

KHULNA UNIVERSITY
Fisheries and Marine Resource Technology Discipline
Master of Science in Fish Genetics and Biotechnology
MS 1st Year, 1st Term Examination **Session: 2025 – 2026**
Course Code: 0831 FGB 5101 **Course Title: Fish Genetics and Breeding**
Full Marks: 60 Time: 03 Hours Credit Hours: 03

- Figures in the margin indicate full marks. The questions are of equal value.
- Use separate sheet for each section.

Section – A

There are **FOUR** questions in this section, answer any **THREE** questions

1. a) Evaluate the genetic diversity concerns for domestication of exotic fish and its potential impacts on native species of Bangladesh. [L4, CLO1] 03
- b) How can you mitigate inbreeding depression and reduce the risks of founder effect in carp breeding? [L3, CLO3] 04
- c) “Integration of qualitative data can enhance the interpretation of quantitative growth metrics in fish populations” – Justify the statement. [L4, CLO4] 03
2. a) Which ethical considerations must be addressed in using GMOs instead of traditional selective breeding in aquaculture? [L2, CLO2] 03
- b) Elucidate the constraints of qualitative traits in conservation genetics and biodiversity assessments of fish populations. [L3, CLO4] 03
- c) How do researchers use both heritability estimates and mutation rates to predict the potential for adaptation in natural populations? [L4, CLO3] 04
3. a) Establish the relationships among chromatin, nucleosome and histone. [L2, CLO1] 02
- b) “Expression of genes in an organism can be influenced by the environment and its genetic makeup” – justify the statement. [L4, CLO4] 08
4. a) Compare among miRNA, siRNA and piRNA. [L1, CLO2] 04
- b) How can predicted phenotypic outcomes be achieved by epigenetics? [L3, CLO2] 04
- c) Briefly describe the enzymes responsible for DNA methylation and histone modification. [L2, CLO2] 02

Section – B

There are **FOUR** questions in this section, answer any **THREE** questions

5. a) What is meant by chromosome manipulation? Briefly explain the methods of evaluating ploidy levels. [L1; CLO1] 03
- b) What are the applications and limitations of triploid fishes? [L2; CLO2] 03
- c) Distinguish between mitotic and meiotic gynogenesis. [L2; CLO1] 04
6. a) Write down the applications of sex reversal in aquaculture and fisheries management. [L2; CLO3] 03
- b) Enumerate the process of YY supermale production in Tilapia. [L3; CLO2] 04
- c) Briefly describe the common methods for sex reversal in fish. [L2; CLO2] 03
7. a) Compare between individual selection and family selection methods. [L2; CLO2] 03
- b) How will you apply marker assisted selection for improving aquaculture traits? [L3; CLO3] 04
- c) Illustrate the relationship between effective population size and inbreeding. [L4; CLO4] 03

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| 8. a) | Briefly describe the hybridization techniques applied in aquaculture. [L3; CLO4] | 05 |
| b) | Distinguish between cross breeding and line breeding. [L3; CLO4] | 02 |
| c) | How will you perform the genetic management of broodstocks? [L4; CLO3] | 03 |

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MS 1st Year, 1st Term Examination **Session: 2025 – 2026**
Course Code: 0831 FGB 5105 **Course Title: Aquatic Animal Physiology**
Full Marks: 60 Time: 03 Hours Credit Hours: 03

- Figures in the margin indicate full marks. The questions are of equal value.
- Use separate sheet for each section.

Section – A

There are **FOUR** questions in this section, answer any **THREE** questions

1. a) Briefly discuss the central themes of aquatic animal physiology. [L2, CLO1] 04
b) How does aquatic animal physiology provide a scientific basis for the management of fish populations to ensure sustainable fisheries? Explain. [L3, CLO3] 06
2. a) Describe the method of calculating fish age using otolith. [L2, CLO2] 03
b) Distinguish between the growth patterns of tropical and temperate fish. [L1, CLO1] 04
c) “Fish growth is often periodic” – justify the statement. [L3, CLO3] 03
3. a) What is meant by digestive enzymes? State the characteristics of enzymes. [L1, CLO1] 04
b) Describe the functional roles of different enzymes in digestion process of fish. [L2, CLO2] 06
4. a) Define stress. Compare the categories of stress in aquatic animals. [L1, CLO2] 04
b) Write short notes on: a) Lethal factors, b) Controlling factors and c) Masking factors. [L2, CLO2] 06

Section – B

There are **FOUR** questions in this section, answer any **THREE** questions

5. a) What do you mean by gill microcirculation? [L1, CLO2] 02
b) Explain the roles of fish gill in extracting O₂ from water. [L2, CLO2] 03
c) “A counter current flow has more advantage than concurrent flow” – Justify. [L3, CLO3] 02
d) Illustrate the process of gill ventilation in fish. [L3, CLO2] 03
6. a) What is meant by hypo- and hyper-osmoregulation in fishes? [L2, CLO2] 03
b) How does diadromous fish maintain osmoregulatory balance? [L4, CLO4] 04
c) Define EDC. Write down the impact of EDC in aquaculture. [L2, CLO3] 03
7. a) Why does a fish migrate? [L2, CLO3] 03
b) Describe the extrinsic and intrinsic factors triggering migration of different fish species. [L3, CLO3] 04
c) Explain the anthropogenic impacts on fish migration. [L4, CLO4] 03
8. a) State the gross morphological stages of a fish reproductive annual cycle. [L2, CLO3] 02
b) How does HPG-axis coordinate fish reproduction? [L4, CLO3] 04
c) “Embryonic development of a typical bony fish follows a series of well-defined stages” – justify the statement. [L4, CLO4] 04

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MS 1st Year, 1st Term Examination

Session: 2025 – 2026

Course Code: 0511 06 BGE 5151

Course Title: Molecular Genetics

Full Marks: 60

Time: 03 Hours

Credit Hours: 03

- Figures in the margin indicate full marks. The questions are of equal value.
- Use separate sheet for each section.

Section – A

There are **FOUR** questions in this section, answer any **THREE** questions

1. a) State the salient features of genetic material. [L1, CLO2] 02
 - b) Illustrate the structural differences between prokaryotic and eukaryotic chromosomes. [L2, CLO2] 05
 - c) Distinguish between unique sequence DNA and repetitive sequence DNA. [L2, CLO2] 03
2. a) Mention the names and functions of different enzymes in eukaryotic DNA replication. [L2, CLO3] 02
 - b) Distinguish between prokaryotic and eukaryotic DNA replication processes. [L3, CLO3] 05
 - c) Briefly describe the steps in recombinant DNA production. [L3, CLO3] 03
3. a) What is meant by protein sorting? Write down the importance of protein sorting. [L1, CLO4] 03
 - b) Illustrate the organelles involved in protein sorting with their corresponding functions. [L4, CLO4] 04
 - c) What are the modes of protein sorting? Explain with a suitable sketch. [L4, CLO4] 03
4. a) Distinguish between protein coding and non-protein coding genes. [L1, CLO4] 03
 - b) What is RNA splicing? Describe the RNA splicing process with a suitable diagram. [L2, CLO4] 04
 - c) 'Transcription and translation are the key features in central dogma' – justify the statement. [L4, CLO4] 03

Section – B

There are **FOUR** questions in this section, answer any **THREE** questions

5. a) Explain the diversity of cell shapes and forms found within the body. [L2, CLO4] 03
 - b) 'Biological membranes are selectively permeable' – Justify the statement. [L4, CLO4] 03
 - c) Describe the mechanisms involved in glucose transport across intestinal epithelial cells. [L4, CLO4] 04
6. a) What do you mean by non-coding DNA? [L1, CLO1] 02
 - b) Discuss the roles of non-coding DNA in transcription and translation. [L2, CLO2] 03
 - c) Explain the functions of primase enzyme during semi-conservative DNA replication in bacteria. [L2, CLO3] 02
 - d) Define transposons. How do they contribute to the development and spread of antimicrobial resistance in bacteria? [L1, CLO4] 03
7. a) What is meant by constitutive (housekeeping) genes, and why are they continuously express in cells? [L1, CLO3] 02
 - b) Distinguish between negative inducible operons and negative repressible operons in bacterial gene regulation. [L2, CLO2] 04

- c) How do DNA binding proteins and regulatory elements control gene expression in prokaryotes and eukaryotes. [L3, CLO4] 04
8. a) Describe the roles of second messengers for integrating and coordinating cellular signaling pathways. [L2, CLO4] 02
- b) How does oxygen deprivation trigger a coordinated cellular response program at the level of gene regulation? Explain. [L3, CLO2] 04
- c) Discuss the roles of trinucleotide and repeat expansion and impaired DNA repair mechanisms in developing genetic disorders. [L4, CLO4] 04