

BIOLOGY FOR ENGINEERS
(BIOT 4223)

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and
any 5 (five) from Group B to E, taking at least one from each group.*

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

- (i) The centromere is that part of the chromosome where_____.
(a) Nicking occurs (b) Chromatids are attached
(c) Nucleoli are formed (d) Crossing-over takes place
- (ii) The nucleic acid synthesis takes place in
(a) 3'-5' direction (b) 5'-3' direction (c) both way (d) any direction.
- (iii) Nuclear DNA replicates in the _____ phase.
(a) G₂ (b) M (c) S (d) none of the above
- (iv) What gametes are produced by a Vv heterozygous plant?
(a) 50% V and 50% v (b) 75% V and 25% v
(c) 25% V and 75% v (d) 100% V and 0% v.
- (v) The enzyme which hydrolyses starch to maltose is_____.
(a) Maltase (b) Lactase (c) Amylase (d) Protease
- (vi) What is the nature of an enzyme?
(a) Vitamin (b) Lipid (c) Carbohydrate (d) Protein.
- (vii) When a threatened plant needs urgent measures to save it from extinction, the desirable approach is
(a) In-situ conservation (b) Ex-situ conservation
(c) Cryopreservation (d) Biopreservation.
- (viii) Restriction enzymes are isolated from
(a) Virus (b) Fungi (c) Protozoa (d) Bacteria.
- (ix) Global warming can be controlled by
(a) increasing solid waste (b) reducing water wastage
(c) burning human-generated waste (d) reducing fossil fuel consumption.

- (x) The greatest biodiversity on earth can be found in
(a) African grasslands (b) Amazonian rain forest
(c) Western Ghats (d) Nile delta.

Group- B

2. (a) Explain the significance of mitosis and meiosis. [(CO3)(Understanding/LOCQ)]
(b) What are the steps involved in transcription? [(CO3)(Remembering/LOCQ)]
(c) Once polypeptides have been made, then analyze how polypeptides are targeted to its various locations. [(CO3)(Analyze/IOCQ)]
4 + 4 + 4 = 12
3. (a) What is the central dogma of molecular biology? [(CO4)(Remember/LOCQ)]
(b) Describe the different features and functions of various types of RNA. [(CO4)(Understand/LOCQ)]
(c) Analyze the steps behind replication of DNA. [(CO4)(Analyze/IOCQ)]
4 + 4 + 4 = 12

Group - C

4. (a) Analyze the three main principles of Mendel's Laws. [(CO4)(Analyze/IOCQ)]
(b) What are the uses of a punnett square? [(CO4)(Remember/LOCQ)]
(c) Why is test cross necessary to deduce the genotype of a parent whose partner is heterozygous recessive. [(CO4)(Apply/IOCQ)]
4 + 4 + 4 = 12
5. (a) Give a comparative analysis of different structure of proteins. [(CO3)(Analyze/IOCQ)]
(b) Distinguish between anabolism and catabolism. [(CO3)(Analyze/IOCQ)]
(c) Give examples of anabolic and catabolic reactions. [(CO3)(Remember/LOCQ)]
4 + 4 + 4 = 12

Group - D

6. (a) State how different factors affect enzyme activity. [(CO5)(Analyze/IOCQ)]
(b) What do you mean by competitive and non-competitive enzyme inhibition? [(CO5)(Remember/LOCQ)]
(c) Analyze the 'Induced fit model' of enzyme action. [(CO5)(Analyze/IOCQ)]
4 + 4 + 4 = 12
7. (a) Analyze the concept of restriction modification system. [(CO5)(Analyze/IOCQ)]
(b) Show with a diagram the formation of Blunt ends and Sticky ends. [(CO5)(Illustrate/IOCQ)]
(c) Give a brief outline of the commercial importance of restriction enzymes. [(CO5)(Analyze/IOCQ)]
4 + 4 + 4 = 12

Group - E

8. (a) What do you mean by Richness and evenness of biodiversity? [[CO6](Remember/LOCQ)]
 (b) Examine the commercial, economic and social benefits of biodiversity. [[CO6](Examine/HOCQ)]
 (c) Analyze the potential threats towards biodiversity conservation. [[CO6](Analyze/IOCQ)]
(2 + 2) + 4 + 4 = 12
9. (a) Max and Judy are a married couple. After years of trying to have a baby, they underwent in-vitro fertilization. In total, 7 of Judy's eggs were fertilized and made into embryos. Two of these embryos were implanted and resulted in the couple's twins, now 5 years old. Even though Max and Judy have decided they do not want any more children, they have been paying a yearly fee to keep the 5 remaining embryos frozen at the fertility clinic. Their yearly fee is due next month. They are unsure if they should continue paying to keep the embryos frozen, donate them to science, or just let them be thawed out and die. What do you think they should do? [[CO6](Criticize/HOCQ)]
 (b) What is Biopiracy? Cite any famous case study involving Biopiracy. [[CO6](Explore/LOCQ)]
 (c) Cite any example of application of Tissue Engineering in human healthcare. [[CO6](Analyse/IOCQ)]
4 + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	37.5	54.16	8.34

Course Outcome (CO):

After completion of the course, the students will be able to:

1. Understand the basic structure and function of cells and cellular organelles.
2. Understand the fundamental concepts of cellular reproduction and cell metabolism.
3. Characterize the different types of proteins, lipids and carbohydrates.
4. Analyze the mechanism of inheritance of characters through generations.
5. Understand and implement the working principles of enzymes and their applications in biological systems and industry.
6. Design and evaluate different environmental engineering projects with respect to background knowledge about bioresources, biosafety and bioremediation.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question.

