

**TISSUE ENGINEERING
(BIOT 4242)**

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 of the following tissue has a high regeneration capacity
(a) Skin, (b) Bone,
(c) Cartilage (d) Brain
 - (ii) Static culture systems may be unsuitable for thick TE constructs because
(a) cells will not attach,
(b) preferential flow paths might develop,
(c) diffusion limitations result in nutrient and oxygen deprivation in central regions
(d) none of the above
 - (iii) The outer covering of each bone made from fibrous connective tissue is called
(a) articular cartilage (b) diaphysis
(c) epiphysis (d) periosteum
 - (iv) Differentiation of stem cells:
(a) occurs only when growth factors are added to the medium,
(b) does not necessarily result in the desired cell type,
(c) can easily be reversed,
(d) does not occur in the human body, because of the cell's capacity to self-renew.
 - (v) Alumina is a/an
(a) inert ceramics (b) bioactive ceramics
(c) bioresorbable ceramics (d) none of these
 - (vi) The most correct sequence of early development following fertilization is
(a) zygote, blastomeres, morula, blastocyst
(b) oocyte, zygote, morula, blastocyst
(c) zygote, conceptus, blastocyst
(d) polar bodies, zygote, conceptus, blastocyst

- (vii) What is the most abundant component of the ECM by dry weight
(a) Collagen, (b) Fibronectin,
(c) Glycosaminoglycan, (d) laminin.
- (viii) Cells that produce new cartilage matrix are
(a) chondroblasts (b) chondrocytes
(c) osteoblasts (d) osteocytes
- (ix) Which statement is true:
(a) G-protein coupled receptors are activated by tyrosine phosphorylation,
(b) G-protein coupled receptors have 7-TM domains and always signal by increasing intracellular cAMP concentrations,
(c) G-protein consist of 3 subunits. Each subunits is having specific role in signal transduction.
(d) none of the above.
- (x) Albuminised surface is used to improve
(a) tissue compatibility (b) mechanical properties
(c) blood compatibility (d) contour

Group – B

2. (a) Discuss how the three embryonic germ layers give rise to different adult body parts.
(b) Elucidate the process of development of a single heart tube into a four-chambered pumping heart.
(c) Give an overview of integrin-mediated cellular signalling.

4 + 4 + 4 = 12

3. (a) Analyze the importance of 'Lines of Blaschko' from the tissue engineering perspective.
(b) Explain the process of endogenous cell therapy by using ECM Bioscaffolds.
(c) Write a brief note on commercially available ECM scaffolds.

4 + 4 + 4 = 12

Group – C

4. (a) Write Short notes on collagen based tissue engineering.
(b) How collagens interact with cells?
(c) What are the advantages of Rapid Prototyping technique over the other scaffold fabrication techniques?

6 + 3 + 3 = 12

5. (a) Explain in detail the role of alginate in tissue engineering.

- (b) Describe any two easy and inexpensive methods for scaffold fabrication with their advantages and disadvantages.

6 + 6 = 12

Group – D

6. (a) (i) Describe kinetic model of mammalian cell proliferation. (ii) Explain the functioning of set-up flow chamber-bioreactor system with diagram.
- (b) (i) What is 3-D cell culture? Explain it. (ii) Write names of different components of ECM. Describe the structure of GAGs and its function in ECM.

(3 + 3) + (3 + 3) = 12

7. (a) (i) Derive the Monod model for mammalian cell growth. (ii) Describe the kinetic model for contact inhibition of mammalian cells.
- (b) (i) Write the names of three different techniques for preservation of cells or tissue. (ii) Describe any one of the cell preservation techniques that you mentioned.

(3 + 3) + (2 + 4) = 12

Group – E

8. (a) Give an outline of the 3 major techniques of controlled modes of release of biomolecules into a scaffold matrix.
- (b) Discuss the applications of Collagen in bioactive matrices used in tissue engineering.
- (c) Comment how tissue engineering scaffolds are being used for immunomodulation.

4 + 4 + 4 = 12

9. (a) Give an overview of commercially used tissue engineered constructs used in wound repair.
- (b) Discuss the usage of different scaffold materials in bone regeneration.
- (c) Describe the different regenerative therapy approaches currently used in case of injury in brain, cochlea and retina.

4 + 4 + 4 = 12

Department & Section	Submission Link
BT	https://classroom.google.com/c/MzE3MTI5NDcwOTQ1/a/MzU1NTEwODExNDQx/details