



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

MSc IN APPLIED MICROBIOLOGY AND BIOTECHNOLOGY

ADVANCED FOOD MICROBIOLOGY SBB5204

JUNE 2011

3 HOURS (100 MARKS)

INSTRUCTIONS

Answer Four (4) Questions. 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

1. Give a detailed account of the characteristics and mechanisms of pathogenicity of;
 - (a) *Clostridium perfringens*, (8 marks)
 - (b) *Vibrio cholerae*, and (8 marks)
 - (c) Enterohaemorrhagic *Escherichia coli*. (9 marks)

2. Describe in detail, the use and role of the following in the preservation of foods;
 - (a) Ultra high temperature pasteurization, (6 marks)
 - (b) low water activity, (7 marks)
 - (c) vacuum packaging, and (6 marks)
 - (d) modified atmosphere packaging. (6 marks)

3.
 - (a) Comment on the significance of substrate pH in the thermal processing of foods. (7 marks)
 - (b) Define the terms D, z and F value in thermal processing. (6 marks)
 - (c) If the $D_{121^{\circ}\text{C}}$ value for a spore population was 0.3 min, how long would it take to reduce an initial population of 1×10^7 to 1×10^3 at 121°C ? (3 marks)
 - (d) Estimate the final population when a sample containing 10 000 spores is heated at 121°C for 0.9 min. (4 marks)
 - (e) If the z value was 10°C , how long would it take to achieve a 5 log reduction at 111°C ? (5 marks)

4.
 - (a) Give an account of the dominant microbial flora and their roles in the spoilage pattern of comminuted beef products. (12 marks)
 - (b) With reference to four named examples, discuss the occurrence and significance of mycotoxins in foods. (13 marks)

5. Approximately half of the guests at a local wedding reception developed stomach cramps with vomiting 2-3 hours after consuming food at the reception, while 1/3 of patrons who consumed a particular dish at a local hotel developed flu-like symptoms or meningo-encephalitis in two to three weeks. For both food-poisoning incidents, which have been confirmed to be bacterial, name the most likely causative agents, and give a detailed account of their morphology, physiology, and significance in the food industry.
- 6 (a) Briefly describe one method that is commonly applied for the long-term preservation of starter cultures. (5 marks)
- (b) Outline in detail, the taxonomy and role of starter microorganisms in the dairy industry. (20 marks)

END OF EXAMINATION