

**BIOPOLYMER
(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) Bone is a/an
 - (a) elastic material
 - (b) viscous material
 - (c) isoelastic material
 - (d) hard material.
 - (ii) Bioglass is a
 - (a) inert ceramic
 - (b) bioactive ceramic
 - (c) composite
 - (d) crystalline polymer.
 - (iii) Alginate is a
 - (a) protein
 - (b) polysaccharide
 - (c) synthetic material
 - (d) lipid
 - (iv) Polymeric biomaterials are generally sterilized by
 - (a) dry heat
 - (b) moist heat
 - (c) gas
 - (d) gamma ray.
 - (v) The most abundant amino acid present in the silk fibroin is
 - (a) valine
 - (b) tyrosine
 - (c) glycine
 - (d) alanine.
 - (vi) Hydrogel is used to improve the
 - (a) blood compatibility
 - (b) tissue compatibility
 - (c) contour
 - (d) mechanical property.
 - (vii) Crystal structure means
 - (a) random alignment of unit cells
 - (b) periodic alignment of unit cells
 - (c) ductile material
 - (d) brittle material.

- (viii) Size of a polymer depends on
 - (a) degree of polymerization
 - (b) molecular weight
 - (c) tensile strength
 - (d) hydration
- (ix) Collagen is a
 - (a) natural polymer
 - (b) synthetic polymer
 - (c) semi-synthetic polymer
 - (d) protein.
- (x) Which of the following carbohydrate acts as lubricant of synovial fluid and contribute to tensile strength and elasticity of cartilage and tendons?
 - (a) Hyaluronic acid
 - (b) Dextran
 - (c) Glycogen
 - (d) Heparin.

Group - B

2. (a) What are the different methods of sterilization of biopolymers? What are the physical properties of biomaterial?
- (b) Define erosion and corrosion. How can you evaluate the biocompatibility of a material?
- (4 + 4) + (2 + 2) = 12**
3. (a) What are the advantages and disadvantages of collagen as a biomaterial? Discuss the significance of hydroxylation of proline in collagen. How collagen like protein is stable in bacteria without the enzyme that are present in mammals? What is collasome?
- (b) What are the characteristic features of keratin? How keratin derived from wool and hair can be used successfully as a support for cell attachment and growth? Which amino acid is prevalent in keratin but not in collagen and elastin?
- (2 + 2 + 1 + 2) + (2 + 2 + 1) = 12**

Group - C

4. (a) What are the differences between starch and cellulose? What are the different ways of modification of starch? Discuss briefly.
- (b) Describe the purification of chitosan from shell with a flow diagram.
- (2 + 6) + 4 = 12**
5. (a) Why chitosan cannot produce nanofibers through electrospinning process? How can this problem be solved?

- (b) Mention the names of the monomers present in alginate. Discuss about the modification of alginate. Discuss about the biodegradability of alginate.

$$(2 + 2) + (2 + 4 + 2) = 12$$

Group – D

6. (a) Name some natural fibres used for reinforcement of bioplastics. What are the advantages and disadvantages of such bio-fibres?

- (b) What is polylactic acid? How is it synthesized from corn starch?

$$(2 + 3) + (1 + 6) = 12$$

7. (a) What are the different types of bioplastic? What is the repeating unit of poly-3-hydroxybutyrate? Draw the structure of the repeating unit.

- (b) Describe the biosynthesis of poly-3-hydroxybutyrate.

$$(4 + 1 + 1) + 6 = 12$$

Group – E

8. (a) Discuss the biodegradation of polycaprolactone.

- (b) What are the different techniques available for analysis of biodegradation of polymer? Discuss in brief.

$$4 + 8 = 12$$

9. (a) Briefly discuss the intracellular degradation of PHA.

- (b) What are the factors that affect the degradation of PHA?

$$7 + 5 = 12$$