

THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

SECOND SEMESTER EXAMINATIONS – 2022

FT 322-- COMMODITY SCIENCE I: Tropical Agricultural Crops

TUESDAY 1ST NOVEMBER 2022 – 8:20 AM

TIME ALLOWED: 2 HOURS

INFORMATION FOR CANDIDATES: -

1. You will have 10 minutes to read the question paper. You **MUST NOT** begin writing in the answer book during this time.
2. **ANSWER ALL QUESTIONS.**
3. All answers **MUST** be written on the answer book provided
4. Calculators are permitted in the examination room. Lecture notes, notebooks plain papers and textbooks are **NOT** allowed.
5. Mobile phones are not allowed. **SWITCH OFF THE MOBILE PHONES.**
6. Show all workings and calculations in the answer book.
7. **DRAW** the **STRUCTURES** clear and visible.
8. **DO NOT** over write.
9. Write your name and student **ID number** clearly on the front page of the answer book. **DO IT NOW.**

MARKING SCHEME: TOTAL 100 MARKS

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. [2½ marks]
- (i) Broccoli.
 - (ii) Lettuce.
 - (iii) Asparagus.
 - (iv) Sweet potatoe.
 - (v) Potatoe.
 - (vi) Strawberry.
- (b) Explain the terms 'source' and 'sink' and give one example for each. [3 marks]
- (c) The growth and development of sink is affected by several factors. Explain ANY THREE of these factors. [3 marks]
- (d) (i) Name three main sugars in fruits and vegetables. [1½ marks]
(ii) Name two dominant organic acids that occur in all fruits. [1 mark]
(iii) Name the compounds which are responsible for orange and yellow colour in carrot and sweet potatoe, blue colour in berries and egg plant, and astringency and flavour in tea and coffee. [1½ marks]
- (e) Fruits go through two respiratory behaviour or pattern during different stages of growth and development. Explain each type and give one example each. [3 marks]
- (f) State ANY FIVE changes that occur when fruits ripen. [2½ marks]

(Total = 18 marks)

2. (a) Explain the respiration process that occurs in plants before and after harvest. Include the overall reaction. [4 marks]
- (b) Three essential elements are needed for photosynthesis reactions in plants.
- (i) Name these elements and explain their roles. [4½ mark]
 - (ii) Write the chemical equation for photosynthesis. [1 mark]
- (c) The three types of photosynthesis occur in different types of plant. These include C3, C4 and CAM (Crassulacean Acid Metabolism).

- (i) The light dependent and light independent or Calvin cycle occur in C₃ photosynthesis. Explain light dependent reaction. Include in your answer where this reaction takes place and the important chemical compounds produced during this process. [3 marks]
- (ii) The light independent reaction consist of three phases. Explain carbon fixation and reduction reactions. [4 marks]
- (iii) Explain either C₄ or CAM photosynthesis. [3 marks]

(d) Post harvest loss can be categorised as quality loss and physical loss. Explain each type. [3 marks]

(e) Chill injury to fresh produce occurs when they are stored below or outside of their safe low temperature. Describe ANY THREE symptoms of chill injury. [1½ marks]

(Total = 24 marks.)

3. (a) List the functions of packaging of fresh produce. [3 marks]

(b) Explain how packaging should be done to prevent or reduce damage to fresh produce. [2 marks]

(c) Give ANY FOUR reasons for waxing certain fresh produce. [2 marks]

(d) Explain the effects of cooling on fresh produce. [2 marks]

(e) List ANY FOUR factors that influence the cooling rate of fresh produce. [4 marks]

(f) Explain why hydrocooling and ice cooling are more effective than the other cooling methods. [1 mark]

(g) Describe controlled atmosphere (CA) and modified atmosphere (MA) storage methods. [2 marks]

(h) Explain equilibrium modified atmosphere packaging often used for packaging freshly-cut fruits and vegetables. [2 marks]

(Total = 18 marks)

4. (a) Explain the term food security. [1 mark]

(b) Various technologies or methods are used to reduce deterioration of fruits and vegetables. Name ANY TWO physical, ANY TWO chemical and ANY TWO biochemical methods which are used to reduce spoilage. [3 marks]

- (c) Many types of value added products can be produced from fruits, vegetables and other food crops such as taro, banana, yam and sago. Name and write short notes on ANY TWO. [4 marks]

(Total = 8 marks)

5. (a) Discuss the disadvantages associated with smoke drying of copra. [3 marks]
- (b) State the essential drying principles of a good kiln dryer. [1½ marks]
- (c) What is the moisture content, free fatty acid content, colour and texture of good quality copra. [2 marks]
- (d) Explain ANY TWO reasons why oil palm fruits are subjected to heating or sterilization prior to digestion (pounding) and extraction of oil. [2 marks]
- (e) Describe alkalization or 'dutching' process and its importance in production of cocoa powder. [2½ marks]
- (f) Production of plain chocolate involves grinding, conching, tempering and moulding. Describe either conching or tempering process and explain its importance. [3 marks]

(Total = 14 marks)

6. (a) Coffee beans are produced using dry or wet method. Briefly describe each type. [4 marks.]
- (b) Explain the importance of roasting of coffee beans and the changes that occur during this process. [2 marks]
- (c) Vanilla production process after harvesting involves killing, sweating, drying and conditioning or maturation. Discuss the changes that occur during sweating and conditioning of vanilla beans. [5 marks]
- (d) Name the major chemical components of tea leaves. [2½ marks]
- (e) The three major types of tea are, black tea, green tea and oolong tea. These three types of tea differ in how they are processed. Explain. [4½ marks]

(Total = 18 marks)