Question Paper

Exam Date & Time: 09-Dec-2023 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

VII SEMESTER B.TECH END SEMESTER EXAMINATIONS, NOV/DEC 2023

Tissue Engineering [BME 4071]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

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

1)		Analyse the signaling pathways involved in the self- renewal of mouse embryonic stem cells. In this context, how you would facilitate differentiation process using the same parameters involved in the signaling pathways.	(3)
	A)		
	B)	Evaluate the steps involved in the isolation of human ES cells also analyse how to assess the potency of the isolated ES cell in vivo.	(5)
	C)	Analyse the impact in human adult stem cells if G1 phase regulator p16 and p21 are present in excess.	(2)
2)		Telomere shortening is considered the prime cause for senescence and cells abide by Hayflick's Limit. How does telomere shortening impact somatic as well as stem cells? justify with proper logic.	(3)
	A)		
	B)	Discuss the major components of cartilage, and analyse why cartilage has limited capacity to get repaired.	(3)
	C)	Illustrate different methodologies for decellularized matrices.	(4)
3)		Analyse the steps involved in angiogenesis (formation of new blood vessels). In this context, evaluate the significance of VEGF and hypoxia in angiogenesis.	(5)
	A)		
	B)	Analyze with schematics the decellularization and re-cellularization process pertaining to liver.	(3)
	C)	10 spherical cross-linked chitosan-alginate beads were prepared in a laboratory. The beads are transparent and homogeneous. When all these beads were dipped in de-ionized water, the water level rose by 0.6ml (void volume). Calculate the diameter of each bead.	(2)
4)		Mrinali wants to make interconnected porous scaffolds using gelatin. She wishes to explore porogen leaching, freeze drying and 3D printing. Compare and analyse her approaches (pros and cons of each process) to get best quality interconnected porous gelatin based scaffolds.	(4)
	A)		
	B)	Explain the different steps of harvesting cells.	(2)
	C)	Analyse the working of following selection methods: (i) Rate zonal gradient centrifugation, (ii) antibody panning, (iii) pre-plating, (iv) selective adhesion using fibronectin.	(4)
5)		Discuss the functions of the components used in culture medium.	(3)

A)

B) Illustrate the role of the following in cell culture: (i) Feeder cell, (ii) micro-carrier. (3)

C) How does a cryo-protectant work in the preservation of cells? Highlight the pros and cons of vitrification and freezing processes of cryopreservation. How can you modify normal fibroblast (3T3) cell into feeder cells? Justify your views. (4)

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