



Name :

Roll No. :

Invigilator's Signature :

CS/B.TECH (BT)/SEM-8/ID-814C/2011

2011

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) Silk protein is one type of
 - a) Fibrous protein
 - b) Globular protein
 - c) Glycoprotein
 - d) Mycoprotein.
- ii) Soft contact lenses are made from
 - a) Teflon
 - b) Polymethyl methacrylate
 - c) 2-Hydroxyethyl methacrylate
 - d) Polyethylene.
- iii) The carbohydrate present in wood is
 - a) Hemicellulose
 - b) Collagen
 - c) Polydextrose
 - d) Dextran.



- iv) A biomaterial should be
- a) Biodegradable
 - b) Biocompatible
 - c) Bioresorbable
 - d) none of these.
- v) Biomaterials are
- a) Natural polymer
 - b) Synthetic polymer
 - c) both of these
 - d) none of these.
- vi) The collagen predominant in skin of adult human is
- a) Type I
 - b) Type II
 - c) Type III
 - d) Type IV.
- vii) In the repeat sequence of amino acids present in collagen Gly-X-Y, Y denotes
- a) Serine
 - b) Proline
 - c) Alanine
 - d) Hydroxy proline.
- viii) The predominant glycosidic linkage in cellulose is
- a) α (1-4)
 - b) α (1-6)
 - c) β (1-4)
 - d) β (1-6).
- ix) The most abundant amino acid present in the silk fibroin is
- a) Valine
 - b) Tyrosine
 - c) Glycine
 - d) Alanine.
- x) Example of modified carbohydrate used as lubricant is
- a) Chondroitin sulphate
 - b) Hyaluronic acid
 - c) both of these
 - d) none of these.
- xi) Biopol is composed of
- a) polyhydroxyoctanoate
 - b) polyhydroxybutyrate
 - c) polyhydroxyvalerate
 - d) poly (3-hydroxybutyrate-Co-3-hydroxyvalerate).



xii) Visco-elasticity of a polymer is presented by

- a) Newton's model
- b) Maxwell and Voigt model
- c) Hooke's model
- d) Burger model.

xiii) Size of a polymer depends on

- a) degree of polymerization
- b) molecular weight
- c) tensile strength
- d) hydration.

GROUP – B

(Short Answer Type Questions)

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

2. What are visco-elastic proportion of a material ? Explain Newtonian and non-Newtonian fluid.
3. The following viscosity data were obtained in an Ostwald viscometer for solutions of styrene in toluene at 30°C :

$t (s)$	65.8	101.2	144.3	194.6	257.0
$C (g/dL)$	0	0.54	1.08	1.62	2.16

Calculate the molecular weight of polystyrene using Mark-Houwink equation :

$[\eta] = KMv^{\frac{1}{2}} \{EQ \setminus S \setminus UP4(a)\}$, where $a = 0.725$ and $K = 1.1 \times 10 \{EQ \setminus S \setminus UP4(-4)\} dL/g$, $[\eta]$ is the intrinsic viscosity to be determined from the above data.

4. a) What are the rubberlike materials produced by bacteria and fungus called ?
b) What is Collasome ? How can Collagen be synthesized using recombinant DNA technology ?
5. How is artificial wood being produced ?
6. What are the properties of a biopolymer you will be looking for, to make a good biomaterial ?



GROUP – C

(Long Answer Type Questions)

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

7. What is PLA ? How is it commercially produced from starch ? Discuss its uses. $2 + 8 + 5$
8. Describe the biochemical pathways for production of PHB and PHV. Identify the genes that need to be introduced for its production by recombinant DNA technology. Name a plant that is used for better production of PHB and PHV. Explain why a copolymer of PHB and PHV is more suitable for industrial use than a homopolymer. $8 + 3 + 4$
9. Describe the industrial production of pectin. Discuss how the gelling property of pectin can be controlled. What is DE index ? Discuss its relation with the gelling property of pectin. $5 + 5 + 5$
10. Name the different proteins found in spider silk. Name the domains that are present in the proteins of spider silk. What is the advantage of spider silk over silk worm silk ? How spider silk can be produced by rDNA technology ? $4 + 5 + 3 + 3$
11. a) What are the five regions of isoelastic polymers ? How is each region characterised by stress, strain and viscosity ?
b) What is the glass transition temperature of a polymer ?
c) Briefly describe the relation between temperature, molecular weight and physical state of polymer. What is the importance of T_g in polymer processing ?