



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH(BT)/SEM-8/ID-814C/2012

2012

BIOMATERIALS

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

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

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

- i) The secondary structure of collagen protein is a
 - a) Left handed α -helix
 - b) right handed α -helix
 - c) β -sheet
 - d) β -turn.
- ii) The plasticizer used in polydextrose preparation is
 - a) Citric acid
 - b) Phosphoric acid
 - c) Sorbitol
 - d) Dextrose.
- iii) Polymer obtained from the bacteria *Leuconostoc mesenteroides* is
 - a) Xanthan
 - b) Hyaluronic acid
 - c) Polydextrose
 - d) Dextran.



GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

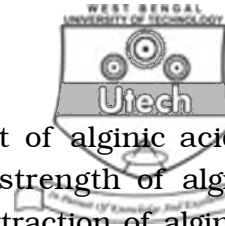
2. What is poly-dextrose ? Briefly describe some commercial applications of this compound. $1 + 4$
3. What is collasome ? How collagen can be synthesized using recombinant DNA technology. $2 + 3$
4. Name the protein present in silkworm silk. Discuss the physical properites of the protein with respect to its amino acid composition and structure. $1 + 4$
5. How is dextran produced by microbial fermentation ? What are the commercial applications of the product ? $3 + 2$
6. What is PCL ? What are its uses ? How is it synthesized ? $1 + 1 + 3$
7. A tensile trip of polystyrene that is 10 cm in length, 5 cm in width and 2 cm in thickness is stretched to a length of 10.5 cm. Assume that the sample is isotropic and deforms uniformly. Calculate the resulting width and % volume change after deformation.

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

8. What is hyaluronic acid ? What are the different properties of hyaluronic acid that are important for mammalian system ?
Elaborate some medical and cosmetic applications of hyaluronic acid. $3 + 4 + 8$
9. Discuss the synthesis of mature collagen from pro-collagen in a biological system. Give a flow sheet for extraction of collagen from calcified tissue. Mention two uses of collagen as a biomaterial. $6 + 7 + 2$



10. What do you mean by M and G content of alginic acid ? Discuss the effect of G-content on the strength of alginic acid. Discuss the industrial process for extraction of alginate from sea weed. Discuss the use of alginate. 2 + 3 + 5 + 5

11. What are two phases in Biopol production ? State the role of propionic acid in Biopol production. What are polyphenols ? How can they be produced by enzymatic method ?

$$2 \frac{1}{2} + 5 + 2 \frac{1}{2} + 5$$

12. a) Following data were obtained for polymethyl methacrylate [monomer $H_2C = C (CH_3) COOCH_3$].

Mean Mol Wt (gm/mole)	40,000	80,000	1,00,000
Weight (g)	2	1	1

Calculate Number Average Molecular Weight (M_N), weight average (M_W), dispersity index and degree of polymerization.

b) A steel bar with modulus $E_s = 2.1 \times 10^5 \text{ N/mm}^2$ elongates by 10 mm, when it was subjected to a tensile force of certain magnitude. What will be the elongation of a copper bar of same length and same cross-sectional area when it is subjected to the same force ? Modulus (E_{Cu}) = $1 \times 10^5 \text{ N/mm}^2$. 8 + 7

13. a) Describe structure and role of silk protein as biomaterial.

b) How this proetin can be synthesized using recombinant DNA technology ? 5 + 5 + 5

