Question Paper

Exam Date & Time: 03-Jan-2023 (02:30 PM - 05:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

SEVENTH SEMESTER B.TECH MAKE-UP EXAMINATIONS, JAN 2023

Nanomedicine [BME 4306]

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

A

Answer all the questions.

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

1)		A researcher synthesized gold nanoparticles of different sizes ranges (5, 8, 10 nm) nm. Predicts the change in the optical properties of the nanoparticles with respect to size change. Illustrate the optical changes and write the reason for the change in optical behaviour.	(4)
	A)		
	B)	Summarize the size dependency of electrical properties in nanomaterials with suitable illustrations.	(4)
	C)	Compare acute and chronic inflammatory responses against a nanomaterial with suitable illustrations.	(2)
2)		Don synthesized nanoparticles by hydrothermal route. Determine the factors that are responsible for the formation of nanoparticles. Prescribe methods that Don could utilize to improve the yields of nanoparticles	(4)
	A)		
	B)	Roy synthesized a spherical nanoparticle by the precipitation method. Roy wants to understand the surface features of the nanoparticles. Choose a method Roy can use to study the surface. Explain the working and principles of the chosen method with suitable illustrations.	(4)
	C)	Justify the use of microwave energy for the synthesis of nanomaterials	(2)
3)		Design a nanocarrier system for the delivery of the drug doxorubicin to cancer using a thermoresponsive nanocarrier. Discuss the rationale and working of your designed carrier with suitable illustrations	(4)
	A)		
	B)	Discuss the mechanism by which thermal energy affects biological macromolecules and its effect on tissues and organs	(4)
	C)	Computed tomography (CT) imaging is used to visualize hard tissues. Formulate a solution using nanomaterials to improve the visualization of soft tissue with poor CT contrast. Explain the working of your formulated solution with suitable illustrations.	(2)
4)		Matrix Metalloproteinases-5 (MMP) is secreted in abundance in the tumour microenvironment. To detect MMP, you want to develop an impedance-based nanananosensor. Conceptualize an impedance-based nano biosensor to detect MMP-5 activity in tumours with an explanation of your design and suitable illustrations.	(4)
	A)		
	B)	Demonstrate the working of a Field emission transistor (FET) based biosensor to detect a protein in a tumour with suitable illustrations. Discuss the working and output of the sensor with suitable illustrations.	(3)
	C)	Discuss the various types of photodynamic therapy (PDT) with suitable illustrations	(3)
5)		Summarize the fabrication and the influence of nano topographic features on the cell adhesion and properties	(4)
	A)		
	B)	Pooja is exposed to a nanomaterial with a high aspect ratio length greater than 10 microns. Predicate the toxicity of the nanoparticle.	(4)

C) A company developed a novel contrast agent for MRI imaging. Summarize the potential risk assessment that the company has to consider before introducing the product to the market. (2)

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