

**Chattogram Veterinary and Animal Sciences University, Chattogram**  
**Faculty of Fisheries**  
**B. Sc. Fisheries (Hons.), Year-04, Semester-01, Final Examination' 2023**  
**Course No. STA-201(T), Course Title: Statistics (Theory) Old Curriculum**  
**Total Marks: 70, Time: 3 hours**

*Figures in the right margin indicate full mark. Answer any 5 (five) questions from each section. Use separate answer script for each section.*

**Section-A**

1. a) Explain the term 'Statistics'. Give two related examples in the field of Fisheries where you can use statistical methods. 3
- b) Distinguish between: i) Qualitative and quantitative variable; ii) Frequency polygon and frequency curve 4
2. a) What are the different ways of representing the statistical quantitative and qualitative data? 3
- b) Define and distinguish the scale of measurement with example: i) Nominal and ordinal scale and ii) Ratio and interval scale. 4
3. a) Discuss the measures of central tendency. Which one is the best measure and why? 3
- b) Explain what you mean by quartiles of a frequency distribution. What do they mean? 4
4. a) Define standard error. The length (cm) of five fishes are given. Calculate standard error of fish length. 20, 25, 40, 50, and 14. 3
- b) State and explain the absolute measures of dispersion. 4
5. a) Write down the comparison between bar diagram and histogram. 3
- b) Describe the different steps of construction of a frequency distribution. 4
6. a) The average sales (kg) of 'Rohu' fishes of different market in a day are given. Calculate coefficient of variation of fishes. 20, 50, 40, 45 and 25. 3
- b) What are the shape characteristics of a distribution? Discuss about kurtosis. 4

**Section-B**

7. a) What is dependent and independent variable? What are the assumptions of a regression model? 3
- b) Define correlation coefficient. State the properties of correlation coefficient. 4
8. a) Explain type II error, test statistic and power of a test. 3
- b) Define binomial distribution. State the properties of binomial distribution. 4
9. a) Briefly describe normal distribution with properties. 3
- b) Write down the test procedure of specified variance test. 4
10. a) Define the factor, treatment, and experimental unit with a suitable example in the context of the analysis of variance. 3
- b) Explain the testing procedure of latin square design. 4
11. a) Estimate the parameters of a simple linear regression model. 3
- b) Describe the test procedure of single proportion test. 4
12. a) Write down the application situation of 'F' test and 't' test. 3
- b) What is design of experiment? Discuss the lay out complexly randomized design. 4



**Chattogram Veterinary and Animal Sciences University, Chattogram**  
**Faculty of Fisheries**  
**B. Sc. Fisheries (Hons.) Year-2, Semester-1, Final Examination' 2023**  
**Course No: MBI-201 (T), Course Title: Marine Biology (Theory) Old curriculumn**  
**Full Marks: 70; Time: 3 hours**

*Answer any 05 (five) questions from each section. Figures in the right margin indicate full mark. Use separate answer script for each section.*

**Section-A**

1. a) Write down the scopes of Marine Biology. 2  
b) Classify marine organisms. 2  
c) Migration patterns in marine fishes are diverse- explain. 3
2. a) How osmoregulation in marine bony fishes is different from cartilaginous fish? 4  
b) Describe the larval nutrition mode in marine fishes with examples. 3
3. a) What is sea grass and seaweed? Write down the common and scientific name of five (05) seaweeds available in Bangladesh. 2+2  
b) How diverse the seaweed reproduction strategies are? 3
4. a) Draw the external morphology of a barnacle? 2  
b) Illustrate the life cycle of oyster. 3  
c) Differentiate among clam, oyster and mussel. 2
5. a) Write down the major groups of zooplankton with examples. 2  
b) Explain the types and causes of cyclomorphosis in marine zooplankton. 3  
c) What is DVM in marine zooplankton. 2
6. a) What is ichthyoplankton? Write down the importance of ichthyoplankton study for marine ecosystem. 1+2  
b) Classify marine benthos according to their type, size and location. 4
7. Write short notes on any 02 (two) of the following: 3.5 x 2 = 7  
a) Horseshoe crab; b) Viviparity in shark and c) Biological pump.

**Section-B**

8. a) Classify the major groups of marine fishes with their recognizable characters and examples. 3  
b) Describe marine fish migration patterns. 4
9. a) What is Ampullae of Lorenzini? 1  
b) How do sharks respire? 3  
c) Differentiate among sharks, rays and skates. 3
10. a) Classify marine bacteria. Write down the importance of marine bacteria. 3  
b) Classify marine viruses and write down their role in marine ecosystem. 4
11. a) Classify marine phytoplankton with example of each group. 5  
b) What do you know about dinoflagellate morphology? 2
12. a) Write down the common and scientific name of marine turtles found in Bangladesh. 3  
b) Draw the life cycle of a turtle species found in Saint Martin's Island. 4
13. a) What is ichthyoplankton? Draw and describe the development stages of ichthyoplankton. 4  
b) Describe the ichthyoplankton collection methods. 3
14. Write short notes on any 02 (two) of the following: 3.5 x 2 = 7  
a) Marine mammals; b) Sea anemones and c) HNLC.



**Chattogram Veterinary and Animal Sciences University, Chattogram**

**Faculty of Fisheries**

**B. Sc. Fisheries (Hons.) Year-02, Semester-01; Final Examination, 2023**

**Course Code: MFC-201 (T); Course Title: Marine Food Chemistry (Theory)-Old Curriculum**

**Full marks: 70; Time: 3 hours**

*Answer any 05 (five) questions from each section. Figures in the right margin indicate full marks. Use separate answer script for each section.*

**Section-A**

1. a) Write down the significance of marine food organisms in the economy of Bangladesh. 3  
b) What do you mean by marine plant? Discuss the present status of mollusks in Bangladesh. 4
2. a) Why do you consider seafood as high-quality food? -justify your answer. 3  
b) What kind of fishes generally contain higher amount of sarcoplasmic proteins? Explain briefly the sarcoplasmic fraction of fish muscle protein. 4
3. a) What is lipid? Write down the chemical structure of a lipid. 3  
b) What are EPA and DHA? Explain human health benefit of EPA and DHA of fish. 4
4. a) Why emulsification important to lipid metabolism? 2  
b) What is the role of lipids in metabolism? Briefly describe the factors influencing the lipid content in fish. 5
5. a) How muscle structure and composition influence the flesh quality of fish? 2  
b) What is rancidity of lipid? How would you prevent lipid oxidation in fish? List down some antioxidants. 3  
c) Enumerate the safety rules and side effects of taking CLA supplements. 2
6. a) "Hypervitaminosis takes place in case of fat-soluble vitamins rather than water soluble vitamins"-justify the statement. 2  
b) Enumerate the water soluble and fat-soluble vitamins with their chemical name. 2  
c) Write in brief about carotenoids found in marine organisms. 3
7. a) Differentiate between water soluble vitamins and fat-soluble vitamins. 2  
b) Do you think water soluble vitamins can cause toxicity in human body? -justify your answer. 2  
c) Write in brief the major role of minerals and vitamins in the human body. 3

**Section-B**

8. a) "Fish and shellfishes are more perishable compared to other foodstuffs"- justify your answer. 2  
b) Mention the common name and scientific name of six commercially important shrimp species of Bangladesh. 2  
c) Do you think seaweed culture would be feasible in Bangladesh? 3
9. a) What is flavor? Briefly describe the available compounds responsible for flavor development in fish and other seafood. 4  
b) Discuss the causes of development of undesirable fishy flavors in fish and seafood. 3
10. a) Why knowledge on the chemical composition of fish is important? Explain. 2  
b) Write in brief non-protein nitrogenous compounds in fish. 5
11. a) List down 5 (Five) algal species responsible for ASP. 2  
b) Define bioaccumulation. Write down the source organisms, symptoms and prevention of CFP. 5
12. a) Write down the chemical properties of amino acids. 2  
b) "Marine fishes are more beneficial for human health compared to freshwater."-justify the statement. 2  
c) Why protein quality is related to its essential amino acids composition and digestibility? 3
13. a) What is free fatty acid? Briefly describe the chemical composition of fish. 5  
b) What are the uses of flavor in seafood industry? 2
14. Write short notes any two (2) from the following 3.5\*2  
i) Stroma Protein, ii) Phospholipid and iii) Toxins in seafood.



**Chattogram Veterinary and Animal Sciences University, Chattogram**  
**Faculty of Fisheries**  
**B.Sc. Fisheries (Hons.) Year-02, Semester-01; Final Examination, 2023**  
**Course Code: LIM-201(T), Course Title: Limnology (Theory) Old curriculum**  
**Full marks: 70; Time: 3 hours**

*Answer any 05 (five) questions from each section. Figures in the right margin indicate full marks. Use separate answer script for each section.*

**Section-A**

1. a) "Limnological knowledge is prerequisite for successful aquaculture"- Justify this statement. 2  
b) Discuss the importance of Limnology. 3  
c) Differentiate between Limnology and Ecology. 2
2. a) Why is sun called "motor" of the aquatic biogeochemical cycle? 2  
b) Illustrate Phosphorus cycle in an aquatic system. 5
3. a) Define cyclomorphosis. 2  
b) Describe cyclomorphosis in zooplankton with necessary figure. 3  
c) Write down the biological significance of cyclomorphosis in aquatic ecosystems. 2
4. a) Define HABs. 2  
b) Enlist the potential sources of HABs. 2  
c) Describe the mechanism of human population affected by consumption of contaminated seafoods. 3
5. a) Write down the significant role of zooplankton in fisheries. 3  
b) Illustrate the life cycle of free-living freshwater copepods. 4
6. a) "Haor is known as inland sea"-Explain this statement. 2  
b) Write down the significance of "Tanguar haor" in fisheries sector. 3  
c) Mention some factor responsible for declining biodiversity in Tanguar haor. 2
7. a) "Benthos acts as biological indicators"- Explain this statement. 3  
b) Write down the role of benthic organism in fish production. 4

**Section B**

8. a) "Reclamation of derelict water bodies is impossible without limnological knowledge"- Justify. 2  
b) Differentiate between swamps and marshes. 3  
c) Why is estuary called most productive natural habitats in the world? 2
9. a) Define limiting nutrient. 2  
b) Describe the nitrogen cycle in aquatic environment. 5
10. a) Differentiate between chironomids and mosquitoes. 3  
b) Discuss the life cycle of Chironomid larvae. 4
11. a) "Parthenogenesis is prevalent in rotifer and cladocerans"- Justify. 2  
b) Illustrate the reproduction of rotifer. 5
12. a) Differentiate between phytoplankton and algae. 2  
b) Illustrate the role of plankton in carbon sequestration. 3  
c) Classify phytoplankton based on habitat. 2
13. a) Define biological productivity of inland waters. 2  
b) Describe the causal factors responsible for fluctuation of biological productivity. 5
14. Write down short notes on any 02 (TWO) of the following:  
i) Seasonal succession of Phytoplankton; ii) Eutrophication; iii) Phytoplankton and zooplankton relationship; &iv) Benthos 3.5x 2= 7



**Chattogram Veterinary and Animal Sciences University, Chattogram**  
**Faculty of Fisheries**

**B. Sc. Fisheries (Hons.) Year -02, Semester-01, Final Examination' 2023**

Course No: 0831FPH201T, Course Title: **Fish Physiology (Theory)**

Total Marks: 70 Time: 3 hours

Answer any 5 (five) questions from each section. Illustrate your answer wherever necessary. Figures in the right margin indicate full marks. Use separate answer script for each section.

**Section-A**

1. a) What do you understand by physiology and anatomy? 2  
b) Enlist different physiological systems found in fish with example. 2  
c) Why the knowledge on fish physiology is important for commercial aquaculture? 3
2. a) Compare the thermal regulation process between poikilotherms and endotherms. 4  
b) Assess the physiological and structural characteristics that make a fish poikilotherms. 3
3. a) "Carbohydrate digestion begins in mouth"-what are the changes occurs for carbohydrates in mouth? 2  
b) Enlist different carbohydrase, source, intermediate substrates and end product during digestion. 2  
c) Point out the role of HCl and bile in digestion. 3
4. a) Evaluate the respiratory efficiency of gill and lung as respiratory organ in fish. 3  
b) How concurrent and counter current exchange helps in efficient gas exchange? 4
5. a) Mention the osmotic challenges faced by fish in freshwater. 2  
b) Illustrates and describe the osmoregulation of diadromous fish. 5
6. a) Give a schematic representation of the hypothalamic-pituitary-gonadal axis in fish. 2  
b) Briefly explain the hormonal regulation of vitellogenesis in teleost. 5
- 7 Write short note on **any 02 (two)** of the following: 3.5 × 2 = 7  
a) AFPs; b) Pacemaker; c) Bohr effect and d) Endocrine control of osmoregulation

**Section-B**

8. a) What are the ways for heat transfer in different animal groups? 2  
b) Differentiate between vasoconstriction and vasodilatation. 2  
c) What do you know about rete mirabile and how it helps in thermal regulation of endothermic fishes? 3
9. a) Differentiate absorption from digestion. 2  
b) Make a comparative assessment between active transport and passive diffusion. 2  
c) Summarize the role of different hormone in digestion and absorption process. 3
10. a) Compare and contrast between anabolism and catabolism. 3  
b) Discuss different factors that control the metabolism in fish. 4
11. a) "Blood is the body's vital component for physiological and immunological function"- Explain. 3  
b) Explain the open blood circulatory system. 4
12. a) State the Fick's law of diffusion. 2  
b) Briefly describe the transportation of O<sub>2</sub> and CO<sub>2</sub> in fish. 5
13. a) Draw and label different types of kidneys found in fish. 3  
b) Briefly describe the factors affecting excretion in fish. 4
14. Write short note on **any 02 (two)** of the following: 3.5 × 2 = 7  
a) Villi; b) SDA; c) Respiratory volume and d) Chloride cell



**Chattogram Veterinary and Animal Sciences University, Chittagong**  
**Faculty of Fisheries**

**B. Sc. Fisheries (Hons.), Year -02 Semester-01 (Jan-Jun), Final Examination' 2023**  
**Course No: 0831PCO202T, Course Title: Physico-chemical Oceanography (Theory)**  
**Total Marks: 70, Time: 3 hours**

Answer any **05 (five)** questions from each section. Figures in the right margin indicate full mark. Use separate answer script for each section.

**Section A**

1. a) Define Oceanography. What are the branches and scopes of oceanography? 2+2  
b) Give an overview of space and timescales of oceanographic phenomenon. 3
2. a) What is constancy of composition in seawater? 3  
b) Enumerate the typical vertical distribution of salinity, temperature and density of seawater. 4
3. a) Classify marine benthic habitat with diagram. 3  
b) Sketch and describe the ocean floor topography. 4
4. a) What is ocean tide? What causes the tide in the ocean? 1+3  
b) Classify tide based on the tidal frequency and height? 3
5. a) Define Bay, Gulf, Spit with necessary drawings? 2  
b) Write down the mechanisms and impacts of *El-nino* and *La-nina*. 5
6. a) How Coriolis effect and Ekman spiral is related to the ocean circulation system? 3  
b) Illustrate the upwelling and downwelling mechanisms in the ocean. 4
7. Write short notes on **any two (02)** of the following: 3.5×2  
a) Tsunami; b) Marine heatwave and c) Ocean gyres.

**Section B**

8. a) What is thermohaline circulation? 2  
b) Describe the pathway and mechanisms of global conveyor belt system. 5
9. a) Draw and explain T-S diagram. 3  
b) How sea water temperature profile varies in different latitudes of the world. 4
10. a) Write down the properties and role of wave? 4  
c) Classify wave based on wave length. 3
11. a) What are the important trace elements of seawater? 2  
b) What is flux heat budget? Describe the carbon sequestration process in the ocean. 2+3
12. a) Describe the features of the SoNG in the Bay of Bengal? 3  
b) Illustrate the main features of the largest submarine fan in the world. 4
13. a) Write down your concept on dissolved gases and organic material in sea water. 3  
b) Illustrate the process and role of biological pump in ocean ecosystem. 4
14. Write short notes on **any two (02)** of the following: 3.5×2  
a) Properties of seawater; b) Salinity: a conservative property and c) Longshore current.



**Chattogram Veterinary and Animal Sciences University, Chattogram**  
**Faculty of Fisheries**

**B.Sc. Fisheries (Hons.) Year-03, Semester-01; Final Examination, 2023**

**Course Code:0831CAM201(T), Course Title: Coastal Aquaculture and Mariculture (Theory)**

**Full marks: 70; Time: 3 hours**

*Answer any05 (five) questions from each section. Figures in the right margin indicate full marks. Use separate answer script for each section.*

**Section-A**

1. a) Why Mariculture is with concerned with economic growth? 4  
b) Write the achievement of Bangladesh in Mariculture production in the global contest. 3
2. a) What is fertilization? 1  
b) Why a pond bottom is dried before fertilization? 2  
c) Give a flowchart of the fate of organic fertilizer after application in a pond. 4
3. a) Write down the larval rearing techniques of *Penaeus monodon*. 5  
b) "Proper hatchery management includes the technical, personal and economic issues" – elaborate above issues. 2
4. a) What is sustainable aquaculture and how does FAO define SDG? 3  
b) Discuss the basic data required for the sustainable aquaculture production for achieving SDG. 4
5. a) Mention the characteristics of pond soil suitable for fish production. 2  
b) Discuss the processes of soil treatments and preparation after harvesting the previous crop. 5
6. a) Write down the characters and importance of Seabass in mariculture. 2  
b) Explain in details the culture techniques of Seabass. 5
7. Write short notes on any 02 (two) of the following: 3.5×2=7  
a) Organic aquaculture; b) Culture of Mullet and c) Biosafety.

**Section B**

8. a) Write down the feasibility and problems of oyster's culture in Bangladesh. 2  
b) Describe the culture techniques of oyster. 5
9. a) Write down the advantages and disadvantages of off-bottom, raft and longline seaweed culture. 3  
b) Explain in details the production techniques of *Porphyra*. 4
10. a) Write down the scientific name of some local and marine indigenous ornamental fish. 2  
b) How to set up an aquarium for ornamental fish culture? 5
11. a) Write down the habitat and distribution of mud crab in Bangladesh. 2  
b) Explain in details the pond culture techniques of mud crab. 5
12. a) What do you mean by biofouling in aquaculture? 2  
b) Give an account on the impacts of pollutants on aquaculture farm. 5
13. a) Describe the importance of brood stock management. 2  
b) Explain in details different methods of brood stock management. 5
14. Write short notes on any 02 (two) of the following: 3.5×2=7  
a) Culture technique of milkfish; b) Culture Technique of Yellowtail Fish and  
c) Suspension culture.



**Chattogram Veterinary and Animal Sciences University, Chattogram**  
**Faculty of Fisheries**

B. Sc. Fisheries (Hons.) Year -02, Semester-01, Final Examination' 2023  
Course No: **SEB-201(T)**, Course Title: **Systematics and Evolutionary Biology (Theory)**  
Total Marks: 70                      Time: 3 hours                      – Old Curriculum

Answer any 5 (five) questions from each section. Illustrate your answer wherever necessary. Figures in the right margin indicate full marks. Use separate answer script for each section.

**Section-A**

1. a) What do you mean by systematics and taxonomy? 2  
b) What is taxon, category and variety? 2  
c) Point out the significance of studying systematics and evolutionary biology. 3
2. a) What is taxonomy? What are the key characters of taxonomic characteristics? 3  
b) Briefly describe the morphological taxonomic characters with example. 4
3. a) What do you mean by evolution and organic evolution? 2  
b) Show the process of chemical and organic evolution in a flowchart. 2  
c) What are the differences between convergence and divergence evolution? 3
4. a) Define species, monotypic species and poly-typic species. 2  
b) Write down the problems associated with typological species concept. 2  
c) Write about biological species concept with limitations. 3
5. a) Mention the zoogeographic regions of marine fish. 4  
b) Briefly describe the Nearctic regional zoogeography with example. 3
6. a) Differentiate between synonymy and homonymy. 3  
b) Explain the principle of priority with appropriate example. 4
7. Write short note on **any 02 (two)** of the following: 3.5 × 2 = 7  
a) Linnaean hierarchy; b) Mutation theory; and c) ICZN

**Section-B**

8. a) What are the basic requirements of taxonomic description of a taxon? 3  
b) Differentiate between classification and identification. 2  
c) Point out key criteria for taxonomic categories. 2
9. a) Briefly describe the Lamarckism theory of organic evolution. 5  
b) What are the main criticisms of Darwinism theory? 2
10. a) What do you mean by speciation? 2  
b) Enlist the evolutionary forces which make the population diverge. 2  
c) Differentiate between sympatric and allopatric speciation. 3
11. a) Enumerate different types of isolation with example. 3  
b) Compare and contrast pre-zygotic and post-zygotic isolating mechanisms. 4
12. a) What do you understand by phylogeny, phylogenetics and phylogenetic tree? 2  
b) What are the different parts of a phylogenetic tree? 2  
c) Elaborate the importance of studying phylogenetics in the field of biology. 3
13. a) Why nomenclature may change? 2  
b) What are the salient features of the "Code"? 5
14. Write short note on **any 02 (two)** of the following: 3.5 × 2 = 7  
a) Cladistics; b) Homonymy; and c) Process of evolution



**Chattogram Veterinary and Animal Sciences University, Chattogram**

**Faculty of Fisheries**

B. Sc. Fisheries (Hons.) Year -02, Semester-01, Final Examination' 2023

Course code and Title: **0831BEB201T, Behavioral and Evolutionary Biology (Theory)**

Total Marks: 70 Time: 3 hours

Answer any 5 (five) questions from each section. Illustrate your answer wherever necessary. Figures in the right margin indicate full marks. Use separate answer script for each section.

**Section-A**

1. a) Define behavior, cognition and communication? 2  
b) What do you understand by cryptic behavior and poster coloration? 2  
c) Mention the importance of studying fish behavior. 3
2. a) What do you know about biological rhythm and biological clock? 2  
b) Diagrammatically show the melatonin synthesis pathway. 2  
c) Write down the functions of pineal gland in maintaining the internal rhythm of fish body. 3
3. a) What do you know about adaptation? 2  
b) What are the adaptive responses observed in relation to depth? 2  
c) Explain the factors affecting the life of aquatic animals in its habitat. 3
4. a) How you will interrelate between HPA and HPG axis? 3  
b) Illustrates and describe the HPA axis in fish. 4
5. a) Differentiate between migration and movement. 1  
b) Why does a fish migrate from one environment to another? 2  
c) Explain the migratory behavior of *Tenualosa ilisha*. 4
6. a) Differentiate between convergent and divergent evolution. 2  
b) Describe the process and pattern of evolution with example. 5
7. Write short note on **any 02 (two)** of the following: 3.5 × 2 = 7  
a) Reproductive behavior; b) Chemoreceptor; c) Cortisol and d) Determination of age in fish

**Section-B**

8. a) What do you mean by circadian rhythm, circadian time and zeitgeber time? 2  
b) "Lunar age, tidal cycle and reproduction is correlated in marine animals"- explain with necessary example and diagram. 5
9. a) What do you mean by stress, arousal and homeostatic challenges? 2  
b) Briefly describe the different stressors and the physiological responses to stressors in fish. 5
10. a) What do you understand by absolute growth, relative growth and allometric growth? 2  
b) Differentiate between growth and development. 2  
c) Summarize the process of muscle growth regulation in fish. 3
11. a) What do you mean by coloration? State the Thayer's principle of coloration. 2  
b) Enlist the benefits of shoaling in marine water habitats. 2  
c) Explain the peculiar behavior of leaf fish. 3
12. a) What do you mean by evolution and natural selection? 2  
b) Diagrammatically show the process of chemical and organic evolution in earth. 2  
c) Criticise the Darwinism theory of organic evolution. 3
13. a) What do you know about phylogeny, phylogenetics and cladistics? 2  
b) What is monophyletic, paraphyletic and polyphyletic groups? 2  
c) Illustrates and describe different component of a phylogenetic tree. 3
14. Write short note on **any 02 (two)** of the following: 3.5 × 2 = 7  
a) Otolith; b) Electricity production behavior; c) Behavioral adaptation and d) GH and IGFs



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**Faculty of Fisheries**  
**B.Sc. Fisheries (Hons.) Year-02, Semester-01; Final Examination, 2023**  
**Course Code: 0831FMI201T, Course Title: Fisheries Microbiology (Theory)**  
**Full marks: 70; Time: 3 hours**

*Answer any 05 (five) questions from each section. Figures in the right margin indicate full marks. Use separate answer script for each section.*

**Section-A**

1. a) Define Microbiology. "Microbiology is a multidisciplinary science"-explain. 4  
b) Who is regarded as the father of modern microbiology? Mention his major contributions in the field of microbiology. 3
2. a) "Spontaneous generation" was a matter of controversy at early history of Microbiology-why? 3  
b) Explain the germ theory of disease. 2  
c) Write down the distinguishing characteristics among bacteria and fungi. 2
3. a) How does mold reproduce? Classify the microorganisms belonging to phylum *Eumycophyta*. 4  
b) Name two (2) species of mold and describe their importance in food. 2  
c) Why food spoilage occurs even in low temperature? 1
4. a) Define bacterial growth curve. During which phase of growth bacterial cell division is maximum? 2  
b) How do redox-potential values of food indicate aerobic, anaerobic and microaerophilic environments? 3  
c) What are the factors responsible for the declining microbial growth? 2
5. a) Name four (4) bacterial genera responsible for fish quality spoilage in Bangladesh. 1  
b) Why do the fishermen of Bangladesh face more problems in summer than in the winter after catching fish? 2  
c) Describe the post-mortem changes that occur in fish proteins, carbohydrates, and lipids due to bacterial activities. 4
6. a) Name five (5) microbial intoxications caused by pathogenic bacteria in fish and shellfish. 1  
b) Why botulin is called a neurotoxin? What are the symptoms of botulisms? 3  
c) Briefly mention the occurrences, symptoms and preventive measures of *Salmonellosis*. 3
7. a) Why do fishes spoil faster than other flesh foods? 2  
b) Write down the sequential mechanism of non-microbial and microbial spoilage of fish. 3  
c) Write down the factors influencing the kind and rate of spoilage of fish. 2

**Section B**

8. a) How will you use the knowledge of microbiology in the field of Fisheries Science? 3  
b) Briefly describe bacterial enzyme recombination with its significance. 4
9. a) What is Listeriosis? Give an account of the microorganisms involved in different types of food infection and intoxication. 5  
b) Differentiate between septate and non-septate molds. 2
10. a) Why viruses are called obligatory parasite? Write down the host ranges of virus. 2  
b) List the characteristics of a viral nucleic acid. 1  
c) Write in brief different stages of multiplication of bacteriophage by lytic cell. 4
11. a) What is chemotaxis? Write the chemical composition of bacterial capsule. 2  
b) What are the sanitary index organisms? Why they are called so? 3  
c) Define coliform bacteria. Which features make coliform bacteria important in food? 2
12. a) Define pathogenic bacteria. Which pathogens are more frequently found in polluted water? 2  
b) What are the post-harvest sources of contamination of fish? 2  
c) "Fish as a substrate for microorganisms"-justify the statement. 3
13. a) Why bacterial growth is called "autocatalytic"? 1  
b) What is botulism? Name causative agent of botulism. How can it be inactivated? 3  
c) What is phenol coefficient? Enumerate the properties of an ideal disinfectants. 3
14. a) Why spores are more heat-resistant than vegetative cells? 3  
b) What are the difference between pilus and flagellum of a bacterial cell? Illustrate different flagellar arrangement of bacterial cell with examples. 4



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**Faculty of Fisheries**  
**B.Sc. Fisheries (Hons.) Year-02, Semester-01; Final Examination, 2023**  
**Course Code: 0831FNU201(T), Course Title: Fish Nutrition (Theory)**

**Full marks: 70; Time: 3 hours**

*Answer any05 (five) questions from each section. Figures in the right margin indicate full marks. Use separate answer script for each section.*

**Section-A**

1. a) Define fish nutrition. Write down the principles of fish nutrition. 2  
b) Describe in details the role of different nutrients in aquaculture. 5
2. a) What is a protein molecule made of? How the structure of protein is different from other molecules? Show the composition and structure of protein in diagram. 1+1+2  
b) Classify protein based on their physical properties. 3
3. a) What are the nutritional value of carbohydrates? Show the structural features of carbohydrate molecule. 2+2  
b) What is fiber? Discuss the function of fiber in fish nutrition. 1+2
4. a) Write down the general functions of lipid in fish nutrition. 2  
b) Classify lipid based on their structure, chemical composition and end product of hydrolysis. 5
5. a) Define vitamins. Write down their importance in fish diet. 1+2  
b) Give a brief description on the dietary source, biological function and deficiency syndromes of folic acid, retinol and phyloquinone. 4
6. a) What are the common nutritional disorders found in cultured fish? 3  
b) Write down the effects of nutrient levels on broodstock of fish. 4
7. Write short notes on any 02 (two) of the following: 3.5×2=7  
a) Specific Dynamic Action; b) Glycolysis and c) De-amination.

**Section B**

8. a) Summarize the importance of amino acid profiles in fish nutrition. 3  
b) What are the methods used to determine essential or non-essential amino acids for the fishes? 4
9. a) What are the factors affecting fatty acid composition of fish? 5  
b) Importance of fatty acid profiles in fish nutrition. 2
10. a) Define the rate of digestion. 1  
b) What are the basic methods used to measure the rate of digestion? 6
11. a) Write down the compositions and chemical properties of protein. 2  
b) Write down the biochemical function, dietary source and deficiency syndromes of magnesium in fish. 5
12. a) What are the sources of dietary energy? Describe the factors influencing the energy requirements of fish. 2+3  
b) Give a schematic diagram of the fate of energy in salmonid fish. 2
13. a) Write down the general function of minerals. 3  
b) Explain in details the structure, biological function, deficiency syndrome and dietary sources of pyridoxine and pantothenic acid. 4
14. Write short notes on any 02 (two) of the following: 3.5×2=7  
a) Metabolism of fatty acid; b) Phospholipid and c) Biochemical functions of zinc.



**Chattogram Veterinary and Animal Sciences University, Chattogram**  
**Faculty of Fisheries**  
**B.Sc. Fisheries (Hons.) Year-02, Semester-01; Final Examination, 2023**  
**Course Code: 0831LIM201(T), Course Title: Limnology (Theory)**

**Full marks: 70; Time: 3 hours**

*Answer any 05 (five) questions from each section. Figures in the right margin indicate full marks. Use separate answer script for each section.*

**Section-A**

1. a) "Limnological knowledge is prerequisite for successful aquaculture"- Justify this statement. 2  
b) Discuss the importance of Limnology. 3  
c) Differentiate between Limnology and Ecology. 2
2. a) Why is sun called "motor" of the aquatic biogeochemical cycle? 2  
b) Illustrate Phosphorus cycle in an aquatic system. 5
3. a) Define cyclomorphosis. 2  
b) Describe cyclomorphosis in zooplankton with necessary figure. 3  
c) Write down the biological significance of cyclomorphosis in aquatic ecosystems. 2
4. a) Define HABs. 2  
b) Enlist the potential sources of HABs. 2  
c) Describe the mechanism of human population affected by consumption of contaminated seafoods. 3
5. a) Write down the significant role of zooplankton in fisheries. 3  
b) Illustrate the life cycle of free-living freshwater copepods. 4
6. a) Differentiate between lentic and lotic water bodies. 2  
b) Enlist five major lakes of the world. 1  
c) Describe the process of origin of lake basin with examples. 4
7. a) "Periphyton serves as an indicator of water quality"- explain. 3  
b) Write down the role of periphyton in aquaculture ponds. 4

**Section B**

8. a) Write down the contribution of Kaptai lake in the national economy of Bangladesh. 4  
b) "Limnological knowledge is essential for the sustainable management of the Kaptai lake" – Explain. 3
9. a) Define limiting nutrient. 2  
b) Describe the nitrogen cycle in aquatic environment. 5
10. a) Discuss the distribution of planktonic forms in lentic and lotic systems. 3  
b) Differentiate between variation of productivity in lentic and lotic habitats. 4
11. a) "Parthenogenesis is prevalent in rotifer and cladocerans"- Justify. 2  
b) Illustrate the reproduction of rotifer. 5
12. a) Differentiate between phytoplankton and algae. 2  
b) Illustrate the role of plankton in carbon sequestration. 3  
c) Classify phytoplankton based on habitat. 2
13. a) Define secondary production. 2  
b) Why primary and secondary production are interdependent? 2  
c) Discuss the factors responsible for the fluctuation of secondary production. 3
14. Write down short notes on any 02 (TWO) of the following:  
i) Seasonal succession of Phytoplankton; ii) Eutrophication; iii) Phytoplankton and zooplankton relationship; & iv) Benthos 3.5x 2= 7



**Chattogram Veterinary and Animal Sciences University, Chattogram**  
**Faculty of Fisheries**  
**B.Sc. Fisheries (Hons.) Year-Two, Semester - One; Final Examination, 2023**  
**Course Code: 0512 BCH 201 Course Title: Biochemistry (Theory)**  
**Full marks: 70; Time: 3 hours**

Answer any 03 (Three) questions from each section of which question number 1 & 5 are compulsory. Figures in the right margin indicate full marks. Use separate answer script for each section.

**Section-A**

1. a) Define Biochemistry. "Biochemistry plays a valuable role in the field of fisheries" – justify the statement. 1+2=3
- b) Define biomolecules. Write down the salient distinguishing features among carbohydrates, proteins, lipids, and nucleic acids. 1+4=5
- c) What is the functional unit of life? Draw and label the different parts and organelles of it. 1+2=3
  
2. a) Define protein. Classify protein with a suitable example. 1+4=5
- b) What is the organizational level of protein? Show how many bonds are involved in the tertiary structure of the protein. 2+2=4
- c) "Proteins are responsible for the structure and strength of the body"- give a logical explanation. 3
  
3. a) Classify carbohydrates with examples. 3
- b) Write down the structure and functions of three biologically important disaccharides. 3
- c) What is reducing sugars? Give an example of monosaccharide with structure and show anomeric carbon, asymmetric carbon, primary alcohol and how many possible isomers will form from this sugar. 1+2=3
- d) Define the following terms: (i) Epimer; (ii) Mutarotation; (iii) Tautomerization; (iv) Esters; (v) Glycosides and (vi) Glycoprotein 0.5x6=3
  
4. a) Define biocatalyst. Are all enzymes proteins? 1+2=3
- b) Enumerate the factors affecting enzymes action. Describe the effect of temperature and pH on enzyme action. 1+2=3
- c) What is active site? Write down the salient features of active site. 1+2=3
- d) Briefly describe the different types of enzyme specificity with example. 3

**Section B**

5. a) Give a salient feature of the double helical structure of DNA. Give experimental evidence in support of DNA as a genetic material. 2+2=4
- b) Define nucleotides. Differentiate between nucleotides and nucleosides. Write down the general structure of nitrogen bases. 1+1+1=3
- c) Define the following terms: i) Annealing; ii) T<sub>m</sub>; iii) Codon and iv) Chargaff's rule 4x1=4
  
6. a) The "Central metabolic pathways" is also called TCA, Krebs or Citric acid cycle.-explain it 3
- b) Catabolism is a breakdown and anabolism is a build up process. Explain with an example. 3
- c) Mention the anaplerotic reaction for the TCA cycle with their significance. Show up the calculation of ATP gain per turn of the TCA cycle. 3
- d) What is HMP shunt? Write down the significance of this pathway. 3
  
7. a) What is gluconeogenesis? Draw a schematic diagram of gluconeogenesis and mention the by-pass reactions in gluconeogenesis that differentiate in from glycolysis 4
- b) Why β oxidation is so called? Give a schematic diagram showing the transport of acyl-CoA across the inner mitochondrial membrane. 4
- c) Mention the probable causes and symptoms of ammonia toxicity. 4
  
8. a) What is phospholipid? Write down the functions of phospholipids. "Unsaturated fats are much better than saturated fats". Show the reason. 1+1+2=4
- b) Define rancidity. Write down the factors affecting rancidity. 1+3=4
- c) Define Antioxidant. Write down the significance of the following tests: i) Iodine number; ii) Saponification number; iii) R.M number and iv) Acid number 1+3=4