Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/B.TECH (BME-OLD)/SEM-4/BME-401/2013

2013

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 the following : 10 × 1 = 10

i) The outermost hard layer of teeth is called

a) Dentin b) Enamel

c) Endosteal d) Gum.

ii) Elastin is a

a) carbohydrate

b) protein

c) polysaccharide

d) fat.

iii) The first phenomenon during blood-material interaction is

a) platelet interaction

b) albumin adsorption

c) intrinsic coagulation

d) fibrinogen polymerization.

iv) The most preferred metallic dental implant material is

a) Tantalum b) Vitallium

c) Titanium d) Aluminium.

v) Bioglass is a

a) inert ceramic

b) bioactive ceramic

c) composite

d) crystalline polymer.

vi) The hardest biological material is

a) Dentin b) Enamel

c) Gum d) Bone.

vii) Pitting is associated with

a) dissolution b) corrosion

c) solution d) absorption.

viii) Strength of a material is its

a) surface properties

b) mechanical properties

c) chemical properties

d) biological properties.

ix) Resorbable suture is made from

a) silicone rubber

b) nylon

c) polylactic acid

d) polyvinyl chloride.

x) Hydrogel is used to improve the

a) blood compatibility

b) tissue compatibility

c) contour

d) mechanical properties.

GROUP – B

(Short Answer Type Questions)

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

2. Define the terms 'biomaterial' and 'biocompatibility'. Briefly discuss about the necessity of biomaterials and classify them. 2 + 3

3. What are the primary uses of metallic implant ? Briefly discuss about the corrosion problem of metallic implant.

2 + 3

4. Classify bioceramics with appropriate examples. Why are ceramic materials more advantageous over metallic implant ? 2 + 3

5. Classify bio-ceramics with appropriate examples. Give the advantage and disadvantage of ceramic materials. $2\frac{1}{2} + 2\frac{1}{2}$

6. Define composite. What are the important features of composite biomaterials ? Classify composite biomaterials.

1 + 2 + 2

7. Draw the stress-strain diagram of metallic (ss316L) and ceramic biomaterials. What is the back bone structure of silicone rubber ? What are the applications of polyurethane biopolymer ? 3 + 1 + 1

GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. 3 × 15 = 45

8. What are the different toxicity testing protocols for evaluation of a biomaterial ? Describe *in vitro* and *in vivo* toxicity screening test for newer biomaterials. 6 + 9

9. Classify biomedical polymer with suitable examples. Briefly discuss the uses of biodegradable polymer in biomedical field. What are the importances of passive film layer for tissue adhesion ? Name at least three synthetic polymeric membranes and their application. 3 + 5 + 3 + 4

10. a) Name four mechanical testings.

    b) Describe the tensile testing of a metallic biomaterial.

    c) What are the data one can get from such a test regarding the mechanical properties of the material ?

    d) What is fracture toughness ? 4 + 5 + 4 + 2

11. Discuss about the uses of Ti and its alloys in dental surgery. Which tests are to be performed for newer biomaterials before clinical trials ? Describe the following terms in the field of polymers :

    a) Syndiotactic

    b) Isotactic

    c) Atactic. 5 + 6 + 4

12. a) Name/classify different crystal systems.

    b) Name different crystal defects.

    c) What are the primary uses of metallic implant materials ? Mention the uses of 316L SS, Co-Cr alloy in orthopaedic and dental surgery.

    d) What are the possible biomedical uses of ceramics ?

    e) Why are ceramic materials more advantageous than metallic implant ? $3\frac{1}{2} + 1\frac{1}{2} + (2 + 3) + 2 + 3$

13. Write short notes on any *three* of the following : 3 × 5

a) Orthopaedic implants

b) Pyrogenicity test

c) Percutaneous and skin implants

d) Haemolysis test

e) Standards of implant materials.