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 CHOs 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 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 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? **(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

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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

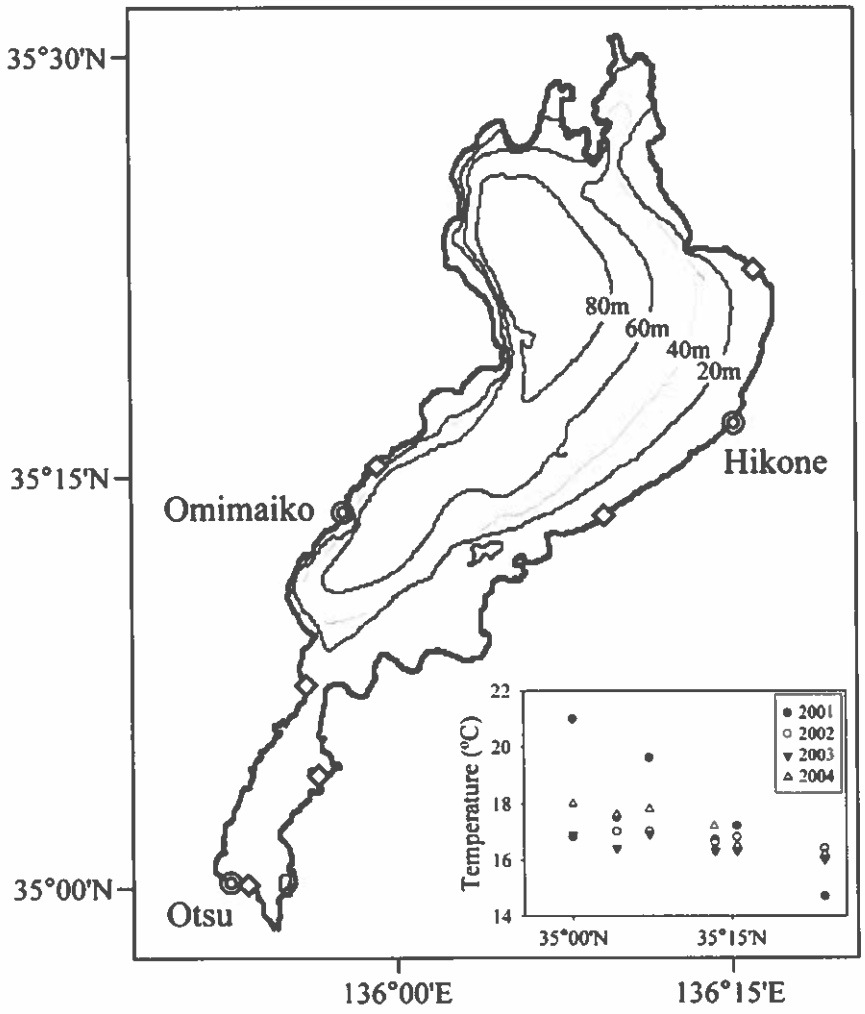
CELLPHONES AND OTHER RELATED GAGETS ARE NOT ALLOWED IN THE EXAMINATION ROOM

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°58´–35°31´N and longitudes of 135°52´–136°17´E. Study the bathymetric map carefully and answer the questions that follow.



Source: Yamamoto, Y. & Kao, 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 km²)

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. Cenotes **(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)*

KAPASA MAKASA UNIVERSITY

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

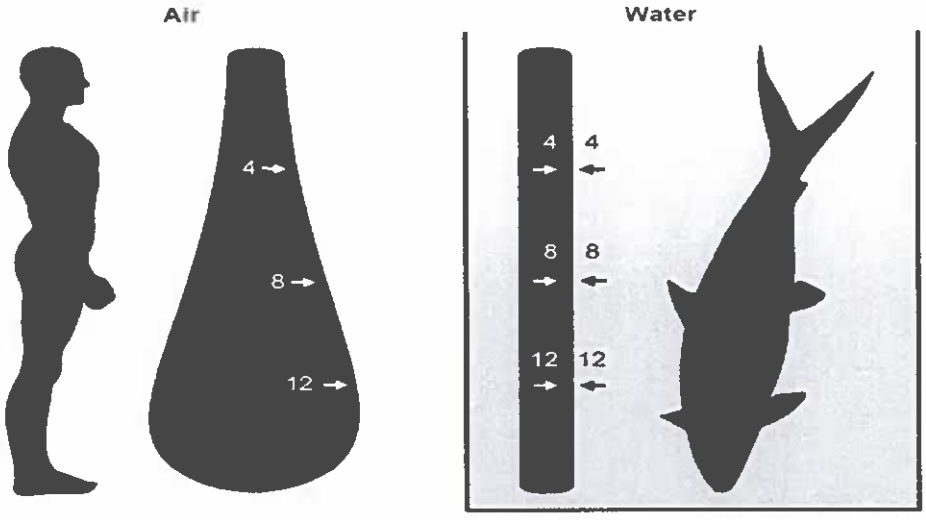
DO NOT TURN THIS PAGE UNTIL YOU HAVE BEEN TOLD TO DO SO BY THE CHIEF INVIGILATOR

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)

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.



a. Briefly explain the meaning of hydrostatic pressure of water. How does it affect the physiology of fish? (**6marks**)

b. Briefly explain how negative buoyance affects or influences the adaptation and swimming modes of fish (**4marks**).

c. 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**)

d. Based on your answer in (c), give two reasons as to why body adulation may not be of significant important in fish employing carangifrom 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 O_2 demand is closely influenced by the inverse relationship between dissolved oxygen and ambient temperature. Most metabolic process in fish are affected by this relationship.

a. Briefly explain how fluctuations in temperature affect oxygen solubility in water (**4marks**).

b. Differentiate fish exhibiting *Stenotherm* and *Eurytherms* adaptation modes. **(4marks).**

c. Explain three (3) ways in which fish subjected to constant hypoxia in the water column may adapt to such conditions (**6marks**).

d. Briefly explain the importance of the brachial circulation system in fish (**2marks**)

e. Suggest and explain two (2) anatomic features that make gill lamella an efficient aperture for gaseous exchange. (**4marks**).

QUESTION SEVEN (20marks)

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. What is the importance of median fins to the welfare of teleost fishes? (**2mark**)

d. What is meant by '*Ontogenetic dietary shift*' and why is it important in piscivores (**4marks**).

e. 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.

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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 m^2 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 105^0C. She then calculated the bulk density of the oven dry core and found 1.05 g/cm^3. 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.