Question Paper

MANIPAL ACADEMY OF HIGHER EDUCATION

SEVENTH SEMESTER B.TECH END SEMESTER EXAMINATIONS, NOV 2022

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)	A researcher synthesized quantum dots 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)
	B)	Summarize the influence of size on the magnetic properties of nanomaterials with suitable illustrations.	(4)
	C)	Discuss the reaction the body elucidates when a nanomaterial cannot be eliminated from the body with illustrations.	(2)
2)	A)	Anwar synthesized nanoparticles by precipitation route. Determine the factors that are responsible for the formation of nanoparticles. Prescribe methods that Anwar could utilize to improve the yields of nanoparticles.	(4)
	B)	Roy synthesized a spherical nanoparticle by the precipitation method. Roy wants to characterize the hydrodynamic radius and surface charge of the nanomaterials. Choose an appropriate characterization method to determine hydrodynamic radius and surface charge. Explain the working and principles of the chosen method with suitable illustrations.	(4)
	C)	Discuss a method for the preparation of fibrous nanomaterials with suitable illustrations.	(2)
3)	A)	Design a nanocarrier system to deliver the drug doxorubicin to nuclei of cancer using pH stimuli responsive nanocarrier. Discuss the rationale and working of your designed carrier with suitable illustrations.	(4)
	B)	Discuss the mechanism by which reactive oxygen species (ROS) affects biological macromolecules and its effect on tissues and organs.	(2)
	C)	Magnetic resonance imaging is used to visualize soft tissues. Formulate a solution using nanomaterials to improve the visualization of soft tissue with poor MRI contrast. Explain the working of your formulated solution with suitable illustrations.	(4)
4)	A)	Matrix Metalloproteinases-7 (MMP) is secreted in abundance in the tumour microenvironment. To detect MMP, you want to develop a FRET-based (Fluorescence Resonance Energy Transfer) nanobiosensor. Conceptualize a FRET-based Nanobiosenor to detect MMP-7 activity in tumours with an explanation of your design and with suitable illustrations.	(4)
	B)	Compare Type 1 and Type II photosensitizers used in Photodynamic therapy (PDT).	(2)
	C)	Demonstrate the working of surface-enhanced raman scattering (SERS) based nanoprobe to detect a protein within tumour cells with suitable illustrations. Justify the use of a Near-infrared laser in the SERS setup to detect the presence of the protein.	(4)
5)	A)	Summarize the fabrication and the influence of nano topographic features on the cell adhesion and properties	(4)

B) Preethi is exposed to a nanomaterial that has the potential to damage tissues. Predict the different possible levels of toxicity elucidated by nanomaterials within Preethi's body with suitable illustrations. (4)

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

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