

R4241

Sub. Code

25IMB1C1

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2025

First Semester

Integrated Marine Biology

FUNDAMENTALS OF MARINE BIOLOGY

(CBCS – 2025 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. Who is the father of modern marine biology? (CO1, K2)
(a) Charles Darwin (b) Aristotle
(c) Ernest Haeckel (d) Rachel Carson
2. What does oceanographic zonation primarily refer to? (CO1, K2)
(a) Wind patterns
(b) Salinity of water
(c) Division of ocean into different ecological regions
(d) Wave height
3. Which property measures the resistance to flow in seawater? (CO2, K3)
(a) Surface tension (b) Viscosity
(c) Conductivity (d) Density
4. Waves are primarily generated by (CO4, K4)
(a) Rainfall
(b) Wind
(c) Underwater volcanoes
(d) Coriolis effect

5. The main dissolved gas responsible for supporting marine life is (CO4, K3)
 - (a) Nitrogen
 - (b) Methane
 - (c) Oxygen
 - (d) Argon
6. Which element is considered a major macronutrient in seawater? (CO5, K3)
 - (a) Carbon
 - (b) Iron
 - (c) Nickel
 - (d) Lead
7. Primary productivity in the oceans is mainly carried out by (CO4, K3)
 - (a) Fish
 - (b) Phytoplankton
 - (c) Zooplankton
 - (d) Bacteria
8. Which of the following best describes secondary productivity? (CO4, K3)
 - (a) Energy produced by plants
 - (b) Energy transfer through consumers
 - (c) Energy from the sun
 - (d) Energy from hydrothermal vents
9. Which ecosystem is characterized by the highest animal biodiversity? (CO5, K4)
 - (a) Coral reefs
 - (b) Sandy beaches
 - (c) Open ocean
 - (d) Abyssal plains
10. Animal association in ecological terms primarily refers to (CO5, K4)
 - (a) Physical interaction among animals
 - (b) Predation only
 - (c) Assemblages of different species in a habitat
 - (d) Migration only

Part B

(5 × 5 = 25)

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

11. (a) Examine the importance of international ocean expeditions in the development of marine biology. (CO1, K3)
- Or
- (b) Demonstrate the historical and modern developments in marine biology. (CO1, K3)

12. (a) Illustrate how temperature and salinity influence the density of seawater with suitable examples. (CO2, K4)
- Or
- (b) Infer the effects of tides on coastal ecosystems. (CO2, K4)
13. (a) Assess the process and significance of gas exchange in ocean-atmosphere interactions. (CO3, K5)
- Or
- (b) Evaluate the roles of carbon and nitrogen in the biogeochemical cycles of the ocean. (CO3, K5)
14. (a) Compare the classification and ecological function of phytoplankton and zooplankton. (CO4, K5)
- Or
- (b) Discuss two methods for measuring primary and secondary productivity in marine environments. (CO4, K5)
15. (a) Outline the productivity gradient from estuaries to open sea and its ecological implications. (CO5, K4)
- Or
- (b) Analyze the animal assemblages found in coral reefs and their ecological roles. (CO5, K4)

Part C

(5 × 8 = 40)

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

16. (a) Critically evaluate the impact of major oceanographic research expeditions on the advancement of marine science. (CO1, K5)
- Or
- (b) Evaluate the historical timeline of key discoveries in marine biology and their significance to oceanography. (CO1, K5)

17. (a) Analyze the combined influence of waves, tides and ocean currents on marine ecosystems and coastal geomorphology. (CO2, K4)

Or

(b) Propose a hypothetical experiment to investigate the effect of surface tension on plankton distribution and explain the expected results. (CO2, K4)

18. (a) Compose a note on the relative importance of major and minor elements in maintaining chemical homeostasis in seawater. (CO2, K6)

Or

(b) Design a comprehensive study to monitor seasonal variations in dissolved gases and relate them to marine productivity. (CO2, K6)

19. (a) Formulate a research plan for measuring primary and secondary productivity, addressing both methodological and ecological aspects. (CO4, K6)

Or

(b) Compose an essay on the interrelationship between phytoplankton and zooplankton in sustaining community ecology in the coastal ocean. (CO4, K4)

20. (a) Critically analyze the significance of animal associations in mangrove and deep-sea ecosystems, focusing on ecological stability. (CO5, K4)

Or

(b) Illustrate the animal assemblages across pelagic, benthic and estuarine ecosystems, highlighting adaptation strategies. (CO5, K4)

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Sub. Code

25IMB1A1

M.Sc. DEGREE EXAMINATION, NOVEMBER – 2025

First Semester

Integrated Marine Biology

Allied — GENERAL CHEMISTRY — I

(CBCS – 2025 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. According to kinetic theory of gases, the pressure of a gas in a container arises mainly due to (CO1, K2)
 - (a) Vibrational energy of molecules
 - (b) Random collisions of molecules with the container walls
 - (c) Intermolecular attractions between molecules
 - (d) Potential energy of the molecules
2. Among the following, the gas that deviates most from ideal behavior under ordinary temperature and pressure is (CO1, K2)
 - (a) Hydrogen (H₂)
 - (b) Oxygen (O₂)
 - (c) Ammonia (NH₃)
 - (d) Helium (He)

3. Trouton's rule establishes an approximate relationship between entropy and (CO2, K2)
- (a) Heat of neutralization
 - (b) Heat of fusion
 - (c) Heat of vaporization
 - (d) Heat of reaction
4. The strong scattering of light in colloidal systems is mainly due to (CO2, K1)
- (a) Presence of dissolved electrolytes
 - (b) The solvent medium
 - (c) Colloidal particles of intermediate size
 - (d) Nature of true solution particles
5. The first law of thermodynamics primarily deals with which of the following principles? (CO3, K1)
- (a) Conversion of heat into work
 - (b) Changes in entropy
 - (c) Changes in enthalpy
 - (d) Conservation of energy
6. Which among the following is considered an irreversible process in thermodynamics? (CO3, K2)
- (a) Melting of ice at 0°C
 - (b) Free expansion of an ideal gas into a vacuum
 - (c) Heating of water at constant pressure
 - (d) Charging and discharging of a reversible battery
7. The Freundlich adsorption isotherm is valid for adsorption processes taking place at (CO4, K2)
- (a) Low pressure
 - (b) High pressure
 - (c) Critical pressure
 - (d) All pressures

8. The half-life period of a first-order chemical reaction is dependent on (CO4, K3)
- (a) Initial concentration of the reactant only
 - (b) The rate constant only
 - (c) Both concentration and rate constant
 - (d) Temperature only
9. The inert pair effect, which explains the stability of lower oxidation states, is observed predominantly in (CO5, K2)
- (a) Alkali metals of group 1
 - (b) Heavier p-block elements
 - (c) Transition metals of the d-block
 - (d) Noble gases
10. Sodium borohydride (NaBH_4) is an important laboratory reagent and is widely used as (CO5, K2)
- (a) Oxidizing agent in redox reactions
 - (b) Reducing agent in organic synthesis
 - (c) Complexing agent in solution chemistry
 - (d) Catalytic poison in heterogeneous catalysis

Part B

(5 × 5 = 25)

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

11. (a) Derive the expression for the pressure of a gas from kinetic theory. Discuss the assumptions made and their limitations. (CO1, K3)

Or

- (b) Explain the deviations of real gases from ideal behavior with suitable PV vs. P plots. Derive the Van der Waals equation and discuss its significance. (CO1, K4)

12. (a) Define surface tension and viscosity. Describe their experimental determination methods and their importance in pharmaceutical/industrial applications. (CO2, K2)

Or

- (b) Explain in detail the classification of colloids (lyophilic, lyophobic, multimolecular, macromolecular, associated colloids) with suitable examples. (CO2, K3)
13. (a) State and explain Hess's law of constant heat summation. Illustrate with the determination of the enthalpy of formation of CO_2 . (CO3, K2)

Or

- (b) Derive the relationship between C_p and C_v . Discuss its importance in calculating the specific heats of gases. (CO3, K3)
14. (a) Distinguish between physisorption and chemisorption based on energetics, reversibility, specificity, and examples. Comment on their industrial importance. (CO4, K2)

Or

- (b) Derive the integrated rate equation for a first-order reaction. Illustrate with an example such as the decomposition of H_2O_2 . (CO4, K3)
15. (a) Classify oxides into acidic, basic, amphoteric and neutral. Give examples from the s-block and p-block elements with uses. (CO5, K3)

Or

- (b) Write the methods of preparation, important reactions, and applications of lithium aluminium hydride (LiAlH_4) as a reducing agent. (CO5, K3)

Part C

(5 × 8 = 40)

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

16. (a) Deduce the Van der Waals equation of state. Discuss the significance of constants a and b and explain how they correct ideal gas behaviour. (CO1, K4)

Or

- (b) Explain the law of corresponding states. Derive the reduced equation of state and discuss its application in generalizing gas behavior. (CO1, K4)
17. (a) Describe the types of crystalline solids (ionic, molecular, covalent, metallic). Discuss their characteristic properties with examples. (CO2, K4)

Or

- (b) Write an essay on the applications of colloids in medicine (drug delivery, blood substitutes), industry (rubber, paints), and environment (air purification, sewage treatment). (CO2, K5)
18. (a) Derive the expressions for change in Helmholtz free energy and Gibbs free energy. Discuss their significance in predicting spontaneity and equilibrium. (CO3, K4)

Or

- (b) Explain entropy as a measure of disorder. Discuss entropy changes for reversible and irreversible processes with suitable examples. (CO3, K5)

19. (a) Describe the Freundlich adsorption isotherm and its experimental verification. Explain its limitations and compare with the Langmuir isotherm. (CO4, K4)

Or

- (b) Explain the role of catalysts in chemical reactions. Discuss acid-base catalysis and enzyme catalysis with mechanisms and examples. (CO4, K5)
20. (a) Discuss the unique position of hydrogen in the periodic table. Explain how it resembles alkali metals and halogens. Comment on its placement in the modern periodic table. (CO5, K4)

Or

- (b) Write an account of isotopes of hydrogen (protium, deuterium, tritium). Discuss their methods of preparation and applications in industry and research. (CO5, K3)
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