

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- JUNE-2024

B.Tech-VI Semester (BT)

Course Code(Credits): 18B1WBT633 (3)

Max. Marks: 35

Course Name: Nano-Biotechnology

Course Instructors:Dr. Abhishek

Max. Time: 2.0 Hour

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*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*

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1. In the fight against cancer, early detection is a key factor for successful treatment. However, the detection of cancer in the early stage has been hindered by the intrinsic limits of conventional cancer diagnostic methods. Nano-theranostic provides high sensitivity, specificity, and multiplexed measurement capacity and has therefore been investigated for the diagnosis as well as imaging of cancer cells. Propose a model to develop a therapeutic agent which can be used as a diagnostic agent also. [5] [CO-4]
2. The global volume of skin damage or injuries has major healthcare implications and, accounts for about half of the world's annual expenditure in the healthcare sector. In the last two decades, tissue-engineered skin constructs have shown great promise in the treatment of various skin-related disorders such as deep burns and wounds. The treatment methods for skin replacement and repair have evolved from utilization of autologous epidermal sheets to more complex bilayered cutaneous tissue engineered skin substitutes. Illustrate the development of tissue engineered skin for wound healing in details. Also mention the importance of nano-materials in tissue engineering [5] [CO-4]
3. Nanoscale materials often present properties different from their bulk counterparts, as their high surface-to-volume ratio results in an exponential increase of the reactivity at the molecular level. Such properties include electronic, optical and chemical properties, while the mechanical characteristics of the nanoparticles (NPs) may also differ extensively. This enables them to be an object of intensive studies due to their academic interest and the prospective technological applications in various fields. Such nanostructures may be synthesized by a wide number of methods, which involve mechanical, chemical and other pathways. Detail out the synthesis of nanostructure using PVD and Ionizing radiations, Also write down the advantages of both the methods. [4+2] [CO-2]

4. The Jablonski diagram, typically used to illustrate fluorescence in molecular spectroscopy, demonstrates the excited states of a molecule along with the radiative and non-radiative transitions that can occur between them. Draw a neat and clean Jablonski diagram with all the possible transition and mentioned the time required for each transition. What do you understand by the different state of transition? Calculate the spin multiplicity of transition state with suitable formula. If you are using 280 nm light for the excitation process, emission light is observing at 455 nm and phosphorescence light observing at 445 nm. What would be the stokes shift? [3+3+2] [CO-3]
5. The major challenges that are matter of concern behind the success of targeted drug delivery systems are, finding the proper target for a particular disease state; finding a drug that effectively treats this disease; and finding a suitable drug carrier system to deliver the drug to specific sites. What are the ideal characteristic you have to keep in mind before selecting a targeted drug delivery system and what are the properties of an ideal drug carrier? [2+2] [CO-4]
6. A cosmetic company developed a formulation for skin allergy and claims its high surface area to volume ratio as compared to existing formulations. If you are applying this formulation over skin to cover an area of  $700 \text{ cm}^2$  with a thickness of 1 nm. Then how much formulation you required in ml [3] [CO-1]
7. Solvent polarity and the local environment have profound effects on the emission spectra of polar fluorophores. These effects are the origin of the Stokes' shift, which is one of the earliest observations in fluorescence. Explain the mechanism of solvent effect on emission spectra with suitable ray diagram. Also detail out the concept of REES in fluorescence spectroscopy. [4] [CO-3]