BIOPOLYMER
(BIOT 4126)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

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

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) Hyaluronic acid plays an important role in _____
(a) wound healing (b) adhesion
(c) migration (d) differentiation.

(ii) Which of the following is known as Shape Memory?
(a) Pyrolytic carbon (b) Polyethylene terephthalate
(c) Platinum-iridium alloy (d) Nickel-titanium alloy.

(iii) Hyaluronic acid can be produced from
(a) Rooster's Comb (b) Cocoons of Bombyxmori
(c) Spider webs (d) Bee hives.

(iv) Which of the following have a structure with three peptide chains bound with each other to form a rope-like structure?
(a) Collagen (b) DNA (c) RNA (d) Peptidoglycan.

(v) The chemical nature of PHB is
(a) Polypeptide (b) Carbohydrate
(c) Polyester (d) Polythene.

(vi) The most abundant amino acid present in the silk fibroin is
(a) valine (b) tyrosine (c) glycine (d) alanine.

(vii) 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).

(viii) Which statement is NOT true for anaerobic digestion?
(a) Anaerobic digestion takes place in absence of oxygen
(b) Anaerobic digestion produces CO2
(c) Anaerobic digestion gives a solid matter which can be used as manure
(d) Anaerobic digestion is often followed by composting.

(ix) The most common compound used for making starch-based and cellulose-based bioplastic is
(a) glycerol (b) water (c) ethanol (d) acetone.

(x) Which enzyme can break a polyester compound?
(a) Esterase (b) Protease
(c) Cellulase (d) Amylase.

Fill in the blanks with the correct word

(xi) Examples of synthetic polymers used as biomaterials _____.

(xii) Amylopectin consists of _____ linkage which makes it a branched chain polymers.

(xiii) The enzyme that breaks down protein is _____

(xiv) Collasome is used in _____.

(xv) _____ is the most widely used modified form of cellulose for making bioplastic.

Group - B

2. (a) How are scaffolds synthesized? *[(CO1)(Understand/LOCQ)]*
(b) Analyse how are bioreactors used in tissue engineering purposes? *[(CO1)(Analyse/IOCQ)]*
(c) What are properties of silk fibroin? *[(CO1)(Remember/LOCQ)]*
4 + 4 + 4 = 12

3. (a) What is a Dacron? *[(CO1)(Remember/LOCQ)]*
(b) Design the process of extraction of collagen by salt precipitation. *[(CO2)(Design/HOCQ)]*
(c) Discuss how you can purify the collagen fibres. *[(CO2)(Analyse/IOCQ)]*
2 + 5 + 5 = 1 2

Group - C

4. (a) Analyse the process of extracting silk from silk fibroin. *[(CO2)(Analyse/IOCQ)]*
(b) Explain the various applications of silk fibroin. *[(CO2)(Evaluate/HOCQ)]*
(c) Distinguish how silk fibroin and hyaluronic acid can be used in wound healing processes? *[(CO1)(Analyse/IOCQ)]*
4 + 4 + 4 = 12

5. (a) Distinguish between chitin and chitosan. *[(CO3)(Understand/LOCQ)]*
(b) Chitosan can be used as an efficient biomaterial. Analyse this statement. *[(CO3)(Analyse/IOCQ)]*
(c) What is dextran and why it has many applications as biomaterials? *[(CO3)(Apply/IOCQ)]*
4 + 4 + 4 = 12

Group - D

6. (a) What are bioplastics? What are the criteria a compound should have to be called bioplastics? *[(CO4)(Analyse/HOCQ)]*

   (b) What are plasticizers? Name the compound that is most widely used as the plasticizer for making bioplastics from starch. Which properties of starch are improved for using this plasticizer? *[(CO4)(Remember/LOCQ)]*

   (c) State two limitations of starch-based bioplastics. *[(CO4)(Understand/IOCQ)]*

(2 + 4) + (2 + 1 + 1) + 2 = 12

7. (a) Discuss polymerization of lactic acid for preparation of bioplastic. *[(CO4)(Discuss/IOCQ)]*

   (b) How Poly Lactic Acid (PLA) is degraded? *[(CO5)(Understand/IOCQ)]*

   (c) PLA is NOT a natural compound. In spite of that PLA is classified as a bioplastic. Comment on this statement. *[(CO4)(Comment/HOCQ)]*

6 + 3 + 3 = 12

Group - E

8. (a) Discuss the soil parameters that influence the rate of degradation of a biopolymer. *[(CO5)(Understand/IOCQ)]*

   (b) Biodegradability can be measured by measuring the growth of microbes by plate count method. Do you agree with the statement? Justify your answer. *[(CO5)(Justify/HOCQ)]*

   (c) Describe anaerobic digestion for degradation of biopolymers. *[(CO5)(Describe/IOCQ)]*

4 + 4 + 4 = 12

9. (a) What are biotic and abiotic degradation of biopolymers? *[(CO5)(Remember/LOCQ)]*

   (b) The rate of degradation of biopolymers depend on both biotic and abiotic factors. Comment on the statement. *[(CO5)(Comment/HOCQ)]*

   (c) State the action of protease and lipase on a biopolymer. *[(CO5)(Remember/LOCQ)]*

(2 + 2) + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	27	46	27