

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

BACHELOR OF SCIENCE HONOURS DEGREE EXAMINATIONS

DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

THEORY: GENERAL MICROBIOLOGY LSBB 1207

JUNE 2004

2 HOURS (100 marks)

INSTRUCTIONS

Answer **Four (4)** questions, **two** 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

- 1.(a) Describe the contributions of
(i) Anthony van Leeuwenhoek.
(ii) John Tyndal
to the study of Microbiology. (5 marks)
- (b) Explain what is studied in the following fields of Microbiology.
Phycology and Mycology
Environmental Microbiology and Microbial Ecology
Genetic engineering (5 marks)
- (c) Draw and label a generalized bacterial cell. (5 marks)
- (d) Using a named species and drawings describe a staphylococcus, a streptococcus, a vibrio, a spirochaete and a bacillus containing an endospore. (6 marks)
- (e) (i) What major difference between Gram positive and Gram negative bacteria is reflected in the Gram reaction of the two groups. Explain how this difference may break down in relatively old cultures.
(ii) What would be the appearance of cells of Gram variable organisms after the Gram stain. (4 marks)
- 2.(a) What is resolution in Microscopy? What factors affect resolution and how can it be improved in light, ultraviolet and electron microscopes. (6 marks)
- (b) List two facilities needed in immunofluorescent microscopic observations and give one important use of this kind of microscopy. (4 marks)
- (c) What bacterial structures can be demonstrated by the following stains; malachite green, India Ink, nigrosine. Explain how either of the last two stains work. (5 marks)
- (d) Name one fixative used in electron microscopy. What features of microbial cells are generally revealed by scanning electron microscopy and by transmission electron microscopy. (5 marks)
- (e) Which objective lens in the light microscope is called inversion oil lens? Why is immersion oil used with this lens? (5 marks)

- 3.(a) What are the factors that affect microbial sensitivities to lethal agents. (6 marks)
 (b) What are the differences between disinfectants and antiseptics? Define sterilization as applied to microbiology (2 marks)
 (c) Write short notes on pasteurization. (5 marks)
 (d) What is chemotherapy and who is the founder of chemotherapy. (2 marks)
 (e) Define the mode of action of erythromycin, cycloheximide and chloramphenicol. (6 marks)
 (f) Write short notes on the consequences of uncontrolled use of antibiotics. (4 marks)

SECTION B

- 4.(a) Define the following terms with examples.
 (i) general purpose medium (2 marks)
 (ii) selective medium (2 marks)
 (iii) differential medium (2 marks)
- (b) Describe the enrichment technique for isolating *Salmonella* from faeces. Explain why enrichment is necessary in this case. (5 marks)
- (c) Describe the principle and practice of using heat to enrich *Bacillus* spp. in a sample. (10 marks)
- (d) List the properties of agar which make it an ideal solidifying agent for microbiological culture media and its concentration (range) normally used. (4 marks)
- 5.(a) Describe the scientific base of catalase, urease and coagulase tests in bacterial identification. (6 marks)
 (b) What are coliforms? Name the classical species and state why they are used traditionally, as indicators of food and water sanitary quality. (5 marks)
 (c) Name the following
 (i) a bacterium commonly associated with human faeces.
 (ii) a bacterium resident on the skin, hands and nasal passages
 (iii) a group of bacterium devoid of peptidoglycan.
 (iv) the extrachromosomal genetic element of microorganisms.
 (v) the bacterium associated with the discovery of transformation as a mechanism of gene transfer.
 (vi) the most resistant pathogen in milk (6 marks)
 (d) Describe the features of actinomycetes and their economic importance. (6 marks)
 (e) Name two *Clostridium* spp of medical importance. (2 marks)
- (a) What field of microbiology deals with classification? Who devised the kingdom Protista. Use typical examples of microorganisms to show why the kingdom was devised. Which of the kingdoms of living organisms contain microorganisms? (4 marks)
- (b) Name two pathogenic protozoa important in Zimbabwe and the diseases they cause. (4 marks)
- (c) Name one ciliated protozoa and one protozoa which engulfs food by means of pseudopodia. (2 marks)
- (d) What disease led to the discovery of viruses. Describe the general structure of a named virus. (5 marks)
- (e) Distinguish between lytic and temperate phages and define the terms prophage and lysogen. (6 marks)
- (f) Fungi are important to humans in both beneficial and harmful ways. Discuss this statement giving appropriate examples. (4 marks)

END OF QUESTION PAPER

odd no's.