

THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY  
SECOND SEMESTER EXAMINATIONS

FOOD TECHNOLOGY -- THIRD YEAR DEGREE

FT 322 FOOD COMMODITY 1

1<sup>st</sup> NOVEMBER 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:**

<u>QUESTION 1</u>	[15 MARKS]
<u>QUESTION 2</u>	[14 MARKS]
<u>QUESTION 3</u>	[20½ MARKS]
<u>QUESTION 4</u>	[9 MARKS]
<u>QUESTION 5</u>	[11½ MARKS]
<u>QUESTION 6</u>	[30 MARKS]
<b>TOTAL</b>	<b>[100 MARKS]</b>

**SECTION A ANSWER ALL QUESTIONS**

1. (a) Name the parts or tissues of plants from which ANY FIVE of the following fruits and vegetables are derived from. [4 marks]
- (i) Broccoli.
  - (ii) Lettuce.
  - (iii) Asparagus.
  - (iv) Sweet potatoe.
  - (v) Potatoe.
  - (vi) Strawberry.
  - (vii) Pineapple
  - (viii) Apple.
- (b) Explain the terms 'source' and 'sink' and give one example for each. [3 marks]
- (c) Name the three essential elements needed by plant for plant life. [1½ marks]
- (d) The growth and development of sink is affected by several factors. Explain ANY FOUR of these factors [4 marks]
- (e) Name THREE main sugars and TWO dominant acids found in fresh produce. [2½ marks]
- (Total = 15 marks)
2. (a) The physiological development of plants go through three stages. Explain each stage. [3 marks]
- (b) Fruits follow two respiratory behaviour or pattern. Explain each type and give one example each. [3 marks]
- (c) State ANY FOUR changes that occur when fruits ripen. [2 marks]
- (d) Ethylene is a plant growth hormone regulator that performs several functions. List them. [2 marks]
- (e) Explain respiration or catabolic process that occur in plants before and after harvest. Include the overall reaction. [4 marks]
- (Total = 14 marks)
3. (a) Explain the term transpiration and how it affects plant life. [2 marks]
- (b) Name and explain the roles of three elements needed for photosynthesis. Include the chemical equation for photosynthesis. [4½ marks]

- (c) There are three types of photosynthesis; C3, C4 and Crassulacean Acid Metabolism (CAM). Most plants exhibit C3 photosynthesis which includes light dependent and light independent reactions.
- (i) Explain the light dependent reaction. Include in your answer where this reaction takes place and the important compounds produced in this process. [3 marks]
  - (ii) The light independent reaction or Calvin cycle consist of three phases; carbon fixation, reduction reaction and regeneration of ribulose 1,5 biphosphate (RuBP). Discuss carbon fixation and reduction reactions. [4 marks]
  - (iii) Discuss either C4 or CAM photosynthesis. [3 marks]
  - (iv) Describe the climatic conditions under which these three types of photosynthesis occur and name one example of a plant that thrive or grow under each of these conditions. [4 marks]

(Total = 20½ marks)

4. (a) Maturity of fruits and vegetables are determined by physiological and commercial maturity. Explain both types. [2 marks]
- (b) Explain and calculate respiratory quotient (RQ) for the following: [2 marks]
- (i) Stearic acid.  

$$\text{C}_{18}\text{H}_{36}\text{O}_2 + 26\text{O}_2 \longrightarrow 18\text{CO}_2 + 18\text{H}_2\text{O}$$
  - (ii) Malate.  

$$\text{C}_4\text{H}_6\text{O}_5 + 3\text{O}_2 \longrightarrow 4\text{CO}_2 + 3\text{H}_2\text{O}$$
- (c) Post harvest losses are categorized into two categories; physical and quality loss. Explain each type. [2 marks]
- (d) Physiological disorder may develop in response to adverse pre-harvest and/or postharvest environmental conditions. Give two examples of physiological disorder in fruits and vegetables. [1 mark]
- (e) Discuss ANY TWO effects of soil management and cultivation practices on the quality of fresh produce. [2 marks]

(Total = 9 marks)

5. (a) Explain the effects of cooling on fresh produce. [3 marks]
- (b) Forced air cooling is the most versatile and commonly used method for cooling fresh produce. Describe how cooling is achieved with this method. [2 marks]

- (c) Explain why hydrocooling and ice cooling are more effective than the other methods including forced air cooling. [1 marks]
- (d) Differentiate between controlled atmosphere and modified atmosphere storage. [2 marks]
- (e) Name and describe the commonly used method for packaging freshly-cut fruits and vegetable. [1½ marks]
- (f) Write short notes on the importance of processing fruits and vegetables. [2 marks]

(Total = 11½ marks)

**SECTION B ANSWER ALL QUESTIONS**

6. (a) Describe the primary processing operations of the following tropical commodities
- |       |          |           |
|-------|----------|-----------|
| (i)   | Palm oil | [4 marks] |
| (ii)  | Sugar    | [4 marks] |
| (iii) | Vanilla  | [4 marks] |
| (iv)  | Cocoa    | [4 marks] |
| (v)   | Tea      | [4 marks] |
| (vi)  | Coffee   | [4 marks] |
| (vii) | Coconut  | [4 marks] |
- (b) Comment on the importance of vanilla and palm oil processing in relation to the economy. [2 marks]

(Total=30 marks)