BIOMATERIALS
(BIOT 4162)

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) Which one of the following biopolymer is rich in Galacturonic acid?
(a) Pectin (b) Alginate (c) Chitin (d) Starch.

(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) Which of the following enzymes is/are used for enzyme extraction process of Collagen?
(a)Pepsin (b) Amylase
(c) Lipase (d) None of the above.

(iv) Which of the following amino acids is most abundant in Silk Fibroin?
(a) Hydroxyproline (b) Proline
(c) Glycine (d) Lysine.

(v) Which one among the following is a Protein?
(a) Alginate (b) Fibroin
(c) Hyaluronic acid (d) Polyphenol

(vi) Nitinol is widely used in
(a) Orthodontics (b) Joint replacement
(c) Electrical replacement of heart (d) Skin grafting.

(vii) The heat capacity of a material defined as _____
(a) $C = \frac{dQ}{dT}$ (b) $C = \frac{dT}{dQ}$
(c) $C = \frac{1}{m}.\frac{dE}{dT}$ (d) $C = m.\frac{dE}{dT}$

(viii) Permanent deformation of material with respect to time due to constant load and variable temperature is termed as _____
(a) Elasticity (b) Isotropy
(c) Hardness (d) Creep.

(ix) Non crystalline polymer is known as _____
(a) Micelle (b) Soft polymer
(c) Amorphous (d) Hard polymers

(x) _____ is a property of both solids and liquids.
(a) Viscoelasticity (b) Elasticity
(c) Rheology (d) Solubility

Group – B

2. (a) What do you mean by natural and synthetic biomaterial?
(b) How can you extract collagen by Acid precipitation
(c) How can you stabilize/reconstruct the collagen fibers?

(2 + 2) + 5 + 3 = 12

3. (a) How can you produce silk from Bombyx mori cocoons?
(b) Briefly describe the role of collagen in bone formation.
(c) What are the advantages of contact lenses over topical eye drops?

5 + 4 + 3 = 12

Group – C

4. (a) Discuss the application of alginate in wound dressing.
(b) Discuss the different applications of chitin and chitosan as biomaterials.

4 + 8 = 12

5. (a) Discuss the processes of extraction of pectin from peels of citrus fruits.
(b) Discuss the different properties of starch making it suitable for a biomaterial?
(c) Why is starch blended with other biopolymers?

5 + 4 + 3 = 12

Group – D

6. (a) What do you mean by the Glass Transition Temperature (Tg) of a polymer?
(b) What do you mean by BIOPOL?
(c) Write down the pathway for the synthesis of BIOPOL.

(d) What do you mean by polylactic acid?

2 + 2 + 5 + 3 = 12

7. (a) What are the properties of Polycaprolactone?

(b) Briefly describe the cycle of Poly-lactic acid in nature?

(c) What is a Hyaluronic acid?

5 + 5 + 2 = 12

Group – E

8. (a) Define
(i) Young's modulus
(ii) Poisson's ratio
(iii) Ultimate Tensile Strength (UTS) of a material.

(b) What is the principle behind creep-recovery test of a viscoelastic biomaterial? Draw and explain the strain response profile of creep recovery test.

(3 × 2) + (3 + 3) = 12

9. (a) Define : (i) Linear polymer (ii) Branched polymer (iii) Crosslinked polymer.

(b) Who will exhibit higher glass transition temperature: semicrystalline polymer or crystalline polymer? Give reason in support to your answer.

(2 + 2 + 2) + 6 = 12

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