

THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

SECOND SEMESTER EXAMINATIONS

FOOD TECHNOLOGY – FOURTH YEAR DEGREE

FT 442 FISH AND SEA FOOD TECHNOLOGY

WEDNESDAY 27TH OCTOBER 2021

STARTING TIME: 12:50 P.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>	[19 MARKS]
<u>QUESTION 2</u>	[25½ MARKS]
<u>QUESTION 3</u>	[30½ MARKS]
<u>QUESTION 4</u>	[13 MARKS]
<u>QUESTION 5</u>	[12 MARKS]
TOTAL	[100 MARKS]

ANSWER ALL QUESTIONS

1. (a) Commercial classification divides fish into three categories, oily fish, white fish and shellfish.
- (i) Compare oily fish and white fish with reference to oil content and its distribution. [2 marks]
 - (ii) Describe the habitat of oily and white fish and give two examples each. [4 marks]
- (b) The scientific classification divides aquatic animals into two groups; vertebrates and invertebrates.
- (i) The vertebrates include osteichthyes or bony fish, chonrichthytes and agnatha. Differentiate between osteichthyes and chonrichthytes with reference to the composition of skeleton. [2 marks]
 - (ii) The invertebrates include the crustaceans and molluscs. Describe the characteristics of all crustaceans and give four examples of species of commercial importance. [4 marks]
 - (iii) The major classes of molluscs include cephalopod, scalopoda, gastropoda, polyplacphora, monoplacophora and aplacophora. Which classes do abalone, squid, clams, octopus, scallops and mussels belong to? [3 marks]
- (c) Match the following structures of bony fish shown in A with their respective functions [4marks]

A. Structures of bony fish	B. Functions
(a) Scales	Assist fish respire.
(b) Dorsal, ventral/pelvic, adipose, anal fins	Sensory organ used to detect vibrations in water and the direction of their source. Also allows fish to detect predators, find food and navigate efficiently and detect electrical signal in aquarium.
(c) Gills	Elastic protective wall to absorb blows and bumps.
(d) Lateral line	Secretes enzymes that help fish digest and absorb food.
(e) Swim bladder	Reproductive organs of fish.
(f) Gonads	Fish structure used for movement and locomotion.
(g) Kidney	Hollow gas-filled balance organ which allow neutral buoyancy in water thereby conserve energy.
(h) Pyloric caeca	Filters liquid waste material from the blood. Regulate salt and water concentration

(Total = 19 marks

2. (a) Light is the key parameter that shapes marine animals and plant life as photosynthesis depends primarily on light. There are 3 light zones; photic, diphotic and aphotic. Describe these three zones [3 marks]
- (b) The water strata or layers include epilimnium, thermocline and hypolimnium. Describe these three water layers. [5 marks]
- (c) Marine animals are divided into two groups depending on Habitat; benthic or benthos and pelagic. Describe these two groups and give two examples each. [5 marks]
- (d) The pelagic environment is divided into neritic province and oceanic province. Describe them. [3 marks]
- (e) The neritic province is further divided into supralittoral, littoral and sublittoral zones. Describe ANY ONE of these zones. [2 marks]
- (f) A diverse group of fish including most of the commercial species in PNG live in the inner sublittoral zone and migrate back and forth to littoral and coral reefs. Name ANY FIVE of these fish species. [2½ marks]
- (g) Explain what estuaries are and name ANY TWO largest estuaries in the world. [2 marks]
- (h) Fresh water bodies are divided into two environmental groups; lentic and lotic. Distinguish between these two groups with examples. [3 marks]

(Total = 25½ marks)

3. (a) The chemical composition of marine and fresh water animals vary greatly and depends upon many factors. List them. [4 marks]
- (b) The muscles of fin fish are arranged in blocks called myotomes and held together by myocommata. Describe and explain the influence of myocommata on 'gaping' of fish fillet. [6 marks]
- (c) There are two major muscle types, white and red muscle. Differentiate between the two by filling the table given below. [9 marks]

Attributes	White muscle type	Red muscle type
Size of fibres		
Colour		
Mitochondria		
Contraction time		
Blood supply (myoglobin)		
Fatigability		
Fat content		
Texture		
Susceptibility to spoilage		

(d) Write short notes on the chemical composition and usage of red or dark and white muscle types. [4 marks]

(e) Deep seated dark muscle in tuna provides certain advantages for the fish. Discuss. [5½ marks]

(f) Write short notes on white and red muscle types in crustaceans with reference to location and functions. [2 marks]

(Total = 30½ marks)

4. (a) Explain autolysis and its influence on textural quality of fish muscle. [2 marks]

(b) Burnt tuna syndrome occurs due to breakdown of certain components of fish muscle by the enzymes known as calcium-activated neutral proteases (CANP). Discuss this condition with reference to ATP. [4 marks]

(c) Rigor mortis is hastened by temperature, size of fish and physical condition of fish. Explain how temperature influences rapid onset of rigor-mortis which causes "gaping" in fish fillets. [4 marks]

(d) Describe breakdown of ANY TWO of following chemical components of fish muscle or flesh into respective compounds and their effects on quality. [3 marks]

- (i) Trimethyl amin oxide (TMAO).
- (ii) Histidine.
- (iii) ATP

(Total = 13 marks)

5. (a) Explain passive and active fishing methods and describe one method for each type. [6 marks]

(b) Write short notes on the cooling methods used to maintain temperature during the fresh fish supply chain or after catching. [6 marks]

(Total = 12 marks)