

ROYAL CIVIL SERVICE COMMISSION
BHUTAN CIVIL SERVICE EXAMINATION (BCSE) 2023
EXAMINATION CATEGORY: TECHNICAL

PAPER III: SUBJECT SPECIALISATION PAPER FOR FISHERY

Date	: October 7, 2023
Total Marks	:100
Writing Time	:150 minutes (2.5 hours)
Reading Time	:15 Minutes (prior to examination time)

GENERAL INSTRUCTIONS:

1. Write your Registration Number clearly and correctly on the Answer Booklet.
2. The first 15 minutes is being provided to check the number of pages of Question Paper, printing errors, clarify doubts and to read the instructions. You are NOT permitted to write during this time.
3. This paper consists of **TWO SECTIONS**, namely SECTION A & SECTION B:
 - **SECTION A** has two parts: Part I - 30 Multiple Choice Questions
Part II - 5 Short Answer QuestionsAll questions under SECTION A are COMPULSORY.
- **SECTION B** consists of case I and Case II. Choose **ONE CASE** and answer the questions.
4. All answers should be written on the Answer Booklet provided to you. Candidates are not allowed to write anything on the question paper. If required, ask for additional Answer Booklet.
5. All answers should be written with correct numbering of Section, Part and Question Number in the Answer Booklet provided to you. Note that any answer written without indicating the correct Section, Part and Question Number will NOT be evaluated and no marks will be awarded.
6. Begin each Section and Part in a fresh page of the Answer Booklet.
7. You are not permitted to tear off any sheet(s) of the Answer Booklet as well as the Question Paper.
8. Use of any other paper including paper for rough work is not permitted.
9. **You must hand over the Answer Booklet to the Invigilator before leaving the examination hall.**
10. This paper has **7 printed pages**, including this instruction page.

GOOD LUCK

SECTION A

PART I: Multiple Choice Questions [30 marks]

Choose the correct answer and write down the letter of your chosen answer in the Answer Booklet against the question number e.g. 31 (d). Each question carries ONE mark. Any double writing, smudgy answers or writing more than one choice shall not be evaluated.

1. When more than single species of fish is cultured at a time, then the type of culture is called as:
 - a) Monoculture
 - b) Sericulture
 - c) Aquaculture
 - d) Polyculture

2. Which of the following is NOT an Exotic/Chinese Carp?
 - a) Crucian Carp
 - b) Mrigal
 - c) Silver Carp
 - d) Common Carp

3. Which fish species is known for its migratory behavior?
 - a) Tilapia
 - b) Mrigal
 - c) Mahseer
 - d) Stone roller

4. What is the common name of *Schizothorax sps*?
 - a) Himalayan Trout
 - b) Trout Barb
 - c) Snow Trout
 - d) Brown Trout

5. What is the term for the scientific study of fish?
 - a) Limnology
 - b) Ichthyology
 - c) Ornithology
 - d) Herpetology

6. In which country was the 2nd International Mahseer Conference held?
 - a) India
 - b) Nepal
 - c) Bhutan
 - d) Thailand

7. What is the term for the removal of excess fish from a fish population to improve growth and yield in aquaculture?
 - a) Thinning
 - b) Stocking
 - c) Grading
 - d) Spawning

8. Which agency in Bhutan is responsible for promoting and development of warm water aquaculture?
 - a) National Research and Development Centre for Riverine and Lake Fisheries
 - b) National Development Centre for Aquaculture
 - c) National Fish Conservation Centre
 - d) Regional Fish Monitoring Centre

9. What is the process of initiating breeding in fish through the administration of pituitary extracts commonly known as?
 - a) Induced spawning
 - b) Hormonal synchronization
 - c) Ovulation control
 - d) Hypophysation

10. What type of lake is characterized by low primary productivity and nutrient levels?
 - a) Oligotrophic lake
 - b) Mesotrophic lake
 - c) Eutrophic lake
 - d) Hypertrophic lake

11. Which of the following is typically NOT considered a food fish?
 - a) Sea Bass
 - b) Guppy
 - c) Common Carp
 - d) Sardine

12. What category does the green mussel or *Macrobrychium rosenbergii* belong to?
 - a) Crustacean
 - b) Mollusca
 - c) Amphibian
 - d) Reptiles

13. Fish that migrate from freshwater to saltwater are known as:
 - a) Catadromous
 - b) Diadromous
 - c) Anadromous
 - d) Potamodromous

14. What is the primary purpose of reducing water temperature during live fish transport?
 - a) To lower pH
 - b) To decrease fish metabolism
 - c) To increase fish metabolism
 - d) To keep the fish cool and fresh

15. What is the top aquaculture producer in the world?
 - a) The USA
 - b) India
 - c) China
 - d) Russia

16. What is the scientific name of Golden Mahseer?
- a) Tor tor
 - b) Tor khudree
 - c) Tor mosal
 - d) Tor putitora
17. Which factor does NOT affect the degree of fish spoilage?
- a) Temperature
 - b) Size of the fish
 - c) Physical damage
 - d) None of the above
18. What does MSY stand for in fisheries management?
- a) Maximum Social Yield
 - b) Minimum Social Yield
 - c) Maximum Sustainable Yield
 - d) Minimum Sustainable Yield
19. Sharks belong to which class of fish?
- a) Placoderms
 - b) Acanthodians
 - c) Chondrichthyes
 - d) Osteichthyes
20. What term is used for microscopic organisms that float near the surface of the water?
- a) Plankton
 - b) Benthic
 - c) Littoral
 - d) Jellyfish
21. What does the catch per unit effort (CPUE) data provide a measure of?
- a) Absolute stock abundance
 - b) Relative stock abundance
 - c) Fishing effort
 - d) None of the above
22. Among the listed fish species, which one primarily acts as a scavenger?
- a) Magur
 - b) Catla
 - c) Rohu
 - d) Silver Carp
23. In the context of disease in fish, which of the following represents the three important factors involved in the disease interaction?
- a) Oxygen, carbon-dioxide, and water
 - b) Environment, fish pond, and water
 - c) Environment, host, and pathogen
 - d) Pathogen, host, and Benthos

24. What is the major osmoregulatory organ in fishes?
- Kidney
 - Gills
 - Liver
 - Stomach
25. What is the most modern method of fish preservation?
- Freezing
 - Drying
 - Salting
 - Chilling
26. What fish species can be used for biological control of mosquitoes?
- Carp
 - Gambusia
 - Eel
 - Chocolate Mahseer
27. What is the scientific name of the Siberian sturgeon?
- Acipenser sturio
 - Huso huso
 - Acipenser baerii
 - Oncorhynchus mykiss
28. What are the objectives of fisheries management?
- MSY (Maximum Sustainable Yield)
 - MEY (Maximum Economic Yield)
 - Maintenance of minimum spawning stock
 - All of the above
29. In fish reproduction, what does the term “broadcast spawning” refer to?
- The release of eggs and sperm into the water simultaneously
 - Parental care of eggs and fry
 - The development of embryos inside the female’s body
 - Sequential hermaphroditism
30. What is the term for the specialized organ in some fish species that allows them to detect changes in water pressure and vibrations?
- Weberian apparatus
 - Lateral line
 - Swim bladder
 - Otolith

PART II – Short Answer Questions [20 marks]

Answer ALL the questions. Each question carries 4 marks.

1. Explain the principle of aquaculture (5 marks)
2. What is overfishing, and why is it a concern in fisheries management? (5 marks)
3. Explain the concept of “bycatch” in commercial fishing. (5 marks)
4. Briefly explain the following: (5 marks)
 - a) Sustainable fisheries
 - b) Selective breeding
 - c) Monoculture
 - d) Spawning
 - e) Sexual dimorphism

SECTION B: Case Study [50 marks]

Choose either Case I OR Case II from this Section. Each case carries 50 marks. Mark for each sub-question is indicated in the brackets.

CASE I

1. You are employed in a fish hatchery (carp) and your main responsibility are fish breeding and seed production.
 - a) Describe your daily routine to ensure that your fish seeds/larvae are healthy. (5 marks)
 - b) As part of your answer, illustrate and discuss a typical carp breeding protocol. (10 marks)
2. Discuss the ecological and economic impacts of invasive fish species on native aquatic ecosystem. Provide examples to support your discussion. (15 marks)
3. You are inspecting a fish pond that has experienced disease outbreak. Evaluate the situation and provide detailed responses to the following:
 - a) Initial assessment: Describe the steps you would take during the initial assessment of the fish pond. What specific indicators would you look for to determine the severity of the disease outbreak? (10 marks)
 - b) Disease identification: Upon identifying potential disease symptoms, explain how you would go about identifying the specific disease affecting the fish. What diagnostic tools and methods would you use and what samples would you collect for laboratory analysis? (10 marks)

CASE II

1. The government wants to set up a fish pond (carp). As a fishery expert, you are asked to do a feasibility study. Explain in details how feasibility study would be done? (10 marks)
2. In your opinion, what the most pressing challenges and opportunities facing the field of fishery science and aquaculture today? (20 marks)
3. List out the core functions of the following agencies in Bhutan:
 - a) National Development Centre for Aquaculture (5 marks)
 - b) Bhutan Sturgeon Farm (5 marks)
 - c) Regional Centre for Aquaculture (5 marks)
 - d) National Research and Development Centre for Riverine and Lake Fisheries (5 marks)

TASHI DELEK