time (D value) iv. z value v. F value

(10 Marks)

b. Derive an equation for thermal death kinetics of microorganisms showing the relationship between Temperature, D and z values. (5 Marks)

c. Using your derived equation in "2b" above answer the following questions:

i. For a suspension of spores of a bacterium in phosphate buffer the D value at 121 "C is 0.204 min. How long would it take to reduce 10^{20} spores of the bacterium in the same buffer to 100 spores at 121 °C?

(2 Marks)

ii. If the z value for the treatment in (2.c.i) above is 10 °C, how long would it take to achieve the same reduction of number of spores i.e. from 10^{20} to 100 at 111 °C?

(3 Marks)

iii. If for a strain of *Staph. aureus* in a product the D value at 60 °C is 15.4 min, and the z value is 6.8 "C, how long would it take to reduce a population of the organism from 10^5 cells to 10^0 at temperatures 55 °C, 60°C and 65 °C?

(5 Marks)