NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE HONOURS DEGREE EXAMINATIONS

DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

SUPPLEMENTARY EXAMINATION: GENERAL MICROBIOLOGY I SBB 1207

AUGUST 2004

2 HOURS (100 marks)

INSTRUCTIONS

Answer **Four (4)** Questions,**Two (2)** from each section. Each question carries 25 marks. Where a question contains subdivisions, the mark value for each subdivision is given in brackets. Illustrate your answer where appropriate with large, clearly labelled diagrams.

SECTION A

(i) Describe briefly the contribution of Joseph Lister to the germ theory of disease. (3 marks)

(ii) List any three contributions of Louis Pasteur to the understanding of fermentation. (3 marks)

(iii) Draw and label a generalized bacterial cell (6 marks)

(iv) Describe the differences between a Gram positive and gram negative bacterial cell wall. (5 marks)

(v) What action might a capsule serve for the following bacteria
(a) a pathogenic bacterium
(b) a soil bacterium where soil is periodically subjected to drought conditions
(c) a bacterium living in a flowing stream (3 marks)

(vi) Giving examples of bacterial species, name the major shapes of bacteria (3 marks)

(vii) Briefly explain what is studied in the following fields of microbiology
(a) cytology
(b) immunology (2 marks)

2.(i) Define the terms culture medium, pure culture and tissue culture. (6 marks)

(ii) What is the difference between chemically defined and complex media. (2 marks)

(iii) Describe what you understand by enrichment giving an example of an enrichment method. (4 marks)

(iv) How would you test for the production of the following enzymes.
(a) amylase
(b) oxidase
Explain the scientific basis of the tests. (4 marks)

(v) List the stains and reagents sequentially used in the Gram stain (2 marks)

(vi) Explain the clinical importance of the acid fast stain and state the final colour of the target organism. How does the Ziehl-Neelsen method make the technique possible? (3 marks)

(vii) The composition of MacConkey agar is as follows:

Peptone	17g/l
Protease peptone	3g
Lactose	10g
Bile salts	1.5g
Na Cl	5.0g
Neutral Red	0.03g
Crystal Violet	0.001g
Agar	18g

Explain how specific components of the medium make it selective and differential. (4 marks)

3.(i) What are the principles of autoclaving? (5 marks)
(ii) Briefly discuss four chemical methods used in the destruction of microbes. (8 marks)
(iii) What are antibiotics? Name two antibiotics and discuss their mechanism of action. (5 marks)
(iv) What are the conditions that an antibiotic has to meet in order to be considered for therapeutic purposes ? (3 marks)
(v) Write short but comprehensive notes on the uncontrolled use of antibiotics. (4 marks)

SECTION B

4.(i) What is a virus and why is it not considered as a living organism? (2 marks)
(ii) What disease led to the discovery of viruses? What early observation showed that the disease was not caused by bacteria. (3 marks)
(iii) Briefly describe the structure of a T-even bacteriophage (5 marks)
(iv) Describe the lytic cycle in the replication of viruses. How does it differ from the non-lytic cycle. (5 marks)
(v) Explain how a plaque assay is performed and the value of the technique. (4 marks)
(vi) Fungi can be both beneficial and detrimental to human beings. Discuss the statement giving examples of organisms involved. (6 marks)

(i) Define the term growth as applied to microorganisms (1 marks)
(ii) Draw a diagram to illustrate the main stages of a bacterial growth curve. Explain why the number of bacteria in the lag phase remains constant. (4 marks)
(iii) What is the difference between viable count and total cell count (2 marks)
(iv) State or name
(a) one precaution necessary while carrying out a pour plate. (1 mark)
(b) two clinical applications of a total cell count . (2 marks)
(c) the equipment used for the total cell count and important dimensions that must be known. (2 marks)
(v) If 180, 200 and 190 colonies are obtained on triplicate agar plates inoculated with 0.2ml volumes of 10-4 dilution of a culture, calculate the viable count of the culture. (5 marks)
(vi) Which are the major parameters which increase when growth takes place in an organism. (6 marks)
(vii) What do you understand by generation time (mean doubling time) (2 marks)

.(i) What field of microbiology deals with classification. Which kingdoms of living organisms contain microorganisms? (2 marks)

(ii) Describe the general characteristics of Enterobacteriacae (4 marks)

(iii) Why are coliforms used as indicators of sanitary quality and what is the classical species (3 marks)

(iv) Give two Bacillus species of medical and/or public health importance (2 marks)

(v) Write short notes on the importance of lactic acid bacteria (4 marks)

(vi) Name the following :

(a) a bacterium commonly associated with the human faeces.

(b) a bacterium resident on skin, hands and nasal passages.

(c) a group of bacterium devoid of peptidoglycan.

(d) the extrachromosomal genetic element of microorganisms

(e) a bacterium associated with the discovery of transformation as a mechanism of gene transfer. (5 marks)

(vii) Using a named species and drawings describe a staphylococcus, a streptococcus, a vibrio, spirochaete and a bacillus containing an endospore (5 marks)

END OF EXAMINATION

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