

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION-2024

MSc-II Semester (BT)

Course Code (Credits): 20MSWBT231 (2)

Max. Marks: 35

Course Name: NanoBiotechnology

Course Instructors: Dr.Abhishek

Max. Time: 2,0 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. Although not as accurate as a blood glucose test, urine testing can be used as a screening tool in patients known to have diabetes. The glucose urine test measures the amount of sugar (glucose) in a urine sample. Urine testing can also be used to detect glucose in the urine in undiagnosed patients. So using the concept of nano-biotechnology, proposed a strategies to detect the glucose in human urine colorimetrically. [5]
2. Doxorubicin (DOX) is one of the most commonly used chemotherapeutic drugs and is a popular research tool due to the inherent fluorescence of the DOX molecule. After DOX injection, fluorescence imaging of organs or cells can provide information on drug biodistribution. How would you design a nanotheranostic system using DOX as drug of interest. Detail out all the steps with the help of schematic diagram. [5]
3. Breast cancer (BC) is the most common malignancy in women worldwide, and one of the deadliest after lung cancer. Currently, standard methods for cancer therapy including BC are surgery followed by chemotherapy or radiotherapy. However, both chemotherapy and radiotherapy often fail to treat BC due to the side effects that these therapies incur in normal tissues and organs. To overcome the above limitations, targeted drug delivery system is emerging as potential therapeutic agent to combat against cancer. If you will get a chance to develop targeted drug delivery system for Breast Cancer using folic acid as a targeting moiety, then how will you design? Explain in detail with suitable schematic diagram. Also write down the name of two FDA approved nano-drug and their applications [4+2]
4. A benign tumor surgically removed from the body of the patient and doctor observed that the size of tumor is big enough with a diameter of 32.0 cm. if the radius of each tumor cell is equal to 100 nm, then what would be the total number of cells present in isolated tumor? [3]

5. Targeted drug delivery is a precise and effective strategy in oncotherapy that can accurately deliver drugs to tumor cells or tissues to enhance their therapeutic effect. In this research field, a large number of researchers have also achieved significant breakthroughs and advances in oncotherapy. Typically, nanocarriers as a promising drug delivery strategy can effectively deliver drugs to the tumor site through **EPR effect-mediated passive targeting**. Justify the role of nanocarrier in EPR effect-mediated passive targeting and its advantages over conventional drug targeting. Also explain RES and its importance in passive drug targeting. [4+2]
6. Nanostructures have attracted huge interest as a rapidly growing class of materials for many applications. Several techniques have been used to characterize the size, crystal structure, elemental composition and a variety of other physical properties of nanoparticles. In several cases, there are physical properties that can be evaluated by more than one technique. Different strengths and limitations of each technique complicate the choice of the most suitable method, while often a combinatorial characterization approach is needed. So which characterization technique you will use to get the hydrodynamic size of nanomaterial and why? Also write down the working principle and advantages of this technique. [3+3]
7. Currently, a plethora of characterization techniques are available to analyze and characterize nano-materials, and they assist in recognizing the end-use applications of the nano-materials by providing a thorough knowledge of the structure and property relationships. Among these, microscopy techniques command a unique position in analyzing various features such as morphology, chemical composition and structure, topology etc. What do you understand by electron microscopy? Explain the working principle of TEM and draw a neat and clean diagram for TEM microscopy. [4]