

B.TECH / CHE /7TH SEM/ BIOT 4182/2017
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) Silk fibroin consists of polypeptide chains arranged in
(a) α -helix (b) β -pleated sheet (c) β -helix (d) none of these.
- (ii) Why is ceramic used in artificial retinas?
(a) It is non-toxic (b) It is smaller than a human hair
(c) It is very strong (d) It detects light.
- (iii) Oligosaccharides linked to proteins are called
(a) glycoproteins (b) glycolipids
(c) galactosides (d) ganglioside.
- (iv) Bioplastics are more environment friendly than synthetic plastics because they are
(a) biodegradable (b) produced from renewable sources
(c) both (a) and (b) (d) none of the above.
- (v) Which of the following is a method for monitoring biodegradation of polymers
(a) enzyme assay (b) plate test
(c) respiratory test (d) all of the above.
- (vi) Tensile strength of fibre reinforced bioplastics is _____ that of normal plastics
(a) equal to (b) higher than
(c) lower than (d) not comparable to.
- (vii) The respiratory test is used as a technique for evaluating the
(a) degree of polymerization
(b) degree of biodegradation of plastic waste
(c) degree of assimilation of toxic waste
(d) degree of formation of alcohol.

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- (viii) In Biopol production the PHA accumulation phase is controlled under which nutrient limitation?
(a) oxygen (b) phosphate (c) carbonate (d) iodine.
- (ix) The introduction of engineered PHA synthase into the plant *A. thaliana* resulted in ____ in PHA content inside the plant
(a) 10 fold increase (b) 2 fold increase
(c) 100 fold increase (d) no increase.
- (x) 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.

Group - B

2. (a) What are the key proteins present in silk extracted from silkworm? How can we extract fibroin from silk? Which amino acids are most prevalent in fibroin?
(b) Discuss the extraction process of keratin from keratinaceous tissue. What are the difference between α keratin and γ keratin? What are the most abundant amino acids in keratin?
3. (a) What is collasome? Write down the medical use of collasome. Write down the merits and demerits of using collagen as biomaterial.
(b) What is the characteristic repetitive sequence of collagen? Which enzyme is responsible for hydroxylation of proline and why the hydroxylation is required? Which microorganism is used industrially to produce recombinant collagen? What are the advantages of recombinant collagen?

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

2 + 1 + 3 + 1 + 2 + 1 + 2 = 12

Group - C

4. (a) What is agarose? What are the different properties of agarose? How can we use agarose as a biomaterial?
(b) What is electrospinning? Discuss the application of electrospinning in case of chitosan and silk fibroin.
5. (a) What are the two constituent of chitosan? Discuss in brief the modification of chitosan and how the modification help in biomedical application?
(b) What is polydextrose? How polydextrose is prepared?

2 + 2 + 2 + 2 + 4 = 12

2 + 7 + 1 + 2 = 12

Group - D

6. (a) Discuss the method of production of Biopol commercially from bacteria R. Eutropha and explain the related pathway. Give some examples of Biopol application.
- (b) Discuss in brief the production of starch based plastic.

8 + 4 = 12

7. (a) Name some natural fibres used for reinforcement of bioplastics. What are the advantages and disadvantages of such bio-fibres?
- (b) Discuss in brief the properties and uses of flax fibre reinforced thermoplastics.

3 + 5 + 4 = 12

Group - E

8. (a) What are the factors that affect the biodegradability of plastics?
- (b) Describe the methods of biodegradation of polyurethane and nylon

4 + 8 = 12

9. (a) What are the environmental problems posed by synthetic plastics?
- (b) Explain the methods of enzyme assay and respiratory test as techniques for analysis of biodegradation of polymers.

4 + 8 = 12