

R3666

Sub. Code

548301

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2025

Third Semester

Integrated Marine Biology

BIOLOGICAL OCEANOGRAPHY

(CBCS – 2022 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Major life forms in the ocean? (CO1, K2)
(a) Fish (b) Turtles
(c) Birds (d) Mammals
2. Life forms in the ocean pelagic environment? (CO1, K2)
(a) Plankton (b) Coral
(c) Seagrass (d) Mangroves
3. Primary productivity of the coastal environment is _____ . (CO2, K2)
(a) Low (b) High
(c) Moderate (d) None of the above
4. Phytoplankton blooms in the coastal environment is caused by _____. (CO2, K2)
(a) Eutrophication (b) Deoxygenation
(c) Overfishing (d) Coralization
5. _____ is the main route of biomass transfer between producers and consumers. (CO3, K4)
(a) Zooplankton (b) Phytoplankton
(c) Microbes (d) Fishes

6. Factors affecting secondary productivity of zooplankton? (CO3, K4)
- (a) Temperature (b) Salinity
(c) Food availability (d) All of the above
7. Seaweed farming involves _____ of seaweed. (CO4, K4)
- (a) Cultivating and Harvesting
(b) Cultivation
(c) Harvesting
(d) Collection
8. Ecological role of mangroves in the marine environment is _____ . (CO4, K4)
- (a) Habitat (b) Nutrient cycling
(c) Erosion control (d) All of the above
9. Animal association in the marine environment? (CO5, K4)
- (a) Mutualism (b) Commensalism
(c) Parasitism (d) All of the above
10. _____ are tiny cells that live within most types of coral polyps. (CO5, K4)
- (a) Phytoplankton (b) Zooplankton
(c) Bacteria (d) Zooxanthellae

Part B

(5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Explain the types of zones in Marine environment. (CO1, K2)

Or

- (b) Write short notes on Plankton and nekton. (CO1, K2)

12. (a) What is Phytoplankton? Discuss the factors affecting their distribution in the sea. (CO2, K2)

Or

- (b) Explain the primary productivity in the Bay of Bengal and in the Arabian Sea. (CO2, K2)

13. (a) Provide a detailed account on Zooplankton with suitable diagram. (CO3, K4)

Or

- (b) Explain the concept of indicator species with suitable example. (CO3, K4)

14. (a) Give short notes on Intertidal, littoral and sub-littoral vegetations. (CO4, K4)

Or

- (b) Explain about Salt marsh and sand dune vegetation. (CO4, K4)

15. (a) Give a detailed account on animal association in the marine environment. (CO5, K4)

Or

- (b) Write a detailed note on commensalism and parasitism with suitable examples. (CO5, K4)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Give an elaborate account on Plankton, nekton and benthos in marine diversity. (CO1, K2)

Or

- (b) Explain the different divisions of marine environment. (CO1, K2)

17. (a) Describe in detail about the phytoplankton classification and the method of estimation of standing stock and biomass. (CO2, K2)

Or

(b) Discuss in detail about phytoplankton blooms, red tide phenomena and causes. (CO2, K2)

18. (a) Describe in detail about the taxonomic classification, Horizontal and vertical distribution of Zooplankton. (CO3, K4)

Or

(b) Discuss in detail about the Secondary productivity and the methods of estimation of secondary productivity. (CO3, K4)

19. (a) Give an elaborate account on morphological, anatomical, adaptations and its economic role of Sea grasses. (CO4, K4)

Or

(b) Discuss in detail about the physiological features, ecological role, uses and conservation of Salt marshes and sand dune. (CO4, K4)

20. (a) Write a detailed account on symbiotic relationship of marine environment. (CO5, K4)

Or

(b) Explain in detail about the Endocoeism, epizoism, inquilinism and phoresis. (CO5, K4)

R3667

Sub. Code

548302

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2025

Third Semester

Integrated Marine Biology

INVERTEBRATES

(CBCS – 2022 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the objective type questions by choosing the correct option.

1. The skeleton of sponges is made of (CO1, K2)
 - (a) Calcium carbonate
 - (b) Silica
 - (c) Spongin fibers
 - (d) All of the above
2. Which of the following animal groups possess nematocysts? (CO1, K1)
 - (a) Protozoa
 - (b) Cnidaria
 - (c) Mollusca
 - (d) Annelida
3. Pogonophora are mostly found in _____.(CO2, K2)
 - (a) Free-living terrestrial worms
 - (b) Marine tubicolous animals
 - (c) Freshwater scavengers
 - (d) Parasitic worms

4. Which phylum shows lophophore feeding structure?
(CO2, K1)
- (a) Brachiopoda (b) Arthropoda
(c) Mollusca (d) Nematoda
5. Antennae are primarily sensory structures of _____.
(CO3, K2)
- (a) Annelids (b) Crustaceans
(c) Polychaetes (d) Molluscs
6. In Polychaetes, the parapodia primarily function in _____.
(CO3, K2)
- (a) Respiration and locomotion
(b) Feeding only
(c) Excretion only
(d) Reproduction
7. Which of the following is the respiratory pigment found in Mollusca?
(CO4, K1)
- (a) Hemoglobin
(b) Hemocyanin
(c) Chlorocruorin
(d) Myoglobin

8. The shell of Nautilus is _____. (CO4, K2)
- (a) Bivalved
 - (b) Straight and unchambered
 - (c) Coiled and chambered
 - (d) Absent
9. Which of the following is a larva of Echinodermata? (CO4, K1)
- (a) Planula
 - (b) Bipinnaria
 - (c) Nauplius
 - (d) Trochophore
10. Notochord in Amphioxus is (CO5, K2)
- (a) Absent in adult
 - (b) Present throughout life
 - (c) Replaced by vertebral column
 - (d) Found only in larval stage

Part B

(5 × 5 = 25)

Answer **all** the questions not more than 500 words each.

11. (a) Examine modes of reproduction in Protozoa and illustrate them with suitable example. (CO1, K3)

Or

- (b) Demonstrate life cycle of Obelia. (CO1, K3)

12. (a) Illustrate the structural organization of Ectoprocta and justify their adaptive importance. (CO2, K4)

Or

- (b) Outline the embryology of Chaetognatha and infer its evolutionary significance. (CO2, K4)

13. (a) Evaluate the role of crustacean fossils in understanding arthropod evolution (CO3, K5)

Or

- (b) Assess the reproductive adaptations in Polychaeta. (CO3, K5)

14. (a) Outline the general characters of the phylum Mollusca. (CO4, K4)

Or

- (b) Analyse the importance of molluscan fossils in reconstructing evolutionary history. (CO4, K4)

15. (a) Assess the regenerative ability of echinoderms. (CO4, K5)

Or

- (b) Recommend the significance of larval metamorphosis in Urochordata. (CO5, K5)

Part C

(5 × 8 = 40)

Answer **all** the questions not more than 1000 words each.

16. (a) Illustrate the morphology and canal system of sponges and demonstrate how it aids in their physiology. (CO1, K4)

Or

- (b) Analyze the various theories of coral reef formation and demonstrate their ecological significance. (CO1, K4)

17. (a) Develop a framework to evaluate the importance of larval development in Phoronida and Pogonophora. (CO2, K6)

Or

- (b) Compose an account of Chaetognatha anatomy and justify its role in feeding and locomotion. (CO2, K6)

18. (a) Compose a brief essay on the evolutionary trends of crustacean morphology. (CO3, K6)

Or

- (b) Develop an account of adaptive radiation in Polychaeta with examples. (CO3, K6)

19. (a) Assess the palaeontological evidence available for molluscan evolution. (CO4, K5)

Or

- (b) Justify torsion as a key evolutionary process in Gastropoda. (CO4, K5)

20. (a) Illustrate the water vascular system of Echinodermata. (CO5, K5)

Or

(b) Classify Prochordata with suitable examples. (CO5, K5)

R3668

Sub. Code

2MB3A1

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2025

Third Semester

Integrated Marine Biology

Allied – BOTANY

(CBCS – 2022 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Which of the following is an example of Cyanophyceae? (CO1, K1)
(a) *Oscillatoria* (b) *Puccinia*
(c) *Selaginella* (d) *Pinus*
2. Lichens are a symbiotic association of: (CO1, K1)
(a) Algae and Fungi (b) Algae and Bacteria
(c) Fungi and Virus (d) Bacteria and Virus
3. Bunchy top disease affects which crop? (CO2, K1)
(a) Apple (b) Banana
(c) Orange (d) Grapes
4. Polytrichum belongs to which group? (CO2, K1)
(a) Algae (b) Fungi
(c) Bryophyta (d) Gymnosperms

5. Rhizophore is present in: (CO3, K2)
(a) *Pinus* (b) *Selaginella*
(c) *Usnea* (d) *Polytrichum*
6. Which of the following belongs to Pteridophyta? (CO3, K2)
(a) Moss (b) *Oscillatoria*
(c) *Selaginella* (d) *Puccinia*
7. *Pinus* produces: (CO4, K1)
(a) Spores only (b) Seeds only
(c) Spores and seeds (d) Neither
8. Which of the following is a gymnosperm? (CO4, K1)
(a) *Selaginella* (b) *Polytrichum*
(c) *Pinus* (d) *Puccinia*
9. Permanent tissues are found in: (CO5, K2)
(a) Growing regions (b) Mature regions
(c) Root tips (d) Apical meristem
10. Cambium helps in: (CO5, K2)
(a) Primary growth (b) Secondary growth
(c) Tertiary growth (d) No growth

Part B (5 × 5 = 25)

Answer **all** the questions not more than 500 words each.

11. (a) Write the general characters of Algae. (CO1, K2)
- Or
- (b) Discuss the life cycle of *Usnea*. (CO1, K2)

12. (a) Describe the symptoms and management of Citrus canker disease. (CO2, K3)

Or

- (b) Explain the structure of *Polytrichum*. (CO2, K3)

13. (a) Explain the development of gametophyte in *Selaginella*. (CO3, K3)

Or

- (b) Describe the salient features of Pteridophyta. (CO3, K3)

14. (a) Write the structure and life history of *Pinus*. (CO4, K5)

Or

- (b) Explain the reproductive structures in *Pinus*. (CO4, K5)

15. (a) Describe different types of plant tissues. (CO5, K2)

Or

- (b) Explain the anatomical differences between dicot and monocot stem. (CO5, K2)

Part C (5 × 8 = 40)

Answer **all** the questions not more than 1000 words each.

16. (a) Describe the structure and life cycle of *Oscillatoria*. (CO1, K3)

Or

- (b) Discuss the economic importance of fungi. (CO1, K3)

17. (a) Write in detail about plant diseases caused by viruses and bacteria. (CO2, K5)

Or

- (b) Explain the structure and reproduction of *Polytrichum*. (CO2, K5)

18. (a) Discuss alternation of generations in *Selaginella*. (CO3, K3)

Or

- (b) Explain the evolutionary significance of Pteridophytes. (CO3, K3)

19. (a) Write in detail about the life history of *Pinus*. (CO4, K6)

Or

- (b) Describe the anatomical structure of Gymnosperms. (CO4, K6)

20. (a) Explain plant tissues and their significance. (CO5, K6)

Or

- (b) Write detailed notes on secondary thickening in dicot stems. (CO5, K6)

R3669

Sub. Code

548501

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2025

Fifth Semester

Integrated Marine Biology

CELL AND MOLECULAR BIOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the following objective type questions
by choosing the correct option.

1. Degree of scattering in transmission electron microscope is a function of_____. (CO1, K2)
 - (a) wavelength of electron beam used
 - (b) number of atoms that lie in the electron path
 - (c) number and mass of atoms that lie in the electron path
 - (d) mass of atoms that lie in the electron path
2. Which of the following biomolecules are not synthesized by the endoplasmic reticulum? (CO1, K2)
 - (a) Proteins
 - (b) Lipids
 - (c) Nucleic acids
 - (d) Cholesterol

3. Whenever the cell's ATP supply is depleted, which of the following enzyme's activity is increased? (CO2, K3)
- (a) Hexokinase
 - (b) Pyruvate kinase
 - (c) Glucokinase
 - (d) Phosphofructokinase-1
4. The DNA threads which appear inside the nucleus at the time of cell division? (CO2, K3)
- (a) Spindle fibers
 - (b) Centrioles
 - (c) Asters
 - (d) Chromosomes
5. Meiosis involves one cycle of _____. (CO3, K2)
- (a) DNA replication
 - (b) Cytokinesis
 - (c) Karyokinesis
 - (d) Separation of chromosomes
6. Programmed cell death is termed as _____. (CO3, K2)
- (a) Metastasis
 - (b) Apoptosis
 - (c) Proliferation
 - (d) Mitotic termination

7. Which of them is used to introduce negative supercoiling in DNA? (CO4, K4)
- (a) Type 1 topoisomerase
 - (b) Ethidium bromide
 - (c) Gyrase/ type 2 topoisomerase
 - (d) SYBR gold
8. Introduction of DNA molecules into the recipient organism is termed as _____. (CO4, K4)
- (a) transformation (b) translation
 - (c) transduction (d) transcription
9. A codon contains how many nucleotides? (CO5, K4)
- (a) 1 (b) 2
 - (c) 3 (d) 4
10. Which of the following bacterial operon is not controlled by attenuation? (CO5, K4)
- (a) Arabinose (b) Tryptophan
 - (c) Leucine (d) Histidine

Part B

(5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Compare compound and electron microscopes. (CO1, K2)

Or

- (b) Write short notes on mesosomes and their functions. (CO1, K2)

12. (a) Explain the role of lysosomes in cellular digestion. (CO2, K3)

Or

- (b) Describe the structure and function of the nucleolus. (CO2, K3)

13. (a) Differentiate between mitosis and meiosis. (CO3, K2)

Or

- (b) Define oncogenes and tumour suppressor genes with examples. (CO3, K2)

14. (a) What is the role of RNA in gene expression? (CO4, K4)

Or

- (b) Describe the structure of a bacteriophage. (CO4, K4)

15. (a) Explain the characteristics of the genetic code. (CO5, K4)

Or

- (b) Outline the main steps in transcription. (CO5, K4)

Part C

(5 × 8 = 40)

Answer **all** the questions not more than 1000 words each.

16. (a) Explain SEM and TEM with principles, components, and applications. (CO1, K2)

Or

- (b) Describe the ultrastructure and functions of the plasma membrane, ER, and Golgi complex. (CO1, K2)

17. (a) Discuss glycolysis and the Krebs cycle with intermediates and energy yield. (CO2, K3)

Or

- (b) Describe the structure, types, and significance of chromosomes, emphasizing giant chromosomes. (CO2, K3)

18. (a) Describe the different phases of the cell cycle and explain the key events that occur in each stage. (CO3, K2)

Or

- (b) Describe the causes, types, and properties of cancer. How are oncogenes and tumor suppressor genes involved in tumour development? (CO3, K2)

19. (a) Describe the Watson and Crick model of DNA. How does the structure of DNA support its function as genetic material? (CO4, K4)

Or

- (b) Write a detailed account of transformation, transduction, and conjugation in bacteria. How do these mechanisms contribute to genetic variation? (CO4, K4)

20. (a) Explain the molecular mechanisms of DNA replication and repair with the roles of the enzymes involved. (CO5, K4)

Or

- (b) Discuss the Lac operon model and explain the mechanism of gene regulation in prokaryotes. (CO5, K4)
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R3670

Sub. Code

548502

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2025

Fifth Semester

Integrated Marine Biology

DEVELOPMENTAL BIOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. During spermatogenesis, the process of transformation of spermatids into spermatozoa is called : (CO1 ,K2)
 - (a) Spermiation
 - (b) Spermatogonia
 - (c) Spermiogenesis
 - (d) Spermatocyte formation
2. The fusion of male and female gametes is known as : (CO1, K2)
 - (a) Cleavage
 - (b) Fertilization
 - (c) Gastrulation
 - (d) Ovulation
3. Which of the following is an extra-embryonic membrane found in chick embryos? (CO2, K2)
 - (a) Chorion
 - (b) Liver
 - (c) Brain
 - (d) Heart

4. In frogs, the organ responsible for detecting vibrations and balance is : (CO2, K2)
(a) Heart (b) Ear
(c) Eye (d) Placenta
5. The hormone primarily responsible for initiating amphibian metamorphosis is _____ (CO3, K2)
(a) Insulin (b) Estrogen
(c) Thyroxine (d) Testosterone
6. Which of the following changes occurs during amphibian metamorphosis? (CO3, K2)
(a) Tail elongation (b) Formation of gills
(c) Limb development (d) Increase in yolk
7. Regeneration involving the formation of a blastema from dedifferentiated cells is called _____ (CO3, K4)
(a) Morphallaxis (b) Epimorphosis
(c) Neogenesis (d) Apoptosis
8. Which animal is known for its remarkable ability of morphallactic regeneration? (CO4, K4)
(a) Salamander (b) Planarian
(c) Chick (d) Frog
9. In Hammerling's experiment on *Acetabularia*, the cap morphology was determined by the _____ (CO4, K4)
(a) Stalk (b) Cap itself
(c) Nucleus (d) Chloroplast
10. Nuclear transplantation helps demonstrate which key biological principle? (CO5, K4)
(a) Totipotency (b) Mutation
(c) Fertilization (d) Cell lysis

Part B

(5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Explain briefly about the oogenesis process.
(CO1 ,K2)

Or

- (b) Write short notes on cleavage and gastrulation.
(CO1, K2)

12. (a) Discuss the placentation process with key process.
(CO2, K2)

Or

- (b) Explain how extra embryonic membrane forms with schematic diagram.
(CO2, K2)

13. (a) Provide a detailed account on organizer during development.
(CO3, K4)

Or

- (b) Differentiate between epimorphosis and morphallaxis with suitable examples. (CO3, K4)

14. (a) What are the cellular and molecular changes during amphibian metamorphosis?
(CO4, K4)

Or

- (b) Discuss environmental factors influencing amphibian metamorphosis.
(CO4, K4)

15. (a) Explain the experiment of nuclear transplantation in *Acetabularia*.
(CO5, K4)

Or

- (b) What is the significance of *Acetabularia* in studying morphogenesis?
(CO5, K4)

Part C

(5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Give an elaborate account on spermatogenesis process. (CO1, K2)
- Or
- (b) Explain the fertilization process with neat labelled sketches. (CO1, K2)
17. (a) Explain the development of eye and ear in frog. (CO2, K2)
- Or
- (b) Explain the development of brain and heart in frog. (CO2, K2)
18. (a) Describe in detail about amphibian metamorphosis. (CO3, K4)
- Or
- (b) Discuss in detail about hormonal control in amphibian development. (CO3, K4)
19. (a) Give an elaborate account on extra embryonic membranes in chick. (CO4, K4)
- Or
- (b) Discuss about the placenta in mammals with neat labelled sketches. (CO4, K4)
20. (a) Write a detailed account on types of regeneration. (CO5, K4)
- Or
- (b) Explain in detail about the regeneration in amphibians. (CO5, K4)
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R3671

Sub. Code

548503

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2025

Fifth Semester

Integrated Marine Biology

FISH AND FISHERIES

(CBCS – 2022 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. _____ have simple, and presumably primitive, skull structures? (CO1, K2)
(a) Osteichthyes (b) Cartilaginous fish
(c) Jawless fish (d) Sarcopterygii
2. Which fish has the whisker-like structures near the mouth? (CO1, K2)
(a) Actinopterygii (b) Dolphin
(c) Catfish (d) Shark
3. _____ is a newly spawned salmon or trout still carrying the yolk. (CO2, K2)
(a) Alevin (b) Fry
(c) Juvenile (d) Adult
4. What term describes the process of fish reproducing and laying eggs? (CO2, K2)
(a) Spawning (b) Mating
(c) Fertilization (d) Hatching

5. What is the term for the decay of organic matter by the action of microorganisms resulting in the production of a foul smell? (CO3, K4)
- (a) Putrefaction (b) Oxidation
(c) Rancidity (d) Fermentation
6. What is a method used for isolating fish from a mixed population? (CO4, K4)
- (a) Electrophoresis (b) Filtration
(c) Centrifugation (d) Caging
7. What is a common type of bacteria affecting fish? (CO4, K4)
- (a) Vibrio (b) Bacillus
(c) Salmonella (d) E. coli
8. What term refers to the responsible management of protection of fish resources? (CO5, K4)
- (a) Conservation (b) Harvesting
(c) Aquaculture (d) Exploitation
9. What is the term for rules and policies governing the management and use of fish resources? (CO5, K4)
- (a) Utilization (b) Regulation
(c) Technology (d) Prevention
10. What term refers to areas designated for the conservation and management of fish populations? (CO5, K4)
- (a) Sanctuaries (b) Reserves
(c) Estuaries (d) Aquariums

Part B

(5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Explain about the general morphology of fishes. (CO1, K2)

Or

- (b) Write a detailed note on the characteristics of Indian fishes. (CO1, K2)

12. (a) Discuss the basic anatomy of fish with a diagram. (CO2, K2)

Or

- (b) Explain about the larval development of fishes. (CO2, K2)

13. (a) Write an account of the theory of fishing. (CO3, K4)

Or

- (b) Explain the methods of surveying the fishery resources. (CO3, K4)

14. (a) What are the factors affecting spoilage in seafood? (CO4, K4)

Or

- (b) Explain about the disease control in fish. (CO4, K4)

15. (a) Given a detailed account on Fisheries administration and principle. (CO5, K4)

Or

- (b) Write a detailed note on the preservation and Fishery regulation. (CO5, K4)

Part C

(5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Give an elaborate account on classification of fishes with diagram. (CO1, K2)

Or

- (b) Explain the detailed account of the major group of fishes and its characteristics. (CO1, K2)

17. (a) Explain in detailed about the spawning in fishes. (CO2, K2)

Or

- (b) Give an account on the embryonic larval development of finfish. (CO2, K2)

18. (a) Describe in detail about of fish tagging and marking methods. (CO3, K4)

Or

- (b) Explain in detail about fish Acoustic methods. (CO3, K4)

19. (a) Give an elaborate account of fish processing technology. (CO4, K4)

Or

- (b) Explain in detail about the microbial spoilage in seafood. (CO4, K4)

20. (a) Write a detailed account on the impoundment of fisheries resources. (CO5, K4)

Or

- (b) What are the organizations involved in fisheries conservation? (CO5, K4)

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Sub. Code

548504

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2025

Fifth Semester

Integrated Marine Biology

COASTAL AND BRACKISH WATER AQUACULTURE

(CBCS – 2022 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Which of the following is a major issue caused by overfishing in aquaculture? (CO1, K2)
 - (a) Sustainable fish populations
 - (b) Depletion of wild fish stocks
 - (c) Enhanced marine habitats
 - (d) Increased genetic diversity
2. Maintaining natural stock in aquaculture is essential for preserving _____ and ensuring sustainable breeding practices. (CO1, K2)
 - (a) Genetic diversity
 - (b) Seafood
 - (c) Breeding
 - (d) Terrestrial plants

3. _____ refers to the changes in the surface elevation of natural ground. (CO2, K2)
- (a) Landscape (b) Geomorphology
(c) Chorography (d) Topography
4. Effective _____ systems are essential for removing waste and controlling disease in aquaculture farms. (CO2, K2)
- (a) Washing
(b) Filtration and circulation
(c) Monitoring
(d) Storage
5. What is the most cultivated seaweed species in Tamil Nadu? (CO3, K3)
- (a) *Kappaphycus alvarezii*
(b) *Undaria pinnatifida*
(c) *Turbinaria sp*
(d) *Gelidium sp*
6. What is the range of pH to be maintained to prevent any disease or mortality problems in pond cultivation? (CO3, K3)
- (a) 7.0 to 8.0
(b) 8.0 to 8.5
(c) 7.5 to 8.5
(d) 6.5 to 7.5

7. Which Marine Fin Fish is majorly used for Culture in Brackish Water? (CO4, K4)
- (a) Cobia and Silver pompano
 - (b) Clownfish
 - (c) Koi
 - (d) Catfish
8. Which of the following is a primary component of a fish hatchery? (CO4, K4)
- (a) Incubation tanks
 - (b) Feed storage
 - (c) Brooder ponds
 - (d) Water filtration system
9. The Fish Farmers Development Agency (FFDA), the centrally sponsored flagship programme for freshwater aquaculture development in India, has been providing technical support and financial assistance since? (CO4, K3)
- (a) 1954
 - (b) 1948
 - (c) 1962
 - (d) 1974
10. What is the primary role of Fisheries Extension in the development of the fisheries sector? (CO5, K3)
- (a) To conduct research on new fishing technologies
 - (b) To provide financial support to fish farmers
 - (c) To bridge the gap between empower aquafarmers and fishing communities
 - (d) To regulate fishing practices

Part B

(5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Describe about the Socio-economic problems in aquaculture. (CO1, K2)

Or

- (b) Explain about overfishing and depletion. (CO1, K2)

12. (a) Give an account of site selection and technical consideration in farm design. (CO2 K2)

Or

- (b) Explain about open sea farming with suitable examples. (CO2, K2)

13. (a) Give a short note on pond management and nursery management. (CO3, K3)

Or

- (b) Explain about the parasites and disease management. (CO3, K3)

14. (a) What are the types and components of hatchery? (CO4, K4)

Or

- (b) Give an overview of fin fishes and molluscans culture. (CO4, K4)

15. (a) Write a short note on fisheries extension and the extension methods. (CO5, K3)

Or

- (b) What are the non-governmental agencies in fisheries development? (CO5, K3)

Part C

(5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Explain in detail about the natural stock with reference to overfishing and depletion. (CO1, K2)

Or

- (b) Write an essay on the types of Marine environment. (CO1, K2)

17. (a) Discuss in detail about the structure, type, and design of supply and drainage canals. (CO2, K2)

Or

- (b) Write an essay on the construction, operation, and maintenance of farm design. (CO2, K2)

18. (a) Elaborate in detail about the seaweed culture, types, and economic importance. (CO3, K3)

Or

- (b) Discuss about the farm stocking and feeding schedules with water quality management. (CO3, K3)

19. (a) Explain in detail about the induced breeding and mass production of seeds in the hatchery management. (CO4, K4)

Or

- (b) Write an account on the collection and maintenance of broodstock in hatchery production. (CO4, K4)

20. (a) Give a detailed account on feed formulation, principle and role of fisheries extension. (CO5, K3)

Or

- (b) Write about the developmental agencies and its role of governmental and non-governmental sectors. (CO5, K3)
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R3673

Sub. Code

548701

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2025

Seventh Semester

Integrated Marine Biology

ANIMAL PHYSIOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the questions
by choosing the correct option.

1. Which of the following structures prevents the backflow of stomach contents into the esophagus? (CO1, K2)
 - (a) Pyloric sphincter
 - (b) Ileocaecal valve
 - (c) Cardiac sphincter
 - (d) Anal sphincter

2. In which respiratory part does the diffusion of gas take place? (CO1, K2)
 - (a) Alveoli
 - (b) Bronchi
 - (c) Bronchioles
 - (d) Trachea

3. For the normal heartbeat, depolarization stimulus originates in _____ . (CO2, K3)
- (a) His-bundle areas
 - (b) Epicardium
 - (c) Sinoatrial (SA) node
 - (d) Atrioventricular (AV) node
4. What will happen if the diameter of the afferent arteriole is less than efferent arteriole? (CO2, K3)
- (a) Dilute urine
 - (b) Concentrated urine
 - (c) No ultrafiltration
 - (d) Black urine
5. In the striated muscles, the functional unit of contractile system is _____ . (CO3, K4)
- (a) Z band
 - (b) cross bridges
 - (c) sarcomere
 - (d) myofibril
6. Afferent neurons carry nerve impulses from _____ . (CO3, K4)
- (a) CNS to muscles
 - (b) CNS to receptors
 - (c) Receptors to CNS
 - (d) Effector organs to CNS

7. What is the organism in which body temperature and the osmotic concentration of the body fluid changes with the ambient temperature and change with that of the ambient water osmotic concentration respectively called?
(CO4, K4)
- (a) Regulators (b) Conformers
(c) Migratory (d) Hibernating
8. Mechanism of regulation, typically between entities and its environment of solutes and the loss and gain of water is known as _____.
(CO4, K4)
- (a) Homeostasis
(b) Hemostasis
(c) Thermoregulation
(d) Osmoregulation
9. _____ hormone is responsible for “fight-or-flight” response.
(CO5, K4)
- (a) Thyroxine and melatonin
(b) Insulin and glucagon
(c) Epinephrine and norepinephrine
(d) Oestrogen and progesterone
10. Circannual rhythms can have a period of _____.
(CO5, K4)
- (a) few hours
(b) 24 hours
(c) more than 24 hours
(d) year cycle

Part B

(5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) List the digestive organs and its secretion.
(CO1, K2)

Or

- (b) Explain how the inspiration and expiration are accomplished.
(CO1, K2)

12. (a) Explain the cardiac function system controls the cardiac cycle.
(CO2, K2)

Or

- (b) Water balance and electrolyte balance are interdependent -How? Justify.
(CO2, K2)

13. (a) Name the parts of the eye and explain the function of each part.
(CO3, K3)

Or

- (b) Explain the mechanism of saltatory propagation.
(CO3, K3)

14. (a) Why Homeostasis is important for survival?
(CO4, K4)

Or

- (b) List some of the animals undergo hibernation?
(CO4, K4)

15. (a) Write down the importance of circadian rhythm and biological clock. (CO5, K4)

Or

- (b) List out few examples for neuroendocrine interactions. (CO5, K4)

Part C (5 × 8 = 40)

Answer **all** the questions not more than 1000 words each.

16. (a) List the major components of blood and its function. (CO1, K2)

Or

- (b) Summarize the gas exchanges that occurs the respiratory membrane. (CO1, K2)

17. (a) Explain the normal EGC pattern. (CO2, K2)

Or

- (b) Give an account on the processes occur in urine formation. (CO2, K2)

18. (a) Explain the ultrastructure of Skeletal muscle with neat sketch. (CO3, K3)

Or

- (b) Give an account on impulse transmission through non-myelinated nerve fibre. (CO3, K3)

19. (a) Explain the role of hormones in osmoregulation.
(CO4, K4)

Or

- (b) Give an account on Thermoregulation as Negative Feedback Control.
(CO4, K4)

20. (a) List out the components of neuro endocrine system.
(CO5, K4)

Or

- (b) Discuss in detail the types of Biological rhythms.
(CO5, K4)

R3674

Sub. Code

548702

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2025

Seventh Semester

Integrated Marine Biology

BIOCHEMISTRY

(CBCS – 2022 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the following objective type questions
by choosing the correct option.

1. A disaccharide linked by a 1-4 glycosidic linkage is: (CO1, K1)
(a) Lactose (b) Sucrose
(c) Cellulose (d) Maltose
2. Starch and glycogen are polymers of: (CO2, K1)
(a) Fructose (b) Mannose
(c) β -D-Glucose (d) α -D-glucose
3. Which of the following amino acid is optically inactive? (CO2, K2)
(a) Aminoacetic acid
(b) Serine
(c) Methionine
(d) Lysine

4. In denaturation of proteins, the bond which is not broken: (CO2, K2)
- (a) Disulfide bond
 - (b) Peptide bond
 - (c) Hydrogen bond
 - (d) Ionic bond
5. The imino acid found in protein structure (CO3, K1)
- (a) Arginine
 - (b) Proline
 - (c) Histidine
 - (d) Lysine.
6. The bonds in protein structure that are not broken on denaturation. (CO3, K1)
- (a) Hydrogen bonds
 - (b) Peptide bonds
 - (c) Ionic bond
 - (d) Disulfide bonds
7. The calorific value of lipid is: (CO3, K1)
- (a) 4.0 Kcal/gm
 - (b) 6.0 Kcal/gm
 - (c) 9.0 Kcal/gm
 - (d) 15 Kcal/gm

8. The smell of the fat turned rancid is due to: (CO4, K1)
- (a) Presence of Vit E
 - (b) Presence of quiniones
 - (c) Phenols
 - (d) Volatile fatty acids
9. All of the following electron carriers are components of the mitochondrial electron transport chain except (CO5, K1)
- (a) FMN
 - (b) FAD
 - (c) NAD⁺
 - (d) NADP⁺
10. A key substance in the committed step of pyrimidine biosynthesis is: (CO5, K1)
- (a) Ribose-5'-phosphate
 - (b) Carbamoyl phosphate
 - (c) ATP
 - (d) Glutamine

Part B

(5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Derive and comment on the utility of the Henderson-Hasselbalch equation. (CO1, K2)

Or

(b) State the relationship between free energy and equilibrium constant. (CO1, K2)

12. (a) Differentiate amylose and amylopectin. (CO2, K4)

Or

(b) Add a note on anomers and anomeric carbon atoms. (CO2, K4)

13. (a) Explain the relationship of denaturation, flocculation and coagulum formation. (CO3, K3)

Or

(b) Add a note on Amphoteric property of amino acids proteins. (CO3, K3)

14. (a) What are "Bloor's" criteria to call a compound as lipid? (CO4, K3)

Or

(b) Describe the chemistry and functions of cholesterol. (CO4, K3)

15. (a) "TCA cycle is called amphibolic in nature"—Justify. (CO5, K3)

Or

(b) Add a note on plasma cholesterol. (CO5, K3)

Part C

(5 × 8 = 40)

Answer **all** the questions not more than 1000 words each.

16. (a) Acid-Base imbalance can manifest as acidosis and alkalosis –Justify. (CO1, K2)

Or

- (b) State and derive second law of thermodynamics. (CO1, K2)

17. (a) Classify carbohydrates and give their importance. (CO2, K4)

Or

- (b) Describe in brief the structure and important properties of Starch and glycogen. (CO2, K4)

18. (a) Classify amino acids depending on their reaction in solution. (CO3, K3)

Or

- (b) What is the primary structure of proteins? Discuss the biochemical functions of proteins. (CO3, K3)

19. (a) Write about the types, characteristics and metabolism of lipoproteins. Add a note on lipoprotein disorders. (CO4, K3)

Or

- (b) Give an account of cholesterol biosynthesis. Add a note on the significance of plasma cholesterol estimation. (CO4, K3)

20. (a) Describe the HMP shunt pathway and state its significance. (CO5, K3)

Or

- (b) Write an account of salvage pathway in purine nucleotide synthesis. Add a note on Lesch-Nyhan syndrome. (CO5, K3)
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R3675

Sub. Code

548703

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2025

Seventh Semester

Integrated Marine Biology

IMMUNOLOGY

(CBCS – 2022 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. The _____ is a primary lymphoid organ where T lymphocytes involved in the activation of mature lymphocytes. (CO1, K2)
(a) Thymus (b) Bone marrow
(c) Lymph nodes (d) Spleen
2. Which of the following best describes the primary immunological function of the spleen? (CO1, K2)
(a) It produces digestive enzymes to assist in breaking down pathogens
(b) It filters blood, removes aged red blood cells, and initiates immune responses against blood-borne antigens
(c) It generates all types of white blood cells and stores bile.
(d) It acts as a physical barrier to prevent pathogens from entering the bloodstream

7. T lymphocytes mature in the _____. (CO4, K4)
- (a) Bone marrow
 - (b) Spleen
 - (c) Thymus
 - (d) Nerves
8. _____ T cells help activate B cells and other immune cells by secreting cytokines. (CO4, K4)
- (a) Cytotoxic
 - (b) Helper
 - (c) Suppressor
 - (d) Dominant
9. Macrophages are large _____ cells that play a key role in innate immunity. (CO5, K4)
- (a) Lymphocytes
 - (b) Phagocytic
 - (c) Lymphatic
 - (d) Erythrocytic
10. Stem cells can differentiate into various cell types under the influence of specific _____. (CO5, K4)
- (a) Signals
 - (b) Enzymes
 - (c) Antibodies
 - (d) Antigen

Part B

(5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Explain briefly about Immunity and its types. (CO1, K2)

Or

- (b) Write short notes on Spleen with schematic diagram. (CO1, K2)
12. (a) Define Immunoglobulin and its structural properties. (CO2, K3)

Or

- (b) Explain briefly about Immune diseases. (CO2, K3)
13. (a) Provide a detailed account on Tumour Immunology. (CO3, K4)

Or

- (b) Explain about the interaction of antigen and anti-body. (CO3, K4)
14. (a) What are the Immune responses against the immune deficiency diseases? (CO4, K4)

Or

- (b) Define Lymphocyte with schematic diagram. (CO4, K4)

15. (a) Explain about T cells and its types. (CO5, K4)

Or

- (b) Explain about the Cell mediated immune response. (CO5, K4)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Give an elaborate account on Immunity and its types. (CO1, K2)

Or

- (b) Explain the lymphoid organs in detail with suitable examples. (CO1, K2)

17. (a) Describe in detail about Immunoglobulin and the immune diseases. (CO2, K3)

Or

- (b) Explain the structure, function and biological properties of Immunoglobulin classes. (CO2, K3)

18. (a) Describe in detail about Hypersensitivity and its types. (CO3, K4)

Or

- (b) Discuss in detail about auto immune diseases and its causes, classification and diagnosis. (CO3, K4)

19. (a) Give an elaborate account on Lymphocyte as unit of Immune system. (CO4, K4)

Or

- (b) Discuss about the immune responses in lymphocyte. (CO4, K4)

20. (a) Write a detailed account on stem cells, B-cells and Macrophages. (CO5, K4)

Or

- (b) Explain in detail about Humoral Immune responses and cell mediated immune responses. (CO5, K4)
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R3676

Sub. Code

548704

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2025

Seventh Semester

Integrated Marine Biology

GENETICS

(CBCS – 2022 onwards)

Time : 3 Hours

Maximum : 75 Marks

Part A

(10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. The law of independent assortment applies when genes are _____. (CO1, K2)
 - (a) Linked
 - (b) On the same chromosome
 - (c) On different chromosomes
 - (d) Recessive
2. A heterozygous tall (Tt) pea plant is crossed with a dwarf (tt). What is the chance of tall offspring? (CO1, K2)
 - (a) 0%
 - (b) 25%
 - (c) 100%
 - (d) 50%
3. Which type of gene interaction results in the masking of one gene by another? (CO2, K2)
 - (a) Complementary
 - (b) Epistasis
 - (c) Co-dominance
 - (d) Polygenic
4. Which term best describes the inheritance of traits like height and intelligence? (CO2, K2)
 - (a) Polygenic inheritance
 - (b) Epistasis
 - (c) Incomplete dominance
 - (d) Codominance

5. Which scientist used *Drosophila* to study linkage?
(CO3, K3)
- (a) Mendel
 - (b) Morgan
 - (c) Watson
 - (d) Punnett
6. Linkage reduces _____? (CO3, K3)
- (a) Mutation
 - (b) Recombination
 - (c) Independent assortment
 - (d) Segregation
7. A female with Turner syndrome has _____.
(CO4, K4)
- (a) XX
 - (b) XY
 - (c) XO
 - (d) XXY
8. Which organism exhibits gynandromorphism? (CO4, K4)
- (a) Mouse
 - (b) Bird
 - (c) Human
 - (d) Cat
9. Which syndrome is characterized by XXY chromosomes?
(CO5, K4)
- (a) Turner
 - (b) Down
 - (c) Klinefelter
 - (d) Edwards
10. Which of the following is an example of non-disjunction?
(CO5, K4)
- (a) Cystic fibrosis
 - (b) Down syndrome
 - (c) PKU
 - (d) Muscular dystrophy

Part B

(5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Briefly explain Mendel's Law of Segregation with a monohybrid cross. (CO1, K2)

Or

- (b) What is the significance of Mendel's experiments in modern genetics? (CO1, K2)

12. (a) Explain complementary gene interaction with an example. (CO2, K2)

Or

- (b) What is polygenic inheritance? How is it different from Mendelian inheritance? (CO2, K2)

13. (a) What is linkage? How was it demonstrated in *Drosophila* by Morgan? (CO3, K3)

Or

- (b) Briefly explain the concept of multiple alleles using the ABO blood group system in humans. (CO3, K3)

14. (a) Define living fossils with two examples and Explain fossilization process. (CO4, K4)

Or

- (b) Define gene pool and genotypic frequency and explain any two isolating mechanisms. (CO4, K4)

15. (a) Describe phenylketonuria and its genetic basis. (CO5, K4)

Or

- (b) Differentiate between Turner and Klinefelter syndrome. (CO5, K4)

Part C

(5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Discuss Mendelian laws of inheritance using dihybrid cross with suitable examples. (CO1, K2)
- Or
- (b) Explain the types of gene interactions with examples. (CO1, K2)
17. (a) Describe the structure of a gene and explain how it regulates protein synthesis. (CO2, K2)
- Or
- (b) Discuss the significance of crossing over and how it is used in gene mapping. (CO2, K2)
18. (a) Describes the mechanisms of sex determination in humans and give an account of chromosomal abnormalities. (CO3, K3)
- Or
- (b) Describe different types of gene interactions with examples: Complementary, Epistasis, and Polygenic inheritance. (CO3, K3)
19. (a) Explain the role of genetic counseling in managing inherited disorders. (CO4, K4)
- Or
- (b) Describe the inheritance of ABO blood groups in humans and explain the concepts of linkage and 9 crossing over with reference to *Drosophila*. (CO4, K4)
20. (a) Discuss any three inborn errors of metabolism, including their cause, symptoms, and treatment. (CO5, K4)
- Or
- (b) Define epistasis. Describe different types of epistasis with examples. (CO5, K4)