

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

MAY 2002

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) Draw and label a diagram of a generalized bacterial cell. (5 marks)
(b) Explain how the bacterial cell differs from a eukaryotic cell in ribosomal and cell wall structure and in relative sensitivities to penicillin, cycloheximide and tetracycline. (9 marks)
(c) What are the modes of genetic recombination in bacteria. (5 marks)
(d) Using a named species and drawings, describe a staphylococcus, a streptococcus, a vibrio, A spirochaete, a bacillus containing an endospore (6 marks)
2. A. Define the following terms with examples.
(a) general purpose medium (3 marks)
(b) selective medium (3 marks)
(c) differential medium (3 marks)
B. List the following:
(a) 3 classes of components which can be used to make a culture selective. (1 ½ marks)
(b) 3 redox reagents which can make a medium anaerobic. (1 ½ marks)
(c) 3 classes of growth factors essential in bacterial nutrition. (1 ½ marks)
(d) stains and reagents applied sequentially in the Gram staining technique. (1 ½ marks)
C.(a) Describe an enrichment technique for isolating *Salmonella* from faeces. Explain why enrichment is necessary in this case. (5 marks)
(b) How would you separate *Escherichia coli* from *Bacillus subtilis* from a broth culture containing the two organisms. Explain the principle of the method you used. (5 marks)
3. (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 for 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
(e) by scanning electron microscopy and by transmission electron microscopy? (5 marks)
(f) Which objective lens in the light microscope is called the inversion oil lens? Why is immersion oil used with this lens. (5 marks)

LIBRARY USE ONLY

SECTION B

- Define sterilization. When is filtration used as a method of sterilization? List any 3 substances which can be so sterilized. (6 marks)
- (b) Write short but comprehensive notes on pasteurization. (5 marks)
- (c) Describe common uses of halogens, metals and alcohols for destroying microbes. (6 marks)
- (d) Briefly discuss the properties of antibiotics and outline the consequences of their uncontrolled use. (8 marks)
5. (a) Name 2 pathogenic protozoa important in Zimbabwe and the diseases they cause. (4 marks)
- (b) Name one ciliated protozoa. (1 mark)
- (c) Name one protozoa which engulfs food by means of pseudopodia. (1 mark)
- (d) What disease led to the discovery of viruses? Describe the general structure of a named virus. (5 marks)
- (e) Distinguish between the lytic and temperate phages and define the terms prophage and lysogen. (6 marks)
- (f) Describe the contribution of Joseph Lister to the germ theory of disease. (3 marks)
- (g) What are Koch's postulates and what are they used for? (5 marks)
6. (a) Describe the scientific basis of the catalase, oxidase and indole tests. Use 2 named bacterial species or genera to illustrate the differential value of each list. (12 marks)
- (b) What are the coliforms? Name the classical genera and explain why they are used as indicators of water sanitary quality. (9 marks)
- (c) Name the genera of Enterobacteriaceae associated with the following characteristics;
- | | |
|---|----------|
| i) pathogenicity to plants | (1 mark) |
| ii) pathogenicity to fish and frogs | (1 mark) |
| iii) urease production | (1 mark) |
| iv) production of red cellular pigments | (1 mark) |

END OF QUESTION PAPER

Odd no's.

LIBRARY USE ONLY