

BIOPOLYMERS (BIOT 4182)

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) BIOPOL is a copolymer of
 (a) PHB and PHV (b) PLA and PHV
 (c) PLA and PHB (d) PHB and PHO.
- (ii) Silk fibroin consists of polypeptide chains arranged in
 (a) α-helix (b) β-pleated sheet
 (c) β-helix (d) none of (a), (b) and (c).
- (iii) Humans do not have the enzyme necessary for the hydrolysis of
 (a) cellulose (b) glycogen
 (c) amylose (d) amylopectin.
- (iv) A carbohydrate commonly known as dextrose
 (a) Dextrin (b) D-Fructose
 (c) D-Glucose (d) Glycogen.
- (v) The major functions of carbohydrates include
 (a) structural framework (b) storage
 (c) both (a) and (b) (d) none of these.
- (vi) In Biopol production the PHA accumulation phase is controlled under which nutrient limitation
 (a) oxygen (b) phosphate
 (c) carbonate (d) iodine
- (vii) Biodegradation of plastics means breaking down of the plastic into
 (a) short chain polymers (b) very small pieces
 (c) CO₂, H₂O, CH₄ and biomass (d) short chain monomers.
- (viii) Which of the following is not a disaccharide?
 (a) Hyaluronic acid (b) Maltose
 (c) Lactose (d) Sucrose.

- (ix) Which of the following is a method for monitoring the biodegradation of polymers
 (a) enzyme assay (b) plate test
 (c) respiratory test (d) all of (a), (b) and (c).
- (x) Tensile strength of fibre reinforced bioplastics is _____ normal plastics
 (a) equal to (b) higher than
 (c) lower than (d) all of the above.

Group - B

2. (a) Define Biocompatibility. How biocompatibility can be established?
 (b) Write down the applications of keratin and fibroin as biomaterials. What are the two cell adhesion sequences present in keratin?
(1 + 3) + (2 + 4 + 2) = 12
3. (a) What is collasome? Write down the medical use of collasome. Write down the merits and demerits of using collagen as biopolymer.
 (b) What are the characteristic repetitive sequences of collagen, keratin, and fibroin? What are the advantages of recombinant collagen?
(2 + 1 + 3) + (4 + 2) = 12

Group - C

4. (a) What are the two linkages present in starch? Which enzyme hydrolyses starch? What are the uses of starch as biopolymer? Discuss the limitation of starch as biopolymer.
 (b) What are the properties of alginate? Briefly discuss the biomedical applications of alginate.
(2 + 1 + 2 + 2) + (2 + 3) = 12
5. (a) What are the monomeric unit of alginate and agarose?
 (b) What is electrospinning? What are the different parameters that affect the electrospinning process?
4 + (2 + 6) = 12

Group - D

6. (a) What is thermoplastic starch? How starch and its derivatives can be used to produce bioplastics?
 (b) Write a brief note on Polycaprolactone.
(2 + 5) + 5 = 12

7. (a) Discuss the production of PHB through fermentation. What are the different properties of PHB?
(b) What is BIOPOL?

(7 + 3) + 2 = 12

Group - E

8. (a) Define aerobic and anaerobic biodegradation. Classify the different biodegradation environments for polymers.
(b) Discuss in brief the biodegradation of fibre-reinforced polymeric composites.

(4 + 4) + 4 = 12

9. (a) Discuss the principle, application and suitability of plate test and gas-evolution test for monitoring biodegradation processes of plastics.
(b) What are the key points agreed upon internationally in defining biodegradability of a polymer?

(5 + 5) + 2 = 12