

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- APRIL-2025

B.Tech-VI Semester (BT)

Course Code(Credits): 18B1WBT633 (3)

Max. Marks: 25

Course Name: Nano-Biotechnology

Course Instructors:Dr. Abhishek

Max. Time:1:3 Hour

Note: All questions are compulsory. Marks are indicated against each question in square brackets.

Q.No	Question	CO	Marks
Q1	A student decides to use a fluorophores (excitation source of 400 nm) for the designing of fluorescence biosensor. After excitation he observed emitted light at 450 nm and one more phospho-emission at 700 nm respectively. Calculate the stokes shift for this system. Explain the most likely reason for the Stokes shift and factors that affect stokes shift. Also justify the role of IC and ISC in fluorescence spectroscopy.	CO-3	2+1 12+1
Q2	Take into consideration the ground and excited state electron spin possibilities. In your opinion, do the energies of these spin states differ? Which do you anticipate having less energy? If the spin state is defined as $(2S + 1)$ where S represents the total electronic spin for the system, calculate the spin multiplicity of ground, singlet and triplet excited state. Also explain why is phosphorescence emission weak in most substances? [5]	CO-3	1+3+1
Q3	Numerous analytical techniques have been employed to determine the size of nanomaterial, such as DLS, TEM, SEM, and AFM. Among them, the technique of DLS can be widely employed for in situ measuring of nanomaterial size due to several advantages. Illustrate the working principle of DLS and signify the importance of Stokes-Einstein equation in size determination. Also list-out the advantages of using DLS over TEM.	CO-3	5
Q4	There are various physical, chemical, biological and hybrid techniques available to synthesize nanomaterials. The technique to be used depends upon the material of interest, type of nanostructure viz., zero dimensional, one dimensional, or two dimensional material size, quantity etc. If you would like to synthesize colloidal nanoparticles and thin film of nanomaterial, which methods you will use and why? Explain in detail.	CO-2	5
Q5	Nanomaterials exhibit unique properties, including high Surface area to volume ratio, enhanced optical, mechanical, magnetic, and electrical characteristics. List out few important industrial applications of high Surface area to volume ratio and enhanced optical properties of nanomaterials	CO-1	2
Q6	For a fixed total volume, if you will decrease the radius of a sphere by a factor of two then surface area of the sphere will increase by a factor of.....?	CO-1	2