BIOMATERIALS
(BIOT 4131)

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) Which of the following enzymes is/are used for the enzyme extraction process of Collagen?
(a) Pepsin (b) Chymotrypsin
(c) Papain (d) All of the above.

(ii) The secondary structure of Silk Fibroin is
(a) Right handed helix (b) Left handed helix
(c) β-sheet (d) None of the above.

(iii) Which step in collagen synthesis requires Vitamin C?
(a) Hydroxylation of proline and lysine (b) Crosslinking of lysine residues
(c) Glycosylation of amino acids (d) Addition of Oligosaccharides.

(iv) Biomaterials _____.
(a) can be naturally derived or synthetic (b) are always synthetic
(c) are always natural (d) are made from metal only

(v) Hydrogel forming natural polymers includes both proteins and _____
(a) Polysaccharides (b) Lipids
(c) DNA (d) Nucleic acids.

(vi) Enzymes catalyzing the conversion of Aceto-acetyl CoA to 3-hydroxybuturyl CoA is
(a) Ketothiolase (b) Acetoacetyl CoA reductase
(c) PHB synthase (d) PHB polymerase.

(vii) Resilon is composed of
(a) PHB (b) Polylactic acid
(c) Polycaprolactone (d) Polyphenol.

(viii) Which of the following is a property of thermosetting plastics?
(a) Can be moulded (b) Soft
(c) Recyclable (d) Can be used at high temperatures.

(ix) Molecular mass of polymers are expressed as a/an _____
(a) average (b) median (c) mode (d) percentage.

(x) The response of a material due to the function of heat is known as _____
(a) mechanical property (b) electrical property
(c) chemical property (d) thermal property.

Fill in the blanks with the correct word

(xi) The cross-linking between tropocollagen molecules is catalyzed by _____.

(xii) Example of a Mucopolysaccharide is _____.

(xiii) Collagen cross-linking is catalyzed by _____.

(xiv) _____ biomaterial posses the both viscous and elastic property.

(xv) Example of linear polymeric biomaterial is _____.

Group - B

2. (a) Classify the natural polymers used as biomaterials. *[(CO1)(Classify/LOCQ)]*
(b) How can you purify the collagen from mixture of proteins? *[(CO3)(Apply/IOCQ)]*
(c) What do you mean by a tissue engineering triad? *[(CO1)(Remember/LOCQ)]*
(d) Discuss the applications of collagen sponges in wound healing. *[(CO3)(Apply/IOCQ)]*

3 + 4 + 1 + 4 = 12

3. (a) What is a Collagen? What is the amino acid sequence of the collagen? *[(CO3)(Remember/LOCQ)]*
(b) Write notes on sterilization of biomaterials. *[(CO2)(Discuss/IOCQ)]*
(c) Illustrate the process of scaffold production for regenerating the tissues. *[(CO1)(Illustrate/IOCQ)]*

(2 + 1) + 5 + 4 = 12

Group - C

4. (a) Write short note on Light- and Chemical-Responsive Hydrogels. *[(CO3)(Analyse/HOCQ)]*
(b) Briefly explain the application of Hyaluronic Acid in Cosmetics. *[(CO4)(Apply/IOCQ)]*

(6 + 4) + 2 = 12

5. (a) Describe with flow diagram how chitin is extracted from crustacean cell. *[(CO3)(Analyse/HOCQ)]*
(b) How starch is produced commercially from potato? *[(CO3)(Remember/LOCQ)]*

6 + 6 = 12

Group - D

6. (a) Discuss the factors effecting PHB synthesis and degradation. *[(CO5)(Explain/IOCQ)]*
(b) Illustrate the synthesis of Polycaprolactone. *[(CO5)(Illustrate/IOCQ)]*

(c) Discuss the applications of BIOPOL. *[(CO5)(Apply/HOCQ)]*

3 + 3 + 6 = 12

7. (a) Discuss the role of *Escherichia coli* as a source of PHA. *[(CO5)(Analyse/IOCQ)]*
   (b) Illustrate the process of production of polylactic acid. *[(CO5)(Illustrate/IOCQ)]*
   (c) Describe the application of Hyaluronic acid in gums. *[(CO4)(Apply/IOCQ)]*

5 + 4 + 3 = 12

Group - E

8. (a) State the Difference of Stress strain curve of metal and polymers. *[(CO6)(Analyse/HOCQ)]*
   (b) Explain : stress shielding. *[(CO5)(Remember/LOCQ)]*
   (c) Define "degree of polymerization of a polymeric biomaterial". *[(CO6)(Remember/IOCQ)]*

6 + 4 + 2 = 12

9. (a) A spherical biomaterial immersed in a body fluid experiences pressure of 0.1 GPa. Due to this, change in diameter of the material is 1% of initial. Calculate the Bulk Modulus. *[(CO6)(Compute/HOCQ)]*
   (b) How is Glass Transition Temperature (Tg) related to structure of polymer? *[(CO5)(Analyse/IOCQ)]*
   (c) What is meant by surface- eroding biomaterial? *[(CO5)(Remember/LOCQ)]*

6 + 4 + 2= 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	19.79	44.79	35.42