Question Paper

Exam Date & Time: 30-May-2023 (02:30 PM - 05:30 PM)



MANIPAL ACADEMY OF HIGHER EDUCATION

SIXTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, MAY-JUNE 2023

BIOMATERIALS [BME 4051]

Α

Marks: 50

Duration: 180 mins.

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1)		Fiona has come across a relatively new class of materials which she intends to evaluate for medical application. What criterions would she consider for the evaluation of the materials.	(5)
	A)		
	B)	Distinguish bio inert, bioactive and bio-resorbable materials with respect to cell-materials interaction.	(3)
	C)	Why are the tissues in bio prosthetic heart valves treated with glutaraldehyde prior to their clinical use?	(2)
2)		The case history of two patients (P1 and P2) who are willing to have dental implants are provided.	(3)
	A)	P1: Bone density: 900 HU, bone height =8mm	
		P2: Bone density: 850, Sinus dips down, bone height < 8mm.	
		Analyse and indicate your suggestion of dental implants for the patients.	
	B)	Differentiate between total hip arthroplasty and hemi hip arthroplasty.	(2)
	C)	Compare and analyse the steps involved for the fixation of total hip replacement and total knee replacement.	(5)
3)		Justify with reason how a bi-leaflet valve is superior to caged and ball valve. Patients receiving mechanical heart valves often suffer with thromboembolism. How is this problem countered?	(4)
	A)		
	B)	Highlight the limitation of rigid contact lenses (PMMA polymer). Propose how these limitations are rectified using elastomeric lenses (PHEMA polymer).	(3)
	C)	Silicone rubber lenses despite their good oxygen permeability are not being accepted widely as contact lenses. Analyse the problems associated for such poor acceptance.	(3)
4)		Gelatin has sol-gel transition temperature at 30° C. In this context to make a stable gelatin film above 35°C which will not form sol, propose a strategy with appropriate logic.	(2)
	A)		
	B)	Porosity is very important characterization step for scaffolds. Illustrate methods to evaluate porosity.	(5)
	C)	You have uncoated and hydroxyapatite coated Co-Cr based dental implant. Which one would you prefer to use for improving bone cell density?	(3)

- 5) You wish to make homogeneous porous scaffolds. Which of the following method would be appropriate for your experiment: (a) porogen leaching (b) freeze drying (c) 3D bio printing? Justify your choice.
 (2)
 - B) Why is the telopeptide region of the collagen fibril appeared weak? You intend to extract collagen (5) for the fabrication of a composite matrix. What type of isolation technique would be appropriate? Describe the steps in brief, and justify your choice. Will the orientation of the collagen fibres make any impact in the design of the composite matrix?
 - C) You intend to make collagen based porous scaffold. In this context you have made collagen (3) hydrogel. Analyse your (Briefly, elaborate the processes involved).

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