

THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

SECOND SEMESTER EXAMINATIONS – 2022

FOOD TECHNOLOGY – SECOND YEAR DEGREE

FT 224 ADVANCED FOOD CHEMISTRY

WEDNESDAY 26TH OCTOBER, 2022 – 8:20 AM

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 workings and calculations in the answer book.

MARKING SCHEME

SECTION A

- Question 1 [29 marks]
Question 2 [16 marks]
Question 3 [5 marks]

SECTION B

- Question 4 [27 marks]
Question 5 [23 marks]

SECTION A

ANSWER ALL QUESTIONS

1. (a) Define the following terms; [3 marks]
- (i) Food additives.
 - (ii) Food colors.
 - (iii) Sweeteners.
- (b) Select ANY FOUR from the list below and write notes about these additives: [12 mark]
- (i) Flavors.
 - (ii) Sulfur and sulfur dioxide.
 - (iii) Nitrates and nitrites.
 - (iv) Annatto.
 - (v) Curcumin.
 - (vi) Aspartame.
 - (vii) Polyols.
 - (viii) Chelating agents.
- (c) State the function/use of the following additives: [10 marks]
- (i) Anti- caking agents.
 - (ii) Bleaching agents.
 - (iii) Propellants.
 - (iv) Clarifying agents.
 - (v) Preservatives.
 - (vi) Antioxidants.
 - (vii) Antibiotics.
 - (viii) Surface active agents.
 - (ix) Stabilizer.
 - (x) Humectant.
- (d) What are the FOUR main reasons why food colors are used? [4 marks]

(Total = 29 marks)

2. (a) What are phytochemicals? [1 mark]
- (b) Write notes on the following phytochemicals: [6 marks]
- (i) Chlorophyll.
 - (ii) Allium compounds.
 - (iii) Alkaloids.

(c) From the list of foods below, name the predominant phytochemical in each of them: [5 marks]

- (i) Eggplant.
- (ii) Broccoli.
- (iii) Potato.
- (iv) Tomato.
- (v) Pistachio.
- (vi) Beetroot.
- (vii) Parsley.
- (viii) Herbs.
- (ix) Mango.
- (x) Legumes.

(d) List the benefits of having grains and nuts in the diet. [4 marks]

(Total = 16 marks)

3. (a) List at least FOUR good sources of nucleic acid. [2 marks]

(b) State the differences between RNA and DNA . [3 marks]

(Total = 5 marks)

SECTION B

ANSWER ALL QUESTIONS

4. (a) Enzymes may use a number of mechanisms to catalyze bond-making/breaking and atomic rearrangement processes, and the ability to do this is founded on the specific amino acids and their spatial arrangement within the active site. Name and describe ANY THREE mechanisms of chemical catalysis that are employed by enzymes. [6 marks]
- (b) With regards to enzyme catalysis, discuss the following; activation energy barrier, transition state, and enzymes. Include relevant diagram in your discussion. [3 marks]
- (c) With the aid of a relevant graph or plot of variables, explain the Lineweaver-Burk plot. [3 marks]
- (d) Discuss the relationship between the velocity of reaction, enzyme concentration and the substrate concentration. Include the relevant graphs or plots. [4 marks]
- (e) Co-enzymes, cofactors and activators help enzymes to function effectively. Discuss how metal ions facilitate enzymes activity. [3 marks]
- (f) Discuss enzymatic browning reaction, how it occurs, effects on food produce/products and the methods used to inactivate or inhibit the enzymatic browning reactions. [8 marks]
- (Total = 27 marks)
5. (a) Hydrocolloids and their impact on viscosity of food is one of those important properties for the use of hydrocolloids in the food industry and gelation is one of those processes which utilizes this. Write short notes discussing the gelation process, also include in the discussion, the definition, descriptions of the mechanisms of gelation, the importance of junction zones and structure breakers. Include relevant sketches in your discussion. [10 marks]
- (b) State and discuss ANY TWO considerations when using hydrocolloids in the food industry. [3 marks]
- (c) With regards to conformation of polysaccharides in solution, answer the following questions;
- (i) Differentiate between ordered and disordered conformations. [2 marks]

- (ii) Name and describe with an aid of a relevant sketch ANY ONE bonding pattern of an ordered structure of polysaccharide. [3 marks]
- (iii) Explain why short chain polysaccharides are not able to produce ordered structures in solution? [2 marks]
- (d) Viscosity modification is an important functional property of hydrocolloids. Viscosity depends on shape and flexibility of the solvated polymer chain and its molecular size or weight. Discuss the viscosity behaviour of linear polymers. [3 marks]

(Total = 23 marks)