

FISHERIES
AND
AQUACULTURE
2023
YEAR 2 TO 4



KAPASA MAKASA UNIVERSITY

PAST EXAMINATION PAPERS

2023

**DEPARTMENT OF AGRICULTURE AND AQUATIC
SCIENCES**

SECOND YEAR

COURSE CODES:

FO 210

FA 210

FA 230

FA 220

FA 250

FA 270

SA 220

NR 220



KAPASA MAKASA UNIVERSITY

School of Natural Resources

Department of Agriculture and Aquatic Sciences

2023/24 SESSIONAL EXAMINATION

FA 250

Soil and Water Quality Management

Date: 20th October, 2023

Time: 09:00 – 12:00 Hrs

Instructions:

1. There are seven questions in total
2. Answer a Compulsory Question (s) (CQ) in **Section A**
3. Answer any four (4) questions out of six in **Section B**
4. There are 100 marks allocated to this paper
5. Each question carries 20 marks
6. Where possible, illustrate your answers
7. Time allowed: **Three (3) hours**
8. When answering follow further instructions in the answer book

SECTION A: Compulsory Question (CQ). Attempt all questions in this section.

Question One

a) Mrs. Shupani received a K200,000 loan from the CEEC Aquaculture seed fund (ASF) to do fish farming at Mulakupikwa village, Chinsali. She secured a 2-hectare farm land and engaged Sepiso, a graduate from Kapasa Makasa University (KMU) to carry out soil tests. She used a 10 cm Auger with a diameter of 10 cm to get a field moist core which she oven dried at 105°C. She then calculated the bulk density of the oven dry core and found 1.05 g/cm³. She placed the oven dry core in a pan of water until it was water satiated. The oven dry soil and water at saturation weighed 1.4Kg.

- i) Calculate the volume of the field moist core? [2 Marks]
- ii) Calculate the total soil porosity. [4 Marks]
- iii) Based on the results in b) what advise should Sepiso give Mrs. Shupani? [2 Marks]

b) Below is an extract from the Soil Survey Report that Sepiso did at Mrs. Shupani's farm land. Carefully examine the report and answer the questions that follow below.

Depth	Horizon	Organic Carbon (%)	pH	Exchangeable Cations (cmol/Kg)				
				Ca	Mg	K	Na	Al
0-5	Ap	0.5	6.1	14	3.5	0.5	0.2	1.43
15-25	A	0.8	6.3	13.8	4.5	0.4	0.1	1.62
25-50	E	0.2	6	0.5	0.7	0.1	0.1	0.1
50-80	B	2	5	14.7	5	0.3	0.2	3
80-120	Bt	2.1	4.4	15	6.1	0.3	0.2	4.67
120-150	C	2.3	4.1	17	6.3	0.4	0.2	4

- i) Calculate the CEC and the percentage base saturation of each horizon. [6 Marks]
 - ii) In your opinion, do you think that this soil is good for pond aquaculture? If not, what could be done to improve it? [2 Marks]
- c) Mention the factors that affect soil colour? [4 Marks]

SECTION B: Attempt any four (4) questions from this section.

Question Two

With the aid of a well labelled illustration briefly explain

a) The pond soil profile. [10 marks]

b) The soil-water nutrient exchange in a typical freshwater fish pond. [10 marks]

Question Three

a) Mention the **four (4)** types of liming materials that you know. [4 marks]

b) Differentiate between the following terms as used in soil and water quality management:

i) Flocculation and coagulation [2 marks]

ii) Odour masking and odour counteraction [2 marks]

iii) Mineralization and solubilization [2 marks]

c) Briefly describe **five (5)** common waste water treatment practices [10 marks]

Question Four

a) Colloids are an important soil fraction due to the properties that make them. Explain in brief the role they play in the transfer of minerals. [10 marks]

b) How would you treat sodic and alkaline soils? [10 marks]

Question Five

a) Discuss five soil ecosystem services [10 marks]

b) Discuss the importance of soil amendments and explain their effect on soils [10 marks]

Question Six

a) With the aid of a well labelled illustration briefly explain the water treatment methods in aquaculture. **[10 marks]**

b) Microbes occupy an important place in the ecology of the water and sediment. Discuss.

[10 marks]

Question Seven

a) Based on their metabolism discuss the classification of microbes. **[10 marks]**

b) With the aid of a well labelled diagram describe the phosphorus cycle in water. **[10 marks]**

END OF EXAMINATION



KAPASA MAKASA UNIVERSITY

School of Natural Resources

Department of Agriculture and Aquatic Sciences

2023/24 SESSIONAL EXAMINATION

FA 230

Limnology

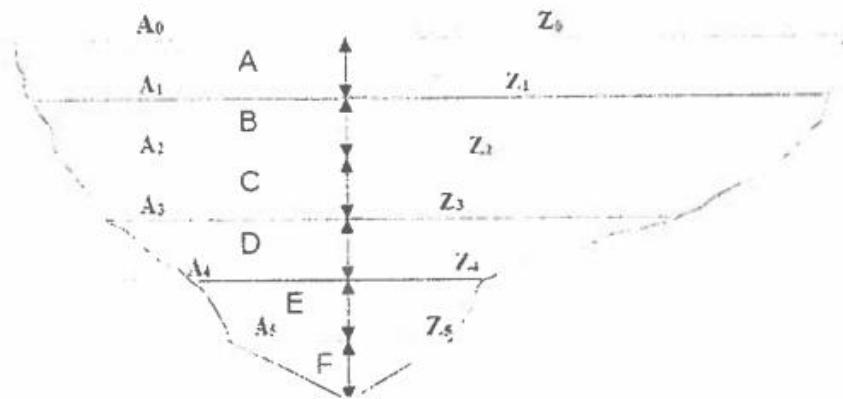
Date: 25/10/2023

Time: 09:00 – 12:00 Hrs

Instructions:

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4. There are 100 marks allocated to this paper
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6. Where possible, illustrate your answers
7. Time allowed: **Three (3) hours**
8. When answering follow further instructions in the answer book
9. A scientific calculator is Allowed.

- b) Illustrated below is Lake Tusha's depth profile. The lake has a conical bottom as indicated by frustra F. Use the information given in the table below to calculate the Lake's volume. (8marks)



Frustra	Area (m ²)	Depth (m)	Volume (m ³)
A	A ₀ = 760	Z ₁ = 5	
B	A ₁ = 650	Z ₂ = 5	
C	A ₂ = 540	Z ₃ = 5	
D	A ₃ = 430	Z ₄ = 5	
E	A ₄ = 320	Z ₅ = 5	
F	A ₅ = 210	Z ₆ = 5	
Total Volume (m ³)			

SECTION B: Answer any four (4) questions

Question Two.

- a) Rain water is not pure. Discuss? (10 marks)
- b) Discuss the factors affecting the solubility of oxygen in Lakes (10 marks)

Question Three.

- (a) With the aid of a well labelled illustration, describe the zonation of a typical lentic ecosystem. (10 marks)
- (b) Discuss the water regime of freshwater ecosystems. (10 marks)

Question Four.

- (a) Water has several characteristics that make it special when compared to other liquids. Mention **four (4)** such characteristics and explain their importance in controlling the physicochemical properties of lakes. **(20 marks)**

Question Five.

- a) There are many factors responsible for various forms of vertical distribution of plankton in Lakes. Mention **five (5)** such factors and explain how they influence these distributions. **(10 marks)**
- b) Describe the Phosphorus cycle in lake ecosystems. **(10marks)**

Question Six.

- a) Plankton groups can be classified in different ways. Discuss the classification of plankton by size. **(10 marks)**
- b) With the aid of a well-illustrated diagram describe the energy and nutrient flow of a typical aquatic ecosystem. **(10 marks)**

Question Seven.

- a) Discuss **two (2)** factors that influence the concentration of ions in water. **(10 marks)**
- b) Distinguish between:
- i) Autogenic and Allogenic plankton? **(2 marks)**
 - ii) Neustons and Nektons? **(2 marks)**
 - iii) Holoplankton and Meroplankton? **(2 marks)**
- c) Mention **four (4)** water chemistry parameters used to determine the trophic states of lakes. **(4 marks)**

END OF EXAMINATION



KAPASA MAKASA UNIVERSITY

School of Natural Resources

Department of Agriculture and Aquatic Sciences

2023/24 SESSIONAL EXAMINATION

FA 230

Limnology

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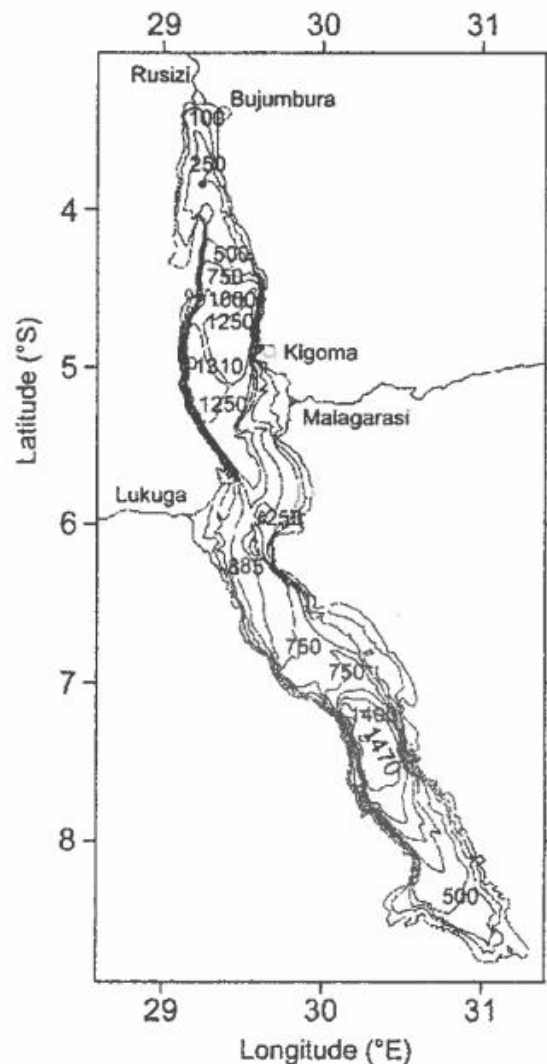
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9. A scientific calculator is Allowed.

SECTION A: Compulsory Question (CQ)

Question One.

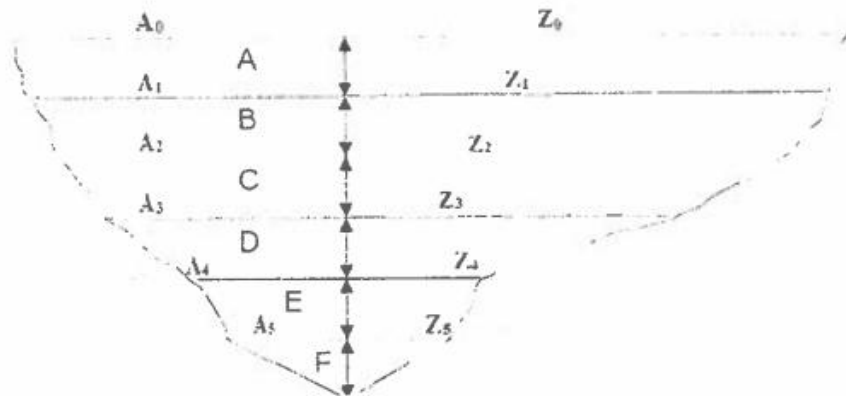
- a) The lake below is the world's longest freshwater lake and the second deepest in the world. It is 673 kilometers long and about 50 kilometers wide. It has a surface area of 32,900 square kilometers. Study the map carefully and answer the questions that follow.



Source: Verburg et al., 2003. Ecological consequences of warming in Lake Tanganyika

- (i) What is the maximum depth of this Lake (Z_m)? (1 mark)
- (ii) Calculate the lake's relative depth (Z_r)? (1 mark)
- (iii) Briefly explain how this lake was formed? (5 mark)
- (iv) Owing to its depth, this lake has been described as **Meromictic**. Explain the significance of this statement? (5 Marks)

- b) Illustrated below is Lake Tusha's depth profile. The lake has a conical bottom as indicated by frustra F. Use the information given in the table below to calculate the Lake's volume. (8marks)



Frustra	Area (m^2)	Depth (m)	Volume (m^3)
A	$A_0 = 760$	$Z_1 = 5$	
B	$A_1 = 650$	$Z_2 = 5$	
C	$A_2 = 540$	$Z_3 = 5$	
D	$A_3 = 430$	$Z_4 = 5$	
E	$A_4 = 320$	$Z_5 = 5$	
F	$A_5 = 210$	$Z_6 = 5$	
Total Volume (m^3)			

SECTION B: Answer any four (4) questions

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END OF EXAMINATION



KAPASA MAKASA UNIVERSITY

SCHOOL OF NATURAL RESOURCES

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

BSc Fisheries and Aquaculture

Sessional Examination 2023

Course Code: FA 270

Course Name: Genetics and Fish Breeding

Time Allowed: Three (3) Hours

DATE: 19 OCTOBER 2023

INSTRUCTIONS: 1. There are two sections in this paper (Section A and B)

2. Section A is **COMPULSORY** (question 1)

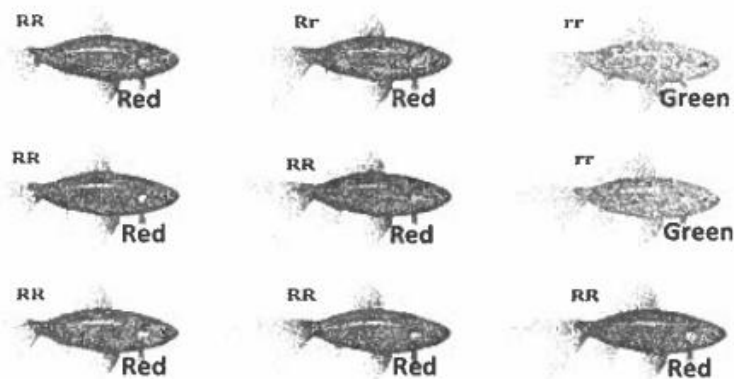
3. Attempt any four (4) questions in section B

4. Write your **SIN** Clearly

SECTION A

QUESTION 1 (COMPULSORY)

- a). State the genetic properties of a population. (2 marks)
- b). Given that in a population some fish are red while some are green, as shown below.



- c). Given that red (R) is dominant over green (r)
- Calculate the frequency of each allele (allele frequency). (2 marks)
 - Calculate the genotypic frequency. (2 marks)
 - Calculate the phenotypic frequency. (2 marks)
- d). A student carried out a feed trial to assess the growth performance of 500 Tilapia. At the end of the trial, it was found that 480 were growing fast whereas 20 were slow-growing. In a highly unlikely circumstance, it was found that growth was genetic rather than environmental, if these traits involve dominant and recessive alleles, and if the 20 fish represent the frequency of the homozygous recessive condition, please calculate the following:
- The frequency of the recessive allele. (2 marks)
 - The frequency of the dominant allele. (3 marks)
 - The frequency of heterozygous individuals. (3 marks)
- e). Within a population of goldfish, the color brown (B) is dominant over the color white (b), and, 39% of all goldfish are white. Given this simple information, calculate the following:
- The percentage of goldfish in the population that are heterozygous. (3 marks)
 - The frequency of homozygous dominant individuals. (3 marks)

SECTION B (ANSWER ANY FOUR (4) QUESTIONS)

QUESTION 2

- a) What is a gene? (2 marks)
- b) What is an allele, give an example. (2 marks)
- c) Define homozygosity (homozygous), and give an example. (2 marks)
- d) What is Heterozygosity (Heterozygous), give an example? (2 marks)
- e) Describe Incomplete-Dominance. (2 Marks)
- f) State the three types of RNAs found in the somatic cells of fish. (4 marks)
- g) What is wild type in genetics? (2 marks)
- h) In what type of cells does mitosis take place, state the stages of mitosis. (4 marks)

QUESTION 3

- a) State Mendel's Law of Segregation and Law of Independent Assortment? (3 marks)
- b) A geneticist crossed a yellow koi carp with a white Koi Carp, explain why all of the F₁ offspring have red phenotypes. (3 marks)
- c) Based on Mendel's observations, a dominant allele 'G' produces grey guppies. Its recessive allele 'g' produces gold guppies. A group of homozygous grey guppies and gold guppies were crossed and produced F₁ offspring which were all heterozygotes (Gg) grey guppies were selfed (crossed). Determine the expected genotypic and phenotypic ratios obtained after crossing the F₁ offspring. (6 marks).
- d) A plant breeder crossed a plant that has a round yellow seed plant with another variety that has a wrinkled green seed. Then the F₁ were selfed. Given that yellow is dominant over green and Round/Smooth shape is dominant over wrinkled shape, let Y=yellow, y=green, R=round/smooth, and r=wrinkled. Predict the genotypic and phenotypic of F₁ and F₂ offspring. (8 marks).

QUESTION 4.

- a) What is cytogenetics? (2 marks)
- b) What is the importance or use of cytogenetic research (chromosome research in aquaculture)? (3 marks)
- c) State and briefly explain chromosome manipulation methods. (5 marks)
- d) Describe androgenesis and its application in aquaculture. (5 marks)
- e) Give a brief description of triploid and tetraploid fishes. (2 marks)
- f) What is the difference between interspecific hybrids and intergeneric hybrids? (3 marks).

QUESTION 5.

- a) What are genetic interactions? (3 marks)
- b) State 2 type of genetic interaction you know. (2 marks)
- c) State and give a brief explanation of one type of sexuality or sex determination in fish. (8 marks)
- d) Give an explanation of the secondary sexual characteristics in fish. (7 marks).

QUESTION 6

- a) What are quantitative and qualitative traits (phenotypes), give examples. (3marks)
- b) Give a brief description of the genotypic value. (3 marks)
- c) Give a brief description of the environmental deviation. (3 marks)
- d) Why do we need genetically improved stocks in aquaculture? (4 marks)
- e) Why do we need genetic variation in selection breeding? (4 marks)
- f) List the guidelines for the selection of broodstock or brooders. (3 marks)

QUESTION 7

- a). List two types of selective breeding methods (programs). **(3 marks)**
- b). A geneticist was tasked to carry out a selection of the candidate breeder from a population of 679,450 fish. Calculate the number of fish required if the;
- i selection intensity is the top 5%? **(2 marks)**
 - ii selection intensity is the top 10%? **(2 marks)**
 - iii selection intensity is the top 15%? **(2 marks)**
- c). The hatchery is to produce 158,850 fry per month with brooders that have an average body weight of 450g. Find how many female and male brooders are needed.
- i. If the sex ratio is 1 male: 3 females. **(2 marks)**
 - ii. If the sex ratio is 1 male: 2 females. **(2 marks)**
 - iii. If the price of one brooder is k12, calculate how much it may cost to buy all the brooders.
 - a. If the sex ratio is 1 male: 3 females **(2 marks)**
 - b. If the sex ratio is 1 male: 2 females **(2 marks)**
- d). You are to produce 750kg feed containing 17 alpha methyltestosterone hormones to reverse the sex of your *Ooreochromis andersonii* fry. Calculate how much of each ingredient is needed to prepare this feed. **(3 marks)**

The End

Good LUCK!!!!



KAPASA MAKASA UNIVERSITY
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

[FA 210]

[ICHTHYOLOGY]

[DATE: 17.10.2023]

[TIME: 14:00-17:00HRS]

Instructions:

1. There are seven questions in total
2. Answer a Compulsory Question (CQ) in **Section A**
3. Answer any Four (4) questions out of Six (6) in **Section B**
4. Each question carries 20 marks
5. Where possible, illustrate your answers
6. Time allowed: Three (3) hours
7. When answering follow further instructions in the answer book

[ICHTHYOLOGY]

SECTION A:

COMPULSORY QUESTION (CQ)

Question One

- (a) Describe the Primary Roles of the intestine and pancreas relative to digestion in fishes [10 Marks]
- (b) What morphological characteristics make the gills of fishes very efficient at extracting oxygen from water? [6 Marks]
- (c) During gas exchange at the tissues carbonic acid and hydrogen ions are formed. How does this influence the hemoglobin affinity for oxygen? [4 Marks]

SECTION B:

Answer any four (4) questions from this section

Question Two

(a) True or False (Circle correct answer)

- 1. Fishes have excellent hearing True False [0.5 Marks]
- 2. Most fishes are positively buoyant True False [0.5 Marks]
- 3. Most species of fishes are found in marine systems True False [0.5 Marks]
- 4. All jawless fish groups are extinct True False [0.5 Marks]
- 5. Sharks and rays are classified in Chondrostei True False [0.5 Marks]

6. Placoderms were first group to have branchiostegal rays True False [0.5 Marks]
7. Lunate tail fins are present in slow swimming fishes True False [0.5 Marks]
8. The homocercal tail is a derived character in Teleostei True False [0.5 Marks]
9. Oxygen binding pigments in muscle tissue are hemoglobin True False [0.5 Marks]
10. The order Myxiniiformes are lamprey True False [0.5 Marks]

(b) Multiple Questions (Circle the correct Answer)

1. A species that lives mainly in freshwater but spawns in the ocean would be termed [0.5 Marks]
- a. oceanadromous
 - b. catadromous
 - c. diadromous
 - d. anadromous
 - e. oceanadromous
2. What is the primary reproductive strategy of most fish species? [0.5 Marks]
- a) Live bearing
 - b) Egg laying
 - c) Parthenogenesis
 - d) Asexual reproduction
3. What type of fish are characterized by a bony skeleton, scales, and two sets of paired fins? [0.5 Marks]
- a) Cartilaginous fish
 - b) Bony fish
 - c) Amphibians

d) Reptiles

4. What is the function of the lateral line system in fish? [0.5 Marks]

- a) Detects vibrations in the water
- b) Helps with balance and orientation
- c) Facilitates communication with other fish
- d) All of the above

5. Which fish species is known for its ability to change colour to blend in with its surroundings? [0.5 Marks]

- a) Clownfish
- b) Electric eel
- c) Cuttlefish
- d) Shark

6. What is the primary function of the gills in fish? [0.5 Marks]

- a) To extract oxygen from the water
- b) To filter out impurities from the water
- c) To excrete waste products
- d) To aid in buoyancy control

7. Which fish species is known for its ability to survive in both freshwater and saltwater environments? [0.5 Marks]

- a) Salmon
- b) Eel
- c) Tilapia
- d) Catfish

8. Which fish species are known for their ability to generate electric fields for navigation and communication? [0.5 Marks]

- a) Electric eels
- b) Tuna
- c) Salmon
- d) Clownfish

9. What is the primary diet of most shark species? [0.5 Marks]

- a) Plankton
- b) Fish and marine mammals
- c) Seaweed
- d) Crustaceans

10. What is the primary function of the dorsal fin in fish? [0.5 Marks]

- a) To aid in propulsion
- b) To provide stability and balance
- c) To protect against predators
- d) To aid in sensing vibrations in the water

11. What is the process by which fish are able to extract oxygen from the water? [0.5 Marks]

- a) Respiration
- b) Osmoregulation
- c) Gas exchange
- d) Digestion

12. If you were an ichthyologist, and you wanted to see where a particular fish would swim during its life, what could you do? [0.5 Marks]

- a) Tag the fish so you could follow it around
- b) Collect it as a specimen

- c) You could not do anything
- d) Put it in a big tank

13. The aquatic organism which can withstand wider range of salinity is known as _____ [0.5 Marks]

- a. Estuarine
- b. Oligahaline
- c. Stenohaline
- d. Euryhaline
- e. None of the above

(c) Write Shorter Answers

1. In some fishes, males deploy alternative reproductive tactics (or polymorphic life histories). Briefly describe the "sneaker" male phenomenon and hypothesize why this represents an evolutionary stable strategy. [2.5 Marks]
2. Why do fish swim in schools? [1 Marks]
3. How do fish sleep? [2 Marks]
4. Do fish feel pain? [1.5 Marks]
5. Define Ichthyology and the role of an Ichthyologist [2.5 Marks]

Question Three

- (a) The osmoregulatory strategies pertaining to salt-water balance in fishes can be classified into four primary strategies. It is imperative to elucidate each of these strategies and their functioning in diverse fish species [12 Marks].
- (b) What are the morphological and functional characteristics of the kidney in cartilaginous fishes, particularly in relation to the process of urea reabsorption? [8 marks]

Question Four

- (a) What is the difference between genus and species in fishes? [6 Marks]
- (b) Mention 10 Characteristic of fish [6 Marks]
- (c) What is the external anatomy and morphology of a fish? [6 Marks]
- (d) What are the two main classes into which fishes are divided? [2 Marks]

Question Five

- (a) Distinguish the differences between the Nerves and Neurons [6 Marks]
- (b) Outline important functions performed by hemoglobin [4 Marks]

Question Six

- (a) What are the major chemoreception roles that impact on the lives and behaviour of fishes? [10 Marks]
- (b) (i) Draw and label the various chambers of fish heart? [4 Marks]
- (ii) Outline the structural and functional units of fish heart? [6 Marks]

Question Seven

Write short notes on:

- | | | |
|-------|---------------|-----------|
| (i) | Oogenesis | [4 Marks] |
| (ii) | Spinal cord | [4 Marks] |
| (iii) | Otoliths | [4 Marks] |
| (iv) | The Liver | [4 Marks] |
| (v) | Pyloric Caeca | [4 Marks] |

THE END –GOOD LUCK



KAPASA MAKASA UNIVERSITY
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

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[ICHTHYOLOGY]

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- c) To protect against predators
- d) To aid in sensing vibrations in the water

11. What is the process by which fish are able to extract oxygen from the water? [0.5 Marks]

- a) Respiration
- b) Osmoregulation
- c) Gas exchange
- d) Digestion

12. If you were an ichthyologist, and you wanted to see where a particular fish would swim during its life, what could you do? [0.5 Marks]

- a) Tag the fish so you could follow it around
- b) Collect it as a specimen

- c) You could not do anything
- d) Put it in a big tank

13. The aquatic organism which can withstand wider range of salinity is known as _____ [0.5 Marks]

- a. Estuarine
- b. Oligahaline
- c. Stenohaline
- d. Euryhaline
- e. None of the above

(c) Write Shorter Answers

1. In some fishes, males deploy alternative reproductive tactics (or polymorphic life histories). Briefly describe the “sneaker” male phenomenon and hypothesize why this represents an evolutionary stable strategy. [2.5 Marks]
2. Why do fish swim in schools? [1 Marks]
3. How do fish sleep? [2 Marks]
4. Do fish feel pain? [1.5 Marks]
5. Define Ichthyology and the role of an Ichthyologist [2.5 Marks]

Question Three

- (a) The osmoregulatory strategies pertaining to salt-water balance in fishes can be classified into four primary strategies. It is imperative to elucidate each of these strategies and their functioning in diverse fish species [12 Marks].
- (b) What are the morphological and functional characteristics of the kidney in cartilaginous fishes, particularly in relation to the process of urea reabsorption? [8 marks]

Question Four

- (a) What is the difference between genus and species in fishes? [6 Marks]
- (b) Mention 10 Characteristic of fish [6 Marks]
- (c) What is the external anatomy and morphology of a fish? [6 Marks]
- (d) What are the two main classes into which fishes are divided? [2 Marks]

Question Five

- (a) Distinguish the differences between the Nerves and Neurons [6 Marks]
- (b) Outline important functions performed by hemoglobin [4 Marks]

Question Six

- (a) What are the major chemoreception roles that impact on the lives and behaviour of fishes? [10 Marks]
- (b) (i) Draw and label the various chambers of fish heart? [4 Marks]
- (ii) Outline the structural and functional units of fish heart? [6 Marks]

Question Seven

Write short notes on:

- | | | |
|-------|---------------|-----------|
| (i) | Oogenesis | [4 Marks] |
| (ii) | Spinal cord | [4 Marks] |
| (iii) | Otoliths | [4 Marks] |
| (iv) | The Liver | [4 Marks] |
| (v) | Pyloric Caeca | [4 Marks] |

THE END –GOOD LUCK



KAPASA MAKASA UNIVERSITY

SCHOOL OF NATURAL RESOURCES

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

BSc Fisheries and Aquaculture

Sessional Examination 2023

Course Code: FA 270

Course Name: Genetics and Fish Breeding

Time Allowed: Three (3) Hours

DATE: 19 OCTOBER 2023

INSTRUCTIONS: 1. There are two sections in this paper (Section A and B)

2. Section A is **COMPULSORY** (question 1)

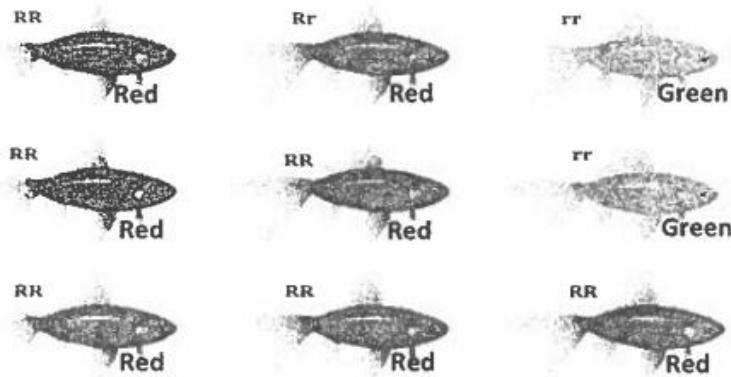
3. Attempt any four (4) questions in section B

4. Write your **SIN** Clearly

SECTION A

QUESTION 1 (COMPULSORY)

- a). State the genetic properties of a population. (2 marks)
- b). Given that in a population some fish are red while some are green, as shown below.



Given that red (R) is dominant over green (r)

- Calculate the frequency of each allele (allele frequency). (2 marks)
 - Calculate the genotypic frequency. (2 marks)
 - Calculate the phenotypic frequency. (2 marks)
- c) A student carried out a feed trial to assess the growth performance of 500 Tilapia. At the end of the trial, it was found that 480 were growing fast whereas 20 were slow-growing. In a highly unlikely circumstance, it was found that growth was genetic rather than environmental, if these traits involve dominant and recessive alleles, and if the 20 fish represent the frequency of the homozygous recessive condition, please calculate the following:
- The frequency of the recessive allele. (2 marks)
 - The frequency of the dominant allele. (3 marks)
 - The frequency of heterozygous individuals. (3 marks)
- d) Within a population of goldfish, the color brown (B) is dominant over the color white (b), and, 39% of all goldfish are white. Given this simple information, calculate the following:
- The percentage of goldfish in the population that are heterozygous. (3 marks)
 - The frequency of homozygous dominant individuals. (3 marks)

SECTION B (ANSWER ANY FOUR (4) QUESTIONS)

QUESTION 2

- a) What is a gene? (2 marks)
- b) What is an allele, give an example. (2 marks)
- c) Define homozygosity (homozygous), and give an example. (2 marks)
- d) What is Heterozygosity (Heterozygous), give an example? (2 marks)
- e) Describe Incomplete-Dominance. (2 Marks)
- f) State the three types of RNAs found in the somatic cells of fish. (4 marks)
- g) What is wild type in genetics? (2 marks)
- h) In what type of cells does mitosis take place, state the stages of mitosis. (4 marks)

QUESTION 3

- a) State Mendel's Law of Segregation and Law of Independent Assortment? (3 marks)
- b) A geneticist crossed a yellow koi carp with a white Koi Carp, explain why all of the F₁ offspring have red phenotypes. (3 marks)
- c) Based on Mendel's observations, a dominant allele 'G' produces grey guppies. Its recessive allele 'g' produces gold guppies. A group of homozygous grey guppies and gold guppies were crossed and produced F₁ offspring which were all heterozygotes (Gg) grey guppies were selfed (crossed). Determine the expected genotypic and phenotypic ratios obtained after crossing the F₁ offspring. (6 marks).
- d) A plant breeder crossed a plant that has a round yellow seed plant with another variety that has a wrinkled green seed. Then the F₁ were selfed. Given that yellow is dominant over green and Round/Smooth shape is dominant over wrinkled shape, let Y=yellow, y=green, R=round/smooth, and r=wrinkled. Predict the genotypic and phenotypic of F₁ and F₂ offspring. (8 marks).

QUESTION 4.

- a) What is cytogenetics? (2 marks)
- b) What is the importance or use of cytogenetic research (chromosome research in aquaculture)? (3 marks)
- c) State and briefly explain chromosome manipulation methods. (5 marks)
- d) Describe androgenesis and its application in aquaculture. (5 marks)
- e) Give a brief description of triploid and tetraploid fishes. (2 marks)
- f) What is the difference between interspecific hybrids and intergeneric hybrids? (3 marks).

QUESTION 5.

- a) What are genetic interactions? (3 marks)
- b) State 2 type of genetic interaction you know. (2 marks)
- c) State and give a brief explanation of one type of sexuality or sex determination in fish. (8 marks)
- d) Give an explanation of the secondary sexual characteristics in fish. (7 marks).

QUESTION 6

- a) What are quantitative and qualitative traits (phenotypes), give examples. (3marks)
- b) Give a brief description of the genotypic value. (3 marks)
- c) Give a brief description of the environmental deviation. (3 marks)
- d) Why do we need genetically improved stocks in aquaculture? (4 marks)
- e) Why do we need genetic variation in selection breeding? (4 marks)
- f) List the guidelines for the selection of broodstock or brooders. (3 marks)

QUESTION 7

- a). List two types of selective breeding methods (programs). **(3 marks)**
- b). A geneticist was tasked to carry out a selection of the candidate breeder from a population of 679, 450 fish. Calculate the number of fish required if the;
- i selection intensity is the top 5%? **(2 marks)**
 - ii selection intensity is the top 10%? **(2 marks)**
 - iii selection intensity is the top 15%? **(2 marks)**
- c). The hatchery is to produce 158,850 fry per month with brooders that have an average body weight of 450g. Find how many female and male brooders are needed.
- i. If the sex ratio is 1 male: 3 females. **(2 marks)**
 - ii. If the sex ratio is 1 male: 2 females. **(2 marks)**
 - iii. If the price of one brooder is k12, calculate how much it may cost to buy all the brooders.
 - a. If the sex ratio is 1 male: 3 females **(2 marks)**
 - b. If the sex ratio is 1 male: 2 females **(2 marks)**
- d). You are to produce 750kg feed containing 17 alpha methyltestosterone hormones to reverse the sex of your *Oreochromis andersonii* fry. Calculate how much of each ingredient is needed to prepare this feed. **(3 marks)**

The End

Good LUCK!!!!



KAPASA MAKASA UNIVERSITY
SCHOOL OF NATURAL RESOURCES
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

Sessional Examination 2023

Course Code: SA 220

Course Name: AQUACULTURE AND APICULTURE

Time Allowed: Three (3) Hours

DATE: 20TH OCTOBER 2023

INSTRUCTIONS:

1. There are **THREE** sections in this paper (Section A, B and C)
2. Section A is **COMPULSORY** (question 1)
3. Attempt any **TWO** questions in section B; and any **TWO** questions from section C
4. Question 1a to be answered in the same booklet as Section B
5. Question 1b to be answered in the same booklet as Section C
6. Submit **TWO** separate answer booklets for section B and section C

SECTION A

QUESTION One (COMPULSORY)

a) In your own words, please differentiate the following terms used in aquaculture:

- i. Tank aquaculture and Raceways (2 marks)
- ii. Freshwater and brackish water (2 marks)
- iii. Semi-intensive and tank aquaculture (2 marks)
- iv. Floating feed and sinking feed (2 marks)
- v. Aquaculture and agriculture (2 marks)

b) Uncle Pojana, a small-scale farmer in Nkenyauna settlement scheme in Kasempa District wants to expand his production of honey and wax on his piece of land whose dimensions is 50.8m in width and 88.7m length. He has been spacing his hives at 10m apart. Mr Pojana now wants to reduce this spacing to 5m apart.

- i. How many hives does he have when the spacing is 10m apart? [2 marks]
- ii. If he reduces the spacing to 5m apart, how many hives will his piece of land accommodate? [2 marks]
- iii. In order to maintain his productivity with the new spacing, what measures should he take? [6 marks]

SECTION B (ANSWER ANY TWO (2) QUESTIONS)

Question Two

- a. Briefly discuss the benefits of aquaculture at the household level. (10 marks)
- b. Give a brief description of how you can conduct a site selection of an aquaculture facility of your choice. (8 marks)

Question Three

- a) Write brief notes on each of the following:
 - (i) Mono-sex culture as a method of controlling reproduction in tilapia. (5 marks)
 - (ii) State any five factors affecting primary production in water. (5 marks)
- b) Give a brief description of how you can conduct a site selection of an aquaculture facility of your choice. (10 marks)

Question Four

- a) With clear examples, explain the concept of an integrated agriculture aquaculture (IAA) system. (6 marks)
- b) In the Zambian context, state three challenges that would hinder the adoption of the recirculation aquaculture system (RAS). (6 marks)
- c) Briefly discuss some of the benefits of fencing an aquaculture facility. (8 marks)

SECTION C : Choose Two Questions from this section

Question Five

- a) Discuss the four effects of bark harvesting for hive construction on forest resources [8 marks]
- b) What are the measures used to control spread of acarine bee disease in the apiary? [12 marks]

Question Six

- a) Give reasons as to why apiculture farmers should harvest their honey during the day? [12 marks]
- b) What are the ecological variables that play an important role for bees and beekeeping activities? [8 marks]

Question Seven

- a) Discuss the importance of the three types of bees found in the colony [9 marks]
- b) What is the importance of scouting by field bees in a colony? [1 mark]
- c) Explain how Apiculture can contribute to well-being of households in Rural Parts of Zambia? [5 marks]
- d) What is the role of the extension service in the promotion of apiculture in Zambia? [5 marks]

The End

I Wish You All The Best!!!!



KAPASA MAKASA UNIVERSITY
DEPARTMENT OF AGRICULTURAL AND AQUATIC SCIENCES
CHINSALI, MUCHINGA PROVINCE
BIOCHEMISTRY – FA 220
DEFERRED SESSIONAL EXAMINATION

NOVEMBER 2023

INSTRUCTIONS TO CANDIDATE

1. Time allowed is **THREE HOURS**
2. Remember to write your identity number on the provided answer sheets
3. Read the instructions carefully before attempting the questions
4. All questions carry equal marks (**20 Marks**)
5. Attempt any **Five** questions
6. Question **ONE** is Compulsory

**CELLPHONES & PROGRAMMABLE CALCULATORS ARE NOT ALLOWED IN THE
EXAMINATION ROOM**

**DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO BY THE
INVIGILATOR**



Question One

1. Attempt any four of the following;

- A. State the circumstances under which farm animals can oxidatively degrade amino acids **(5 Marks)**
- B. Mention the significance of feedback inhibition in biochemical reactions in farm animals **(5 Marks)**
- C. Illustrate the fate of pyruvate **(5 marks)**
- D. State the features that make water a cradle of life **(5 marks)**
- E. Describe the basic structure of nucleotide **(5 Marks)**

Question two

2. Discuss some of the factors that would affect the function of Hexokinase in food animals **(20 marks)**

Question three

3. In your elementary Biology and perhaps Home Economics, the importance of Lipids has emphasized before. Re-enforced in Biochemistry and yet to be repeated in Animal Nutrition, kindly elaborate how these lipids are absorbed, transported and presented for instance to biceps muscles to support the work of the muscle or any other tissue in food animals.

(20 Marks)

Question four

4. Maize bran and other feeding stuffs continue to holistically support the growth and performance of food animals. Based on your rare and strong knowledge of biochemical pathways, discuss the major reactions involved in the pay-off

phase of glycolysis in most farm animals.

(20

Marks)

Question five

5. All that which is ingested mostly ends up contributing to the Central TCA cycle in food animals. Many reactions also have they raw materials supplied by the TCA cycle to promote good animal reproductive and productive performance. Kindly explain this TCA cycle to Mr Nkowani, an overzealous farmer but a Geologist who boasts of being “well read”

(20 Marks)

Question Six

6. Hormones, released in minute quantities yet have a profound effect in food animals continue to play a crucial role in promoting animal reproduction and production. However, unregulated hormones can produce undesirable results such as diseases and abnormal phenotypic expressions. Based on good understanding of Biochemistry, kindly elaborate how hormone are regulated in the body.

(20 Marks)

Question Seven

7. Biochemistry lays a strong foundation in understanding virology, immunology, animal nutrition, physiology and several other key specialties. Therefore, demonstrate your clear knowledge of cellular structure with respect to biochemical activities related to each cellular organelle.

(20 Marks)



**KAPASA MAKASA UNIVERSITY
CHINSALI, MUCHINGA PROVINCE
APPLIED BIOCHEMISTRY - FA 220
END OF YEAR FINAL EXAMINATION**

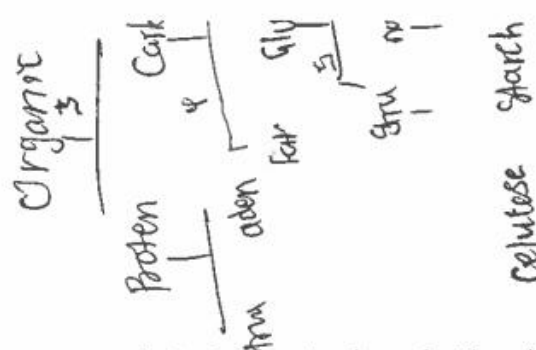
OCTOBER 2023

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your identity number on the provided answer sheets
3. All questions carry equal marks (**20 Marks**)
4. Question **ONE** is compulsory
5. Attempt any **FOUR** questions

CELLPHONES & PROGRAMMABLE CALCULATORS ARE NOT ALLOWED IN THE EXAMINATION ROOM

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO BY THE INVIGILATOR



QUESTION ONE

1. Nutrition plays an important role in farm animal production. With your knowledge of Biochemistry, kindly attempt any four:

- A. Illustrate the different components of feed (5 marks)
- B. State the features of common monosaccharides (5 marks)
- C. State the properties of water that make it the cradle of life (5 marks)
- D. Why is fat a better energy storage form than CHOs in animals (5 marks)
- E. Mention the sources of water and effects of low water in animal? (5 marks)

QUESTION TWO

2. Optimum feeding for food animal is crucial to attain some retain on investment. However, failure to properly balance the diet may result in losses due limited optimal resource utilization and increased wastage. Mr Kayombo is a neophyte weekend farmer and hires you for consultation to explain biochemically how nutrients influence profitability. Kindly demonstrate to Mr Kayombo:

- A. How excess carbohydrates can be converted and stored in the form of lipids in the body of a boar if not feed a properly balanced diet? (10 marks)
- B. How lipid and glucose metabolism is tightly linked (10 marks)

QUESTION THREE

3. Proteins form an integral component of living organisms and have profound effects on either livestock and fisheries production or aquaculture production.
 - 4.1. Discuss the importance of proteins in animal production (10 marks)
 - 4.2. Describe the structure of amino acid (5 marks)
 - 4.3. Explain the biochemical basis of supplementing indispensable amino acids in animals' diets including humans (5 marks)

QUESTION FOUR

4. Biochemistry is a strong bedrock upon which the future of the livestock and fisheries subsector depend. Its understanding and application has potential to transform the industry. Knowing so well that most activities occur at tissue and cellular level, demonstrate your clear knowledge of cellular structure with respect to biochemical activities in each cellular organelle in an ox at *Golonita* farms. (20 Marks)

QUESTION FIVE

5. Vitamins and minerals are crucial dietary components of an animal's diet to promote and support optimum food animal production and reproduction. Kindly:
- A. Indicate the different classes of minerals (10 marks)
 - B. State the deficient signs associated with minerals (10 marks)

QUESTION SIX

6. Application of molecular techniques in modern biological sciences cannot be not be over-emphasized including the livestock sector such gene preservation, disease diagnosis and improved livestock and fisheries production. Bearing this in mind and with the aid of sketch, explain how DNA replication occurs. (20 marks)

QUESTION SEVEN

7. Describe how food animals absorb and transport dietary lipids (20 marks)

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KAPASA MAKASA UNIVERSITY

School of Natural Resources

Department of Agriculture and Aquatic Sciences

2023/24 SESSIONAL EXAMINATION

FA 250

Soil and Water Quality Management

Date: 20th October, 2023

Time: 09:00 – 12:00 Hrs

Instructions:

1. There are seven questions in total
2. Answer a Compulsory Question (s) (CQ) in **Section A**
3. Answer any four (4) questions out of six in **Section B**
4. There are 100 marks allocated to this paper
5. Each question carries 20 marks
6. Where possible, illustrate your answers
7. Time allowed: **Three (3) hours**
8. When answering follow further instructions in the answer book

SECTION A: Compulsory Question (CQ). Attempt all questions in this section.

Question One

a) Mrs. Shupani received a K200,000 loan from the CEEC Aquaculture seed fund (ASF) to do fish farming at Mulakupikwa village, Chinsali. She secured a 2-hectare farm land and engaged Sepiso, a graduate from Kapasa Makasa University (KMU) to carry out soil tests. She used a 10 cm Auger with a diameter of 10 cm to get a field moist core which she oven dried at 105°C. She then calculated the bulk density of the oven dry core and found 1.05 g/cm³. She placed the oven dry core in a pan of water until it was water satiated. The oven dry soil and water at saturation weighed 1.4Kg.

- a) Calculate the volume of the field moist core? [2 Marks]
- b) Calculate the total soil porosity. [4 Marks]
- c) Based on the results in b) what advise should Sepiso give Mrs. Shupani? [2 Marks]

b) Below is an extract from the Soil Survey Report that Sepiso did at Mrs. Shupani's farm land. Carefully examine the report and answer the questions that follow below.

Depth	Horizon	Organic Carbon (%)	pH	Exchangeable Cations (cmol/Kg)				
				Ca	Mg	K	Na	Al
0-5	Ap	0.5	6.1	14	3.5	0.5	0.2	1.43
15-25	A	0.8	6.3	13.8	4.5	0.4	0.1	1.62
25-50	E	0.2	6	0.5	0.7	0.1	0.1	0.1
50-80	B	2	5	14.7	5	0.3	0.2	3
80-120	Bt	2.1	4.4	15	6.1	0.3	0.2	4.67
120-150	C	2.3	4.1	17	6.3	0.4	0.2	4

- i) Calculate the CEC and the percentage base saturation of each horizon. [6 Marks]
- ii) In your opinion, do you think that this soil is good for pond aquaculture? If not, what could be done to improve it? [2 Marks]
- c) Mention the factors that affect soil colour? [4 Marks]

SECTION B: Attempt any four (4) questions from this section.

Question Two

With the aid of a well labelled illustration briefly explain

- a) The pond soil profile. [10 marks]
- b) The soil-water nutrient exchange in a typical freshwater fish pond. [10 marks]

Question Three

- a) Mention the **four (4)** types of liming materials that you know. [4 marks]
- b) Differentiate between the following terms as used in soil and water quality management:
 - i) Flocculation and coagulation [2 marks]
 - ii) Odour masking and odour counteraction [2 marks]
 - iii) Mineralization and solubilization [2 marks]
- c) Briefly describe **five (5)** common waste water treatment practices [10 marks]

Question Four

- a) Colloids are an important soil fraction due to the properties that make them. Explain in brief the role they play in the transfer of minerals. [10 marks]
- b) How would you treat sodic and alkaline soils? [10 marks]

Question Five

- a) Discuss five soil ecosystem services [10 marks]
- b) Discuss the importance of soil amendments and explain their effect on soils [10 marks]

Question Six

a) With the aid of a well labelled illustration briefly explain the water treatment methods in aquaculture. **[10 marks]**

b) Microbes occupy an important place in the ecology of the water and sediment. Discuss.

[10 marks]

Question Seven

a) Based on their metabolism discuss the classification of microbes. **[10 marks]**

b) With the aid of a well labelled diagram describe the phosphorus cycle in water. **[10 marks]**

END OF EXAMINATION



KAPASA MAKASA UNIVERSITY
CHINSALI, MUCHINGA PROVINCE
APPLIED BIOCHEMISTRY – FA 220
END OF YEAR FINAL EXAMINATION

OCTOBER 2023

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your identity number on the provided answer sheets
3. All questions carry equal marks **(20 Marks)**
4. Question **ONE** is compulsory
5. Attempt any **FOUR** questions

CELLPHONES & PROGRAMMABLE CALCULATORS ARE NOT ALLOWED IN THE EXAMINATION ROOM

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO BY THE INVIGILATOR

QUESTION ONE

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- D. Why is fat a better energy storage form than CHO's in animals (5 marks)
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 - B. State the deficient signs associated with minerals (10 marks)

QUESTION SIX

6. Application of molecular techniques in modern biological sciences cannot be not be over-emphasized including the livestock sector such gene preservation, disease diagnosis and improved livestock and fisheries production. Bearing this in mind and with the aid of sketch, explain how DNA replication occurs. (20 marks)

QUESTION SEVEN

7. Describe how food animals absorb and transport dietary lipids (20 marks)



KAPASA MAKASA UNIVERSITY

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

BIOMETRY FINAL EXAMINATION FOR ACADEMIC YEAR 2023

COURSE CODE: FO 210/NR 220

DATE : FRIDAY, 27, 2023

TIME: 14:00 – 17:00 Hours

TOTAL MARKS: 100

Instructions:

1. There are two sections (A and B) and six (6) questions in total in this exam paper.
2. Answer two (2) compulsory questions in Section A.
3. Answer any three (3) questions out of four (4) in Section B.
4. There are 100 marks allocated to this paper; each question carries 20 marks.
5. Time allowed is three (3) hours.
6. Please write legibly and include all the necessary steps in your calculations in order to get full marks.
7. No mark(s) will be given for any unclear working/calculations even if the final answer may be correct.
8. Where necessary, give your answers correct to four (4) decimal places.
9. Please be concise (short, clear and to the point) in your explanations.
10. Statistical tables will be provide and Please do not write anything on the Statistical Tables.
11. When answering questions, follow further instructions in the Question paper and Answer booklet.



KAPASA MAKASA UNIVERSITY

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

BIOMETRY FINAL EXAMINATION FOR ACADEMIC YEAR 2023

COURSE CODE: FO 210/NR 220

DATE : FRIDAY, 27, 2023

TIME: 14:00 – 17:00 Hours

TOTAL MARKS: 100

Instructions:

1. There are two sections (A and B) and six (6) questions in total in this exam paper.
2. Answer two (2) compulsory questions in Section A.
3. Answer any three (3) questions out of four (4) in Section B.
4. There are 100 marks allocated to this paper; each question carries 20 marks.
5. Time allowed is three (3) hours.
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10. Statistical tables will be provide and Please do not write anything on the Statistical Tables.
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SECTION A (COMPULSORY – ANSWER BOTH QUESTIONS 1 AND 2)

QUESTION 1

- a) A researcher conducted an experiment to compare two room temperatures for doing a particular type of work. There were 6 rooms available for the experimentation. Three randomly selected rooms were set at 60 degrees and the other three were set at 72 degrees. Five workers were put in each room and various measurements were made on each relative to their work performance.
- (i) What are the treatments in this experiment?
 - (ii) What are the experimental units?
 - (iii) How many replications are there for each treatment?
 - (iv) Provide analysis of variance table outlining **ONLY** the sources of variability and the degrees of freedom. **[10 marks]**
- b) Briefly explain why each of the following tools are important in design of experiments
- (i) Replication
 - (ii) Blocking
 - (iii) Randomization **[3 marks]**
- c) An experiment was set to test the effect of three agroforestry species on crop yield. The data below shows the yield of sorghum in Kgs that was collected from plots that had been intercropped with *Cajanus cajan*, *Sesbania sesban* and *Leucaena leucocephala*.

Plot	<i>Cajanus cajan</i>	<i>Sesbania sesban</i>	<i>Leucaena leucocephala</i>
1	11	13	21
2	4	9	18
3	6	14	15

Answer the following questions.

- (i) Formulate the hypothesis for the above experiment? **[2 marks]**
- (ii) What test would be suitable for the above hypothesis and why? **[2marks]**
- (iii) State your assumptions regarding the test done above. **[3marks]**

QUESTION 2

- a) After a pollution accident, 180 dead fish were recovered from a stream. The Table below gives their lengths measured to the nearest millimeter.

Length of Fish(mm)	Frequency
1 - 19	38
20 - 39	31
40 - 59	59
60 - 79	45
80 - 99	7

- (i) Find the mean, variance, and standard deviation for the data. [8marks]
- (ii) Find the median for this data.[6marks]
- b) In a time study conducted at a manufacturing plant, the length of time to complete a specified operation is measured for each of $n = 40$ workers. The mean and standard deviation are found to be 12.8 and 1.7, respectively. Describe the sample data using the Empirical Rule. [6marks]

SECTION B (ANSWER ANY THREE QUESTIONS FROM THIS SECTION)

QUESTION 3

- a) A furniture company wants to know whether there are differences in stain resistance among the four chemicals used to treat three different fabrics. The Table below shows the yields on resistance to stain (a low value indicates good stain resistance).

Chemical	Material			
	I	II	III	Total
C1	3	7	6	16
C2	9	11	8	28
C3	2	5	7	14
C4	7	9	8	24
Total	21	32	29	82

- (i) At $\alpha = 0.01$ level of significance, is there evidence to conclude that there is a difference in mean resistance among the treatments? [10marks]
- (ii) At $\alpha = 0.01$ level of significance, is there any difference in the mean resistance among the materials? [5marks]
- (iii) Write down the linear statistical model for one-way analysis of variance. Explain all the terms in the model. [5marks]

QUESTION 4

- a) In an experiment to study the dependence of gastric ulcers in horses depending on hard feed quantity, the following data were collected on 180 horses:

	Less than 3 Kg	3kg – 6kg	More than 6kg
Ulcers	21	36	30
No Ulcers	48	26	19

If one of the horses is selected at random, find the probability that the horses is

- (i) Experiencing ulcers, given that the horse is on more than 6kg hard feed;
- (ii) On less than 3kg hard feed, given that the horse has gastric ulcers

[6 marks]

- b) You have just bought a car insurance policy through ZISC (Zambia State Insurance Company) as a new retiree for your farm. In the past, you have averaged 5 car accidents per 3 year period. The insurance company makes you a provisional customer over the next 3 years. They will drop your cover if you have three or more accidents during three year period. Find the probability that you have at least 2 accidents. [3 marks]

- c) A university has found that 20% of its students withdraw without completing Biometry course. Assume that 10 students have registered for the course this academic year.

- (i) What is the probability that two or fewer will withdraw?
- (ii) What is the probability that exactly four will withdraw?
- (iii) What is the probability that more than three will withdraw?
- (iv) What is the expected number of withdrawals?

[4 marks]

or

- d) Suppose 1.2% of the population cattle test positive for FMD virus serotype 'O' causing Foot and Mouth Disease. A new test comes up to detect the virus. In cattle known to have the virus it correctly comes back positive saying they have it 99% of the time. In cattle known not to have the virus it correctly comes back negative saying they do not have it 98% of the time. You decide to use this test on your cattle and it comes back positive, what is the probability that your cattle actually have the virus. **[7 marks]**

QUESTION 5

University students at KMU who graduate with very good cumulative average marks have high expectations of finding a good job after completion. KMU consult managed by academic office collects information on the cumulative average scores for graduates from KMU and their respective monthly salaries (in Kwacha) after getting a job.

The table below summaries the information above, use the table to answer the question that follow:

Average Marks	65	71	75	80	82	85	90	93	95	97
Salary	120	150	100	125	140	80	200	210	160	110

Using a simple linear regression of the form $Y = \alpha + \beta X + \epsilon$, where α is the y-intercept, β is the slope and ϵ is the error term.

- a) Find the values of α and β **[4 marks]**
- b) Interpret the results from (a) above **[1 mark]**
- c) What will be the salary of a graduate who obtained a cumulative average score of zero **[1 mark]**
- d) Predict the salary of a graduate who had an average mark of 55? **[1 mark]**
- e) Estimate the Pearson's correlation coefficient and interpret **[5 marks]**
- f) Estimate the coefficient of determination and interpret **[2 marks]**
- g) Differentiate between correlation analysis and regression analysis **[2 marks]**
- h) List two properties of correlation coefficient **[2 marks]**
- i) State two assumptions of linear regression **[2 marks]**

QUESTION 6

- a) A consumer rating magazine has developed a test to compare the mean life length of two batteries. Five electronic aerators for fish tanks were used to make the comparison. Two of each type of aerator was purchased and one aerator of each type was powered by each of the battery (Type 1 and Type 2). The resulting durations of the aerators usage are given below.

Aerator	Battery Type 1	Battery Type 2
1	52.6hr	61.4hr
2	103.4hr	112.8hr
3	68.2hr	67.1hr
4	88.4hr	92.3hr
5	111.6hr	121.5hr

- State the null and alternative hypotheses [1 mark]
 - Identify the test statistic and critical region using a level of significance of 5%. [4 marks]
 - State the conclusion resulting from the test. [1 mark]
 - Construct a confidence interval that is relevant to this problem and use it to verify the conclusion identified in part (c). [4 marks]
- b) A dog food manufacture sells 50kg bags of food. Due to manufacturing processes not every bag will be exactly 50kg. Suppose you randomly select 75 of these bags and weigh them. Assume you get a mean for the 75 bags of 50.21 with a standard deviation of 0.84. Find a 95% confidence interval for the true man. What can you conclude from this? [5 marks]
- c) Six sheep randomly selected from a heard weigh:
- 24.5 24.3 25 24 24.7 24.6
- Find a 95% confidence interval for the mean mass of all the sheep in the heard. [5 marks]

END OF EXAMINATION

Some useful formulas

$$1. \quad \bar{x} = \frac{\sum_{i=1}^n x_i}{n}; s^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1} \text{ or } s^2 = \frac{\sum_{i=1}^n x_i^2 - \frac{(\sum_{i=1}^n x_i)^2}{n}}{n-1} \text{ or } s^2 = \frac{\sum_{i=1}^n x_i^2 - n\bar{x}^2}{n-1}; z = \frac{x - \mu}{\sigma}$$

$$2. \quad z \text{ test for: } \mu \rightarrow z = \frac{\bar{x} - \mu_0}{\sigma/\sqrt{n}}; \mu_1 - \mu_2 \rightarrow z = \frac{(\bar{x}_1 - \bar{x}_2) - D_0}{\sqrt{\left(\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}\right)}}; p \rightarrow z = \frac{\hat{p} - p_0}{\sqrt{p_0 q_0/n}}; p_1 - p_2 \rightarrow$$

$$z = \frac{\hat{p}_1 - \hat{p}_2 - 0}{\sqrt{\hat{p}\hat{q}\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

$$3. \quad t \text{ test for: } \mu \rightarrow t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}; \mu_1 - \mu_2 \rightarrow t = \frac{(\bar{x}_1 - \bar{x}_2) - D_0}{\sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}} \quad df =$$

$$\frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{(s_1^2/n_1)^2}{(n_1-1)} + \frac{(s_2^2/n_2)^2}{(n_2-1)}}; \text{ and}$$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - D_0}{\sqrt{s_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \quad \text{with } df = n_1 + n_2 - 2; s_p^2 = \frac{(n_1-1)s_1^2 + (n_2-1)s_2^2}{n_1 + n_2 - 2}$$

$$4. \quad t \text{ test for: } \mu_d \rightarrow t = \frac{\bar{d} - D_0}{s_d/\sqrt{n}} \text{ with } df = n - 1$$

$$5. \quad \chi^2 \text{ test for } \sigma^2 \rightarrow \chi^2 = \frac{(n-1)s^2}{\sigma_0^2} \text{ with } df = n - 1; F \text{ test for } \frac{\sigma_1^2}{\sigma_2^2} \rightarrow F = \frac{s_1^2}{s_2^2}$$

$$6. \quad r = \frac{S_{xy}}{\sqrt{S_{xx}S_{yy}}}; \hat{\beta}_1 = \frac{S_{xy}}{S_{xx}}; \hat{\beta}_0 = \bar{y} - \hat{\beta}_1\bar{x}; t = \frac{\hat{\beta}_1 - 0}{\sqrt{MSE/S_{xx}}}; S_{xy} = \sum_{i=1}^n x_i y_i - \frac{(\sum_{i=1}^n x_i)(\sum_{i=1}^n y_i)}{n}$$

$$7. \quad S_{xx} = \sum_{i=1}^n x_i^2 - \frac{(\sum_{i=1}^n x_i)^2}{n}; S_{yy} = \sum_{i=1}^n y_i^2 - \frac{(\sum_{i=1}^n y_i)^2}{n}$$

$$8. \quad p(x) = p^x q^{1-x}; p(x) = pq^{x-1}; p(x) = \binom{n}{x} p^x q^{n-x}; p(x) = \frac{e^{-\lambda} \lambda^x}{x!}; p(x) = \lambda e^{-\lambda x}$$

$$9. \quad LSD = t_{\alpha/2} * \sqrt{MSE\left(\frac{1}{r_i} + \frac{1}{r_j}\right)}; \text{ df for } t_{\alpha/2} \text{ is for MSE.}$$

$$10. \quad 100(1 - \alpha)\% \quad \text{Confidence} \quad \text{Interval} \quad \text{for:}$$

$$\mu_d \Rightarrow \bar{d} \pm t_{\alpha/2} * \frac{s_d}{\sqrt{n}}; \mu \Rightarrow \bar{x} \pm z_{\alpha/2} * \frac{\sigma}{\sqrt{n}}; \mu \Rightarrow \bar{x} \pm t_{\alpha/2} * \frac{s}{\sqrt{n}}; \mu_1 - \mu_2 \Rightarrow (\bar{x}_1 - \bar{x}_2) \pm z_{\alpha/2} * \sqrt{\left(\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}\right)}$$

$$\mu_1 - \mu_2 \Rightarrow (\bar{x}_1 - \bar{x}_2) \pm t_{\alpha/2} * \sqrt{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)}; \mu_1 - \mu_2 = > (\bar{x}_1 - \bar{x}_2) \pm t_{\alpha/2} * \sqrt{s_p^2 \left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$$

$$p \Rightarrow \hat{p} \pm z_{\alpha/2} * \sqrt{\frac{\hat{p}\hat{q}}{n}}; p_1 - p_2 \Rightarrow (\hat{p}_1 - \hat{p}_2) \pm z_{\alpha/2} * \sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}}$$

$$\sigma^2 \Rightarrow \frac{(n-1)s^2}{\chi_{\alpha/2}^2} < \sigma^2 < \frac{(n-1)s^2}{\chi_{(1-\alpha/2)}^2}; \frac{\sigma_1^2}{\sigma_2^2} \Rightarrow \left(\frac{s_1^2}{s_2^2}\right) \frac{1}{F_{\alpha/2, df_1, df_2}} < \frac{\sigma_1^2}{\sigma_2^2} < \left(\frac{s_1^2}{s_2^2}\right) F_{\alpha/2, df_2, df_1}$$

11. Note: for the z test, both 1 and 2 sample cases, if the sample sizes are large, i.e. $n \geq 30, n_1 \geq 30$ and $n_2 \geq 30$ the sample variances can be used in place of the population variances in the formulas given above (2 and 10).



KAPASA MAKASA UNIVERSITY

PAST EXAMINATION PAPERS

2023

DEPARTMENT OF AGRICULTURE AND AQUATIC
SCIENCES
THIRD YEAR

COURSE CODES:

FA 300 ✓

FA 310

FA 320 ✓

FA 330

FA 360



Copperbelt University

Kapasa Makasa University

Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

FA 300 – Aquatic Ecology Environment

Duration 3 hours (14:00-17:00)

Date 23rd October, 2023

INSTRUCTIONS

There are seven (7) questions in this this paper

Answer ANY FIVE using the answer booklet provided

QUESTION 1

a) What is an aquatic ecosystem?

(2 Marks)

b) Describe three roles of aquatic ecosystem

(18 Marks)

QUESTION 2

a) Define fish migration?

(4 Marks)

b) Discuss four migration techniques used by fish

(16 Marks)

QUESTION 3

Write short notes on the following

a) Allopatric speciation

(10 Marks)

b) Cover

(10 Marks)

QUESTION 4

Navigation is key to the survival of fish. Discuss four navigation techniques employed by fish

(20 Marks)

QUESTION 5

On earth, fish exists in different shapes and sizes. Discuss five threats to fish biodiversity

(20 Marks)

QUESTION 6

Foraging is an adaptive behavioral trait that is very key to survival of fish species. Give an account indicating merits of foraging behavior in fish.

QUESTION 7

Migration is moving between sites. Discuss four disadvantages of fish migration.

(20 Marks)



The Copperbelt University

Kapasa Makasa University Campus

Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: FA 320

COURSE NAME: FISH HEALTH AND DISEASE

TIME ALLOWED: THREE (3) HOURS

DATE: 12TH OCTOBER 2023

INSTRUCTIONS:

- 1. Answer the COMPULSORY QUESTION ONE**
- 2. Answer ANY other FOUR questions in the exam and follow the instructions given in the answer booklet such as "START A NEW QUESTION ON A FRESH PAGE"**

Question 1

Define terms some commonly used in fish disease; Abrasion, Acute, prophylaxis, vaccine, sign, pathogenic, etiological agent and predisposing factor. (20 marks)

Question 2

Imagine you are scientist working in a fish diagnostic laboratory and you are visited by students, briefly explain to the student the difference between Gram – negative and a Gram-positive bacterium. (20 marks)

Question 3

What are 8 the diagnostic tools used in fish disease diagnosis and explain each? (20 marks)

Question 4

Discuss five (5) fish sampling techniques for disease diagnosis? (20 marks)

Question 5

- (a) Define Bio-security? (5 marks)
- (b) Imagine your fish farm with two enterprises (epidemiological sub units) next to an industry, kindly set a sketch and come up with a Bio-security plan. (15 marks)

Question 6

Discuss the five (5) stress conditions that lead to the outbreak? (20 marks)

Question 7

In detail discuss one disease you know, in your response include, causative agent, species affected, predisposing factors, and treatment and control? (20 marks)



KAPASA MAKASA UNIVERSITY

CHINSALI CAMPUS

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCE

EXAMINATION

COURSE : AQUATIC SYSTEMS AND ENGINEERING

CODE : FA 310

DATE : 16th OCTOBER, 2023

INSTRUCTIONS

1. Write your name and ID correctly on the answer booklet provided.
2. Answer four questions and question seven is compulsory.
3. There are SEVEN questions in this paper
4. Marks are indicated at the end of each question

Question 1

Say something on Pond dyke, pond See page, Bio-filter, Pond free board and Intensive aquaculture system (20 marks)

Question 2

Briefly discuss Regulatory Aquaculture System; in your discussion include a labeled sketch? (20 marks)

Question 3

Discuss cage aquaculture production facility; in your discussion include advantages and disadvantages. (20 marks)

Question 4

Discuss four (4) intensity of aquaculture production systems? (20 marks)

Question 5

- (a) What are the 2 main water sources for aquaculture enterprise? (5 marks)
- (b) What are the advantages and disadvantages of groundwater sources? (15 marks)

Question 6

List and explain five (5) culture facilities used in fish farming? (20 marks)

Question 7

A pond of 25m by 50m to be constructed has the following dimensions;

- Width dike on top (CW)= 1.8m
- Water depth (WD) = 1m
- Freeboard (FB) = 0.45m
- Slope ratio on dry side (SD)= 1.5:1

- Slope ratio on wet side (SW)= 2:1
- Bulking (Settlement Allowance) = 25%

a) Sketch the fish pond with dimensions and determine the area of the fish pond?

(10 marks)

b) You have been asked to check the site for fish farming establishment. List and explain the factors you would consider to select that site?

(10 marks)



KAPASA MAKASA UNIVERSITY
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2023 SESSIONAL EXAMINATION

[FA 330]

[FISH NUTRITION AND FEED TECHNOLOGY]

[DATE: 20.10.2023]

[TIME:09:00-12:00HRS]

Instructions:

1. There are seven questions in total.
2. Answer a Compulsory Question (CQ) in **Section A**.
3. Answer **four (4) questions, two from Section B and two from Section C**.
4. There are 100 marks allocated to this paper.
5. Each question carries 20 marks.
6. Where possible, illustrate your answers.
7. Time allowed: Three (3) hours.
8. When answering follow further instructions in the answer book.

[FISH NUTRITION AND FEED TECHNOLOGY]

SECTION A:

COMPULSORY QUESTION (CQ)

Question One

- (a) Some fish are able to use natural foods in fish ponds. Name several types of natural food. **[4 Marks]**
- (b) Compare and contrast the differences between larval and adult fish foods from a nutritional standpoint and from a practical one. **[6 Marks]**
- (c) As a fish becomes larger, it needs more food. How would you ensure a smooth transition between larval and adult sizes in your grow out operation? **[10 Marks]**

SECTION B: Answer any two (2) questions from this section

Question Two

(a) Multiple Choice: Circle the best answer to each question.

1. Poikilothermic animals may be best described by which of the following terms? **[0.5 Marks]**
 - a. warm-blooded
 - b. cold-blooded
 - c. temperature sensitive
 - d. tolerant of extreme temperature changes
 - e. extremophiles

2. Fish have larval and adult stages. How does this contribute to our understanding of their dietary needs? **[0.5 Marks]**
- a. Fish's dietary needs change greatly with changing life stages.
 - b. Fish always need the same amount of dietary nutrition.
 - c. Fish need much less protein than terrestrial animals need.
 - d. Fish must watch what they eat or they will grow too big.
 - e. Fish should be fed as often as you think is needed to remain healthy.
3. Which of the following is an acceptable definition for nutrition? **[0.5 Marks]**
- a. The provision of all indispensable nutrients in adequate amounts to insure proper growth and maintenance of body functions.
 - b. Involves various chemical reactions and physiological transformations which convert foods into body tissues and activities.
 - c. Involves ingestion, digestion and absorption of various nutrients, transport into cells, and removal of unusable elements and waste products of metabolism.
 - d. All of the above are useful definitions.
 - e. None of the above.
4. What became a defining reason for studying fish nutrition and its effects in the early part of the 20th century until today? **[0.5 Marks]**
- a. Fish are great to look at so we need to feed them good food.
 - b. Fish need constant dietary monitoring, or they will get too fat.
 - c. Fish is good for you to eat and can alleviate several major health risk factors.
 - d. Fish nutrition is just cool.
 - e. Understanding fish nutrition can help us grow more fish.

5. Which of the following is a good larval fish food? **[0.5 Marks]**

- a. rotifers
- b. artemia
- c. minnows
- d. extruded catfish pellets
- e. A and B

6. Instrument for measuring energy value is **[0.5 Marks]**

a	Bomb calorimeter	b	Respirometer
c	Both	d	None of the above

7. Glycogen as a storage polysaccharides occurs mostly in **[0.5 Marks]**

a	Liver	b	Muscle	
c	Both	d	None	

8. Commonly used external markers for digestibility studies is **[0.5 Marks]**

a	Cr_2O_3	b	FeO_2
c	SiO_2	d	None of the above

9. Most powerful anti-nutritional factor present in plant ingredient is
[0.5 Marks]

a	Phytic acid	b	Trysin inhibitor
c	Glucosinolates	d	Haemagglutinins

10. Major storage lipid in fish is [0.5 Marks]

a	Triglycerides	b	Phospholipids
c	Sterols	d	All of the above

(b) True/False

- _____: Fish meal is an infinite source of protein for fish feeds. [0.5 Marks]
- _____: Soybeans are the number one fish meal replacement in fish diets. [0.5 Marks]
- _____: Fish meal provides essential nutrients such as amino acids and minerals to fish feeds. [0.5 Marks]
- _____: Nothing can replace fish meal in diets fed to fish. [0.5 Marks]
- _____: Larval fish food can be fed to adult fish. [0.5 Marks]

2950 fish with an average body weight (ABW) of 503g. Calculate the FCR.
[4 marks].

- f) A farmer wishes to produce 5390kg of fish, on the market there are three types of feeds available, Aller aqua, Novatek, and Namfeeds. If Aller Aqua has an FCR of 1.12 and costs k13/kg, Novatek has an FCR of 1.41 and costs k11.5/kg, and Namfeeds has an FCR of 1.71 and costs k9.89/kg. Determine the feed brand that will lead to the least production cost in terms of feed to be used. **[4 marks].**

Question 7

- a) Feed can be divided into several groups or categories based on several factors. List the different categories of fish feeds you know. **[3 marks]**
- b) Why is it important to monitor fish growth during the culture period from the nutrition and feeding perspective? **[2 marks]**
- c) What are the factors that would affect the feeding rate of fish in a fish pond? **[5 marks]**
- d) What are fish feed additives? **[2 marks]**
- e) List and give a brief description of any three (2) types of feed additives you know. **[4 marks].**
- f) Explain what nutritional deficiency disorders, symptoms, or diseases are in fish. **[2 marks]**
- g) List the categories or groups of nutritional diseases. **[2 marks]**

THE END



KAPASA MAKASA UNIVERSITY

CHINSALI CAMPUS

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCE

EXAMINATION

COURSE : FISHING GEAR AND TECHNOLOGY

CODE : FA 360

DATE : OCTOBER, 2023

INSTRUCTIONS

1. Write your name and ID correctly on the provided answer booklet
2. Answer four questions and question seven is compulsory.
3. There are SEVEN questions in this paper
4. Marks are indicated at the end of each question

Question 1

Define: Fish detection device? Fish aggregation device? Fishing gear And Fishing method?
(20 marks)

Question 2

Discuss in full two (2) broader categories of fishing gears and methods. (20 marks)

Question 3

Discuss acoustic fishing method in the era of advanced fishing methods. (20 marks)

Question 4

Discuss in full gear selectivity and impacts. (20 marks)

Question 5

Seine and Trawl nets are used in fishing; differentiate them with an aid of the diagram.
(20 marks)

Question 6

Discuss in full, the factors to consider when designing a fishing gear. (20 marks)

Question 7

Construct 2 gill nets of standard spacing of 1 meter, staple length of 10 cm. Each net length should be 30 meters. (20 marks)

To do so you need to make computations.

- Determine the total length of netting webbing required for each net with 0.2 and 0.6 hanging ration, respectively?
- How many floaters and sinkers would you need in total?



The Copperbelt University
Kapasa Makasa University Campus
Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: FA 320

COURSE NAME: FISH HEALTH AND DISEASE

TIME ALLOWED: THREE (3) HOURS

DATE: 12TH OCTOBER 2023

INSTRUCTIONS:

- 1. Answer the COMPULSORY QUESTION ONE**
- 2. Answer ANY other FOUR questions in the exam and follow the instructions given in the answer booklet such as "START A NEW QUESTION ON A FRESH PAGE"**

Question 1

Define terms some commonly used in fish disease; Abrasion, Acute, prophylaxis, vaccine, sign, pathogenic, etiological agent and predisposing factor. (20 marks)

Question 2

Imagine you are scientist working in a fish diagnostic laboratory and you are visited by students, briefly explain to the student the difference between Gram - negative and a Gram-positive bacterium. (20 marks)

Question 3

What are 8 the diagnostic tools used in fish disease diagnosis and explain each? (20 marks)

Question 4

Discuss five (5) fish sampling techniques for disease diagnosis? (20 marks)

Question 5

- (a) Define Bio-security? (5 marks)
- (b) Imagine your fish farm with two enterprises (epidemiological sub units) next to an industry, kindly set a sketch and come up with a Bio-security plan. (15 marks)

Question 6

Discuss the five (5) stress conditions that lead to the outbreak? (20 marks)

Question 7

In detail discuss one disease you know, in your response include, causative agent, species affected, predisposing factors, and treatment and control? (20 marks)

2. Fish have larval and adult stages. How does this contribute to our understanding of their dietary needs? **[0.5 Marks]**
- a. Fish's dietary needs change greatly with changing life stages.
 - b. Fish always need the same amount of dietary nutrition.
 - c. Fish need much less protein than terrestrial animals need.
 - d. Fish must watch what they eat or they will grow too big.
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3. Which of the following is an acceptable definition for nutrition? **[0.5 Marks]**
- a. The provision of all indispensable nutrients in adequate amounts to insure proper growth and maintenance of body functions.
 - b. Involves various chemical reactions and physiological transformations which convert foods into body tissues and activities.
 - c. Involves ingestion, digestion and absorption of various nutrients, transport into cells, and removal of unusable elements and waste products of metabolism.
 - d. All of the above are useful definitions.
 - e. None of the above.
4. What became a defining reason for studying fish nutrition and its effects in the early part of the 20th century until today? **[0.5 Marks]**
- a. Fish are great to look at so we need to feed them good food.
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 - c. Fish is good for you to eat and can alleviate several major health risk factors.
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 - e. Understanding fish nutrition can help us grow more fish.

5. Which of the following is a good larval fish food? **[0.5 Marks]**

- a. rotifers
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- c. minnows
- d. extruded catfish pellets
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6. Instrument for measuring energy value is **[0.5 Marks]**

a	Bomb calorimeter	b	Respirometer
c	Both	d	None of the above

7. Glycogen as a storage polysaccharides occurs mostly in **[0.5 Marks]**

a	Liver	b	Muscle	
c	Both	d	None	

8. Commonly used external markers for digestibility studies is **[0.5 Marks]**

a	Cr_2O_3	b	FeO_2
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9. Most powerful anti-nutritional factor present in plant ingredient is
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a	Phytic acid	b	Trysin inhibitor
c	Glucosinolates	d	Haemagglutinins

10. Major storage lipid in fish is [0.5 Marks]

a	Triglycerides	b	Phospholipids
c	Sterols	d	All of the above

(b) True/False

- _____: Fish meal is an infinite source of protein for fish feeds. [0.5 Marks]
- _____: Soybeans are the number one fish meal replacement in fish diets. [0.5 Marks]
- _____: Fish meal provides essential nutrients such as amino acids and minerals to fish feeds. [0.5 Marks]
- _____: Nothing can replace fish meal in diets fed to fish. [0.5 Marks]
- _____: Larval fish food can be fed to adult fish. [0.5 Marks]

(c) Short Answer:

1. Why would you choose to feed a floating ration (feed) to your fish? **[0.5 Marks]**
2. Why is a binder necessary for fish diets? **[0.5 Marks]**
3. Why is fish meal being replaced in fish diets? **[2 Marks]**
4. Why is it necessary that fish consume feed rapidly? **[2 Marks]**
5. List several fish meal substitutes. **[1.5 Marks]**
6. Provide a list of ingredients to a common fish diet. **[2 Marks]**
7. List several sources of protein found in fish diets. **[2 Marks]**
8. What can be done to reduce the cost of fish feeds? **[2 Marks]**

Question Three

- (a) What is pond fertilization and why is it important to fertilize ponds?
[8 Marks]
- (b) What factors affect Nutrient Requirements of Larval **[8 Marks]**
- (c) Vitamins are micro-nutrients required for normal growth, reproduction, health and maintenance of fish metabolism. List down at least four (4) fat-soluble and eleven (11) water-soluble vitamins known to be required by the fish **[4 Marks]**

Question Four

- (a) What is the fate of nutrients in fish feeds? **[8 Marks]**
- (b) Describe Protein (amino acids) requirement in Fish **[12 Marks]**

Section C: Answer any two (2) questions from this section

Question 5

- a) List the methods of feed formulation. [2 Marks]
- b) State the steps involved in feed formulation. [4 Marks]
- c) Using Pearson's square method, formulate grass carp feed containing 25% crude protein using rice bran (8.2% CP) and soybean meal (44% CP). [4 Marks].
- d) As a fish nutritionist, use Pearson's square method to formulate an *Oreochromis andersonii* diet containing 29.9% crude protein (CPF) using rice bran (8.2% CP), soybean meal (44% CP), shrimp meal (52.7% CP) and of maize meal (10.2% CP). [5 Marks].
- e) As a graduate trainee, use Pearson's square method to formulate a salmon diet containing 40% crude protein (CPF) using brewer waste (22.8% CP), fish meal (60% CP), and soybean meal (44% CP). [5 Marks]

Question 6

- a) List and briefly explain the steps involved in feed manufacturing. [4 Marks]
- b) Explain four benefits or advantages of extrusion. [3 marks]
- c) List the parameters used in the evaluation of the efficiency of fish feeds. [3 marks]
- d) Give a brief description of the feed conversion ratio (FCR). [2 marks]
- e) A farmer stocks 4500 *Oreochromis andersonii* fingerlings with an average body weight (ABW) of 10g. The farmer uses 71 bags with each bag weighing 25kg throughout the production period and harvests a total of

2950 fish with an average body weight (ABW) of 503g. Calculate the FCR.
[4 marks].

- f) A farmer wishes to produce 5390kg of fish, on the market there are three types of feeds available, Aller aqua, Novatek, and Namfeeds. If Aller Aqua has an FCR of 1.12 and costs k13/kg, Novatek has an FCR of 1.41 and costs k11.5/kg, and Namfeeds has an FCR of 1.71 and costs k9.89/kg. Determine the feed brand that will lead to the least production cost in terms of feed to be used. **[4 marks].**

Question 7

- a) Feed can be divided into several groups or categories based on several factors. List the different categories of fish feeds you know. **[3 marks]**
- b) Why is it important to monitor fish growth during the culture period from the nutrition and feeding perspective? **[2 marks]**
- c) What are the factors that would affect the feeding rate of fish in a fish pond? **[5 marks]**
- d) What are fish feed additives? **[2 marks]**
- e) List and give a brief description of any three (2) types of feed additives you know. **[4 marks].**
- f) Explain what nutritional deficiency disorders, symptoms, or diseases are in fish. **[2 marks]**
- g) List the categories or groups of nutritional diseases. **[2 marks]**

THE END



**KAPASA MAKASA UNIVERSITY
PAST EXAMINATION PAPERS
2023**

**DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES
FOURTH YEAR F/A**

COURSE CODE:

FA 410

FA 440

FA 420

FA 430

FA 400



The Copperbelt University

Kapasa Makasa University Campus

Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: FA 400

COURSE NAME: AQUACULTURE MANAGEMENT

TIME ALLOWED: THREE (3) HOURS

DATE: 23TH OCTOBER 2023

TIME: 09:00hrs

INSTRUCTIONS:

- 1. Answer the COMPULSORY QUESTION ONE**
- 2. Answer any other FOUR questions to make it a total of FIVE questions attempted.**
- 3. Write your Student Identification Number (S.I.N) clearly**

SECTION A

QUESTION 1 (COMPULSORY)

a). In your own words, please clearly differentiate the following terms used in aquaculture:

- i. Aquaponic systems and hydroponic systems. (2 Marks)
- ii. Aquaculture and capture fisheries. (2 Marks)
- iii. Semi-intensive and intensive aquaculture. (2 Marks)
- iv. Fish food and food fish. (2 Marks)
- v. Aquaculture and agriculture. (2 Marks)

b). Imagine you have just been recruited as an Aquaculture Research Officer in the Ministry of Fisheries and Livestock in Zambia and you have just been posted to one of the government research stations where you have been appointed as the officer responsible for fish seed production. You have just learnt that the station has been producing poor-quality fish seeds (fingerlings) and you have set out a fish seed production team to help you solve the problem.

- i). Explain to your team members the reasons why natural breeding fails in some fish species in captivity. (4 marks)
- ii). State some of the key characteristics of good-quality fingerlings. (6 marks)

SECTION B (ANSWER ANY FOUR (4) QUESTIONS)

Question 2

- a. Define hypophysation, and explain how it is used in aquaculture. (4 marks)
- b. Outline at least eight benefits a household in Mulakupikwa can derive from practising aquaculture. (16 marks)

Question 3.

Write brief notes on each of the following:

- (i) Mating systems in fishes. (5 marks)
- (ii) Attributes of good quality broodstock. (5 marks)
- (iii) Sex reversal as a method of controlling reproduction in tilapia. (5 marks)
- (iv) Integrated agriculture aquaculture (IAA) systems. (5 marks)

Question 4

- a. What are some of the advantages and disadvantages of using pituitary extracts in fish breeding? (10 marks)
- b. Discuss four factors affecting spawning in aquaculture and fishes. (10 marks)

Question 5

- a. Discuss any three factors affecting carrying capacity in aquaculture. (6 marks)
- b. Briefly outline at least three factors influencing growth rate in fish. (6 marks)
- c. Outline some of the **strengths** and **weaknesses** of IAA as a food production system. (8 marks)

Question 6

Discuss in detail four (4) breeding strategies exhibited by fishes. (20 marks)

Question 7

Some of the most commonly farmed fish species globally include *Clarias gariepinus* (African catfish), *Chanos chanos* (Milkfish), *Cyprinus carpio* (Common carp), *Salmo salar* (Atlantic salmon) and several tilapia species mostly Nile Tilapia (*Oreochromis niloticus*). Please outline the general guidelines for the culture and management of any one of these listed fish species. (20 marks)

THE END

WISHING YOU ALL THE SUCCESS!!!!!!!



The Copperbelt University

Kapasa Makasa University Campus

Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: FA 430

COURSE NAME: FISHERIES MANAGEMENT, EXTENSION AND RURAL SOCIOLOGY

TIME ALLOWED: THREE (3) HOURS

DATE: 16TH OCTOBER 2023

TIME: 09:00-12:00

INSTRUCTIONS: 1. There are two sections A and B

2. Question 1 should be answered in the same booklet as any TWO questions from Section A

3. Question 5 should be answered in the same booklet as any TWO questions from Section B

4. Submit separate answer booklets for section A and B

SECTION A

QUESTION 1 (COMPULSORY)

Discuss annual fishing ban that runs from 1st December to 28th /29th February in Zambia

(10 marks)

QUESTION 2

I. Define co-management

(2 marks)

II. Discuss five disadvantages of fisheries co-management

(15 marks)

III. Is fisheries co-management something good or not? Explain.

(3 marks)

QUESTION 3

Upon graduation you get employed as Fisheries Research Officer for Mweru Luapula Fisheries, which has a Fisheries Management Plan (FMP) in place. Discuss five challenges being addressed by the FMP.

(20 marks)

QUESTION 4

Discuss five primary considerations in fisheries management

(20 marks)

SECTION B

QUESTION 5 (COMPULSORY)

Discuss Edgar Dale's Cone of Experience

(10 marks)

QUESTION 6

- (a) Discuss various factors that should be considered for Selection of Extension Teaching Methods (8 marks)
- (b) Explain the Seven R's of Audio-Visual Aids (7 marks)
- (c) In details discuss different types of leadership styles (5 Marks)

QUESTION 7

- (a) Write few notes on the following
 - i. Rapid Rural Appraisal
 - ii. Participatory Learning Approaches
 - iii. Extension Education
 - iv. Ethnocentrism
 - v. Horizontal communication(10 Marks)
- (b) Teaching, in the context of extension and development, can be thought of as providing purposeful direction through learning process. Discuss step by step processes involved in extension teaching. (10 marks)

QUESTION 8

- a. In details, discuss the participatory approaches below which are used in agricultural extension.
 - i. Participatory Rural Appraisal
 - ii. Participatory Learning Methods
 - iii. Participation Action Research(6 marks)
- b. The agricultural sector in Zambia has made strides aiming at improving crop production per hector mainly through the promotion of agricultural technologies among the rural people. However, the adoption rates of such technologies are still low. Discuss various factors that affect the transfer of technologies. (8 marks)
- C. Discuss different steps in extension teaching / (6 marks)



THE COPPERBELT UNIVERSITY

KAPASA MAKASA CAMPUS

SCHOOL OF NATURAL RESOURCES

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

BSc Fisheries and Aquaculture

Sessional Examination 2023

Course Code: FA 420

Course Name: Fish Post Harvest Technology

Time Allowed: Three (3) Hours

DATE: 19 OCTOBER 2023

INSTRUCTIONS: 1. There are two sections in this paper (Section A and B)

2. Section A is **COMPULSORY** (question 1)

3. Attempt any four (4) questions in section B

4. Write your **SIN** Clearly

SECTION A

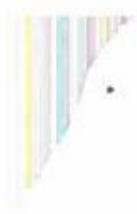
QUESTION 1 (COMPULSORY)

- a. What is quality assurance of fish and fishery Products? **(2 marks)**
- b. State and briefly explain the hazards found in fish fishery products. **(6 marks)**
- c. Why is quality assurance in fish and fishery products important? **(4 marks)**
- d. List the main elements of the HACCP. **(6 marks)**
- e. List two advantages and two disadvantages of HACCP. **(2 marks)**

SECTION B (ANSWER ANY FOUR (4) QUESTIONS)

QUESTION 2

- a. List three (3) factors on which the chemical composition of fish depends. **(2 marks)**
- b. List the biochemical (nutrient) components of fish. **(2 marks)**
- c. Give a brief description of the structure of fish muscles. **(6 marks)**
- d. Explain the difference in the amount of white muscles and red muscles in active fish like tiger fish and less active fish like flounder, and how it relates to their swimming behavior. **(6 marks)**
- e. List two (2) differences between white and red Muscles in fish. **(2 marks)**
- f. Why are health organizations and national authorities today recommending the consumption of at least 2 servings of fish per week? **(2 marks)**



QUESTION 3

- a) List the basic mechanisms that lead to fish spoilage. **(3 marks)**
- b) After harvesting fish from your pond you find that your fish is deteriorating quickly, after analyzing your fish carefully you discover that the cause of the spoilage is bacteria contamination, what do you think could be the source of the bacteria, state four (4) sources and give a brief explanation. **(6 marks)**
- c) State any five (5) changes taking place as the fish spoilage proceeds. **(5 marks)**
- d) State and explain any four (4) factors affecting or contributing to fish spoilage. **(6 marks)**

QUESTION 4

- a) What is fish preservation? **(2 marks)**
- b) What is the importance of fish preservation and what is its role in food security? **(7 marks)**
- c) As a catfish farmer, you have received an order from DR. Congo to supply them with 30,000 pieces of catfish which will be sold in local markets in rural areas, describe the best preservation method you would use to process this fish in readiness for delivery. **(7 marks)**
- d) State the advantages and disadvantages of the preservation method you have stated in question 4c above. **(4 marks)**

QUESTION 5

- a) During the processing of fish and fishery products, food additives may be added, what do you think is the reason for adding the food additives? **(4 marks)**
- b) List and explain five (5) fish and fishery Products. **(8 marks)**
- c) List and explain five (5) ways in which fish and fishery by-products are utilized. **(8 marks)**

QUESTION 6

- a) Why is the packaging of fish and fishery products important, give five reasons. **(5 marks)**
- b) What are some of the fish and fishery products packaging principles, state five? **(5 marks)**
- c) Describe five (5) skills in packaging fresh/dry fish and fishery products. **(5 marks)**
- d) Describe five (5) qualities of good packaging materials for fish and fishery products. **(5 marks)**

QUESTION 7

- a) Why is marketing of fish and fishery products important, give four (4) reasons. **(3 marks)**
- b) Give a brief explanation of any two (2) elements of marketing fish and fishery products. **(5 marks)**
- c) List five (5) of the marketing channels for fish and fishery products you have learned. **(3 marks)**
- d) Explain any four (4) skills that could be adopted by farmers in marketing fish and fishery products to ensure success. **(4 Marks)**
- e) Give a brief explanation of any four (4) challenges to the marketing of fish products **(5 Marks)**

The End

Good LUCK!!!!



Copperbelt University

Kapasa Makasa University

Department of Agriculture and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

FA 440 – Fish Stock Assessment and Population Dynamics

Duration 3 hours (09:00-12:00)

Date 26th October, 2023

INSTRUCTIONS

There are seven (7) questions in this paper

Answer ANY FIVE using the answer booklet provided

QUESTION 1

On 2nd December, 2017, major fishing nations (Canada, EU, Russia, South Korea, China, Japan, Iceland, Denmark) agreed a fishing moratorium (fishing ban) in the Arctic Ocean. The Arctic Ocean was until recently frozen and inaccessible. Therefore, the marine fish/fish stocks are unexploited. Whilst the fishing ban is (moratorium) in place, research will be conducted for a period of 20 years. Thereafter, fishing will or won't happen, according to a BBC report.

a) Explain the term unexploited fish stocks

(5 Marks)

b) Why is the fishing ban (moratorium) necessary at this moment in time?

(5 marks)

c) Research will be conducted for 20 years. What information/data are these researchers interested in?

(5 Marks)

d) What is the ultimate purpose of this research?

(5 Marks)

QUESTION 2

Discuss five reasons why fish is significant to a nation

(20 Marks)

QUESTION 3

Write brief notes on the following:

a) Tragedy of the commons

b) A stock

c) Landing records

d) Portside sampling

(20 Marks)

QUESTION 4

Mention five differences between analytical and holistic models

(20 Marks)



QUESTION 5

Write short notes on the following

a) Mortality

(7 Marks)

b) Spawning potential ratio

(7 Marks)

c) CPUE

(6 Marks)

QUESTION 6

A survey conducted by the Department of Fisheries indicates that there are 10,000,000 fish in stratum 1 of Lake Kariba at the beginning of the year in 2023. Mortality rate in stratum 1 is at 10%, calculate how much fish remained at the end of the year in 2023

QUESTION 7

Fishing effort is capacity harvest fish. Discuss what would happen if capacity to harvest equals fish being born over time.

(20 Marks)



The Copperbelt University

Kapasa Makasa University Campus

Department of Agricultural and Aquatic Sciences

SESSIONAL EXAMINATIONS 2023

COURSE CODE: FA 410

COURSE NAME: FISHERIES ECONOMICS AND ENTREPRENEURSHIP

TIME ALLOWED: THREE (3) HOURS

DATE: 12TH OCTOBER 2023

INSTRUCTIONS: 1. Answer the COMPULSORY QUESTION ONE.

2. Question 1a must be answered in the same booklet as any TWO questions from Section B

3. Question 1b must be answered in the same booklet as ANY TWO questions in Section C.

4. PLEASE SUBMIT TWO SEPARATE ANSWER BOOKLETS

SECTION A COMPULSORY QUESTION

ANSWER QUESTION 1a and Section B in one booklet

ANSWER QUESTION 1b and Section C in one booklet.

QUESTION 1

a) In the economic model of the fishery developed, compare the effect on fishing effort of an increase in cost of a fishing license with an increase in a per-unit tax on fishing effort that raises the same amount of revenue.

i) Assume the fishery is private property. (5 marks)

ii) Repeat the analysis assuming that the fishery is a free-access common property resource.

(5 marks)

b) In summarizing characteristics, features, attitudes and behaviours, experts in entrepreneurship and research advance six dominant themes called Universal Personal Entrepreneurial Competences. Discuss these in detail.

(10 marks)

SECTION B (ANSWER ANY TWO QUESTIONS)

QUESTION 2

Assume that a local fisheries council imposes an enforceable quota of 100 tons of fish on a particular fishing ground for one year. Assume further that 100 tons per year is the efficient sustained yield. When 100 tons have been caught, the fishery would be closed for the remainder of the year.

a) Is this an efficient solution to the common property problem? Why or why not? (10 marks)

b) Would your answer be different if the 100-ton quota were divided into 100 transferable quotas, each entitling the holder to catch 1 ton of fish, and distributed among the fishermen in proportion to their historical catch? Why or why not? (10 marks)



QUESTION 3

Suppose that your state has a problem with pollution of rivers and lakes, from both residential and industrial sources. You are asked to advise on appropriate pollution control policies.

- a) Which kinds of policies would be appropriate? (10 marks)
- b) How would you decide whether to recommend one policy or another? What factors (e.g., different kinds of pollution) would affect your decision? (10 marks)

QUESTION 4

- a) What kinds of problems arise from the focus on standard GDP measures in discussing economic policy? (10 marks)
- b) How do these problems differ for highly industrialized countries like the United States and developing countries like Indonesia? (10 marks)

SECTION C (ANSWER ANY TWO QUESTIONS)

Question 4

Kapasa Makasa University (KMU's) Business Unit is considering buying bakery business from Mr Muna Bweengwa. The trial balance for the last quarter ended 30th September 2023 is presented below. The closing balance for stock was 10% of the purchases.

Details	Dr	Cr
Sales		297,952.00
Purchases	158,178.00	
Opening stock	7,392.00	
Direct transport expenses	4,500.00	
Direct Labour	6,000.00	
Salaries	74,615.00	
Motor vehicle expenses	3,192.00	
Rent	2,500.00	
Insurance	491.00	
General expenses	112.00	
Stationery	6,000.00	
Phones and Internet	2,800.00	
Premises	125,954.00	
Motor vehicles	21,903.00	
Furniture and fittings	22,000.00	
Equipment	35,200.00	
Computer	20,000.00	
Debtors	35,297.00	
Cash at bank	21,804.00	
Cash at hand	451.00	
Creditors		24,011.00
Capital		237,547.00

Drawings	11,121.00	
	559,510.00	559,510.00

Advise the Business Unit whether they should go ahead or not in buying the bakery business from Mr. Muna Bweengwa by drafting the statement of comprehensive income and expenditure and the statement of financial position as at 30th September 2023 to justify your answer.

(20 marks)

Question 6

Kapasa Musonda is having challenges in selling her Japanese quails on the market. She has been advised to use the marketing mix to boost her sales.

- Discuss the marketing mix elements that Kapasa Musonda can use. (14 marks)
- List the four different methods of protecting innovations. (2 marks)
- Discuss what is meant by an innovation falling within the patentable subject matter in entrepreneurship and give two examples of items that do not fall within the patentable subject matter. (4 marks)

Question 7

- Discuss the creativity and innovation process. (10 marks)
- Discuss at least five triggers of entrepreneurship. (5 marks)
- Explain the rationale of registering business organizations. (5 marks)

FISHERIES
AND
AQUACULTURE
2024
YEAR 2 TO 4



KAPASA MAKASA UNIVERSITY
CHINSALI, MUCHINGA PROVINCE
APPLIED BIOCHEMISTRY – FA 220
END OF YEAR FINAL SESSIONAL EXAMINATION

OCTOBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (03) HOURS**
2. Remember to write your identity number on the provided answer sheets
3. All questions carry equal marks **(20 Marks)**
4. Question **ONE** is compulsory
5. Attempt any other **FOUR** questions

**CELLPHONES & PROGRAMMABLE CALCULATORS ARE NOT ALLOWED IN THE
EXAMINATION ROOM**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO BY THE INVIGILATOR

QUESTION ONE

1. Nutrition plays an important role in farm animal production. With your knowledge of Biochemistry, kindly attempt any four:
 - 1.1. Illustrate the different components of feed (5 marks)
 - 1.2. State the features of common monosaccharides (5 marks)
 - 1.3. State the properties of water that make it the cradle of life (5 marks)
 - 1.4. Why is fat a better energy storage form than CHO in animals (5 marks)
 - 1.5. Mention the sources of water and effects of low water in animal? (5 marks)

QUESTION TWO

2. Optimum feeding for food animal is crucial to attain some return on investment. However, failure to properly balance the diet may result in losses due to limited optimal resource utilization and increased wastage. Mr. Kayombo is a neophyte weekend farmer and hires you for consultation to explain biochemically how nutrients influence profitability. Kindly demonstrate to Mr Kayombo How excess carbohydrates can be converted and stored in the form of lipids in the body of a boar if not fed a properly balanced diet? (20 marks)

QUESTION THREE

3. Proteins form an integral component of living organisms and have profound effects on either livestock and fisheries production or aquaculture production.
 - 3.1. Discuss the importance of proteins in animal production (10 marks)
 - 3.2. Describe the structure of an amino acid (5 marks)
 - 3.3. Explain the biochemical basis of supplementing indispensable amino acids in animals' diets including. (5 marks)

QUESTION FOUR

4. Formulating a balanced diet for food animals requires all supplied nutrients are within acceptable limits. Knowing the interplay between lipids and carbohydrates, describe in detail;
 - 4.1. How dietary lipids are absorbed from the GIT and presented to the various target cells in the body. (10 marks)

4.2. How fat degradation is tightly linked to carbohydrate metabolic degradation pathway (10 marks)

QUESTION FIVE

5. Hormones play a significant biological role both in food animals. In detail and with an aid of an illustration, explain how release of hormones is regulated. (20 marks)

QUESTION SIX

6. Carbohydrate metabolism in the liver is very important for several reasons including storage of excess sugars.

6.1. Describe the factors influencing the amount of carbohydrates reaching the liver (10 marks)

6.2. Fate of glucose in the liver (10 marks)

QUESTION SEVEN

7. The understanding and application of Biochemistry has potential to transform the Livestock industry. Knowing so well that most activities occur at tissue and cellular level, demonstrate your clear knowledge of cellular structure with respect to biochemical activities in each cellular organelle in an ox at *Golonita* farms. (20 Marks)



KAPASA MAKASA UNIVERSITY
CHINSALI, MUCHINGA PROVINCE
APPLIED BIOCHEMISTRY – FA 220
END OF YEAR FINAL SESSIONAL EXAMINATION

OCTOBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (03) HOURS**
2. Remember to write your identity number on the provided answer sheets
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KAPASA MAKASA UNIVERSITY
FACULTY OF APPLIED SCIENCE AND OPEN LEARNING
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES
CHINSALI, MUCHINGA PROVINCE
LIMNOLOGY – FA 230
END OF YEAR FINAL SESSIONAL EXAMINATION

22ND OCTOBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks (**20 Marks**)
4. Question one is **COMPULSORY**
5. Attempt a total of **FIVE** questions

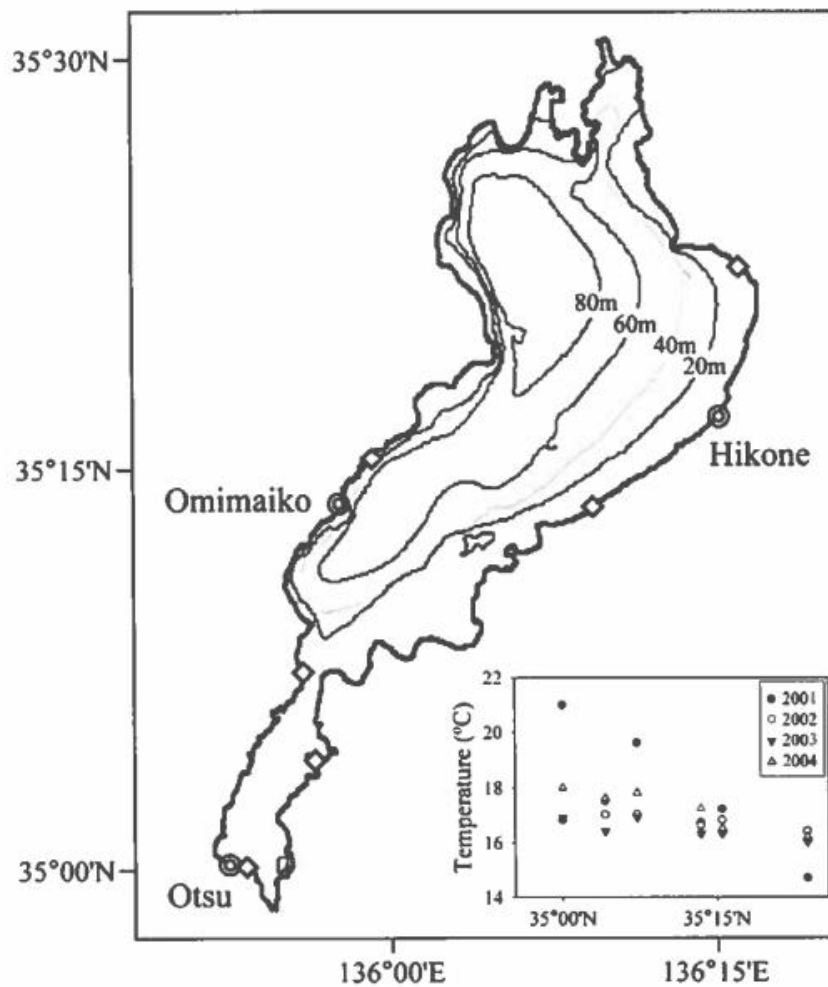
**CELLPHONES AND OTHER RELATED GAGETS ARE NOT ALLOWED IN THE EXAMINATION
ROOM**

**DO NOT TURN THIS PAGE UNTIL YOU HAVE BEEN TOLD TO DO SO BY THE CHIEF
INVIGILATOR**

QUESTION ONE.

1.

- A. The lake below is Lake Biwa, the largest lake in Japan, located at latitudes of $34^{\circ}58' - 35^{\circ}31' \text{ N}$ and longitudes of $135^{\circ}52' - 136^{\circ}17' \text{ E}$. Study the bathymetric map carefully and answer the questions that follow.



Source: Yamamoto, Y. & K90, S. J. 2012: Relationship between latitude and growth of bluegill *Lepomis macrochirus* in Lake Biwa, Japan.

- i. What is the maximum depth of this Lake (Z_m)? (1 mark)
- ii. Calculate the lake's relative depth (Z_r)? (1 mark)

$$(A = 672 \text{ km}^2)$$

- iii. Calculate the Lake's volume given that the area bound by each Isobath is given in the table below. **(8 marks)**

Isobath	Area (m ²)
0	A ₀ = 618
20	A ₁ = 462
40	A ₂ = 243
60	A ₃ = 131
80	A ₄ = 52

- B. Lake basins are formed due to endogenous geological processes and exogenous activities. Mention five (5) types of lake basins and describe how they are formed. **(10 marks)**

QUESTION TWO.

2.

- A. Water chemistry influence water biology," Discuss **(10 marks)**
 B. With the aid of a well labelled illustration describe the Clinograde oxygen profile.

(10 marks)

QUESTION THREE

3.

- A. With the aid of a well labelled illustration, describe the zonation of a typical lentic ecosystem. **(10 marks)**
 B. Discuss the water budget of freshwater ecosystems. **(10 marks)**

QUESTION FOUR

4. Account for the roles of light, food, temperature and gravity in the vertical distribution of zooplanktons in lakes. **(20 marks)**

QUESTION FIVE.

5. Water has several characteristics that make it special when compared to other liquids. Mention **four (4)** such characteristics and explain their importance in controlling the physicochemical properties of lakes. **(20 marks)**

QUESTION SIX.

6.

A. Write brief notes on each of the following:

- i. Gross production **(2 marks)**
- ii. Thermocline **(2 marks)**
- iii. Ecological efficiency **(2 marks)**
- iv. Cenoses **(2 marks)**
- v. Vertical extinction coefficient **(2 marks)**

B. Discuss the fixation of nitrogen in a typical freshwater lake. **(10 marks)**

QUESTION SEVEN

7.

A. Mention **five (5)** the factors that control the distribution of macrophytes. **(10 marks)**

B. Distinguish between:

- i. Autogenic and Allogenic plankton? **(2 marks)**
- ii. Cirque and Kettle Lakes? **(2 marks)**
- iii. Holoplankton and Meroplankton? **(2 marks)**
- iv. Oligotrophic and Eutrophic lakes? **(2 marks)**
- v. Neustons and Nektons? **(2 marks)**

END OF EXAMINATION, BEST WISHES



KAPASA MAKASA UNIVERSITY

School of Applied Science and Open Learning

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCE

EXAMINATION

COURSE : FISH GENETICS AND BREEDING

CODE : FA 210

DATE : 29th OCTOBER, 2024

INSTRUCTIONS

1. Write your name and ID correctly on the answer booklet provided.
2. There are SEVEN questions in this paper
3. Answer Five (5) questions and question Seven is compulsory.
4. Marks are indicated at the end of each question

Question 1

i) Which of the following is the basic unit of heredity?

- a) Chromosome
- b) DNA
- c) Gene
- d) Allele

(10 marks)

ii) Define the term "allele" and explain how it relates to fish breeding.

(10 marks)

Question 2

i) What are the advantages and disadvantages of using genetic markers in fish breeding programs?

(10 marks)

ii) Explain the concept of inbreeding and its potential consequences in aquaculture breeding programs.

(10 marks)

Question 3

Describe the primary goals of fish breeding programs and explain the importance of genetic improvement in aquaculture. *(20 marks)*

Question 4

Explain the concept of sex determination in fish. Provide examples of different mechanisms. *(20 marks)*

Question 5

Describe the basic structure of a fish's genome and discuss how it differs from that of other vertebrates. *(20 marks)*

Question 6

Explain the methods used in selective breeding of fish and discuss their advantages and disadvantages. *(20 marks)*

Question 7

You are a geneticist for a fish farming company that specializes in tilapia. The farm has noticed reduced growth rates in their fish over the past few generations.

Identify possible genetic and environmental factors that may be contributing to these reduced growth rates. Propose a breeding strategy to enhance growth traits in the tilapia population *(20 marks)*



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FACULTY OF APPLIED SCIENCE AND OPEN LEARNING
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

ICHTHYOLOGY – FA210
END OF YEAR FINAL SESSIONAL EXAMINATION

29th OCTOBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks (**20 Marks**)
4. Question one in (Section A) is **COMPULSORY**
5. Attempt a total of **FOUR optional** questions in Section B

**CELLPHONES AND OTHER RELATED GAGETS ARE NOT ALLOWED IN THE
EXAMINATION ROOM**

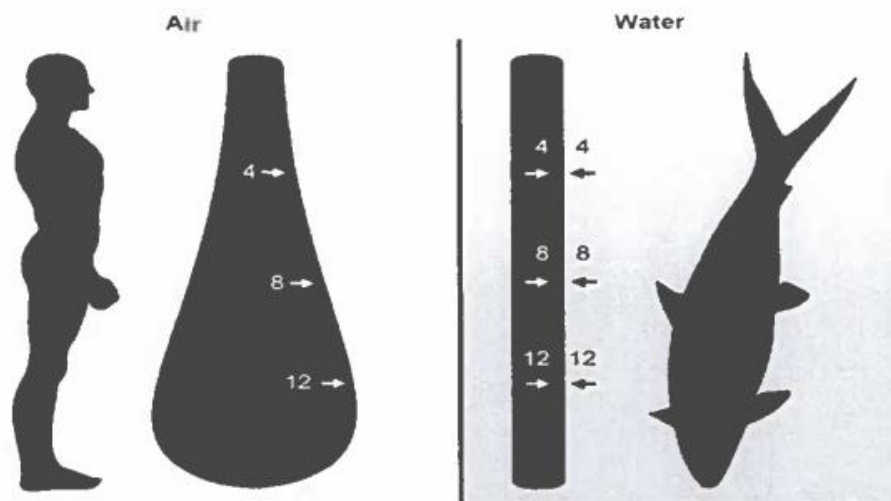
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INVIGILATOR**

SECTION A - Compulsory

This section contains only **one compulsory** question which you are required to attempt in addition to the other four (4) in Section B

QUESTION ONE (20marks)

The figure below shows the effect of hydrostatic pressure on a terrestrial organism (man) while standing, compared to an aquatic organism (fish) at various depths within the water column.



- Briefly explain the meaning of hydrostatic pressure of water. How does it affect the physiology of fish? **(6marks)**
 - Briefly explain how negative buoyancy affects or influences the adaptation and swimming modes of fish **(4marks)**.
 - Carangiform is an intermediate swimming mode between undulation and oscillation, and is associated with periodic swimming; with constant cruising & acceleration. Briefly explain how fluctuations in water pH may affect the swimming ability of fish with carangiform mode **(6marks)**
 - Based on your answer in (c), give two reasons as to why body adulation may not be of significant important in fish employing carangiform swimming mode? **(4mark)**.
-

SECTION B - Optional

There are six (6) questions in this section. You are required to choose and attempt any **four (4)** questions. Failure to adhere to this instruction may result in loss of marks.

QUESTION TWO (20marks)

Blood is an important component in the circulatory system and plays vital roles in gaseous exchange, nutrient distribution and immune balance of the fish. Ichthyologists study blood to improve the care and welfare of fish.

- a. Differentiate the role of Lymphocyte and Thrombocytes in the physiology of fish. **(6marks)**.
 - b. What is blood viscosity and why is it a factor of concern in the circulatory system of fish? **(4marks)**.
 - c. What is meant by 'Haematocrit' and how is it important in the metabolic process of fast swimming fish, such as *Lates stappersii*? **(5marks)**.
 - d. Differentiate between arteriosus and venous circulatory systems. In which one, do you expect highest blood volume? **(5marks)**.
-

QUESTION THREE (20marks)

Musculature of fish is similar to other vertebrates and the effectiveness of the muscles is dependent on the species, sex and age. A greater proportion (40–60%) of the mass of a fish's muscle is made up of locomotory muscle.

- a. Differentiate between red and white muscles in fish. What is the metabolic significance of pink muscles in the body of fish? **(5marks)**.
 - b. What is Myocommata and why is it important in the physiology of fish? **(4mark)**.
 - c. What are myofibrils and why are they important in the general architecture of fish anatomy? **(3mark)**.
 - d. Distinguish *Epicardium* from the *Endocardium*. In which one do you expect to find smooth muscles and why? **(4marks)**.
 - e. How does age and fast swimming modes, such as thunniform, influence the musculature system of fish? **(4marks)**.
-

QUESTION FOUR (20marks)

Reproductive output of a fish is an important parameter in understanding and management of fisheries resources. However, this parameter is greatly affected by environmental factors as well as the physical fitness of fish.

- a. As a fish biologist, briefly explain two (2) parameters you would measure on a fish to effectively understand its reproductive output? **(6mark)**
 - b. What do you understand by the term '*Relative Fecundity*' and why is it important in appreciating the breeding ecology of fish? **(3mark)**
 - c. Suggest and briefly explain how any three (3) environmental factors may affect gonadal somatic index (GSI) of fish on spatiotemporal scale **(6marks)**.
 - d. Explain why iteroparity may be an ideal breeding mode for diadromous fish species **(4marks)**
 - e. What two proxies would one use to determine the quality of fish eggs? **(1mark)**
-

QUESTION FIVE (20marks)

Diadromy or fish migration is the predictable movements of individuals between marine and freshwater environments and is biogeographically and phylogenetically widespread across fishes.

- a. Briefly describe three diadromy models commonly exhibited in fish **(6marks)**.
 - b. In your opinion, what two (2) factors are most likely to influence fish to exercise diadromy or migrate? **(6marks)**.
 - c. Diadromy is closely linked to the physical fitness of the fish and the decision of the fish either to engage in the practice is influenced by the environment. State and briefly explain the part of the brain responsible for activities such as diadromy **(6marks)**.
 - d. Why is it important for diadromous fish species to return to their natal places/habitats? **(2marks)**.
-

QUESTION SIX (20marks)

Fish are poikilotherms and their O₂ demand is closely influenced by the inverse relationship between dissolved oxygen and ambient temperature. Most metabolic process in fish are affected by this relationship.

- Briefly explain how fluctuations in temperature affect oxygen solubility in water (4marks).
- Differentiate fish exhibiting *Stenotherm* and *Eurytherms* adaptation modes. (4marks).
- Explain three (3) ways in which fish subjected to constant hypoxia in the water column may adapt to such conditions (6marks).
- Briefly explain the importance of the brachial circulation system in fish (2marks)
- Suggest and explain two (2) anatomic features that make gill lamella an efficient aperture for gaseous exchange. (4marks).

QUESTION SEVEN (20marks)

- Describe how the three types of fish, Osteichthyes, Chondrichthyes and Cyclostomata can be distinguished from each other on an evolutionary scale (6marks)
- Actinopterygii* (Teleost or Teleostei) fishes make up the vast majority of fish known today, both at sea and in continental waters. Briefly describe the distinguishing anatomic features of these fishes (4marks)
- What is the importance of median fins to the welfare of teleost fishes? (2mark)
- What is meant by '*Ontogenetic dietary shift*' and why is it important in piscivores (4marks).
- How does the relationship between fish size and length of its intestine (Relative gut length) help in determining the feeding habits of fish? (4marks)

END OF EXAMINATION, BEST WISHES.



KAPASA MAKASA UNIVERSITY

CHINSALI, MUCHINGA PROVINCE

BACHELOR OF SCIENCE IN FISHERIES AND AQUACULTURE

SOIL AND WATER QUALITY MANAGEMENT – FA 250

END OF YEAR FINAL SESSIONAL EXAMINATION

16TH OCTOBER 2024 (09:00 HRS)

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks (**20 Marks**)
4. Question one is **COMPULSORY**
5. Attempt a total of **FIVE** questions. One compulsory question and two questions from each section.
6. Do **NOT** write in pencil (except for graphs and diagrams).
7. The marks shown against the requirement(s) for each question should be taken as an indication of the expected length and depth of the answer.
8. All workings must be done in the answer booklet.
9. Present legible and tidy work.

CELLPHONES AND OTHER RELATED GAGETS ARE NOT ALLOWED IN THE EXAMINATION ROOM

DO NOT TURN THIS PAGE UNTIL YOU HAVE BEEN TOLD TO DO SO BY THE CHIEF INVIGILATOR

QUESTION ONE.

1.

A. Mrs. Lusato wants to construct two 600 m² ponds at her farm. She consulted Mwaka, a KMU graduate to determine whether the soil at her farm was good for pond aquaculture. Mwaka collected soil samples at three different sites and carried out soil tests. She then used a 10 cm Auger with a diameter of 10 cm to get a field moist core which she oven dried at 105°C. She then calculated the bulk density of the oven dry core and found 1.05 g/cm³. She placed the oven dry core in a pan of water until it was water satiated. The satiated oven dry soil weighed 1.25 kg.

- i. Calculate the volume of the field moist core? [3 Marks]
- ii. Calculate the total soil porosity. [2 Marks]
- iii. When constructing the pond, Mrs. Lusato was told to remove 15 cm thick top layer of the soil over the entire pond area. What would be the weight of this soil be?

[3 marks]

B. Below are Mwaka's other soil test findings.

Soil Sample	pH	Exchangeable Cations (cmol/Kg)			CEC (cmol/Kg)	Per% Aluminum Saturation
		Ca	Mg	Al		
Site A	6.2	0.61	0.04	1.43		
Site B	6	0.71	0.08	1.62		
Site C	5.8	0.30	0.03	2.67		
Average						

- i. Calculate the CEC of this Soil. [3 Marks]
- ii. Calculate the percentage aluminum saturation of this soil. [3 Marks]
- iii. Do you think this soil would be good for pond aquaculture? What would you advise Mrs. Lusato to do? [2 Marks]
- iv. Assuming that the lime requirement of this soil is 1.5 times the amount of exchangeable Aluminum cation, and that the lime penetration depth is 10 cm. What amount of lime would have to be applied to the soil over the entire pond area to improve its pH? [4 Marks]

QUESTION TWO.

2.

- A. Discuss the importance of soil amendments and explain their effect on soils. **[10 Marks]**
- B. John Mafoshi is a Bachelor of Science graduate from Kapasa Makasa University. He wants to prepare a 100 Kg of 6-6-6 fertilizer using ammonium nitrate (33.5% of N), triple superphosphate (46% P_2O_5) and muriate of potash (60 % K_2O) fertilizers to be used in his grandfather's earthen fish pond in Chinsali.
- i. Calculate the amount of ammonium nitrate (35% N), triple superphosphate (46% P_2O_5) and muriate of potash (60% K_2O) needed? **[9 Marks]**
- ii. How much filler must he add to make a 100 Kg bag of fertilizer? **[1 Marks]**

QUESTION THREE

3.

- A. To what extent is waste water treatment in Recirculation Aquaculture systems similar to that of conventional WWTP? **[10 Marks]**
- B. Distinguish between the following terms:
- i. Coagulation and Flocculation **[2 Marks]**
- ii. Odour masking and odour counteraction **[2 Marks]**
- iii. Radial flow settler and Swirl separator **[2 Marks]**
- iv. Settleable solids and Suspended solids **[2 Marks]**
- v. Turbidity and Water transparency **[2 Marks]**

QUESTION FOUR.

4.

- A. Discuss the soil-water Nutrient exchange of a typical earthen Pond. **[10 Marks]**
- B. Illustrate five (5) types of mechanical weathering. **[10 Marks]**

QUESTION FIVE.

5.

- A.** Based on their metabolism discuss the classification of microbes. **[10 Marks]**
- B.** With the aid of a well labelled diagram describe the carbon cycle in water. **[10 Marks]**

QUESTION SIX.

6.

- A.** Write Short notes on each of the following terms (as used in Aqua
 - i.** Activated Sludge **[2 Marks]**
 - ii.** Cation Exchange Capacity **[2 Marks]**
 - iii.** Probiotics **[2 Marks]**
 - iv.** Pedogenesis **[2 Marks]**
 - v.** Biological Surface Area **[2 Marks]**
- B.** Discuss solids removal in Recirculation Aquaculture Systems. **[10 Marks]**

QUESTION SEVEN.

7.

- A.** Colloids are an important soil fraction due to the properties that make them. Explain in brief the role they play in the transfer of minerals. **[10 Marks]**
- B.** Discuss five soil ecosystem services **[10 Marks]**

END OF EXAMINATION, BEST WISHES.



KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCES AND EDUCATION
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2024 SESSIONAL EXAMINATION

[FA 330]

[FISH NUTRITION AND FEED TECHNOLOGY]

[DATE: 14 OCTOBER 2024]

[TIME: 9:00-12:00 Hrs]

Instructions:

1. There are seven questions in total.
2. Answer a Compulsory Question (CQ) in **Section A**.
3. Answer **four (4) questions from Section B**.
4. There are 100 marks allocated to this paper.
5. Each question carries **20 marks**.
6. Where possible, illustrate your answers.
7. Time allowed: **Three (3) hours**.
8. When answering follow further instructions in the answer book.

[FISH NUTRITION AND FEED TECHNOLOGY]

SECTION A:

COMPULSORY QUESTION (CQ)

Question One

- a)** Briefly outline the importance of fish nutrition and technology, and explain how advancements in this area contribute to the growth, health, sustainability, and economic efficiency of aquaculture. **[6 Marks]**
- b)** Briefly explain the fundamentals of fish nutrition, focusing on the relationship between nutrition and fish growth. **[5 Marks]**
- c)** Explain natural feeds and artificial feeds, highlighting the differences and their roles in fish nutrition. **[4 Marks]**
- d)** As a graduate trainee, your supervisor, Mr. Gunduza, has asked you to plan the feed quantity for Thursday. The pond has 5600 fish with an average body weight (ABW) of 65g. Fish are fed three times a day at 3-5% of their body weight. Calculate the total feed required and the feed ration for each feeding time. **[5 Marks]**

SECTION B: ANSWER ANY FOUR (4) QUESTIONS FROM THIS SECTION

Question Two

- a)** Briefly describe one macronutrient, detailing its properties, classification, and functions, and providing examples of its sources. **[7 Marks]**

- b) List at least three essential amino acids that fish frequently need and limiting that must supplemented in fish feeds. [2 Marks]**
- c) Discuss how protein requirements vary among different fish species and explain the optimal protein level for practical diets in herbivorous and omnivorous fish used in pond feedings. [5 Marks]**
- d) Explain one common nutritional deficiency disorder in fish, including their symptoms and effects. [6 Marks]**

Question Three

- a) What are fish feed ingredients? Briefly explain how they are classified and provide examples. [5 Marks]**
- b) List five (5) ingredients that are commonly used in fish diet formulation. [4 Marks]**
- c) What are alternative feed ingredients? Give examples. [3 Marks]**
- d) What are fish feed additives? [3 Marks]**
- e) List and give a brief description of any two (2) types of feed additives you know. [6 marks]**

Question Four

- a) Why are binders necessary in fish diets? [3 Marks]**
- b) Why are vitamin/mineral premixes important in fish feeds? [3 Marks]**
- c) Micro-nutrients are required for normal growth, reproduction, health, and maintenance of fish metabolism. Describe one category of micronutrient you are familiar with and provide examples of its sources. [7 Marks]**
- d) What are anti-nutritional factors? Provide one example, explain its effect on fish health, and describe how it can be eliminated from feed ingredients. [7 Marks]**

Question Five

- a) What are the steps involved in fish feed formulation? **[5 Marks]**
- b) List three methods used in fish feed formulation. **[3 Marks]**
- c) As a graduate trainee, Mr. Dumbwiza has tasked you with formulating feed for his tilapia using soybean meal (44% CP), fish meal (57% CP), and maize meal (10.2% CP). The target is a feed containing 35% crude protein (CP). Using Pearson's square method, show how you would formulate this diet. **[7 Marks]**
- d) State the advantages of extrusion in fish feed manufacturing? **[5 Marks]**

Question Six

- a) List the steps involved in feed manufacturing. **[2 Marks]**
- b) What parameters are used to evaluate fish feed efficiency? **[3 Marks]**
- c) Mr. Tombwe cultured his *Oreochromis andersonii* for 5 months. He stocked 5900 fingerlings weighing 21g. At the end of the 5 months, he harvested 5785 fish weighing 400g each and the total feed used was 120 bags weighing 25kg each. Calculate the following:
 - i) Feed Conversion Ratio (FCR). **[4 Marks]**
 - ii) Feed Efficiency Ratio (FER). **[2 Marks]**
 - iii) Average Daily Gain (ADG). **[2 Marks]**
 - iv) Residual Feed Intake (RFI) if the predicted intake is 0.004kg/day. **[3 Marks]**

- d)** Mr. Polopela plans to produce 6,090 kg of fish and has three feed options: Aller Aqua (FCR=1.12, price=K31/kg), Novatek (FCR=1.41, price=K29/kg), and Namfeeds (FCR=1.71, price=K27/kg). Calculate which feed brand will result in the lowest total feed cost based on the amount of feed required. **[4 Marks]**

Question Seven

- a)** Feed can be divided into several groups or categories based on several factors. List two (2) categories of fish feeds you know. **[3 marks]**
- b)** Provide a brief explanation of precision nutrition and its importance in aquaculture. **[5 marks]**
- c)** Explain nutrigenomics and its relevance to improving aquaculture production. **[6 marks]**
- d)** Discuss the role of artificial intelligence in enhancing fish nutrition and feed technology. **[6 marks]**

THE END



KAPASA MAKASA UNIVERSITY

School of Applied Science and Open Learning

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCE

EXAMINATION

COURSE : FISH HEALTH AND DISEASE

CODE : FA 320

DATE : 30th OCTOBER, 2024

INSTRUCTIONS

1. Write your name and ID correctly on the answer booklet provided.
2. Answer Five (5) questions and question Seven is compulsory.
3. There are SEVEN questions in this paper
4. Marks are indicated at the end of each question

Question 1

Which of the following is a common viral disease in fish?

- a) Loiasis
- b) Viral Hemorrhagic Septicemia (VHS)
- c) Lyme disease
- d) Rabies

What is the primary causative agent of columnaris disease in fish?

- a) Virus
- b) Bacteria
- c) Parasite
- d) Fungi

(20 marks)

Question 2

What are some common symptoms of mycobacterial infections in fish?
How do these infections typically affect fish physiology? *(20 marks)*

Question 3

Which of the following practices below can help prevent the spread of fish diseases in aquaculture? And explain your answer?

- a) Overcrowding tanks
- b) Quarantine new fish before introduction
- c) Using untreated water sources
- d) Feeding fish with high-density feed

(20 marks)

Question 4

Explain the importance of biosecurity measures in aquaculture. Provide at least three specific examples? *(20 marks)*

Question 5

Evaluate the effectiveness of different treatment options for external parasites (such as lice or flukes) in fish. Compare and contrast at least two treatment methods. *(20 marks)*

Question 6

You are tasked with conducting a disease survey in a local fish population. Outline the sampling strategy you would use and the factors you would consider in your assessment. *(20 marks)*

Question 7

Given a scenario where a farmer reports high mortality rates in a specific fish species, outline a step-by-step approach to diagnose the issue. What diagnostic tools and techniques would you employ? *(20 marks)*



KAPASA MAKASA UNIVERSITY

FA 300

AQUATIC ECOLOGY AND ENVIRONMENT

(09:00-12:00)

Date 17th October, 2024

INSTRUCTIONS

There are seven (7) questions in this this paper

Answer ANY FIVE using the answer booklet provided

QUESTION 1

- a) What is an aquatic ecosystem? [2 marks]
- b) Explain, with examples, three (3) aquatic ecosystems [18 marks]

QUESTION 2

Fish species migration can be categorized into two groups – migratory and non-migratory. Define fish migration and outline its four (4) advantages

[20 marks]

QUESTION 3

Write short notes on of the following:

- a) Rheotaxis
- b) Niche differentiation
- c) Size selective predation

[20 marks]

QUESTION 4

Foraging is an adaptative behavior trait that is key to the survival of fish species. Describe four merits of foraging. [20 marks]

QUESTION 5

What is fish diversity? Discuss the five (5) navigational techniques employed by migratory fish.

[20 marks]

QUESTION 6

Fish is waterborne organism. Discuss four (4) characteristics that make it survive in water environments.

[20 marks]

QUESTION 7

Globally, fish is known to undergo lot of developmental stage. Discuss allopatric speciation as it relates to fish.

[20 marks]



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DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

FISHING GEARS & TECHNOLOGY – FA360
END OF YEAR FINAL SESSIONAL EXAMINATION 2024

25th OCTOBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks **(20 Marks)**
4. Question one in (Section A) is **COMPULSORY**
5. Attempt a total of **FOUR optional** questions in Section B

**CELLPHONES AND OTHER RELATED GAGETS ARE NOT ALLOWED IN THE
EXAMINATION ROOM**

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INVIGILATOR**

SECTION A - Compulsory

This section contains only **one compulsory** question which you are required to attempt in addition to the other four (4) in Section B.

QUESTION ONE (20marks)

- i. What is a monofilament net? (**2 marks**)
 - ii. The Zambian government under the auspices of the Department of Fisheries (DoF) has prohibited the use of monofilament nets, regardless of the mesh size and net construction. Most monofilament nets are made of a synthetic polymer called polyamide (PA) or Nylon. Using your knowledge on netting materials and specifically synthetic fibers, give four (4) reasons as to why the step being taken by the Department of Fisheries for complete ban of monofilament nets is correct in ecological terms (**8 marks**).
 - iii. Natural fibers as netting materials have been cited to have limitations in their use, especially that they are susceptible to biodegradation and increase on thickness, bulkiness and weight upon wetting. Provide four (4) reasons as to why these limitations are a positive attribute as far as the conservation of a given fishery is concerned (**8 marks**).
 - iv. Why are synthetic fibers most preferred as netting material for fishing gear compared to natural fibers? (**2 marks**).
-

SECTION B - Optional

There are six (6) questions in this section. You are required to choose and attempt any **four (4)** questions. Failure to adhere to this instruction may result in loss of marks.

QUESTION TWO (20marks)

“Military prowess and industrialization have largely contributed to the rapid depletion of fish stocks in most aquatic ecosystems of the world.” Argue for or against this school of thought, providing technical justification for your arguments. (**20 marks**)

QUESTION THREE (20marks)

- a. Briefly discuss two (2) senses that are played upon when constructing and using traps for catching fish in a small lentic ecosystem (**10marks**).
 - b. In your opinion, why are traps and weir detrimental to the ecological integrity of a multispecies fishery? (**5marks**).
 - c. Discuss any two factors that are most likely to influence gear selectivity of traps (**5marks**).
-

QUESTION FOUR (20marks)

- a. What is the difference between a fishing gear and a fishing method? (**2marks**).
- b. Briefly discuss limitations associated with the use of gillnets in collecting biological data on fish or fisheries (**8marks**).

Describe as to why the foraging ecology and vertical adaptation of a targeted fish species are important parameters to consider when constructing a fishing gear. (**10marks**).

QUESTION FIVE (20marks)

- a. On a technical scale, differentiate fish aggregating devices from fish detection devices (**4marks**).
 - b. Briefly explain how the technology of echosounder work in hydroacoustic studies of bathypelagic fish populations (**6marks**).
 - c. The Nature Conservancy (TNC) are working on Lake Itzhi Tezhi to improved stock performance of *Limnothrissa miodon* (Kapenta), a small pelagics introduced in that lake. As a fisheries expert, advise TNC on how best they can use hydroacoustic methods (such as echosounder) to effectively design conservation and management measures? (**8marks**).
 - d. What is sock time and why is it an important parameter in determining efficiency of a gear? (**2marks**).
-

QUESTION SIX (20marks)

- a. Some conservationists have argued that use of fish aggregating devices (FADs) may be detrimental to the stability of fish stocks on spatiotemporal scale. With two examples, briefly discuss why you may concur with this school of thought **(8marks)**.
 - b. Briefly discuss two ways in which fish aggregating devices (FADs) can be used to improve stock performance of inshore fisheries in a multispecies system such as the Lake Mweru Wa Ntipa **(8marks)**.
 - c. Why is site survey an important initial step in the setting of fish aggregating devices (FADs) or artificial reefs? **(4marks)**.
-

QUESTION SEVEN (20marks)

- a. Distinguish gear selectivity from gear efficiency **(2marks)**.
- b. Technically explain four ways how a beach seine affects the reproduction and population structure of fish in an area its frequently operated in **(8marks)**.
- c. As a scientist, why would you insistently prefer to use the beach seine net to collect fisheries biological data even when then gear is banned for use in commercial fisheries of Zambia **(5marks)**?
- d. Briefly discuss three ecological impacts associated with the use of dredges in commercial fisheries. **(5marks)**.

END OF EXAMINATION, BEST WISHES.



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FACULTY OF APPLIED SCIENCE AND OPEN LEARNING
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES
CHINSALI, MUCHINGA PROVINCE
AQUACULTURE SYSTEMS AND ENGINEERING - FA 310
END OF YEAR FINAL SESSIONAL EXAMINATION

21ST OCTOBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks (**20 Marks**)
4. Question one is **COMPULSORY**
5. Attempt a total of **FIVE** questions

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QUESTION 1

1.

- A. State and write short notes on the three parameters required to describe the re-use or recirculation system. **[6 Marks]**
- B. What are the advantages and disadvantages of:
 - i. Open channel **[2 Marks]**
 - ii. Re-use system **[3 Marks]**
- C. Sketch and label a centralized water re-use system **[9 Marks]**

QUESTION 2

- 2. With the help of a well-labeled diagram, discuss all the possible technical components of a land-based fish hatchery and juvenile production farm. **[8 Marks]**
 - A. State and briefly describe four advantages of the water recirculation system. **[8 Marks]**
 - B. State and briefly describe two disadvantages of the water recirculation system. **[4 Marks]**

QUESTION 3

- 3. You are managing a freshwater aquaculture pond system, and during routine water quality monitoring, you find that the pH levels have dropped to 5.8, well below the optimal range for the species you're cultivating.
 - A. What could be the possible causes of the low pH in your pond, and how might this affect the health of the fish? **[10 Marks]**
 - B. Describe the actions in detail you would take to adjust the pH back to the optimal range and prevent it from dropping again. **[10 Marks]**

QUESTION 4

- 4. Kafue Fisheries fish farm has just constructed one pond, measuring 12.5m x 30m, and as employed you as a Graduate trainee to estimate the profits in 1 year project period. Refer to the following assumptions below; **[20 Marks]**
 - 60% running costs from the gross revenue realized.
 - Using sexually reversed fingerlings.

- 10% mortalities.
- Stocking density of 6 fingerlings/m².
- 2 production cycles per year (each cycle is 6 months).
- A growth rate of 300g at the end of each cycle.
- Kafue fisheries fish price of K89/kg.

QUESTION 5

5. Write short notes on the following.

- | | |
|-----------------------------------|-----------|
| A. Hatchery. | [4 Marks] |
| B. Semi-intensive farming system. | [4 Marks] |
| C. Mooring system. | [4 Marks] |
| D. Pond culture system. | [4 Marks] |
| E. Raceway culture system. | [4 Marks] |

QUESTION 6

6. A government initiative plans to expand aquaculture operations in rural areas to improve food security and create jobs. However, the initiative lacks detailed guidelines on site selection for aquaculture projects.
- A. As an aquaculture expert, you are tasked with advising the government on developing comprehensive guidelines for selecting suitable sites for aquaculture. [15 Marks]
- B. Discuss how the improper consideration of these factors could negatively impact the sustainability and productivity of the aquaculture project. [5 Marks]

QUESTION SEVEN

7. A fish farming company in Zambia is considering starting a cage farming project in a large freshwater lake. The company has identified two potential locations:

Location A: Near the lake's shoreline, with shallow water and moderate currents. The area is close to a fishing village, providing easy access to labor and markets.

However, the water quality fluctuates due to runoff from nearby agricultural activities, and there is a risk of theft due to the proximity to the village.

Location B: Farther from the shore, in deeper water with strong currents and good water quality. It is located far from human settlements, making labor and transportation more expensive. However, the risk of pollution and theft is low.

TASK:

Evaluate both locations in terms of their suitability for cage farming. Recommend which location the company should choose for their cage farming project, and justify your recommendation.

(20 marks)

END OF EXAMINATION, BEST WISHES.



KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCES AND EDUCATION
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2024 SESSIONAL EXAMINATION

[FA 330]

[FISH NUTRITION AND FEED TECHNOLOGY]

[DATE: 14 OCTOBER 2024]

[TIME: 9:00-12:00 Hrs]

Instructions:

1. There are seven questions in total.
2. Answer a Compulsory Question (CQ) in **Section A**.
3. Answer **four (4) questions from Section B**.
4. There are 100 marks allocated to this paper.
5. Each question carries **20 marks**.
6. Where possible, illustrate your answers.
7. Time allowed: **Three (3) hours**.
8. When answering follow further instructions in the answer book.

[FISH NUTRITION AND FEED TECHNOLOGY]

SECTION A:

COMPULSORY QUESTION (CQ)

Question One

- a)** Briefly outline the importance of fish nutrition and technology, and explain how advancements in this area contribute to the growth, health, sustainability, and economic efficiency of aquaculture. **[6 Marks]**
- b)** Briefly explain the fundamentals of fish nutrition, focusing on the relationship between nutrition and fish growth. **[5 Marks]**
- c)** Explain natural feeds and artificial feeds, highlighting the differences and their roles in fish nutrition. **[4 Marks]**
- d)** As a graduate trainee, your supervisor, Mr. Gunduza, has asked you to plan the feed quantity for Thursday. The pond has 5600 fish with an average body weight (ABW) of 65g. Fish are fed three times a day at 3-5% of their body weight. Calculate the total feed required and the feed ration for each feeding time. **[5 Marks]**

SECTION B: ANSWER ANY FOUR (4) QUESTIONS FROM THIS SECTION

Question Two

- a)** Briefly describe one macronutrient, detailing its properties, classification, and functions, and providing examples of its sources. **[7 Marks]**

- b) List at least three essential amino acids that fish frequently need and limiting that must supplemented in fish feeds. [2 Marks]**
- c) Discuss how protein requirements vary among different fish species and explain the optimal protein level for practical diets in herbivorous and omnivorous fish used in pond feedings. [5 Marks]**
- d) Explain one common nutritional deficiency disorder in fish, including their symptoms and effects. [6 Marks]**

Question Three

- a) What are fish feed ingredients? Briefly explain how they are classified and provide examples. [5 Marks]**
- b) List five (5) ingredients that are commonly used in fish diet formulation. [4 Marks]**
- c) What are alternative feed ingredients? Give examples. [3 Marks]**
- d) What are fish feed additives? [3 Marks]**
- e) List and give a brief description of any two (2) types of feed additives you know. [6 marks]**

Question Four

- a) Why are binders necessary in fish diets? [3 Marks]**
- b) Why are vitamin/mineral premixes important in fish feeds? [3 Marks]**
- c) Micro-nutrients are required for normal growth, reproduction, health, and maintenance of fish metabolism. Describe one category of micronutrient you are familiar with and provide examples of its sources. [7 Marks]**
- d) What are anti-nutritional factors? Provide one example, explain its effect on fish health, and describe how it can be eliminated from feed ingredients. [7 Marks]**

Question Five

- a) What are the steps involved in fish feed formulation? **[5 Marks]**
- b) List three methods used in fish feed formulation. **[3 Marks]**
- c) As a graduate trainee, Mr. Dumbwiza has tasked you with formulating feed for his tilapia using soybean meal (44% CP), fish meal (57% CP), and maize meal (10.2% CP). The target is a feed containing 35% crude protein (CP). Using Pearson's square method, show how you would formulate this diet. **[7 Marks]**
- d) State the advantages of extrusion in fish feed manufacturing? **[5 Marks]**

Question Six

- a) List the steps involved in feed manufacturing. **[2 Marks]**
- b) What parameters are used to evaluate fish feed efficiency? **[3 Marks]**
- c) Mr. Tombwe cultured his *Oreochromis andersonii* for 5 months. He stocked 5900 fingerlings weighing 21g. At the end of the 5 months, he harvested 5785 fish weighing 400g each and the total feed used was 120 bags weighing 25kg each. Calculate the following:
 - i) Feed Conversion Ratio (FCR). **[4 Marks]**
 - ii) Feed Efficiency Ratio (FER). **[2 Marks]**
 - iii) Average Daily Gain (ADG). **[2 Marks]**
 - iv) Residual Feed Intake (RFI) if the predicted intake is 0.004kg/day. **[3 Marks]**

- d)** Mr. Polopela plans to produce 6,090 kg of fish and has three feed options: Aller Aqua (FCR=1.12, price=K31/kg), Novatek (FCR=1.41, price=K29/kg), and Namfeeds (FCR=1.71, price=K27/kg). Calculate which feed brand will result in the lowest total feed cost based on the amount of feed required. **[4 Marks]**

Question Seven

- a)** Feed can be divided into several groups or categories based on several factors. List two (2) categories of fish feeds you know. **[3 marks]**
- b)** Provide a brief explanation of precision nutrition and its importance in aquaculture. **[5 marks]**
- c)** Explain nutrigenomics and its relevance to improving aquaculture production. **[6 marks]**
- d)** Discuss the role of artificial intelligence in enhancing fish nutrition and feed technology. **[6 marks]**

THE END



KAPASA MAKASA UNIVERSITY

School of Applied Science and Open Learning

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCE

EXAMINATION

COURSE : FISH HEALTH AND DISEASE

CODE : FA 320

DATE : 30th OCTOBER, 2024

INSTRUCTIONS

1. Write your name and ID correctly on the answer booklet provided.
2. Answer Five (5) questions and question Seven is compulsory.
3. There are SEVEN questions in this paper
4. Marks are indicated at the end of each question

Question 1

Which of the following is a common viral disease in fish?

- a) Loiasis
- b) Viral Hemorrhagic Septicemia (VHS)
- c) Lyme disease
- d) Rabies

What is the primary causative agent of columnaris disease in fish?

- a) Virus
- b) Bacteria
- c) Parasite
- d) Fungi

(20 marks)

Question 2

What are some common symptoms of mycobacterial infections in fish?
How do these infections typically affect fish physiology? *(20 marks)*

Question 3

Which of the following practices below can help prevent the spread of fish diseases in aquaculture? And explain your answer?

- a) Overcrowding tanks
- b) Quarantine new fish before introduction
- c) Using untreated water sources
- d) Feeding fish with high-density feed

(20 marks)

Question 4

Explain the importance of biosecurity measures in aquaculture. Provide at least three specific examples? *(20 marks)*

Question 5

Evaluate the effectiveness of different treatment options for external parasites (such as lice or flukes) in fish. Compare and contrast at least two treatment methods. *(20 marks)*

Question 6

You are tasked with conducting a disease survey in a local fish population. Outline the sampling strategy you would use and the factors you would consider in your assessment. *(20 marks)*

Question 7

Given a scenario where a farmer reports high mortality rates in a specific fish species, outline a step-by-step approach to diagnose the issue. What diagnostic tools and techniques would you employ? *(20 marks)*



KAPASA MAKASA UNIVERSITY

FA 300

AQUATIC ECOLOGY AND ENVIRONMENT

(09:00-12:00)

Date 17th October, 2024

INSTRUCTIONS

There are seven (7) questions in this this paper

Answer ANY FIVE using the answer booklet provided

QUESTION 1

- a) What is an aquatic ecosystem? [2 marks]
- b) Explain, with examples, three (3) aquatic ecosystems [18 marks]

QUESTION 2

Fish species migration can be categorized into two groups – migratory and non-migratory. Define fish migration and outline its four (4) advantages

[20 marks]

QUESTION 3

Write short notes on of the following:

- a) Rheotaxis
- b) Niche differentiation
- c) Size selective predation

[20 marks]

QUESTION 4

Foraging is an adaptative behavior trait that is key to the survival of fish species. Describe four merits of foraging. [20 marks]

QUESTION 5

What is fish diversity? Discuss the five (5) navigational techniques employed by migratory fish.

[20 marks]

QUESTION 6

Fish is waterborne organism. Discuss four (4) characteristics that make it survive in water environments.

[20 marks]

QUESTION 7

Globally, fish is known to undergo lot of developmental stage. Discuss allopatric speciation as it relates to fish.

[20 marks]



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FACULTY OF APPLIED SCIENCE AND OPEN LEARNING
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

FISHING GEARS & TECHNOLOGY – FA360
END OF YEAR FINAL SESSIONAL EXAMINATION 2024

25th OCTOBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks **(20 Marks)**
4. Question one in (Section A) is **COMPULSORY**
5. Attempt a total of **FOUR optional** questions in Section B

**CELLPHONES AND OTHER RELATED GAGETS ARE NOT ALLOWED IN THE
EXAMINATION ROOM**

**DO NOT TURN THIS PAGE UNTIL YOU HAVE BEEN TOLD TO DO SO BY THE CHIEF
INVIGILATOR**

SECTION A - Compulsory

This section contains only **one compulsory** question which you are required to attempt in addition to the other four (4) in Section B.

QUESTION ONE (20marks)

- i. What is a monofilament net? (**2 marks**)
 - ii. The Zambian government under the auspices of the Department of Fisheries (DoF) has prohibited the use of monofilament nets, regardless of the mesh size and net construction. Most monofilament nets are made of a synthetic polymer called polyamide (PA) or Nylon. Using your knowledge on netting materials and specifically synthetic fibers, give four (4) reasons as to why the step being taken by the Department of Fisheries for complete ban of monofilament nets is correct in ecological terms (**8 marks**).
 - iii. Natural fibers as netting materials have been cited to have limitations in their use, especially that they are susceptible to biodegradation and increase on thickness, bulkiness and weight upon wetting. Provide four (4) reasons as to why these limitations are a positive attribute as far as the conservation of a given fishery is concerned (**8 marks**).
 - iv. Why are synthetic fibers most preferred as netting material for fishing gear compared to natural fibers? (**2 marks**).
-

SECTION B - Optional

There are six (6) questions in this section. You are required to choose and attempt any **four (4)** questions. Failure to adhere to this instruction may result in loss of marks.

QUESTION TWO (20marks)

“Military prowess and industrialization have largely contributed to the rapid depletion of fish stocks in most aquatic ecosystems of the world.” Argue for or against this school of thought, providing technical justification for your arguments. (**20 marks**)

QUESTION THREE (20marks)

- a. Briefly discuss two (2) senses that are played upon when constructing and using traps for catching fish in a small lentic ecosystem (**10marks**).
 - b. In your opinion, why are traps and weir detrimental to the ecological integrity of a multispecies fishery? (**5marks**).
 - c. Discuss any two factors that are most likely to influence gear selectivity of traps (**5marks**).
-

QUESTION FOUR (20marks)

- a. What is the difference between a fishing gear and a fishing method? (**2marks**).
- b. Briefly discuss limitations associated with the use of gillnets in collecting biological data on fish or fisheries (**8marks**).

Describe as to why the foraging ecology and vertical adaptation of a targeted fish species are important parameters to consider when constructing a fishing gear. (**10marks**).

QUESTION FIVE (20marks)

- a. On a technical scale, differentiate fish aggregating devices from fish detection devices (**4marks**).
 - b. Briefly explain how the technology of echosounder work in hydroacoustic studies of bathypelagic fish populations (**6marks**).
 - c. The Nature Conservancy (TNC) are working on Lake Itzhi Tezhi to improved stock performance of *Limnothrissa miodon* (Kapenta), a small pelagics introduced in that lake. As a fisheries expert, advise TNC on how best they can use hydroacoustic methods (such as echosounder) to effectively design conservation and management measures? (**8marks**).
 - d. What is sock time and why is it an important parameter in determining efficiency of a gear? (**2marks**).
-

QUESTION SIX (20marks)

- a. Some conservationists have argued that use of fish aggregating devices (FADs) may be detrimental to the stability of fish stocks on spatiotemporal scale. With two examples, briefly discuss why you may concur with this school of thought **(8marks)**.
 - b. Briefly discuss two ways in which fish aggregating devices (FADs) can be used to improve stock performance of inshore fisheries in a multispecies system such as the Lake Mweru Wa Ntipa **(8marks)**.
 - c. Why is site survey an important initial step in the setting of fish aggregating devices (FADs) or artificial reefs? **(4marks)**.
-

QUESTION SEVEN (20marks)

- a. Distinguish gear selectivity from gear efficiency **(2marks)**.
- b. Technically explain four ways how a beach seine affects the reproduction and population structure of fish in an area its frequently operated in **(8marks)**.
- c. As a scientist, why would you insistently prefer to use the beach seine net to collect fisheries biological data even when then gear is banned for use in commercial fisheries of Zambia **(5marks)**?
- d. Briefly discuss three ecological impacts associated with the use of dredges in commercial fisheries. **(5marks)**.

END OF EXAMINATION, BEST WISHES.



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DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES
CHINSALI, MUCHINGA PROVINCE
AQUACULTURE SYSTEMS AND ENGINEERING - FA 310
END OF YEAR FINAL SESSIONAL EXAMINATION

21ST OCTOBER 2024

INSTRUCTIONS TO CANDIDATES

1. Time allowed is **THREE (3) HOURS**
2. Remember to write your student identity number (SIN) on the provided answer sheets
3. All questions carry equal marks (**20 Marks**)
4. Question one is **COMPULSORY**
5. Attempt a total of **FIVE** questions

CELLPHONES AND OTHER RELATED GAGETS ARE NOT ALLOWED IN THE EXAMINATION ROOM

DO NOT TURN THIS PAGE UNTIL YOU HAVE BEEN TOLD TO DO SO BY THE CHIEF INVIGILATOR

QUESTION 1

1.

- A. State and write short notes on the three parameters required to describe the re-use or recirculation system. **[6 Marks]**
- B. What are the advantages and disadvantages of:
 - i. Open channel **[2 Marks]**
 - ii. Re-use system **[3 Marks]**
- C. Sketch and label a centralized water re-use system **[9 Marks]**

QUESTION 2

- 2. With the help of a well-labeled diagram, discuss all the possible technical components of a land-based fish hatchery and juvenile production farm. **[8 Marks]**
 - A. State and briefly describe four advantages of the water recirculation system. **[8 Marks]**
 - B. State and briefly describe two disadvantages of the water recirculation system. **[4 Marks]**

QUESTION 3

- 3. You are managing a freshwater aquaculture pond system, and during routine water quality monitoring, you find that the pH levels have dropped to 5.8, well below the optimal range for the species you're cultivating.
 - A. What could be the possible causes of the low pH in your pond, and how might this affect the health of the fish? **[10 Marks]**
 - B. Describe the actions in detail you would take to adjust the pH back to the optimal range and prevent it from dropping again. **[10 Marks]**

QUESTION 4

- 4. Kafue Fisheries fish farm has just constructed one pond, measuring 12.5m x 30m, and as employed you as a Graduate trainee to estimate the profits in 1 year project period. Refer to the following assumptions below; **[20 Marks]**
 - 60% running costs from the gross revenue realized.
 - Using sexually reversed fingerlings.

- 10% mortalities.
- Stocking density of 6 fingerlings/m².
- 2 production cycles per year (each cycle is 6 months).
- A growth rate of 300g at the end of each cycle.
- Kafue fisheries fish price of K89/kg.

QUESTION 5

5. Write short notes on the following.

- | | |
|-----------------------------------|-----------|
| A. Hatchery. | [4 Marks] |
| B. Semi-intensive farming system. | [4 Marks] |
| C. Mooring system. | [4 Marks] |
| D. Pond culture system. | [4 Marks] |
| E. Raceway culture system. | [4 Marks] |

QUESTION 6

6. A government initiative plans to expand aquaculture operations in rural areas to improve food security and create jobs. However, the initiative lacks detailed guidelines on site selection for aquaculture projects.
- A. As an aquaculture expert, you are tasked with advising the government on developing comprehensive guidelines for selecting suitable sites for aquaculture. [15 Marks]
- B. Discuss how the improper consideration of these factors could negatively impact the sustainability and productivity of the aquaculture project. [5 Marks]

QUESTION SEVEN

7. A fish farming company in Zambia is considering starting a cage farming project in a large freshwater lake. The company has identified two potential locations:

Location A: Near the lake's shoreline, with shallow water and moderate currents. The area is close to a fishing village, providing easy access to labor and markets.

However, the water quality fluctuates due to runoff from nearby agricultural activities, and there is a risk of theft due to the proximity to the village.

Location B: Farther from the shore, in deeper water with strong currents and good water quality. It is located far from human settlements, making labor and transportation more expensive. However, the risk of pollution and theft is low.

TASK:

Evaluate both locations in terms of their suitability for cage farming. Recommend which location the company should choose for their cage farming project, and justify your recommendation.

(20 marks)

END OF EXAMINATION, BEST WISHES.

FISHERIES
AND
AQUACULTURE
2025
YEAR 2 TO 4



KAPASA MAKASA UNIVERSITY
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCE
END OF YEAR EXAMINATIONS
2024/2025 ACADEMIC YEAR

AA200/NR200 : BIOMETRY

Thursday, 13th November 2025 : 09 : 00 – 12 : 00

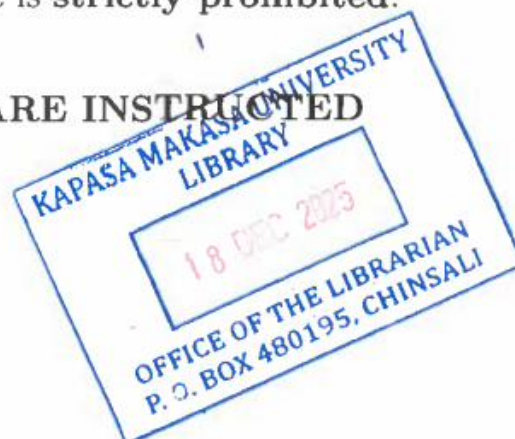
Time Allowed: 3 hours

Total Marks: 100

Instructions

1. Indicate your **computer number** on all your answer booklets.
2. There are **Two** sections in this examination paper. The question in **Section A** is compulsory and in **Section B** attempt **any three (3)** questions.
3. All questions carry equal marks. Mark allocations are shown in brackets.
4. **Full credit** will only be given when **all necessary working** is shown.
5. Use of scientific, non-programmable **calculators** is **allowed**.
6. Use of smartphones, smartwatches, or any other electronic devices capable of communication, calculation, or data storage is **strictly prohibited**.

DO NOT TURN OVER UNTIL YOU ARE INSTRUCTED



Section A

1. (a) Distinguish the following terms used in Biometry.
- (i) Biometry and Statistics [2]
 - (ii) Descriptive and Inferential statistics [2]
 - (iii) Quantitative and Qualitative data [2]
- (b) The following data represent the yields (in tons per hectare) of a specific crop collected from various agricultural fields during a regional field survey:

12.4 17.8 14.2 20.6 11.3 16.9 18.5 22.7 28.4 19.6 23.5 25.0
30.2 13.1 17.4 21.9 24.3 27.8 29.1 10.7 15.9 18.2 26.6 34.0
19.8 15.3 20.4 25.7 31.3 33.5 32.1 14.6 11.9 16.2 21.1 23.8
28.9 29.4 24.0 30.8

- (i) Create a cumulative distribution table using class intervals of width 4, starting with a lower limit of 10.0. [8]
 - (ii) Construct a frequency polygon. [3]
 - (iii) Construct an Ogive [3]
- (c) A researcher collected data on the weight (in kilograms) of maize harvest from 12 small-holder farms. The following summary statistics were obtained:

$$\sum_{i=1}^{12} x_i = 960 \quad \text{and} \quad \sum_{i=1}^{12} x_i^2 = 82,560$$

Using this information, calculate the following.

- (i) The mean harvest weight per farm. [2]
- (ii) The variance of the harvest weights. [3]

Section B

2. (a) Show that for a sample $x_1, x_2, \dots, x_n$, the sample variance

$$\frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2 = \frac{1}{n-1} \left(\sum_{i=1}^n x_i^2 - n\bar{x}^2 \right)$$

[4]

- (b) A total of 50 fish farmers participated in a training workshop. As part of a skills assessment, they were tested on their ability to correctly grade Tilapia. The number of fish each farmer correctly graded in a 5-minute period is shown below along with their frequencies.

Fish Graded Correctly	Number of Farmers (Frequency)
10	3
15	6
20	10
25	15
30	9
35	5
40	2

Find the following:

- (i) The mean number of fish correctly graded. [4]
- (ii) The median number of fish correctly graded. [3]
- (iii) The standard deviation of the number of fish graded. [5]
- (c) The following data represents the daily water requirements (in liters) for 30 different small-scale irrigation plots recorded during one growing season:

25 32 28 30 27 35 40 33 31 29
 34 36 38 41 37 26 24 39 43 45
 22 23 21 44 42 20 19 18 17 46

- (i) Find the **Interquartile Range (IQR)** [5]
- (ii) Find the **25th percentile**

[4]

3. (a) Distinguish the following terms used in Probability.

- (i) Mutually exclusive and Non mutually exclusive events [2]
- (ii) Statistically dependent and independent events [2]
- (iii) Discrete random variable and Continuous random variable [2]

(b) At a large grain cooperative, the moisture content of a randomly selected batch of wheat is normally distributed with a mean of 14.5% and a standard deviation of 2.2%. This is a critical measure, as high moisture can lead to spoilage during storage.

Determine the probability that a randomly selected batch of wheat will have a moisture content that is:

- (i) Between 13% and 16%. [4]
- (ii) Between 17% and 19%. [4]
- (iii) Below 12%. [2]

(iv) To prevent spoilage, batches in the highest 5% of moisture content must be dried before storage. What is the minimum moisture content that requires a batch to be dried? [5]

(c) A study was conducted on the monthly fertilizer usage for a sample of 80 small-scale maize farms. The average fertilizer usage for the sample is 420 kg per month. Assuming the standard deviation of fertilizer usage for all farms is 50 kg, construct a 95% confidence interval estimate of the actual mean fertilizer usage. [4]

4. (a) A grain storage facility has observed that trucks delivering maize arrive randomly at an average rate of 30 trucks per hour. Calculate the probability that:

(i) only 2 trucks will arrive during a specified 1-hour period [2]

(ii) at least 3 trucks will arrive during a specified 30-minute period. [5]

(b) A study is conducted to compare maize yields under two different sustainable farming practices: **Conservation Tillage (CT)** and **Organic Farming (OF)**. A random sample of 60 farms using CT records an average yield of **4.8 tons per hectare** with a known population standard deviation of **0.6 tons**, while 55 farms using OF record an average yield of **4.5 tons per hectare** with a known population standard deviation of **0.5 tons**. At the 5% level of significance, test whether the average maize yields are the same under the two farming practices. [8]

(c) A study was conducted on 9 different commercial tomato farms to investigate the relationship between the amount of fertilizer applied and the resulting crop yield. The data collected are shown below:

Farm	Fertilizer Applied (kg/ha)	Tomato Yield (tons/ha)
1	50	12.5
2	200	28.0
3	100	22.0
4	150	26.5
5	250	29.0
6	75	18.0
7	175	27.5
8	125	24.0
9	225	30.5

(i) Identify which variable is the dependent variable and why? [2]

(ii) Calculate the Pearson correlation coefficient and interpret. [8]

5. (a) A survey was conducted among students in the School of Agricultural Sciences at Kapasa Makasa University. The students were classified by their *field of specialization* and by *gender*. The results are shown below:

Field of Specialization	Male	Female	Total
Crop Science (CS)	18	22	40
Animal Production (AP)	20	15	35
Fisheries Management (FM)	25	30	55
Total	63	67	130

If one student is chosen at random from this group, find:

- (i) $P(\text{Female})$ [2]
 - (ii) $P(\text{Male} \cap \text{Crop Science})$ [2]
 - (iii) $P(\text{Fisheries Management} \mid \text{Female})$ [3]
- (b) A nutritionist claims that a certain breed of goats produces an average of **2.5 liters of milk per day**. A random sample of 12 goats produces a mean of **2.8 liters/day** with a sample standard deviation of **0.4 liters**. Using a 5% significance level, test whether the average daily milk production differs from the claimed 2.5 liters. [6]
- (c) A researcher recorded the **amount of fertilizer applied (kg/ha)** and the corresponding **maize yield (tons/ha)** from eight experimental plots, as shown below:

Fertilizer (kg/ha)	0	20	40	60	80	100	120	140
Maize yield (t/ha)	1.2	1.8	2.3	2.6	3.0	3.3	3.5	3.6

- (i) Identify independent variable [1]
 - (ii) Construct a **scatter plot** of maize yield against fertilizer rate. [3]
 - (iii) Determine the **linear regression equation** that best fits the data. [7]
 - (iv) Using the regression line, **estimate the expected maize yield** when 50 kg/ha of fertilizer is applied. [1]
6. (a) Define the following terms used in Biometry
- (i) Variable [1]
 - (ii) Sample [1]
- (b) A commercial farming company has observed that only 30% of job applicants for farm machinery operation are fully qualified. If 6 applicants are interviewed, let X be the number of qualified applicants.

Find the following probabilities:

(i) $P(X = 1)$

(ii) $P(X \geq 3)$

[3,5]

- (c) A livestock nutritionist conducted an experiment to compare the average daily weight gain (in kg) of lambs fed four different dietary supplements (Supplement P, Q, R, and S). The weight gains over a 30-day trial period are shown below:

Here's the table with totals for each group added:

Supplement P	Supplement Q	Supplement R	Supplement S
0.8	1.2	1.5	1.0
0.9	1.1	1.4	0.9
0.7	1.3	1.6	1.1
1.0	1.0	1.3	0.8
0.8			1.2
Total: 4.2	Total: 4.6	Total: 5.8	Total: 5.0

- (i) State three assumptions assumed to carry out analysis of variance [3]
- (ii) Test the hypothesis that there is no significant difference in the mean daily weight gain among the four supplements at $\alpha = 0.05$ level of significance. [12]

END OF EXAMINATION PAPER!



KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCES AND OPEN LEARNING
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES
BACHELOR OF SCIENCE DEGREE

FA210 – ICHTHYOLOGY

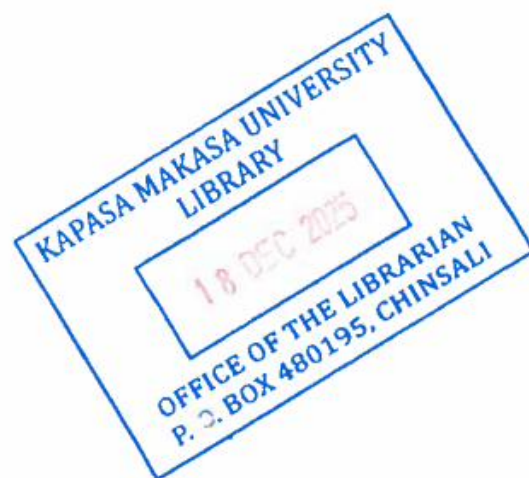
SESSIONAL EXAMINATION

DATE: 3rd NOVEMBER 2025

TIME: THREE (3) HOURS

INSTRUCTIONS

- Write your Student Identification Number on the Answer Booklet provided
- There are seven questions in this paper.
- There two sections in this paper (A and B).
- Section A** has one compulsory question.
- Choose any four (4) questions from **section B**.
- Start **each** answer on a new page.
- No unauthorized materials are allowed
- No electronic devices are allowed unless specified.
- Write clearly and legibly.

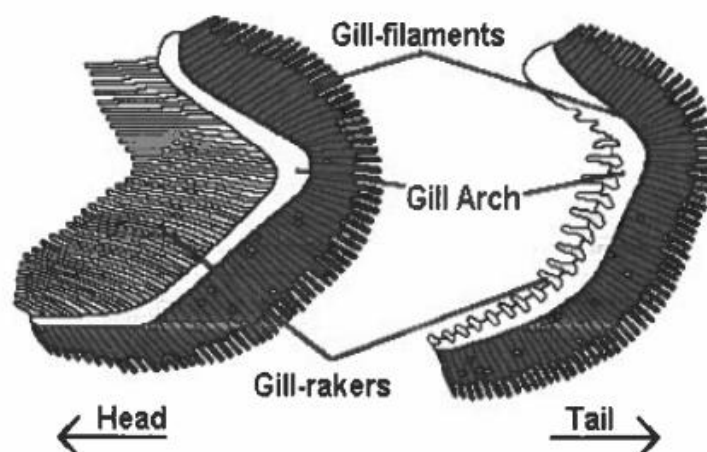


DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO.

SECTION A - COMPULSORY

QUESTION ONE (20 marks)

The major distinguishing feature of fish from other vertebrate is its ability to breath under water using gills (Figure 1). For gaseous exchange, fish have been known to have a single circulatory system, i.e, blood passes the heart only once in a complete circuit. Study the below and attempt the questions that follows.



- Explain the functions of gill rakers, gill arch and gill filament in a fish (3marks).
- Explain two adaptations that make gill filaments efficient breathing organ of fish (2marks).
- Differentiate between gill and ram ventilation. In which one is mainly exercised by fish with thunniform swimming mode? (4marks).
- Reasoning from your answer in (c), which ventilation (gill or ram) do you expect the fish to exercise in the event of extreme hypoxia. Justify your answer (2marks).
- How does super saturation (hyperoxia) of dissolved oxygen (DO) in water affect the physiology of fish? (2marks).
- Many fish species are known to be 'oxygen regulators' in their gaseous, explain (3marks).
- Briefly explain what is meant by aquatic and aerial breathing and in each case, give examples of any fish species that able to exercise either type of breathing (4marks).

SECTION B – ATTEMPT ANY FOUR QUESTIONS

QUESTION TWO (20 marks)

The success of an organism in its natural setting is defined as the ability to reproduce fertile offsprings. However, biological and environmental factors often disrupt successful reproduction for many organisms including fish. From this backdrop;

- Explain two (2) important hormones and their role in the reproductive process of fish (**4marks**).
- Briefly explain two (2) ways in which endocrine disrupting compounds (EDH) released in water, such as heavy metals can affect the reproductive process of fish (**4marks**).
- Fecundity is the number of eggs a fish lays per spawning event. Briefly explain two (2) biological factors that would affect the fecundity of fish (**4marks**).
- What is gonadal somatic index (GSI) and why is it important in reproductive ecology of fish (**4marks**).
- Briefly discuss two (2) ecological factors that would cause a fish to migrate from one habitat to another in order to maximize in its reproduction (**4marks**).

QUESTION THREE (20 marks)

- Briefly explain how heat shock proteins (HSP) help in the process of homeostasis of fish in habitats with fluctuating temperatures (**3marks**).
- Differentiate the following terms; ectotherms, endotherms and heterotherms (**3marks**).
- Based on your answer in (c), how is fish able to attain heterothermic state (**2marks**).
- Briefly discuss how a stenohaline adapted fish species is able to maintain ionic balance between the environment and its body (**5marks**).
- Differentiate between canal and superficial neuromasts of the lateral line in fish (**4marks**).
- Briefly explain what electroreceptors are and how they are used by the fish (**3marks**).

QUESTION FOUR (20 marks)

- a. Describe how the three types of fish, Osteichthyes, Chondrichthyes and Cyclostomata can be distinguished from each other on an evolutionary scale (6marks).
- b. *Actinopterygii* (Teleost or Teleostei) fishes make up the vast majority of fish known today, both at sea and in continental waters. Briefly describe the distinguishing anatomic features of these fishes (4marks).
- c. Briefly explain how chemoreception is important for breeding and parenting among teleost fishes? (4mark).
- d. Describe any two (2) effects of chemical pollutants on the olfactory abilities of teleost fishes adapted to benthic habitats (4marks).
- e. What are 'pheromones' and how are they used by the fish? (2marks).

QUESTION FIVE (20 marks)

Musculature of fish is similar to other vertebrates and the effectiveness of the muscles is dependent on the species, sex and age. A greater proportion (40–60%) of the mass of a fish's muscle is made up of locomotory muscle.

- a. Differentiate between skeletal and cardiac muscles in fish. What is the metabolic significance of pink muscles in the body of fish? (5marks).
- b. What is Myocommata and why is it important in the physiology of fish? (4mark).
- c. What are sonic muscles and why are they important in the general physiology of fish? (3mark).
- d. Distinguish *Epicardium* from the *Endocardium*. In which one do you expect to find smooth muscles and why? (4marks).
- e. Comment on the muscle integrity of anguilliform swimmers compared to their thunniform counterparts in teleost fishes? (4marks).

QUESTION SIX (20 marks)

Blood is an important component in the circulatory system and plays vital roles in gaseous exchange, nutrient distribution and immune balance of the fish. Ichthyologists study blood to improve the care and welfare of fish.

- a. Differentiate the role of Lymphocyte and Thrombocytes in the physiology of fish. **(6marks)**.
- b. What is blood viscosity and why is it a factor of concern in the circulatory system of fish? **(4marks)**.
- c. What is meant by 'Haematocrit' and how is it important in the metabolic process of fast swimming fish, such as *Lates stappersii*? **(5marks)**.
- d. Differentiate between arteriosus and venous circulatory systems. In which one, do you expect highest blood volume? **(5marks)**.

QUESTION SEVEN (20 marks)

- f. With examples, discuss in detail four (4) ecological factors that would most likely influence diadromy of fish **(12marks)**
- g. Briefly discuss two (2) reasons why diadromous fish species are usually semelparous in the reproductive strategy **(8marks)**



KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCES
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

6TH NOVEMBER, 2025

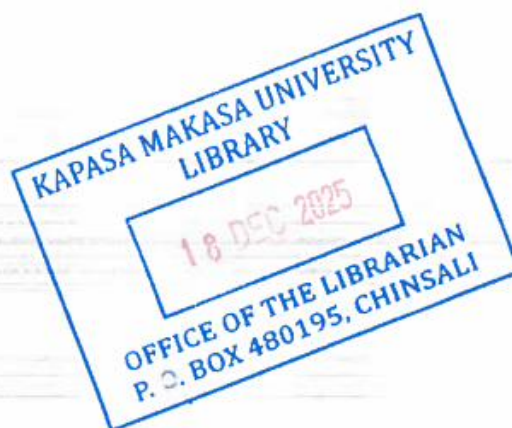
09:00-12:00

PRINCIPLES OF BIOCHEMISTRY

FA 220

INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory (CQ) in **Section A**
3. Answer any four (4) questions out of six in **Section B**
4. There are 100 marks allocated to this paper
5. Each question carries **20 marks**
6. Where possible, illustrate your answers
7. Time allowed: **Three 3 hours**
8. When answering follow further instructions in the answer book



**CELLPHONES AND PROGRAMMABLE CALCULATORS ARE NOT ALLOWED IN THE
EXAMINATION ROOM**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO BY THE INVIGILATOR

The Government of the Republic of Zambia, through the Ministry of Fisheries and Livestock Development, is scheduled to export its beef to the Democratic Republic of the Congo. A great milestone for the country. Similarly, Zambia has continued to demonstrate a remarkable growth in aquaculture production in the last 10 years, reaching an estimated 63,000 tonnes per year. These sub-sectors must grow proportionally with the human population projected to be 24 million by 2030. The demand for fish-derived proteins during the same period is expected to be about 72,000 tonnes of fish. Based on current estimates, Zambia is poised for a fish deficit of about 9,000 tonnes. This, however, must be viewed as an opportunity for entrepreneurs to venture into livestock and aquaculture production to mitigate fish deficit, sustain the beef export window, and meet the demands of a growing population. The essential role of animal Science, aquaculture and fisheries science is vital. To accomplish the macro-scale goals of export, the meso-scale aspects of production must be well-taken care of, such as good management, improved nutrition, enhanced genetics and reproduction at Gristek farm. The former two rely on a better comprehension of micro-scale fundamentals in Biochemistry, anatomy, physiology and other sciences. Given this understanding:

QUESTION 1 (Compulsory)

1. Demonstrate how glucose is degraded, leading to the production and storage of fat in food animals at Gristek Farms in Kawambwa. **(20 marks)**

CHOOSE ANY 4 QUESTIONS FROM THE 6 QUESTIONS BELOW

2. Discuss how lipids are absorbed from the intestines via the lymphatic system to the liver and reach other body parts. **(20 marks)**
3. Vitamins and minerals play an essential role in both livestock and aquaculture production. hence, the constitution in the diet must be well-balanced. Owing to this fact:
 - 3.1. State the major classes of minerals supplied to farm animals **(5 Marks)**
 - 3.2. State the major deficiencies associated with vitamin deficiency **(5 Marks)**

- 3.3. Mention the signs associated with mineral deficiency (5 Marks)
- 3.4. How can both deficiencies listed above be corrected (5 Marks)
4. Discuss how hormones are regulated to exert their profound effects on the physiological well-being of farm animals. (20 marks)
5. Water comprises more than 70% of the cell, depending on the age of the animal. This, in turn, has several profound effects on farm production, retailing and domestic consumption of these products. Therefore;
- 5.1. Discuss the features of water that make it a cradle of life (10 marks)
- 5.2. Discuss the sources of water in animals (5 marks)
- 5.3. Explain the importance of water in food animals. (5 marks)
6. Explain how lipid and carbohydrate degradation are tightly regulated (20 Marks)
7. Discuss cellular structure and cellular organelles with respect to their biochemical activities in both aquatic and terrestrial animals at Gristek farm. (20 Marks)

ALL THE BEST.



KAPASA MAKASA UNIVERSITY

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DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

28TH OCTOBER, 2025

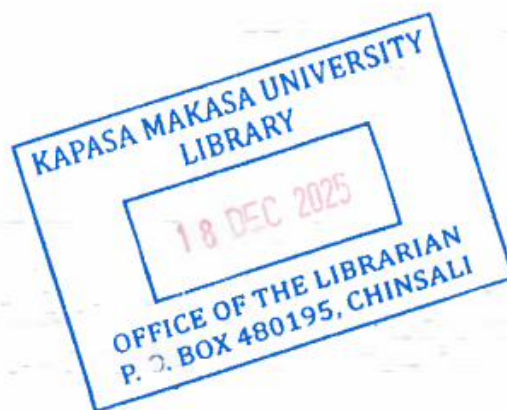
09:00-12:00

LIMNOLOGY

FA 230

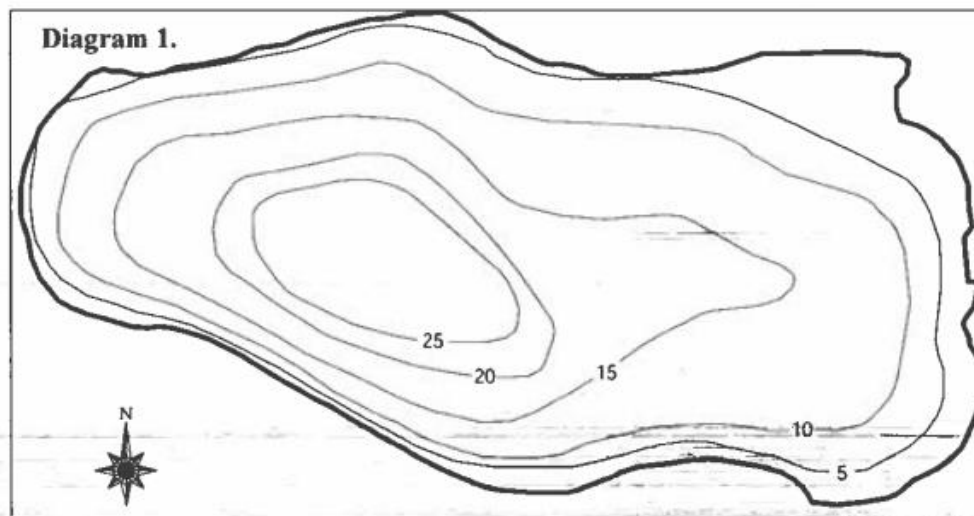
INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory (CQ) in **Section A**
3. Answer any four (4) questions out of six in **Section B**
4. There are 100 marks allocated to this paper
5. Each question carries **20 marks**
6. Where possible, illustrate your answers
7. Time allowed: **Three 3 hours**
8. When answering follow further instructions in the answer book
9. Using any unauthorized document in the exam room is prohibited



SECTION A: Compulsory Question (CQ)

Question One.



- a) **Diagram 1.**, is a bathymetric map of Lake Tusha, a small lake in Chinsali district. Given that the lake has the total surface area (A) of $76,000\text{m}^2$, what is the lake's:—

- (i) Relative depth (Z_r) (1 mark)
- (ii) Maximum depth (Z_m) (1 mark)

- b) Considering that Lake Tusha has a conical bottom and use the information given in the table below to calculate the Lake volume.

Frustra	Area (m^2)	Volume (m^3)
A	$A_0 = 7600$	
B	$A_1 = 6500$	
C	$A_2 = 5400$	
D	$A_3 = 4300$	
E	$A_4 = 3200$	
F	$A_5 = 2100$	
Total Volume (m^3)		

(8 marks)

- c) Lake basins are formed due to endogenous geological processes and exogenous activities. Mention five (5) types of lake basins and describe how they are formed. (10 marks)

SECTION B: Answer any four (4) questions

Question Two.

- (a) With the aid of a well labelled illustration, describe the zonation of a typical lentic ecosystem. (10 marks)
- (b) Explain the differences between the Orthograde and Clinograde oxygen profiles. (10 Marks)

Question Three.

Water has several characteristics that make it special when compared to other liquids. Mention four (4) such characteristics and explain their importance in controlling the physicochemical properties of lakes.

(20 marks)

Question Four.

- (a) Discuss the water budget of freshwater ecosystems. (10 marks)
- (b) Lake Tanganyika has been described as an **oligotrophic meromictic** lake, briefly explain how this lake was formed and what makes it an oligotrophic meromictic lake? (10 marks)

Question Five.

- a) Rain water is not pure. Discuss? (10 marks)
- b) Discuss the factors affecting the solubility of oxygen in Lakes (10 marks)

Question Six.

- a) There are many factors responsible for various forms of vertical distribution of plankton in Lakes. Mention **five (5)** such factors and explain how they influence these distributions. (10 marks)
- b) Describe the Phosphorus cycle in lake ecosystems. (10 marks)

Question Seven.

- a) Discuss the fixation of nitrogen in a typical freshwater lake. **(10 marks)**
- b) Discuss **four (4)** water chemistry parameters used to determine the trophic states of lakes. **(10 marks)**

END OF EXAMINATION



KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCES
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

22ND OCTOBER, 2025

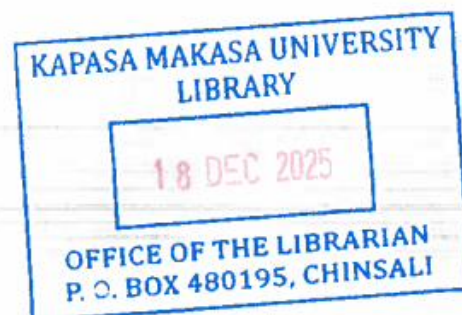
09:00-12:00

SOIL AND WATER QUALITY MANAGEMENT

FA 250

INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory (CQ) in **Section A**
3. Answer any four (4) questions out of six in **Section B**
4. There are 100 marks allocated to this paper
5. Each question carries **20 marks**
6. Where possible, illustrate your answers
7. Time allowed: **Three 3 hours**
8. When answering follow further instructions in the answer book
9. Using any unauthorized document in the exam room is prohibited



SECTION A - COMPULSORY

Question 1 (20 marks)

A farmer plans to establish an earthen fishpond and seeks your advice on soil suitability.

- a. Define soil texture and explain its importance in aquaculture pond construction. **(5marks)**
- b. Discuss four (4) soil characteristics that determine the suitability of soils for aquaculture. **(8marks)**
- c. Outline three simple field tests that can be used to assess soil quality before pond construction. **(7 marks)**

SECTION B -Choose any 4 questions

Question 2 (20 marks)

A farmer applies large amounts of raw cow dung into a tilapia pond. After two weeks, the farmer observes foul smell, reduced water transparency, and fish gasping at the surface.

- a. Identify two possible causes of these observations. **(4 marks)**
- b. Explain the effects of organic overload on pond water quality. **(6 marks)**
- c. Suggest three corrective management practices the farmer can take to restore pond health. **(6 marks)**
- d. Propose one long-term best management practice (BMP) to prevent recurrence of this problem. **(4 marks)**

Question 3 (20 marks)

You are working with a fish farmer in Lusaka who wants to improve pond productivity but is unsure about whether to use organic manures or inorganic fertilizers. The pond is 1.2 m deep, stocked with tilapia, and surrounded by crop fields and livestock enclosures.

- a. Explain the role of fertilizers and manures in aquaculture. **(6 marks)**
- b. Compare two advantages and two disadvantages of using organic manures versus inorganic fertilizers in fishponds. **(8 marks)**
- c. Recommend which option is most suitable for the farmer's pond and justify your choice. **(6 marks)**

Question 4 (20 marks)

- a. What factors affect soil productivity in aquaculture? (10 marks)
- b. What factors affect water productivity in aquaculture? (10 marks)

Question 5 (20 marks)

Discuss the importance of the following water quality parameters in relation to fish health:

- i. Dissolved oxygen (4 marks)
- ii. Ammonia (4 marks)
- iii. Nitrates (4 marks)
- iv. Turbidity (4 marks)
- v. pH (4 marks)

Question 6 (20 marks)

Microorganisms play a vital role in maintaining soil and water quality in aquaculture systems through processes such as nutrient cycling, organic matter decomposition, disease control, and water purification.

- a. Explain the roles of **heterotrophic and autotrophic microorganisms** in pond ecosystems. (6 marks)
- b. Discuss the contribution of microorganisms in the **carbon, nitrogen, and phosphorus cycles** within aquaculture ponds. (9 marks)
- c. With reference to **probiotics and biofloc technology**, evaluate how the application of beneficial microbes can improve water quality and fish production. (5 marks)

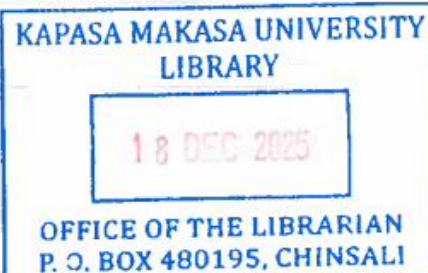
Question 7 (20 marks)

Explain the interactions between pond bottom soils and overlying water, and how poor soil quality can degrade water quality and affect fish performance.



KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCES AND OPEN LEARNING

Course Title: Fish Genetics and Breeding
Course Code: FA270
Instructor Name: Dr Arthertone Jere
Moderator Name: Namakau Muyumbana
Date: 30/10/2025
Duration: 3 hours
Total Marks: 100 Marks



General Instructions to Candidates:

1. Answer questions as instructed.
2. No unauthorized materials are allowed
3. No electronic devices are allowed unless specified.
4. Start each answer on a new page.
5. Write clearly and legibly.

Exam Instructions:

1. There are SEVEN questions in this paper
2. Answer Five (5) questions and questions Seven is compulsory.
3. Marks are indicated at the end of each question

Question 1

i) Which of the following is the primary mode of inheritance for **mitochondrial DNA** in fish?

- a) Mendelian inheritance
- b) Maternal inheritance
- c) Paternal inheritance
- d) Autosomal dominant inheritance

(10 marks)

ii) In fish, which genetic technique is most commonly used for identifying genetic diversity within populations?

- a) Karyotyping
- b) Microsatellite analysis
- c) Southern blotting
- d) Fluorescence in situ hybridization (FISH)

(10 marks)

Question 2

Evaluate the ethical implications of gene editing in fish, in the context of conservation, aquaculture, and ecosystem impact.

(10 marks)

Question 3

Discuss the challenges and opportunities of using genomic selection in fish breeding programs. Include considerations related to genetic diversity, trait heritability, and technological requirements

(20 marks)

Question 4

Explain the concept of sex determination in fish. Provide examples of different mechanisms.

(20 marks)

Question 5

Describe the basic structure of a fish's genome and discuss how it differs from that of other vertebrates.

(20 marks)

Question 6

Describe the role of quantitative trait loci (QTL) mapping in fish breeding and provide an example of a trait that can be improved using this technique. (20 marks)

Question 7

- i. How can DNA barcoding and Metabarcoding help Zambian aquaculture & fisheries? (13 marks)
- ii. Give four benefits of the methods in (a) above for aquaculture and fisheries. (4 marks)
- iii. Give three challenges for the implementation of these methods in Zambian Aquaculture and fisheries. (3 marks)



KAPASA MAKASA UNIVERSITY

SCHOOL OF APPLIED SCIENCES

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

27TH OCTOBER, 2025

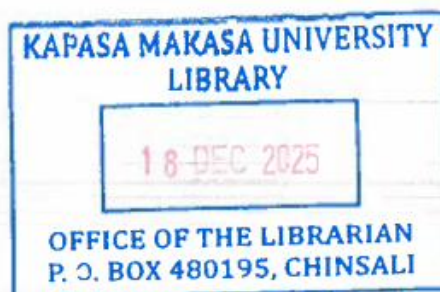
14:00-17:00

AQUATIC SYSTEMS AND ENGINEERING

FA 310

INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory Question in **Section A**
3. Answer any four (4) questions out of six in **Section B**
4. There are 100 marks allocated to this paper
5. Each question carries **20 marks**
6. Where possible, illustrate your answers
7. Time allowed: **Three 3 hours**
8. When answering follow further instructions in the answer book
9. Using any unauthorized document in the exam room is prohibited



SECTION A -Compulsory

QUESTION 1

- a) With examples, distinguish between flow-through systems and recirculating aquaculture systems. **(8 marks)**
- b) List and explain four engineering challenges faced in cage culture systems. **(8 marks)**
- c) Suggest two engineering innovations that can make aquaculture systems more sustainable. **(4 marks).**

SECTION B -Choose any 4 Questions

QUESTION 2

A pump delivers water from a borehole to a hatchery tank at a flow rate of $0.02 \text{ m}^3/\text{s}$ against a head of 15 m.

- a) Calculate the hydraulic power required (kW). **(5 marks)**
- b) If pump efficiency is 70%, calculate the actual power input. **(5 marks)**
- c) Discuss three factors that may cause energy losses in pumping systems. **(6 marks)**
- d) Suggest two ways to improve energy efficiency in aquaculture pumping systems. **(4 marks)**

QUESTION 3

Nkandu fish farm has just constructed two ponds, measuring 3m x 20m and has employed you as a Graduate trainee to estimate the profits in 1 year project period. Refer to the following assumptions below; **(20 marks)**

- Using sexually reversed fingerlings
- 10% mortalities
- Stocking density of 10 fingerlings/m²
- 2 production cycles per year (each cycle is 6 months)
- Growth rate of 250g at the end of each cycle

- Nkandu selling price of K96/kg
- 60% running costs from the gross revenue realized

QUESTION 4

A group of youth farmers want to establish fishponds on communal land. The land is flat, close to a dam, with sandy soil and poor road access.

- a) Identify two advantages and two disadvantages of this site for pond development. **(6 marks)**
- b) Suggest two soil improvement measures that could allow pond construction in sandy soils. **(4 marks)**
- c) Explain two socio-economic challenges the farmers may face in operating the ponds. **(4 marks)**
- d) Propose two reasons why proximity to markets is important when selecting a fishpond site. **(6 marks)**

QUESTION 5

A commercial aquaculture company is considering whether to invest in a raceway culture system or a pen culture system for expanding its fish production.

- a) Describe the main design features of a raceway culture system and a pen culture system. **(6 marks)**
- b) Compare the advantages of raceway systems versus pen systems in terms of water quality management, productivity, and control of fish stocks. **(6 marks)**
- c) Discuss the limitations or challenges associated with each system (raceway and pen culture). **(4 marks)**
- d) If the company's priority is high stocking density and efficient feeding management, which system would you recommend, and why? **(4 marks)**

QUESTION 6

Compare the advantages and disadvantages of the following feeding systems in aquaculture:

- a) Manual feeding **(5 marks)**
- b) Automatic feeding **(5 marks)**
- c) Demand feeders **(5 marks)**

Which system would you recommend for a commercial cage culture farm, and why? **(5 marks)**

QUESTION 7

What are the factors to consider in site selection for pond construction? **(20 marks)**

Formulas

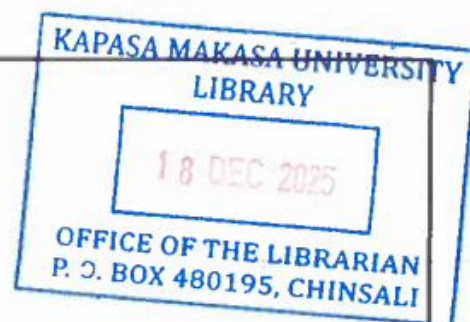
$$Q=VA$$

$$H_f=kV^2/2g$$

$$P=pghq$$

$$P=b+2y$$

$$R=(1-(Q_N/Q_T))*100$$



KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCES AND EDUCATION
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

[FA 330]

[FISH NUTRITION AND FEED TECHNOLOGY] [

DATE: 20 OCTOBER 2025]

09:00-12:00

Instructions:

1. There are seven questions in total.
2. Answer a Compulsory Question (CQ) in **Section A**.
3. Answer **four (4) questions from Section B**.
4. There are 100 marks allocated to this paper.
5. Each question carries **20 marks**.
6. Where possible, illustrate your answers.
7. Time allowed: **Three (3) hours**.
8. When answering follow further instructions in the answer book.

SECTION A:

COMPULSORY QUESTION (CQ)

Question One

- a)** Outline the importance of fish nutrition and technology, and explain how advancements in this area contribute to the growth, health, sustainability, and economic efficiency of aquaculture? **[6 Marks]**
- b)** Explain the fundamentals of fish nutrition, focusing on the relationship between nutrition and fish growth. **[6 Marks]**
- c)** In the context of fish nutrition energetics, what is the importance of energy and list 5 forms of energy? **[5 Marks]**
- d)** As a graduate trainee, your supervisor, Mr. Chimbinde, has asked you to plan the feed quantity for Tuesday. The pond has 6555 fish with an average body weight (ABW) of 89g. Fish are fed three times a day at 3- 5% of their body weight. Calculate the total feed required and the feed ration for each feeding time. **[3 Marks]**

SECTION B: Answer any FOUR(4) questions from this section

Question Two

- a)** What do you understand by the term nutritional requirement of fish? Give a brief explanation and examples. **[5 Marks]**
- b)** Briefly describe protein, detailing its properties, classification, and functions, and provide examples of its sources. **[5 Marks]**
- c)** Mr. Dimbwi was present during feed formulation and manufacturing. He wondered why people were adding oil to the feed and said they were wasting it. Explain to him the importance of lipids in a fish diet, giving examples where necessary. **[5 Marks]**
- d)** List two essential fatty acids needed in a fish diet and state which are suitable for freshwater species and for marine species. **[4 Marks]**

Question Three

- a)** Mr. Greater overheard people talking about feed formulation and heard the term feed ingredient. Help him understand what feed ingredients are and give examples to aid his understanding. **[5 Marks]**
- b)** What are non-conventional feed ingredients? Give examples. **[4 Marks]**
- c)** What are antinutritional factors (ANFs)? Give a description of any ANF, explain how it affects fish, and how it can be removed or reduced from feed ingredients. **[5 Marks]**
- d)** Provide a list of ingredients that are commonly used in fish diet formulation. **[3 Marks]**
- e)** What are fish feed additives? **[3 Marks]**

Question Four

- a) State the steps involved in fish feed manufacturing? [5 Marks]**
- b) List the method of fish feed formulation and state which one can be easily be used by a farmer in rural areas, give reasons. [5 Marks]**
- c) As a graduate trainee, Mr. Gunduza has tasked you with formulating feed for his tilapia using soybean meal (44% CP), fish meal (57% CP), and maize meal (10.2% CP). The target is a feed containing 34.5% crude protein (CP). Using Pearson's square method, show how you would formulate this diet. [5 Marks]**
- d) What is extrusion and what are the advantages of extrusion in feed manufacturing? [5 Marks]**

Question Five

- a) Feed can be divided into several groups or categories based on several factors. Briefly explain any feed type you know? [4 Marks]**
- b) What is the importance of evaluating feed efficiency? [3 Marks]**
- c) List two critical parameters used to measure feed efficiency. [2 Marks]**
- d) Explain what fish feed digestibility coefficients of 20% and 90% mean in the context of fish nutrition [4 Marks]**
- e) Mr. Tombwe cultured his *Oreochromis niloticus* for 6 months. He stocked 3200 fingerlings weighing 25g. At the end of the 6 months, he harvested 2700 fish weighing 450g each, and the total feed used was 60 bags weighing 25kg each. Calculate the following:**
 - i) Feed Conversion Ratio (FCR). [4 Marks]**
 - ii)). Average Daily Gain (ADG). [3 Marks]**

Question Six

- a)** Mr. Bravo plans to produce 8,090 kg of fish and has three feed options: Aller Aqua (FCR 1.20, K25/kg), Novatek (FCR 1.41, K24/kg), and Namfeeds (FCR 1.43, K24/kg). Calculate which feed brand will result in the lowest total feed cost based on the amount of feed required. **[5 Marks]**
- b)** What are fish feed additives? List and give a brief description of any three (2) types of feed additives you know. **[5 Marks]**
- c)** Explain what nutritional deficiency disorders, symptoms, or diseases are in fish and list the categories or groups of nutritional diseases. **[6 marks]**
- d)** Give a brief explanation of any three (3) types of nutritional deficiency diseases you know. **[4 marks]**

Question Seven

- a)** Fish nutrition and feed technology is an important and complex course. Based on what you have learned, explain any topic or component you have understood that is relevant to it and to aquaculture development. **[20 Marks]**



KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCES AND OPEN LEARNING
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES
BACHELOR OF SCIENCE DEGREE

FA360 – FISHING GEAR & TECHNOLOGY

SESSIONAL EXAMINATION

DATE: 30th OCTOBER 2025

TIME: THREE (3) HOURS

INSTRUCTIONS

- Write your Student Identification Number on the Answer Booklet provided
- There are seven questions in this paper.
- There two sections in this paper (A and B). **Section A** has one compulsory question.
- Choose any four (4) questions from **section B**.
- Start **each** answer on a new page.
- No unauthorized materials are allowed
- No electronic devices are allowed unless specified.
- Write clearly and legibly.

DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO.

SECTION A - COMPULSORY

QUESTION ONE (20 marks)

Load shedding of electrical power is one economic constraint the Zambian government has faced for the past five years. To solve this problem, government has embarked on a mammoth task of establishing mini-hydropower dams across the country, mainly in smaller rivers with considerable current and rapids. One of the requirements for a successful establishment of a hydropower dam is completion of a full assessment of environmental and related ecological impacts. ZESCO has just awarded Namiko Consultancy to conduct a strategic environmental impact assessment (SEIA) in Lufubu river of Kasama district. Lufubu River has an average width of 5m and depth of 0.4m to 0.8m, with pools and rapids as it passes through the mountainous patches of Chilubula Catholic Mission before draining into the Kalungwishi River.

Working for this firm (Namiko Consultancy) and relying on your knowledge in fishing gear and technology, your supervisor tasks you to lead a team on the fisheries component of the assessment. Your task is to sample the ichthyofauna on the Lufubu River to establish baseline data (fish species inventory – composition and diversity) and related environmental impacts.

Taking this scenario into consideration;

- i. Choose two fishing gears and methods suitable to use to collect fish samples from Lufubu River and provide technical argument for the choice. **(6marks)**.
- ii. From the selected gears/methods in (i), which one would you use to sample diurnal and nocturnal fish species? **(4marks)**
- iii. For each of the gears/methods selected in (i), what are their recommended soak time? Justify your answer **(2marks)**.
- iv. Discuss two limitations that may be associated with the selected gears in terms of catchability **(2marks)**.
- v. Which two factors are likely to affect the selectivity of the chosen gears/methods in (i) above? **(2marks)**.
- vi. Suggest and justify four biometric parameters you will collect from the collected fish to help you fully understand the status of the fishery in Lufubu River? **(4marks)**.

SECTION B – ATTEMPT ANY FOUR QUESTIONS

QUESTION TWO (20marks)

Briefly discuss why the **four (4)** underlisted factors may be considered as critical when constructing or selecting a fishing gear.

- a. Ecology of the target fish species;
- b. Legal and ecological factors;
- c. Socioeconomic factors;
- d. Environmental factors.

QUESTION THREE (20marks)

Technically, explain **four (4)** ecological effect associated with the use of a beach seine for the exploitation of fish in a commercial fishery area such as Lake Kariba **(20marks)**.

QUESTION FOUR (20 marks)

- a. Explain two (2) difference between fish aggregating devices (FADs) and artificial reefs (ARs) as viewed in fishing gear technology **(5marks)**.
- b. Briefly discuss how FADs and ARs are able to improve the trophic structure of fish communities in areas where they are installed **(5marks)**.
- c. Briefly explain two (2) limitations associated with FADs and ARs as aspects for improving trophic structure of fish stocks at localized level? **(4marks)**
- d. Briefly discuss three (3) reasons why community engagement is important when choosing a site for installation of FADs or ARs **(6marks)**

QUESTION FIVE (20 marks)

- a. Selectivity of a trap targeting sedentary fish species is highly dependent on the quality of baits used. Discuss! **(5marks)**
- b. What is *precision fishing* and how does it contribute to the decline of fish stocks on a spatiotemporal scale **(5marks)**
- c. Highlight **two (2)** ways in which military technologies have helped in improving fishing efficiency and contributed to the collapse of global fisheries **(10marks)**.

QUESTION SIX (20marks)

Importation, sale possession and use (for fishing) of *Monofilament gillnets* have completely been banned by the Zambian government and contravening of this regulation attracts a minimum of three years jail sentence. From your knowledge on fishing gear material, gear selectivity and destructive fishing gears;

- a. With two reasons, justify why you would support the decision of the Zambia government on *Monofilament gillnets* (8marks)
- b. In your opinion and in the case of *Monofilament gillnets*, why is it difficult to classify a gear as being 'destructive'? (5marks)
- c. Demonstrate how *Monofilament gillnets* may be associated with secondary derelict fishing (4marks).
- d. Explain what is meant by 'indiscriminate fishing' (3marks)

QUESTION SEVEN (20marks)

- a. Briefly discuss two (2) senses that are played upon when constructing and using traps for catching fish in a small lentic ecosystem (10marks).
- b. In your opinion, why are traps and weirs detrimental to the ecological integrity of a multispecies fishery? (5marks).
- c. Briefly, discuss any two (2) factors that are most likely to influence gear selectivity of traps (5marks).



KAPASA MAKASA UNIVERSITY

SCHOOL OF APPLIED SCIENCES

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

27TH OCTOBER, 2025

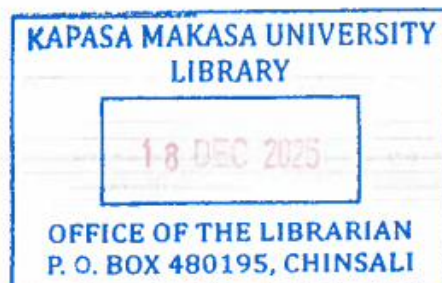
14:00-17:00

AQUACULTURE MANAGEMENT

FA 400

INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory Question in **Section A**
3. Answer any four (4) questions out of six in **Section B**
4. There are 100 marks allocated to this paper
5. Each question carries **20 marks**
6. Where possible, illustrate your answers
7. Time allowed: **Three 3 hours**
8. When answering follow further instructions in the answer book
9. Unauthorized materials are not allowed in the examination room



SECTION A -COMPULSORY

QUESTION 1

You are the newly appointed Assistant Farm Manager at Mungule Fish Farm, a medium-scale Nile tilapia operation in Chongwe District. The farm operates ten earthen ponds and a small hatchery that supplies fry for internal use and occasional sales to nearby farmers. The following is a section from the weekly operations report submitted to the Farm Manager by the production team: Weekly Operations Summary (Week 22)

Water Management: Light rains were recorded early in the week. To reduce turbidity, Pond 3 was partially drained and later refilled using water from Pond 6 through an interconnecting channel. The pipe system used for water transfer was cleaned on Tuesday using brushes from the hatchery's cleaning area.

Harvesting and Grading Activities: The marketing team harvested 1.2 tonnes of fish from Pond 8 on Wednesday morning. After washing the harvesting nets and buckets in the farm canal, the same crew assisted hatchery staff later that afternoon in grading fry for dispatch to local farmers. Some grading equipment was shared as hatchery tools were under maintenance.

Feed and Storage: A delivery of 500 bags of floating feed (3 mm) was received on Monday. Due to fumigation of the main store, the feed was temporarily stored overnight under the shade shed adjacent to the fertilizer store before being transferred indoors.

Farm Transport and Logistics: The farm truck was used on Thursday to deliver feed to a nearby farmer and collect empty oxygen cylinders from the Fisheries Department. On Friday, it transported harvested fish to Lusaka. For convenience, the vehicle was parked near the pond area overnight for early loading.

Human Resources: Two new employees joined the farm this week after completing short-term contracts at a neighbouring fish farm. They were immediately assigned to assist in

hatchery and fry pond operations. Two days after the report, hatchery staff observed unusual fry behaviour and increased mortalities in two holding tanks.

a) Using information from the operations report, analyze and discuss the possible biosecurity weaknesses or oversights that may have led to the fry mortalities. In your analysis, demonstrate your understanding of how pathogens could be transmitted between farm sections or from external sources. *(10 marks)*

b) As the Assistant Manager, outline a biosecurity risk management plan to address the weaknesses you identified in part (a). Your plan should propose both short-term containment measures and long-term preventive strategies that are realistic for a medium-scale farm. *(10 marks)*

SECTION B – Answer any 4 Questions

QUESTION 2

A hatchery in Central Province wants to expand its operations and improve seed production. The manager is considering different broodstock breeding approaches natural, semi-induced, and induced methods and must also decide which species (tilapia, catfish or carp) to prioritize for commercial production

a) Describe how natural breeding, semi-induced breeding, and induced breeding are carried out in hatcheries. In your explanation, use examples to show how each method is applied. *(15 marks)*

b) What are the advantages and limitations of these three methods in terms of cost, technical skill required, fry survival. *(5 marks)*

QUESTION 3

You have been appointed as a government extension officer in a rural district of Zambia. A group of crop farmers is interested in diversifying into aquaculture.

- a) How would you describe aquaculture to them in simple terms and the role of aquaculture in promoting economic development, livelihood improvement, and food security in Zambia? *(5 Marks)*
- b) Of the three aquaculture systems (extensive, semi-intensive, or intensive), what are their differences and which would you recommend for the farmers first project? *(15 Marks)*

QUESTION 4

During a routine broodstock examination, you cut open five female tilapia and placed their eggs on an observation plate.

- a) Describe five distinguishable stages of egg development that can be used to determine the maturity stage of the female fish. In your description, include key visual characteristics observed at each stage. *(10 marks)*
- b) Explain the major post-hatching developmental stages, from egg to adult, highlighting the main morphological and physiological features that define each stage. *(10 marks)*

QUESTION 5

Integrated systems have both advantages and risks that can affect their success and sustainability.

- a) Explain the purpose of conducting a SWOT analysis in Integrated Aquaculture–Agriculture Systems. *(4 marks)*
- b) Discuss four (4) strengths of IAAS that make it suitable for smallholder farmers in Zambia. *(6 marks)*

c) Identify and explain two (2) weaknesses and two (2) opportunities that influence IAAS performance. *(6 marks)*

d) Examine two (2) threats that could limit the expansion of IAAS in Zambia and propose mitigation measures for each. *(4 marks)*

QUESTION 6

Aquaculture systems vary widely depending on the level of management, species combinations, and culture environments.

a) Define the following culture systems and provide one example for each:

i. Monoculture

ii. Polyculture

iii. Cage culture

iv. Pond culture

v. Tank culture

(10 marks)

b) Discuss the advantages and limitations of monoculture compared to polyculture systems in improving farm productivity and risk management. *(6 marks)*

c) Explain how the choice between pond, cage, and tank culture systems depends on site characteristics, resource availability, and market access. *(4 marks)*

QUESTION 7

You recently conducted a consultative visit to Mr. Banda's tilapia farm in Southern Province. The farm operates three earthen ponds (each 400 m²) stocked with *Oreochromis andersonii*. During your assessment, you recorded the following farm data:

Parameter / Observation	Recorded Value / Practice
Dissolved Oxygen (DO)	2.5 mg/L (early morning)
Water pH	5.8
Temperature	34 °C
Turbidity	Very high (brown water, heavy runoff)
Feeding Practice	Feeding once daily, feed scattered on pond bottom
Feed Type	Unpelleted maize bran
Record Keeping	None
Transportation	Fish moved to market in open buckets, no aeration
Mortality	25 % per cycle

Based on the data collected, the farm's results and survival rates are poor. Using your knowledge of Aquaculture Best Management Practices (BMPs), discuss how you would guide Mr. Banda to improve his farm under the following areas:

- a) Water Quality Management (5 Marks)
- b) Feeding and Feed Management (5 Marks)
- c) Transportation of Fish (5 Marks)
- d) Biosecurity and Fish Health Management (5 Marks)



KAPASA MAKASA UNIVERSITY

SCHOOL OF APPLIED SCIENCES

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

21ST OCTOBER, 2025

09:00-12:00

FISHERIES ECONOMICS AND ENTREPRENEURSHIP

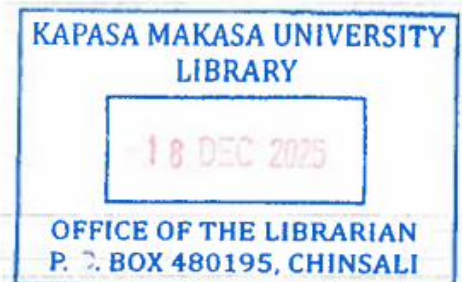
FA 410

INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory Question in **Section A**
3. Answer any Two (2) questions out of 3 in **Section B (Economics)**
4. Answer any Two (2) questions out of 3 in **Section C (Entrepreneurship)**
5. Use **TWO different answer booklets, 1 for economics and another for Entrepreneurship section**
6. There are 100 marks allocated to this paper
7. Each question carries **20 marks**
8. Where possible, illustrate your answers
9. Time allowed: **Three 3 hours**

1. Cell Phones are NOT allowed in the Examination Room.

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO



SECTION A- Compulsory

Consider the following information about the Zambian economy:

- i. In order to finance the 2026 National Budget, the government introduces a **tax function**:

$$T = 0.2Y + 0.001Y^2$$

and **Consumption** is $C = 100 + 0.7(Y - T)$, with $I = 200, G = 150$

- a. Write down the national income function that the government will use to determine its total income. **[4 Marks]**
b. Determine the level of equilibrium Income **[4 Marks]**
- ii. By how much will equilibrium income change if the government spending increases by 200 **[2 Marks]**

[Total: 10 Marks]

Question 1 B (Fisheries Entrepreneurship)

Mr. Mulenga obtained a one-year Loan of K15, 000 from ZANACO Bank with the Principal and interest both to be paid at the end of the year. The Minimum Balance was K1, 000 and the amount for the Interest rate paid was K1, 500.

1.1 Find the Sated interest rate in Percentage (%) that Mr. Banda was charged by ZANACO Bank **(2.5Marks)**

1.2 Find the Effective Rate in Percentage (%) for the loan Mr. Banda obtained. **(2.5 Marks)**

1.3 Given that the principal and interest is to be paid by Mr. Banda at the end of the year.

- ✓ And that the Minimum Balance for Mr. Banda's loan is K1, 000
- ✓ The sated interest rate in Percentage (%) is at 10%
- ✓ Amount paid for Interest rate by Mr. Banda is K 1,800

1.3.1 Find the amount for the One year Loan **(2.5Marks)**

1.3.2 Find the Effective Rate **(2.5Marks)**

SECTION B (Fisheries Economics) - Choose any 2 question

QUESTION 2

- (a) Tilapia Delight Ltd. is a small-scale fish processing business located near a Kapasa Makasa fishing research centre. The company specialises in preparing and packaging boneless tilapia fillets for local restaurants and institutions. The business pays K100 per month for rent. The company pays each worker K80.00, and the cost of other variable inputs is estimated at 2% of labour as a contribution per kg of fish produced. The market price is K5 per kg. Calculate and construct a cost schedule indicating (a) Total cost, (b) marginal costs, (c) Average total cost, (d) profit or loss

Labour	Quantity (kg)	Fixed Cost	Variable Cost	Total Cost	Marginal Cost	Average Total Cost	Profit /loss
1	160						
2	400						
3	600						
4	720						
5	800						
6	840						

[18 Marks]

(b) Distinguish between implicit costs and explicit costs

[2 Marks]

[Total: 20 Marks]

QUESTION 3

You plan to buy a **laptop** that will cost **K5,500** in the future. The bank offers an annual **interest rate of 10%**, compounded quarterly. However, a **20% tax** is charged on the **interest earned**.

- How much money should you invest **now** to have **K5,500** at the **end of 2 years**, after accounting for tax on interest? [5 Marks]
- Suppose you decide to postpone the purchase and buy the laptop at the **end of 5 years** instead. How much money should you set aside **now**, considering the same interest rate and tax rate? [5 Marks]
- At a price of K50, a company sells 200 units per week. If the price increases to K55, sales fall to 180 units. Using the **point elasticity formula** and assuming a linear demand curve, compute the price elasticity at the initial point. [5 Marks]
- If a household's disposable income has increased from K1, 200 to K2, 200 per week and consumption has increased from K900 to K1, 800. Compute the household's marginal propensity to consume (MPC) and interpret your result. [5 Marks]

[Total: 20 Marks]

Question 4

In September 2025, the **Zambian Government** presented the **2026 National Budget** totalling **K253.1 billion**, highlighting a shift from crisis-era spending toward consolidation and prioritising continuity over sweeping new programs. The government also projects a reduction in the fiscal deficit from approximately 3.1% of GDP in 2025 to 0.7% by 2027. With that in mind, answer the following using analytical, policy-oriented reasoning.

- Explain fiscal deficit and how fiscal and monetary policies influence economic growth and stability. [4 Marks]
- Given the government's stated intent to consolidate and reduce its deficit, describe a contractionary fiscal stance and its likely macroeconomic effects in Zambia (on growth, debt, and inflation). [5 Marks]
- The Bank of Zambia currently maintains its Monetary Policy Rate at **14.5 %** to tame inflation, while inflation has been declining from **16.5 %** toward targets. Explain how the central bank uses the policy rate to influence inflation and aggregate demand. [5 Marks]

[5 Marks]

- iv. Outline and justify fiscal policy strategies the Government of Zambia may employ to promote job creation and reduce youth unemployment.

[6 Marks]

[Total: 20 Marks]

SECTION C: Entrepreneurship (Choose any 2 questions)

Question Five (5)

Developing a viable and bankable fish farming business plan involves analysing several component of the business plan, such as the *organisation's vision, Mission statement, problem statement, and management strategy*. Explain what is involved in each of the component of the business plan listed above?
(20 MARKS)

Question Six (6)

- 3.1 Discuss in details any two (2) boom factors contributing to entrepreneurship development?

(10 MARKS)

- 3.2 Discuss in details any two (2) characteristics/profile that describes entrepreneurs?

(10 MARKS)

Question seven (7).

Entrepreneurship is vital to economic development as it drives and stimulates economic growth. Discuss four (4) ways in which entrepreneurship add value to economic development?
(20 Marks).

The End of Examination



KAPASA MAKASA UNIVERSITY
SCHOOL OF APPLIED SCIENCES AND EDUCATION
DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

[FA 420]

[FISH POST-HARVEST TECHNOLOGY]

[DATE: 11 NOVEMBER 2025]

[TIME: 14:00-16:00 Hrs]

KAPASA MAKASA UNIVERSITY
LIBRARY

18 DEC 2025

OFFICE OF THE LIBRARIAN
PO BOX 480195, CHINSALI

Instructions:

1. There are seven questions in total.
2. Answer a Compulsory Question (CQ) in **Section A**.
3. Answer any **four (4) questions from Section B**.
4. There are 100 marks allocated to this paper.
5. Each question carries **20 marks**.
6. Where possible, illustrate your answers.
7. Time allowed: **Three (3) hours**.
8. When answering follow further instructions in the answer book.

[FISH POST-HARVEST TECHNOLOGY]

SECTION A:

COMPULSORY QUESTION (CQ)

Question One

- a) Marketing of fish and fishery products is one of the most important components of fisheries and aquaculture. Explain five key importance of marketing of fish and fishery products. *(8 Marks)*
- b) State four features of markets for fish and fishery products. *(3 Marks)*
- c) For successful marketing of fishery products, one must understand the necessary skills in marketing fish products. State four skills that a fish farmer must have to market their fish and fishery products effectively. *(3 Marks)*
- d) Mr. Chinkwanda wants to start cage culture in Chilubi Islands. As a fisheries expert, explain four challenges to the marketing of fish and fishery products that he may encounter. *(6 Marks)*

SECTION B:

ANSWER ANY FOUR (4) QUESTIONS FROM THIS SECTION

Question Two

- a. Mr. Bimbwe is curious about the significance of fish post-harvest technology in fisheries and aquaculture, as well as its impact on

consumers. Explain how post-harvest technology is crucial for both fisheries and aquaculture. (7 Marks)

- b. Explain the structure of fish muscle and how it affects or influences the quality and spoilage of fish. (9 Marks)
- c. What factors influence the biochemical composition of fish? (4 Marks)

Question Three

- a. State and explain any two (2) factors affecting or contributing to fish spoilage. (8 Marks)
- b. Careful handling of fish during and after harvesting helps reduce post-harvest losses. State what should be considered when handling fish onboard a fishing vessel and during harvesting. (8 Marks)
- c. Explain in detail how altitude influences the spoilage of fish and fishery products. (4 Marks)

Question Four

- a. As a graduate trainee at Yalelo, you have been tasked with determining the best preservation method to use when supplying fresh fish to hotels and restaurants. State the method, explain it in detail, and highlight the benefits of using this method. (10 Marks)
- b. State the two general categories into which smoked fish can be divided and state the three preservative effects of smoking on fish. (4 Marks)
- c. What are food additives in fish processing? Explain how they are classified and describe their benefits. (6 Marks)

Question Five

- a. How does fish post-harvest technology contribute to food and nutrition security? (5 Marks)
- b. List five ways in which fish and fishery by-products are utilized. (5 Marks)
- c. Why is fish meal important in animal feed production? (10 Marks)

Question Six

- a. What is quality assurance of fish and fishery products, and why is it important for ensuring food safety? (4 Marks)
- b. Mention and explain two major hazards found in fish and fishery products, providing examples for each. (10 Marks)
- c. List the main elements of the Hazard Analysis Critical Control Point (HACCP). (3 Marks)
- d. What are the merits and demerits of the Hazard Analysis Critical Control Point (HACCP) system? (3 Marks)

Question Seven

As a fisheries and aquaculture graduate, you have learned about *fish post-harvest technology* and how it supports sustainability and development in aquaculture. Choose one topic or component of fish post-harvest technology that you understand well and explain it in detail. (3 Marks)

GOOD LUCKY!!

"Survival is Winning We Chiswango"



KAPASA MAKASA UNIVERSITY

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

FISHERIES MANAGEMENT AND EXTENSION

FA 430

4TH NOVEMBER, 2025

14:00-17:00

KAPASA MAKASA UNIVERSITY
LIBRARY

18 DEC 2025

OFFICE OF THE LIBRARIAN
P. O. BOX 480195, CHINSALI

INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory Question in **Section A**
3. Answer any Two (2) questions out of 3 in **Section B (Fisheries Management)**
4. Answer any Two (2) questions out of 3 in **Section C (Extension)**
5. Use TWO different answer booklets, 1 for Fisheries Management and another for Extension
6. There are 100 marks allocated to this paper
7. Each question carries **20 marks**
8. Where possible, illustrate your answers
9. Time allowed: **Three (3) hours**
1. Cell Phones are NOT allowed in the Examination Room.

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO

QUESTION 1 (COMPULSORY)

Question 1 a. (Fisheries Management)

i. Explain the concept of the tragedy of the commons in relation to open-access fisheries.

(5 marks)

ii. Discuss how it affects fish stocks in Zambia's capture fisheries.

(5 marks)

Question 1 b. (Extension)

A new, highly effective and highly efficient, but somewhat costly fisheries/animal science technology has been presented to a group of smallholder farmers in mugubudu village who mainly depend on traditional methods to carry out their activities. Three years after its introduction, the rate of adoption is still under 8%.

Using Diffusion of Innovation Theory, examine the possible factors contributing to the low adoption rate. Subsequently, formulate a three-phase extension strategy by incorporating all approaches to expedite the adoption process. Provide justification for each phase.

(10 marks)

SECTION B- Fisheries Management (Answer any TWO (2) Questions)

QUESTION 2

Discuss the role of area and time restrictions in fisheries management. Explain how these measures contribute to stock recovery, habitat protection, and long-term sustainability; using examples from Zambia.

(20 marks)

QUESTION 3

a. Explain input and output controls in fisheries management. Analyse their effectiveness in regulating fishing effort and maintaining sustainable yields. Mention one advantage and one limitation of each.

(10 marks)

b. Define fisheries management and list its main objectives.

(4 marks)

c. Briefly explain how biological and social factors interact to promote sustainable use of fishery resources.

(6 marks)

QUESTION 4

- a. Using the example of *Lake Kariba*, analyse the successes and challenges of fisheries co-management. (10 marks)
- b. Suggest how lessons from the Lake Kariba experience could be applied to strengthen co-management in another Zambian fishery of your choice (e.g., Lake Mweru-Luapula or Lake Bangweulu). (10 marks)

SECTION C: EXTENSION (Answer any TWO questions)

QUESTION 5

- a. Explain why Agricultural Extension is classified as an informal type of education and discuss the unique benefits that this classification offers in working with adult farmers. (6 marks)
- b. Compare and contrast the core principles, strengths, and weaknesses of the Farm Visits (FV) and Methods and Results Demonstration (MRD) System approach. Imagine you are appointed to lead a team of extensionists with the sole purpose to reform a national extension system, which model's philosophy would you choose and advance as the foundation, and explain why? (14 marks)

QUESTION 6

- a. In details, discuss various perceived attributes that should be encompassed by an innovation and their effect on the rate of adoption. Illustrate your answer with a hypothetical and clear example of an innovation/technology you can think of in relation to your specialty. (8 marks)
- b. It is a known fact that women farmers in most rural areas are mainly responsible for post-harvest handling of most farming produce and products be it crops, fish or animal products but they are systematically excluded from formal extension training due to cultural norms, tradition, values and timing constraints.

As a trained extension expert, develop a comprehensive, gender-sensitive extension program to address post-harvest losses being encountered. Your answer must specifically detail the methods used in designing the said extension program and the role of Participatory Rural Appraisal (PRA) in the planning phase.

(12 Marks)

QUESTION 7

- a.** Discuss the arguments for and against the privatization of agricultural extension services, meaning moving from purely public to private/NGO-led services.

Further, discuss clearly and concisely under what specific conditions is a public sector extension service still indispensable, paying particular attention to smallholder farmers demands

(12 marks)

- b.** Explain in details the extension teaching methods according to their forms which are commonly used by extension professionals to enhance adoption of an innovation /technology.

(8 marks)

THE END OF THE EXAMINATION



KAPASA MAKASA UNIVERSITY

SCHOOL OF APPLIED SCIENCES

DEPARTMENT OF AGRICULTURE AND AQUATIC SCIENCES

2025 SESSIONAL EXAMINATION

10TH NOVEMBER, 2025

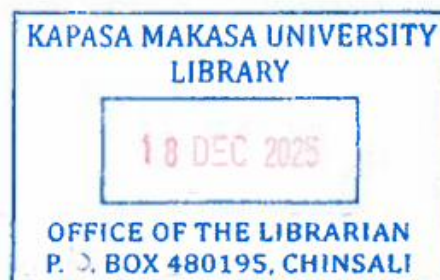
09:00-12:00

FISH STOCK ASSESSMENTS AND POPULATION DYNAMIC

FA 440

INSTRUCTIONS:

1. There are seven questions in total
2. Answer a Compulsory (CQ) in **Section A**
3. Answer any four (4) questions out of six in **Section B**
4. There are 100 marks allocated to this paper
5. Each question carries **20 marks**
6. Where possible, illustrate your answers
7. Scientific calculators are allowed
8. Time allowed: **Three 3 hours**
9. When answering follow further instructions in the answer book
10. Using any unauthorized document in the exam room is prohibited



SECTION A: Compulsory Question (CQ).

QUESTION 1:

You are a newly employed Fisheries Research Officer at Lusiwasi Fisheries Research Station. Suddenly, you receive a report of the proliferation of an invasive Red Claw Crayfish in Lake Lusiwasi and the Director of Fisheries has assigned you to investigate the population dynamics of this invasive species. **Table 1** below is the Tagging data obtained by the Department of Fisheries and sent to you for analysis and further investigation.

Tag number of Specimen	Length at Tagging (mm)	Length at Recapture (mm)	Growth Interval (Days)	Growth Increment/ Time	Average size in Growth Interval
121	40	85	289	0.156	62.5
452	46	53	26	0.269	49.5
223	29	55	84	0.310	42
124	30	56	77	0.338	43
325	18	25	14	0.500	21.5
456	31	43	38	0.316	37
347	48	70	89	0.247	59
668	49	59	38	0.263	54
239	59	62	28	0.107	60.5
410	58	80	149	0.148	69
611	61	72	89	0.124	66.5
212	65	83	74	0.243	74
313	57	65	38	0.211	61
314	55	56	21	0.048	55.5

- Using the **Gulland-Holt Plot** and **Pauly's empirical models** determine the VBGF parameters (L_{∞} , t_0 and K). (12 Marks)
- Using the VBGF parameters in (a) and the Then et al (2014) Model, estimate the natural mortality (M) of this species? (4 Marks)
- If total mortality (Z) of this species is twice larger than natural mortality (M), what is the exploitation status of this species? (4 Marks)

SECTION B: Attempt any FOUR (4) questions in this Section

QUESTION 2.

Lutangu Moya is a Fisheries Biologist recruited to conduct a fish stock assessment of Lake Mweru-wantipa. What steps would you advise Mr. Moya to take in order to successfully complete this task? (20 Marks)

QUESTION 3.

Mention and discuss the factors that challenge the Stock Concept (20 Marks)

QUESTION 4.

Discuss **four (4)** factors that would control the population dynamics of a closed fish stock in a typical lake.

(20 marks)

QUESTION 5.

Distinguish between:

- | | | |
|------|---|-----------|
| i) | Fishery-dependant and Fishery-independent data. | (5 marks) |
| ii) | Holistic and Analytical models | (5 marks) |
| iii) | Growth overfishing and Recruitment overfishing | (5 marks) |
| iv) | Target Reference point and Limit Reference points | (5 marks) |

QUESTION 6.

- v) Discuss **four (4)** different methods used in fish stock assessments to identify and separate fish stocks. (16 marks)
- vi) During a fishing operation 2500 fish of one species are caught, of which 15 are tagged. These 15 specimens are part of 1000 fish that were tagged 3 months ago. It is assumed that the natural mortality (M) during these two months was about 2%. How large is this population? (4 marks)

QUESTION 7.

Write brief notes on each of the following terms in reference to fish stock assessment and population dynamics:

- | | | |
|-------|-----------------------------|-----------|
| (i) | Maximum Sustainable Yield | (5 marks) |
| (ii) | Cohort | (5 marks) |
| (iii) | Spawning Potential Ratio | (5 marks) |
| (iv) | Biological Reference Points | (5 marks) |

END OF EXAMINATION

EMPIRICAL FORMULAS

Growth Parameters

1) Gulland & Holt – Plot Model

$$\frac{L_2 - L_1}{t_2 - t_1} = a + K * L_m \qquad L_{\infty} = -\frac{a}{K} \qquad K = -b$$

2) Pauly (1979) Model

$$\text{Log}_{10} (-b) = -0.3922 - 0.2752 * \text{Log}_{10} (L_{\infty}) - 1.038 * \text{Log}_{10} (K)$$

Mortality and Exploitation Rates

3) Then et al (2014) Model

$$M = 4.118 * K^{0.73} * L_{\infty}^{-0.33}$$

4) $E = F/Z$