

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), November 2018

B. Tech (Branch: Open Elective), Semester V

Roll No.....

PH501: Introduction to Nanotechnology

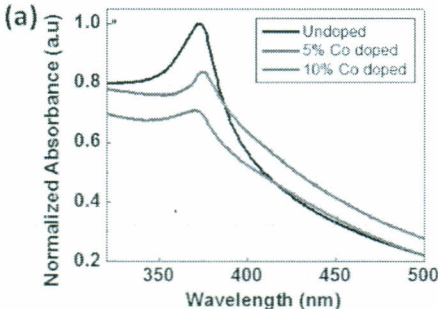
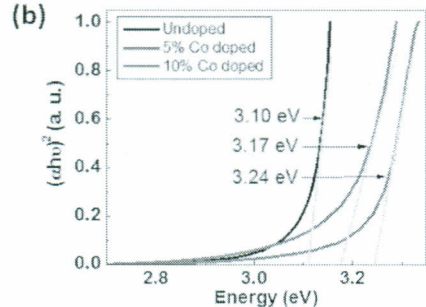
Time: 3 hours

Max. Marks: 80

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.
4. Mobiles are not allowed during examination.
5. Non-programmable calculator is allowed.

Q.1A	Objective type multiple choice questions (10 questions @ 1 mark)	10
i.	In photo detectors, energy of incident photons must be _____ band gap energy a) Lesser than b) Greater than c) Same as d) Negligible	
ii.	X-ray diffractometers are not used to identify the physical properties of which of the following? a) Metals b) Liquids c) Polymeric materials d) Solids	
iii.	Which among the following helps us in getting a three-dimensional picture of the specimen? a) Transmission Electron Microscope b) Scanning Electron Microscope c) Compound Microscope d) Simple Microscope	
iv.	Nanotubes usually form in bundles. Which is the best description of such a bundle? a) The tubes are connected together by covalent C-C bonds b) The tubes are randomly organized, with the axes of the tubes lying in random directions c) The tubes are aligned, axes parallel, with van der Waals forces operating between adjacent tubes d) The bundles are of discrete sizes, and dipole-dipole forces hold the tubes together	

Q.3B	How one can characterize a sample to know its electrical properties using Four Probe method. How electrical properties of a material can be correlated with its structural properties.	05
Q.4A	Explain with neat schematic diagram the working mechanism of Sputtering method to deposit thin films. What is difference between RF and DC Sputtering? What is advantage of Sputtering method over thermal evaporation?	05
Q.4B	Write a short note on Graphene and Carbon Nanotube.	05
Q.5A	Explain the working principle of AFM. How it works on contact mode and non-contact mode. What kind of information can be extracted from 2D and 3D AFM images?	05
Q.5B	What is difference between Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM). Explain the working principle of TEM. How TEM image analysis value to the material characterization?	05
Q.6	Explain with neat schematic diagram the working mechanism of Chemical Vapor Deposition (CVD) Method. How to synthesis Carbon Nanotubes (CNT) using CVD Method?	10
Q.7	State the principle of UV-Vis Spectroscopy. Explain the methodology of quantitatively estimation of nanomaterials using UV-Vis Spectroscopy. How it can be used to interpret the results of following plots of Co doped ZnO?	10
(a)  (b) 		

- Q.8 Explain X-ray diffraction technique. What is the importance of the XRD in characterizing a sample? Analyze following XRD plot of a sample i.e. Crystallite size determination etc. and write a draft for it. [Given $\lambda = 1.054 \text{ \AA}$ for CuK_α Source, Cell parameters: $a=2.665$, $c=4.947$, FWHM = 0.314 nm at diffraction angle $2\theta=43.230^\circ$]

