

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- APRIL-2024

B.Tech-VI Semester (BT)

Course Code(Credits): 18B1WBT633 (3)

Max. Marks: 25

Course Name: Nano-Biotechnology

Course Instructors:Dr. Abhishek

Max. Time: 1.5 Hour

Note: (a) All questions are compulsory.

(b) Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

1. In recent years, dynamic light scattering (DLS), which is both fast and non destructive technique, has become the method of choice for evaluating particle size and particle size distribution (PSD) in a range of colloidal systems. Write down the working principle of DLS and the significance of Stokes-Einstein equation in size determination. Also explain the effect of solvent, temperature and viscosity on the size distribution of particles measured by dynamic light scattering [5] [CO-3]
3. A molecular transition from triplet excited to ground state was observed with a single peak wavelength of 752 nm and singlet excited state to ground state transition was observed as a single emission peak at 548 nm. The absorption peak is observed at 425 nm. Sketch a rough Jablonski diagram based on this information, label all the transitions in nm and calculate the stoke shift using above data. Also Calculate Stern-Volmer constant in M⁻¹, If 0.001M of a substance quenches the efficiency of fluorescence by 20%. [5] [CO-3]
4. Nanomaterials are one of the most important areas of scientific and industrial development, with impacts in virtually every area touched by materials science. Their unique properties have particularly widespread applications in biomedical and environmental research, where they contribute to sustainable and cost-effective processes. The synthesis of nanomaterials, however, can itself be costly and environmentally damaging; green or sustainable synthesis of nanomaterials is an essential development if the full potential of these transformative materials is to be realized. Detail out the synthesis of nanomaterial using environmental friendly methods and its significance in biomedical science. [3] [CO-2]
2. Mr Edward would like to monitor the mitotic division of cell and for the same initially he used a microscope with orange light source but unable to visualize the cell division later on he change the microscope with violet light source this time he observed the division perfectly, explain why? What would the size of the object be if the image was 5 times larger than the object and the magnification of compound microscope's been 10 and its eyepiece was 2? Calculate the ratio of resolving power of an optical microscope for two wavelength $\lambda_1 = 3000 \text{ \AA}$ and $\lambda_2 = 8000 \text{ \AA}$. [5] [CO-3]

- 5 Nanomaterials exhibit a variety of unusual and interesting optical properties that can differ significantly from the properties exhibited by the same bulk material. Justify this statement using suitable example [2] [CO-1]
6. Scanning electron microscopy is a highly versatile technique used to obtain high-resolution images and detailed surface information of samples. It is a type of electron microscopy that uses a focused beam of electrons to scan the surface of a specimen and generate images at a much greater resolution compared to optical microscopy. Write down the working principle and draw neat labelled diagram of scanning electron microscope. Also describe the different specimen interactions involved for image formation. [5] [CO-3]

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