Chittagong Veterinary and Animal Sciences University, Chittagong
Faculty of Fisheries
B. Sc. Fisheries (Hons.) Year -02 Semester-02 Final Examination' 2015
Course No: FEC-202 (T), Course Title: Fisheries Economics
Total Marks: 70, Time: 3 hours

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

Section-A

1.	a)	Define fisheries economics and aquaculture.	3.0
	b)	Why demand curve slope downward to the right?	4.0
2.	a)	Briefly discuss the basic assumptions underlying the Law of Diminishing Marginal Utility.	4.0
	b)	Show the relationship between total utility and marginal utility.	3.0
3.	a)	What is commercial bank?	3.0
	b)	Discuss the functions of commercial bank.	4.0
4.	a)	What are TP, AP and MP?	3.0
	b)	Which stage of production is rational producer seeking?	4.0
5.	a)	Define indifference curve.	2.0
	b)	Diagrammatically explain how consumer reaches in equilibrium?	5.0
6.	a)	Define division of labour.	2.0
	b)	Briefly discuss the criticism of the Malthusian theory of population.	5.0
7.		Write short notes on (a) Labour efficiency (b) Production Possibility Frontier (PPF)	7.0

Section B

8.	a)	What is demand?	3.0
	b)	Briefly discuss the factors influencing the demand of fish in Bangladesh.	4.0
9.	a)	Define project.	3.0
	b)	Discuss the most important discounted project appraisal techniques.	4.0
10.		Differentiate between- (a) Credit and micro credit (b) Iso-quant curve and indifference curve	7.0
11.		Describe the importance of fish production in the economy of Bangladesh.	7.0
12.	a)	What is break-even point?	2.0
	b)	Graphically discuss the break-even analysis.	5.0
13.	a)	What is capital formation?	2.0
	b)	Discuss the stages of capital formation.	5.0
14.		Write short notes on **any two** of the followings:	3.5×2=7.0

a) Factors influencing efficiency of labour;
b) Rational zone of production; and
c) NPV, BCR and IRR.

Chittagong Veterinary and Animal Sciences University, Chittagong
Faculty of Fisheries
B. Sc. Fisheries (Hons.) Year -02 Semester-02 Final Examination, 2015
Course No: FPA-202 (T); Course Title: Fish Parasaitology
Full Marks: 70; Time: 3 hours

*Answer any **05 (FIVE)** questions from each section. The figures in the margin indicate full marks.*

Section-A

1.	a)	Define parasite and host.	2
	b)	Discuss the importance and application of Parasitology in Fisheries Science.	5
2.	a)	What do you understand by parasitic infestation?	2
	b)	How do you estimate the intensity of infestation using ecological parameters?	2
	c)	Explain at least two such ecological parameters with examples.	3
3.	a)	What do you mean by definitive host and vector?	2
	b)	Describe briefly the life cycle of a cestode which cause disease in fish.	5
4.	a)	What is argulosis? Give the names of its susceptible host fishes of Bangladesh.	3
	b)	Find out the cost of the medicated feed for 2000 kg of carps at a feeding rate of 3 % body weight for 10 days. [Antibiotic 2.5 g active ingredient and Tk 25/g; Feed Tk 30/g]	4
5.	a)	What do you mean by reservoir and definitive host?	2
	b)	Describe the life cycle of a common Protozoan parasite of fish.	3
	c)	Mention its developmental stages and infective stages.	2
6.	a)	Define zoonosis?	1
	b)	Discuss public health problem associated with fish consumption.	3
	c)	Suggest how these problems can be minimized.	3
7.		Write notes on any **02 (TWO)** of the followings:	3.5x2=7
	a)	Attachment organs of fish parasites.	
	b)	Parasites as indicator of pollution.	
	c)	Pseudoparasitism and temporary parasitism.	

Section-B

8.	a)	Describe a fish borne nematodiasis with its etiology, life cycle, symptoms and control measures.	5
	b)	What are the aquatic organisms other than fish that are infested by nematode parasites?	2
9.	a)	Discuss the following diseases with description of causative agents, symptoms and diagnosis: i. Lernaeasis; ii. Ichthyobodosis.	5
	b)	Describe the control measures of these diseases.	2
10.	a)	Define stress and stressor.	2
	b)	Describe the stages of stress.	2
	c)	Briefly narrate the biological and procedural factors of stress.	3
11.	a)	What do you mean by host-parasite relationship?	3
	b)	Describe the basic concept of immunity and defense mechanism in fish.	4
12.	a)	Distinguish between intermediate and final host.	2
	b)	Illustrate the life cycle of a digenean fish parasite.	5
13.	a)	What is Dephylobothriasis?	2
	b)	Describe the nature of damage of its causative agent on host fishes.	3
	c)	What preventive measures can be taken against its infestation?	2
14.		Write notes on any **02 (TWO)** of the followings:	3.5x2=7
	a)	Parasymbiosis.	
	b)	Ichthyophthiriasis.	
	c)	Parasite as a biological tag.	

Chittagong Veterinary and Animal Sciences University, Chittagong
Faculty of Fisheries
B. Sc. Fisheries (Hons.) Year -02 Semester-02 Final Examination' 2015
Course No: FMI-202 (T), Course Title: Fisheries Microbiology
Total Marks: 70, Time: 3 hours

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

Section-A

1.	a)	Discuss the role of microorganisms in nature. As a student of Fisheries science why should you study microbiology?	5.0
	b)	Write down the classification of fungi important in food and ingredients.	2.0
2.	a)	Who is the father of microbiology? Write down his contribution in the development of microbiology.	3.0
	b)	What is the spontaneous generation theory?	1.0
	c)	Write down the Koch's postulates on germ theory.	3.0
3.	a)	Write down the fundamental differences between prokaryotic and eukaryotic cells.	2.0
	b)	Show the steps of asexual reproduction of mold within the help of diagram.	2.0
	c)	Define bacteria. Write down the shapes and dimensions of bacteria.	3.0
4.	a)	Draw and label a typical bacterial cell.	2.0
	b)	What is piscirickettsiosis? Name its causative agents along with the sign and symptoms of the disease.	3.0
	c)	Classify bacteria on the basis of arrangements of flagella on the surface of bacterial cells with example and figure.	2.0
5.	a)	Why bacterial spores are called cryptobiotic?	1.0
	b)	Why spores are more heat resistant than vegetative cells?	2.0
	c)	Show the steps of spore formation in a bacterial cell with labeled diagram.	4.0
6.	a)	Why bacteria is considered as most important microorganisms in fisheries?	3.0
	b)	Define true yeasts, false yeasts, top yeasts and bottom yeasts with examples.	3.0
	c)	Explain the following terms: i) Pasteurization and ii) Basophilic bacteria.	1.0
7.	a)	Define virus.	1.0
	b)	Why viruses are called obligate parasites?	1.0
	c)	Briefly describe different steps of multiplication of bacteriophage with figure.	5.0

Section-B

8.	a)	How do you define "Äquatic bacteria"? Write down the general characteristics of marine bacteria.	3.0
	b)	What are the sanitary index organisms? Why they are called so?	2.0
	c)	Define coliform bacteria. Write down the characteristics of coliform bacteria that makes them important in food industry.	2.0
9.	a)	Why fishes spoil faster than other flesh foods?	2.0
	b)	Write down the sequential mechanism of non-microbial and microbial spoilage of fish.	3.0
	c)	Write down the factors influencing the kind and rate of spoilage of fish.	2.0
10.	a)	Why bacterial growth is called "Autocatalytic"?	2.0
	b)	What is putrefaction? What will happen when microbes act upon amino acids?	2.0
	c)	Write down the important distinguishing characteristics of the following genera: i) *Pseudomonas* and ii) *Clostridium.*	3.0
11.	a)	Define microbial contamination and spoilage of fish.	2.0
	b)	What are the evidences of spoilage?	2.0
	c)	How the kind of fish and harvesting method influence the kind and rate of spoilage of fish?	3.0
12.	a)	Briefly discuss the effect of Water Activity (a_w) and p^H of food on the growth and activity of microorganisms.	4.0
	b)	What interactions are expected during growth of mixed bacterial populations?	3.0
13.	a)	What is botulism? Write down the characteristics of its causative agent.	3.0
	b)	Briefly describe the occurrence, symptoms and prevention of shigellosis.	4.0
14.	a)	Describe the characteristics of following molds with their industrial importance: i) *Aspergillus* and ii) *Penicillium*	4.0
	b)	Write shot notes on: thermoduric bacteria, bread yeast and film yeast.	3.0

Chittagong Veterinary and Animal Sciences University, Chittagong
Faculty of Fisheries

B. Sc. Fisheries (Hons.) Year -02 Semester-02, Final Examination' 2015
Course No: **CZM-202 (T)**, Course Title: **Coastal Zone Management (Theory)**
Total Marks: 70, Time: 3 hours

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

Section-A

1. a) Define coastal zone. What are the basic characteristics of coastal zone? 2.5
   b) Illustrate the extent of a coastal zone. 2.0
   c) "The practice of Integrated Coastal Zone Management (ICZM) is crucial for coastal resilience" – Justify the statement. 2.5

2. a) What do you mean by the boundaries of coastal zone? 2.0
   b) "Land-sea interactions influence the coastal zone which act as a system" – Illustrate the statement. 3.0
   c) Sketch the ICZM framework for coastal resource management in Cox's Bazar, Bangaldesh. 2.0

3. a) Differentiate between seagrass and seaweed. 1.0
   b) Discuss the types of coral reefs with examples. 3.0
   c) Illustrate the impacts of bilge and ballast water in coral reef. 3.0

4. a) What are the roles of integrations for coastal resource management? 2.0
   b) Discuss the dimension of integration for coastal resource management. 2.0
   c) Mention the traditional and present practices for coastal resource management in the coastal belt of Bangladesh. 3.0

5. a) Discuss the impacts of shrimp farming in coastal regions. 2.0
   b) What are the major issues related to coastal aquaculture expansions? 2.0
   c) "Shrimp farming and salt production activities accelerated the destruction of Chakoria Sundarban" – Justify the statement. 3.0

6. a) What do you mean by resource use conflicts? 2.0
   b) Show the coastal resource use conflict pattern using problem tree analysis. 3.0
   c) Enumerate the causes related to biodiversity loss in the coastal zone of Bangladesh. 2.0

7. Write short note on any 02 (Two) of the followings: 3.5×2= 7.0
   a) Vulnerability indicators;
   b) Natural coastal disaster;
   c) Salt marsh communities;
   d) Marine Protected Areas.

Section-B

8. a) Sketch the general morphology of a typical coast. 1.0
   b) Illustrate briefly the landward and seaward boundaries of coastal zone. 3.0
   c) Prepare a land use zoning map of Cox's Bazar coast. 3.0

9. a) Define EEZ. 1.0
   b) What are the importances of a coast? 2.5
   c) Illustrate the impacts of industrial waste on aquatic environment of a coast. 3.5

10. a) What do you understand by protected areas? 1.5
    b) Discuss on management mechanisms or assessment tools of ICZM. 2.5
    c) Illustrate the methodology for ICZM plan preparation of an island. 3.0

11. a) What is tourism? 1.0
    b) Identify the major stakeholders for coastal tourism development. 3.0
    c) Illustrate the assets categories of SLA. 3.0

12. a) Define coastal planning. 1.0
    b) Discuss the importance of GIS and Remote Sensing for ICZM. 3.0
    c) Discuss the importance of CBCRM and seven-tier management system of the coastal zone. 3.0

13. a) What do you mean by shore protection works? 1.0
    b) Define Eco-engineering in the field of CZM. 2.0
    c) Illustrate the uses and functions of the Chittagong coast along the BoB. 4.0

14. Write short note on any 02 (Two) of the followings: 3.5×2= 7.0
    a) Soft Engineering
    b) Salt Production Techniques
    c) GIS technology in CZM
    d) Community resilience

Chittagong Veterinary and Animal Sciences University, Chittagong
Faculty of Fisheries
B. Sc. Fisheries (Hons.) Year -02 Semester-02 Final Examination' 2015
Course No: FPH-202 (T), Course Title: Fish Physiology
Total Marks: 70, Time: 3 hours

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

Section-A

1.	a)	Define poikilothermy and homeothermy.	2.0
	b)	Write down the effects of extreme high temperature on fish physiology.	2.0
	c)	Fish is a poikilothermic animal- explain.	3.0
2.	a)	Distinguish between enzyme and zymogen.	2.0
	b)	Briefly describe the absorption mechanism of digested food materials.	3.0
	c)	Write down the role of HCl in digestion.	2.0
3.	a)	Describe the components of fish RBC and WBC.	4.0
	b)	Write down the name of organs that take part in the formation of blood cells in fish and amphibians.	3.0
4.	a)	Define respiration.	1.0
	b)	What do you know about Fick's Law of diffusion?	2.0
	c)	Briefly describe the O_2 transport mechanism in fish.	4.0
5.	a)	Define excretion.	1.0
	b)	Briefly describe the excretory process in fish with diagram.	5.0
	c)	Enlist the functions of fish kidney.	1.0
6.	a)	Write down the forms of nitrogenous wastes that occur in different animals.	3.0
	b)	Briefly describe the osmoregulatory mechanisms of a freshwater fish.	4.0
7.	Write short note on **any two** of the following:		3.5×2=7.0
	a)	Bohr effect;	
	b)	Fish heart ;	
	c)	Glomerulus; and	
	d)	Proteolytic enzyme	

Section B

8.	a)	Define fish and fish physiology.	2.0
	b)	Write down the importance of studying fish physiology.	3.0
	c)	What are the relationships between fish physiology and other branches of fisheries science?	2.0
9.	a)	What do you mean by 'rete mirabile' and 'piloerection'?	2.0
	b)	Differentiate between vasoconstriction and vasodilatation.	2.0
	c)	What are the adaptations made by poikilotherms in fluctuating temperature?	3.0
10.	a)	Differentiate between digestion and metabolism.	3.0
	b)	What are the two stages of catabolism?	2.0
	c)	What do you know about metabolic activity in fish?	2.0
11.	a)	Define cardiovascular system.	1.0
	b)	What do you know about cardiovascular control in fish?	3.0
	c)	Differentiate between renal portal system and hepatic portal system in fish.	3.0
12.	a)	Define osmosis, homeostasis and osmoregulation.	2.0
	b)	Briefly describe the osmoregulatory mechanism of *Tenualosa ilisha*.	5.0
13.	a)	Define reproduction.	1.0
	b)	Briefly describe the spermatogenesis in fish.	6.0
14.	Write short note on **any two** of the following:		3.5×2=7.0
	a)	HPG axis	
	b)	Countercurrent exchange;	
	c)	Chloride cell; and	
	d)	Bowman's capsule	

Chittagong Veterinary and Animal Sciences University, Chittagong
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B. Sc. Fisheries (Hons.) Year -02 Semester-02, Final Examination' 2015
Course No: **FOC-202 (T)**, Course Title: **Fisheries Oceanography (Theory)**
Total Marks: 70, Time: 3 hours

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

Section-A

1.	a)	Define Oceanography.		2
	b)	Briefly describe the importance of studying Oceanography for Fisheries Development.		3
	c)	Mention 4 (four) important findings of the Voyage of Challanger.		2
2.	a)	Draw and label the geological layers of earth.		2
	b)	How oceanic crust form?		2
	c)	Illustrate different convergent plate boundaries.		3
3.	a)	Define: Surf zone, Gulf.		2
	b)	What is continental margin?		2
	c)	Classify marine habitat with schematic diagram.		3
4.	a)	Define Marine Sediments.		1
	b)	Classify sediments on the basis of origin and particle size.		4
	c)	Design the arrangement pattern of marine sediments (any two).		2
5.	a)	Define ocean wave. Draw and label a simple but representative wave.	1+2=	3
	b)	What are causes of ocean wave?		2
	c)	Categorize wave on the basis of wave size.		2
6.	a)	Define Fishing Grounds.		1
	b)	How to identify a new fishing ground?		2
	c)	Briefly describe the Fishing grounds in the Bay of Bengal identified so far.		4
7.	Write down short note on **any two** of the followings:		3.5×2=	7
	a) SOFAR Channel;	b) Ooze;		
	c) Longshore drift;	d) Mn-nodules.		

Section-B

8.	a)	What is EEZ? Why EEZ water is so important for Bangladesh?		2
	b)	How improvement of fishing tactics can increase harvest in the seas?		3
	c)	Can subduction zone in ocean influence fisheries?-Explain.		2
9.	a)	What is Red Clay?		1
	b)	Sketch and describe the sediment transportation process to the sea.		3
	c)	Write down the sources and distribution pattern of sediment in ocean.		3
10.	a)	What is Ekman Transport?		2
	b)	What do you know about Oceanic Gyres?		2
	c)	Write down the mechanism of upwelling relating Coriolis effect.		3
11.	a)	What is diurnal and semi-diurnal tide?		2
	b)	Classify tide on the basis of Tidal Bulging.		3
	c)	Write down the mechanism of tide mentioning major forces.		2
12.	a)	Why ocean water is salty?		2
	b)	What are the factors affecting the salinity changes in the ocean?		2
	c)	Give a short description about the composition of sea water.		3
13.	a)	What is flood current and ebb current?		2
	b)	How tide influence coastal and marine organisms?		2
	c)	Write down the components and mechanism of Rip current.		3
14.	Write down short note on **any two** of the followings:		3.5×2=	7
	a) World Convection Cell ;	b) Tsunami;		
	c) The Gulf Stream;	d) Origin of the Ocean.		

Chittagong Veterinary and Animal Sciences University, Chittagong
Faculty of Fisheries

B. Sc. Fisheries (Hons.) Year -02 Semester-02 Final Examination' 2015

Course No: FPD-202 (T), Course Title: **Fish Population Dynamics (Theory)**

Total Marks: 70, Time: 3 hours

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

Section-A

1. a) Define Species and Poulation. 3
   b) 'The number of individuals of a fish population fluctuates'- explain. 4
2. a) Mention at least two cases that fish species individuals exist as unit stocks. 3
   b) Name the types of spacing for individuals within a unit stock. Describe one of them briefly. 4
3. a) Give 6 real-life examples of CPUE from the fisheries of the Bay of Bengal. 3
   b) Differentiate between 'apparent effort' and 'effective effort'. 4
4. a) Define vulnerability. 1
   b) What does the value of vulnerability depend on? 2
   c) Write down the assumptions to be made in running depletion method. 4
5. a) Define absolute abundance and relative abundance. 2
   b) What does standard error suggest about sample mean? 1
   c) Suppose in a fish stock, the initial CPUE was 25 fish per hour, and after 2080 fish had been caught, the CPUE was 20 fish per hour. Calculate the percent that the CPUE was reduced. 4
6. a) Mention the difference between Loslie and Delury model in depletion method. 2
   b) A depletion experiment using traps on an isolated 24 km^2 stock of crabs was run over 4 weeks. Estimate the catchability coefficient per km^2 and the initial stock size using the following table showing the number of crabs caught and the number of traps used per week. 5

Week	**1**	**2**	**3**	**4**
Catch	2274	2376	2734	1836
Traps	140	183	235	204

7. a) What is condition factor? 1
   b) What do you mean by isometric growth? 1
   c) Linearize the power curve equation. 3
   d) What do correlation coefficient and coefficient of determination express about the two variables of linear relationship? 2

Section-B

8. a) What is Lα? 2
   b) Define pseudo-cohorts. 1
   c) Derive the equations to estimate the parameters of Von-Bertalanffy growth model. 4
9. a) List some commonly used tags used in fisheries study. 1
   b) Write down the merits of fin clipping. 1
   c) The numbers of Sea cucumbers of seven quadrates sampled from a habitat of 156000 m^2 area were 4, 15, 9, 6, 7, 13 and 5. All the quadrates are of equal size of 100 m^2. Calculate the absolute abundance of the population with 95% confidence level. Use t = 2.45. 5
10. a) Name the hard parts of fishes on which growth are formed. 2
    b) Analyze the mean lengths at ages of ribbon fish stock in the Bay of Bengal, given in the following table to estimate the growth parameters K and Lα. 5

Age (year)	**I**	**II**	**III**	**IV**	**V**	**VI**
Length (mm)	234	295	346	390	427	458

11. a) Give the most useful definitions of recruitment in fisheries studies. Illustrate a generalized life history triangle for fish species. 3
    b) Linearize both the 'Beverton & Holt' and 'Ricker' models in stock-recruitment relationships. 4
12. a) Show schematically the events and the inter-event phases in life history of exploited species. Do all species have geographically separated spawning and nursery areas? 3
    b) Define Lm. 1
    c) What is GSI? How is it calculated? 3
13. a) Describe the reasons for death in a fish population. 3
    b) Define catch curve. How do you obtain the equation to estimate mortality rate algebraically in a length-based catch curve? 4
14. a) Describe the factors that reduce the chance of survival of individual in a fish population. 2
    b) Describe the reasons for fish death during planktonic larval stage. 2
    c) Mention the rate of fishing mortality in an unexploited stock. Write down the Pauly's equation to predict natural mortality. 3

Chittagong Veterinary and Animal Sciences University, Chittagong
Faculty of Fisheries
B. Sc Fisheries (Hons.), Year -02, Semester-02 (July-December), Final Examination' 2016
Course Code: FEC-202 (T), Course Title: Fisheries Economics
Full Marks: 70, Time: 3 hours

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

Section-A

1.	a.	Differentiate between fisheries and fisheries economics.	3
	b.	Why does a student of fisheries science need to study fisheries economics?	4
2.	a.	What is demand? State and graphically explain the law of demand.	4
	b.	Briefly explain the exceptions to the law of demand.	3
3.	a.	Define gross margin and farm profitability.	3
	b.	Explain the equilibrium of a farm with the help of MR and MC curve.	4
4.		Differentiate between- a) Indifference Curve analysis and Marshallian Utility analysis; b) Demand and want.	3.5X2=7
5.	a.	Define production and production function.	3
	b.	Which stage of production has a rational producer seek?	4
6.	a.	Construct a hypothetical short run cost schedule and draw the cost curves in a two dimensional graph.	4
	b.	Why is the average curve U-shaped?	3
7.	a.	Define a project.	1
	b.	Discuss the discounted project appraisal techniques with advantages and disadvantages.	6

Section-B

8.	a.	How do you measure point elasticity of demand by geometrical method?	4
	b.	If quantity demand of Tilapia fish fall from 15 million ton to 10 million ton due to increase in price from Tk 120/kg to Tk 145/kg, what is Tilapia fish's price elasticity of demand? Interpret your result.	3
9.	a.	Define Iso-quant curve.	2
	b.	Graphically explain the equilibrium of a producer by using the Iso-quant curve and Iso-cost line.	5
10.		Do you think fish cultivation effects on our environment? Justify your opinion.	7
11.	a.	What is capital and capital formation?	2
	b.	Discuss the stages of capital formation.	5
12.	a.	What are the characteristics of perfect competition? Discuss briefly.	3
	b.	How is price of a commodity determined with the help of demand curve and supply curve?	4
13.	a.	Define money and credit.	3
	b.	Discuss the function of money.	4
14.		Write short notes on the following: a) Division of labour; b) Capture fisheries in Bangladesh.	3.5X2=7

Chittagong Veterinary and Animal Sciences University, Chittagong
Faculty of Fisheries
B. Sc. Fisheries (Hons.) Year -2 Semester-2, Final Examination' 2018
Course No: **FPH-202 (T),** Course Title: **Fish Physiology (Theory)**
Total Marks: 70, Time: 3 hours

*Answer any **5 (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 fish physiology.	1
	b)	How will you apply your fish physiological knowledge in aquaculture?	3
	c)	Justify fish as a poikilothermic animal.	3
2.	a)	"Digestion is a physiological process"-explain the statement.	2
	b)	Explain the role of an acid and an alkaline solution in food digestion.	2
	c)	Define the following terms- proteolytic enzyme, zymogen and emulsification.	3
3.	a)	Write the biological definition of respiration.	1
	b)	How does countercurrent exchange work in teleost?	4
	c)	How does high temperature create respiratory problems in fish?	2
4.	a)	Define fish blood.	1
	b)	Write the components and functions of leucocytes.	3
	c)	Write the name of the organs taking part in the formation of blood cells in fish and amphibians.	3
5.	a)	Define excretion.	1
	b)	Distinguish between kidney of freshwater and marine teleosts.	3
	c)	Diagrammatically show the structural unit of a mesonephric kidney.	3
6.	a)	Classify fishes on the basis of their reproductive behaviour.	2
	b)	Summarize the breeding behaviour of Three Spine Stickleback.	5
7.	a)	Write the forms of nitrogenous wastes occur in different animals.	3
	b)	Explain the osmoregulatory mechanisms of a marine fish.	4

Section B

8.	a)	Define metabolism.	1
	b)	Write different types of metabolic activities found in fish.	3
	c)	Diagrammatically show the metabolic pathways that involved in cellular respiration.	2
	d)	Write the name of the environmental factors that affect metabolism in fish.	1
9.	a)	Point out the components of the circulatory system and how will you relate among them.	3
	b)	Draw and label a fish heart and indicates the flow of blood through the heart.	1
	c)	Between 3 chambered and 4 chambered heart, which one is more efficient and why?	3
10.	a)	Distinguish between homeotherm and poikilotherm animals.	2
	b)	Explain how dohomeotherms maintain a constant body temperature?	4
	c)	In which situation vasoconstriction mechanism is followed?	1
11.	a)	What do you mean by spermiogenesis?	1
	b)	Illustrate the spermatogenesis process in fish.	4
	c)	Draw and label a mature spermatozoon of a teleost.	2
12.	a)	Define endocrine gland.	1
	b)	Is hormone a chemical messenger? Explain.	3
	c)	Write the name and function of hormones secreted from the anterior pituitary gland.	3
13.	a)	"Fish gill use countercurrent oxygen exchange to maximize the uptake of oxygen"- justify this statement.	3
	b)	Explain how oxygen is carried out from gill to body tissue.	4
14.	Write down short notes on any ***TWO (02)*** of the followings: i) Sexuality in fishes; (ii) HPG-axis iii) Fick's Law of diffusion		3.5 X 2 = 7