JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- MAY-2023

Course Code (Credits): 11B1WBT840 (3)   Max. Marks: 25
Course Name: NanoBiotechnology
Course Instructors: Dr.Abhishek   Max. Time: 1.5 Hour

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

1. There are two fundamental approaches for nanoparticles synthesis top down and bottom up approach, in both the approaches we achieves nanoscalic dimension of particles. Keep in mind both the approaches how will you obtained nanothin film of materials, which methods you will use to fabricate the thin film and why? Using carbon as example, detail out the synthesis mechanism of fullerene. [5]

2. Fluorescence is the emission of light by a substance that has absorbed light or other electromagnetic radiation. In the absorption process an absorption band maximum of protein complex is observed at 280 nm but its emission maximum in polar solvent appears at 340 nm. Calculate the stokes shift in this case and explain the most likely reason for the Stokes shift. Also define internal conversion and intersystem crossing.[5]

3. A molecule phosphoresces with a single peak wavelength of 550 nm. The single fluorescence peak is at 500 nm. The absorption peak is at 425 nm. Sketch a rough Jablonski diagram based on this information, label all the transitions in nm. [3]

4. A Research scholar tried to observe the mitotic cell division under optical microscope. For the same he used an excitation source of wavelength 750 nm. After adjustment and focusing on the slide, he was unable to observe cell division. Later on, the scholar changed the source of excitation and start working with 350 nm illumination sources. This time student observed the image of cell division, explain why? Also calculate the resolving powder of microscope in above two cases. If the magnifying power of the two lenses used in microscope (eyepiece and objective lenses) are 2.5X and 15X, then what would be the magnifying power of microscope? [5]

5. Consider the electron spin possibilities for the ground and excited state. Do you think these different spin states have different energies? Which one do you expect to be lower in energy? If the spin state is defined as (2S + 1) where S represents the total electronic spin for the system, try to come up with names for the ground and possible excited states for the system that are based on their spin state. Also explain why is phosphorescence emission weak in most substances? [5]

6. A student observing binary fission in amoeba using microscope, in his study he used a compound microscope of magnifying power 10 and the size of amoeba under microscope ise 20 mm (image size). Later on he changed the microscope and this time he observed the size of image 30 mm. calculate the magnifying power of second microscope. [2]