JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- MAY-2023

Course Code (Credits): 20MSWBT231 (2) 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. Sandwich ELISA is a type of Enzyme-linked immunosorbent Assay that uses two antibodies: primary antibody and secondary antibody. It is called a sandwich because antigen of interest is bound between two antibodies. The purpose of ELISA is to detect the presence of a target antigen in a sample. If you would like to detect an allergen then you have to perform ELISA. Suppose you have need 5µl of 0.1 nM primary antibodies and 10µl of 0.25 µM secondary antibodies for allergen detection and you have a stock solution of primary and secondary antibody having concentration 200 µM and 350mM respectively. Then how will you prepare 5µl of 0.1 nM primary antibodies and 10µl of 0.25 nM secondary antibody solution from stock solution [5]

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

   a) Show mathematically that the surface area to volume ratio of a nanoparticles is much higher than the that of the bulk particle of the same material [2]
   b) Bottom-up approach is more convenient for nanoparticle synthesis explain? Also describe the turkevich methods of spherical gold nanoparticles synthesis. [2.5]
   c) What are the different processes that control the subsequent growth of nuclei during the nanoparticle synthesis? Discuss any one of them in term of growth of uniform size particles. [2.5]
   d) What is biogenic synthesis? Describe the various biological ingredient for the synthesis of nanomaterials also detail out the steps involved in the synthesis of nanoparticles by making use of Bacteria [3]

3. A student observed a microorganism under light microscope using green light as source of illuminations but unable to get the perfect image. Later on he changed the light source and this time he used blue light for illuminations and get perfect image with high resolution explain why? [2]

4. Gadolinium contrast media are Gadolinium based chemical substances used in magnetic resonance imaging (MRI) scans. When injected into the body, gadolinium contrast medium enhances and improves the quality of the MRI images. After injecting, contrast agent forms a thin layer around the affected area. Suppose the thickness of the thin layer is 25nm and the surface area of that organ is 250 m^2. How much volume of contrast agent you required to get highly contrast MRI image. [3]

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5. Electron microscopy (EM) is a technique for obtaining high resolution images of biological and non-biological specimens. It is used in biomedical research to investigate the detailed structure of tissues, cells, organelles and macromolecular complexes. Illustrate the working principle of transmission electron microscope (TEM) with neat and clean diagram. Also explain the significance of goniometer and LaB6 filament in TEM microscopy [5]