

THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

FIRST SEMESTER EXAMINATIONS

FOOD TECHNOLOGY – THIRD YEAR DEGREE

FT 313 FOOD MICROBIOLOGY II

THURSDAY 17<sup>TH</sup> JUNE 2021

STARTING TIME: 8:20 A.M.

**TIME ALLOWED: 3 HOURS**

**INFORMATION FOR CANDIDATES:**

1. You have 10 minutes to read the paper. You must not begin writing in the answer book during this time.
2. ANSWER ALL QUESTIONS.
3. ALL answers must be written in the answer books provided.
4. Write your name and number clearly on the front page. Do it now.
5. Calculators are permitted in the examination room. Notes and textbooks are not allowed.
6. Show all working and calculations in the answer book.

**MARKING SCHEME:**

QUESTION 1	[5 MARKS]
QUESTION 2	[16 MARKS]
QUESTION 3	[17 MARKS]
QUESTION 4	[13 MARKS]
QUESTION 5	[26 MARKS]
QUESTION 6	[17 MARKS]
QUESTION 7	[6 MARKS]
<b>TOTAL</b>	<b>[100 MARKS]</b>

**ANSWER ALL QUESTIONS**

1. (a) List ANY FOUR changes in food properties due to growth of microorganisms. [1 mark]
- (b) List ANY THREE biochemical reactions in foods caused by microorganisms. [3 marks]
- (c) List ANY FOUR sources of contamination of foods. [1 marks]

(Total = 5 marks)

2. The intrinsic and extrinsic parameters of foods influence the rate of growth of microorganisms and consequently affect their keeping quality or storage life as well as their safety.
- (a) Explain growth of different groups of microorganisms in chicken with pH of 6.2-6.3 and apples with pH of 2.9-3.3. [3 marks]
- (b) Discuss the importance of resting animals prior to slaughter on the storage life of fresh meat. [2 marks]
- (c) Explain why dehydrated or dry foods have longer storage life compared to fresh foods. [3 marks]
- (d) The types and amount of nutrients required for growth varies widely among different microorganisms. List in order the nutritional requirements by different groups starting with the group which has the highest nutritional requirement. [2 marks]
- (e) Describe the rate of spoilage and storage life of fresh poultry stored at 5<sup>0</sup>C, 10<sup>0</sup>C, and 15<sup>0</sup>C respectively. [3 marks]
- (f) Explain what hurdle concept means. Give examples to support your answer. [3 marks]

(Total = 16 marks)

3. (a) Discuss the primary and secondary or intermediate sources of contamination of fresh meat and what measures you would take to reduce the level of contamination from these sources. [5 marks]
- (b) Upon death of the animal, invasion of the tissues by contaminating microorganisms takes place. List and explain ONE factor that influences the rate of invasion by microorganisms. [2 marks]
- (c) Discuss the causes of microbial spoilage of canned foods. [5 marks]
- (d) Discuss the influence of pH on the severity of heat treatment applied to canned foods. [2 marks]
- (e) Eggs naturally have protective barriers and antimicrobial components that increases stability against microbial attack. Explain with examples. [3 marks]

(Total = 17 marks)

4. (a) Explain why it is impractical to test for all the pathogenic microorganisms. [2 marks]
- (b) Explain why pathogenic microorganisms which cause severe hazards are not tested for on routine basis. Name one species of bacteria which causes severe hazard. [2 marks]
- (c) Discuss the factors that influence the degree of microbiological hazards in foods. [4 marks]
- (d) Explain the following sampling plans.
- (i) For *Salmonella* in liquid egg.  
 $n = 10$ ,  $C = 0$  in 25 g. [1 mark]
- (ii) For total aerobic plate count in pasteurized milk.  
 $n = 4$ ,  $c = 1$ ,  $m = 10^2$ ,  $M = 10^3$  per ml. [2 marks]
- (iii) Explain consumer risk when  $c$  value is increased and  $n$  is decreased. [2 marks]

(Total = 13 marks)

5. (a) Explain ANY TWO hurdles that a foodborne pathogenic microorganism has to overcome to cause disease in a consumer. [2 marks]
- (b) Describe two groups or types of foodborne illnesses caused by foodborne pathogenic microorganisms. [3 marks]

- (c) Poultry such as chicken, duck, geese and turkey are probably the most important reservoir of *Salmonella* in the human food chain. Write short notes on how poultry acquire *Salmonella* on the farm. [3 marks]
- (d) *Salmonella* can be controlled on the farm, during processing, handling and storage of foods. Discuss ANY THREE control measures on the farm and ANY TWO during processing, handling and storage of foods. [5 marks]
- (e) Name the different strains or pathotypes of *Escherichia coli* that cause foodborne diseases. Which of these cause the most severe type of disease. [3 marks]
- (f) Name the species of *Shigella* that causes the most severe type of disease and the disease it causes. [1 mark]
- (g) Which pathogenic bacterium occurs naturally in salt water and therefore has the potential to contaminate seafoods? [1 mark]
- (h) What is the optimum growth temperature and oxygen concentration for growth of *Campylobacter*? [1 mark]
- (i) *Clostridium botulinum* causes one of the most severe type of foodborne diseases. Describe the disease symptoms and the control measures. [4 marks]
- (j) Describe the natural habitat of *Staphylococcus aureus*. [2 marks]
- (k) Name the two types of diseases caused by *Bacillus cereus*. [1 mark]

(Total = 26 marks)

6. (a) Explain what biotechnology means. [1 mark]
- (b) List the key microbial groups involved in food fermentation. [2 marks]
- (c) Explain ANY THREE key biochemical reactions in food fermentation. [3 marks]

- (d) Name one enzyme produced either from plants or animals its source and application. [2 mark]
- (e) Name one enzyme produced by microorganisms its source and application. [2 marks]
- (f) List ANY TWO reasons why microorganisms are major sources of enzymes on industrial scale. [2 marks]
- (g) List ANY TWO features that need to be taken into account when selecting a microbial species or strain for production of enzymes. [2 marks]
- (h) Describe constitutive and inducible enzyme biosynthesis. [1 mark]
- (i) Name the group of microorganisms involved in cocoa bean fermentation [2 marks]

(Total = 17 marks]

7. Discuss EITHER (a) or (b).

- (a) Discuss alcoholic fermentation of wine by addition of yeast starter culture and by natural fermentation. Include in your answer the species of yeasts involved in fermentation. [6 marks]
- (b) Discuss *koji* and *moromi* fermentation during soy sauce production. [6 marks]

(Total = 6 marks]