JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION-2024

MSc-II Semester (BT)

Course Code (Credits): 20MSWBT231 (2) Max. Marks: 25

Course Name: NanoBiotechnology

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. Electron microscopy (EM) has been at the forefront of high-resolution cellular imaging for over 50 years, thanks to its ability to examine nanometer-scale intracellular structures. From manifold bacteria to complex structures of materials, electron microscopy allows us to unravel all the mysteries. Illustrate the working principle of electron microscope using TEM as an example and list out all the similarities between TEM and wide field microscope. Also explain how did de-Broglie's theory help in the development of electron microscopes? [6]

2. The radiolytic reduction has been proven to be a powerful tool to produce monosized and highly dispersed metallic clusters. The normal ionization radiations which are used for synthesis of nanoparticles are electron beam, X-ray, gamma-ray, and UV light. The metallic nanoparticles can be prepared in an aqueous solution in the presence of a stabilizer without using chemical reducing agents, namely by using of radiolytic method. Detail-out the mechanism of nanoparticles synthesis using radiolytic approach and its advantages over other methods. [5]

3. High surface area-to-volume ratio of the nanomaterials is distinctly advantageous for nanomedicine and other fields. On the same concept, Mr Brown split a sphere of diameter 16.0 mm into smaller sphere of diameter 2 mm. Then what would be the surface area of sphere in above two cases, keeping volume constant in both the cases. Also explain the significance of high surface area to volume ration in catalysis or nano-medicine [4]

4. A dye is used as contrast agent to diagnose a tumor in a patient. After injecting, dye form a layer around tumor cell of thickness 10 nm and cover an area of 7000 cm^2. Calculate the minimum volume of dye required to stain all the cells of tumor. [3]

5. Write the answer of each of the following question and explain your answer

a) Various methods are available for the synthesis of nanomaterial through Top down and Bottom-up approach. Which methods you will use for the synthesis of buckyball and CNT and why explain? Also describe the turkevich methods of spherical gold nanoparticles synthesis. [2.5]

b) What are the isotropic and anisotropic nanoparticles and their significance in nano-biotechnology. Discuss the mechanism of anisotropic nanoparticles formation. [2.0]

c) What is Polyol process of nanomaterial synthesis? Describe the various resources for the synthesis of nanomaterials also detail out the steps involved in the synthesis of nanoparticles by making use of hexose sugar [2.5]