JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- APRIL-2025

M.Sc II Semester (BT)

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.*

Q.N	Question	Marks
Q1	a. Mr. Gabriel would like to observe paramecium for his research work, in his study he used a compound microscope of magnifying power 05 and the size of paramecium under microscope was 25 mm (image size). Later on he changed the microscope and this time he observed the size of image 40 mm. calculate the magnifying power of second microscope. b. If Gabriel plan to use electron microscope (with electron beam of wavelength 0.1 angstrom) instead of optical microscope (with 400 nm light source). What will be the ratio of resolving power in two cases?	[3+2]
Q2	Electron microscopy (EM) is a technique for obtaining high resolution images of biological and non-biological specimens and uses a beam of accelerated electrons as a source of illumination. a. What material is commonly used to generate electron as source of illumination? [1] b. Explain schottky electron gun and list out the advantages of using schottky element over other elements.[1+2] c. Signify the role of elastically scattered and in-elastically scattered electrons in TEM imaging[1] d. Elaborate the role of Goniometer in electron microscopy[1] e. Which type of lenses in electron microscopy is used to control and focus the beam of electron and how?[1]	[7]
Q3	Atomic Force Microscopy (AFM) is a high-resolution non-optical imaging technique first demonstrated by Binnig, Quate and Gerber. AFM allows accurate and non-destructive measurements of the topographical, electrical, magnetic, chemical, optical, mechanical, etc. properties of a sample surface with very high resolution in air, liquids or ultrahigh vacuum. a. Can you detail out the working principal of AFM with neat and clean diagram. b. What are the three different modes of operation of AFM. c. List out the advantages & disadvantages of all the three mode of operations in AFM.	3+1+3
Q4	a. Nanomaterial synthesis utilizes two primary approaches: top-down and bottom-up approaches. Explain both the approaches using suitable examples and list-out the advantages and disadvantages of both the approaches. b. Detail-out the top down and bottom up approach of nanomaterials using laser ablation and turkevich method as an example.	[3+3]