St. Philomena's College (Autonomous), Mysore
PG Department of Physics

III Semester

Course: Nanomaterials and Thin Films
QP Code: 88331

Question Bank

Sl. No.	Module	Question	Marks
1.	1	A Vickers hardness test on a coating layer yielded square indentations measuring 1µm x 1 µm. a) How deeply did the indenter penetrate the coating? b) What load was applied if Vicker's hardness was 2500 Kg/mm^2 ?	5
2.	1	What is the role of gas pressure and vacuum chamber in synthesizing nanomaterials employing physical vapour deposition technique? Explain.	5
3.	1	Calculate the Vicker's Hardness for a material which shows a depth of indentation of 5nm on application of 500mN of load.	5
4.	1	Explain the significance of nanoscaled materials.	5
5.	1	Discuss the electrical and optical properties of nanomaterials.	5
6.	1	Describe the general principle involved in Physical Vapour deposition method.	5
7.	1	Discuss the size dependent physical properties of nanostructured materials.	5
8.	1	Describe the preparation of nanomaterials using laser ablation method.	5
9.	1	Discuss the basic principle involved in sputtering method and mention the parameters affecting the yield of the target material.	5
10.	1	Calculate the energy band gap of the nanomaterials which shows UV absorption at 200 and 400nm. Explain the observation.	5
11.	1	Determine the ratio of surface atoms to bulk atoms given radius of particle is approximately 6a where a is the average interatomic spacing.	5
12.	1	With neat labelled diagrams give the comparison between optical and electron microscope.	5
13.	1	How are nanomaterials prepared using Pseudomonas stutzeri Ag 259 and Lactobacillus bacteria.	5
14.	1	In an electron microscope, the electrons are accelerated with an accelerating voltage of 200 keV. Calculate the corresponding wavelength of electrons.	5
15.	1	Discuss the different processes of metal – microorganism interactions.	5
16.	1	Outline the synthesis of nanomaterial using plant extract.	5
17.	1	Discuss the importance of microscopic, spectroscopic and diffraction techniques in characterizing the prepared nanostructured materials.	5

18.	1	With neat labelled diagram explain the principle and working of Fourier Transform Infrared Spectroscopy.	5
19.	1	Explain the role of nanomaterials in the field of semiconductor electronics.	5
20.	1	What are sensors and acutators? How are nanomaterials useful in preparing them?	5
21.	1	What are the environmental applications of nanomaterials? Explain.	5
22.	1	Explain the various role of nanomaterials in the field of biomedicine.	5
23.	1	Show the thermal decomposition of germane to obtain epitaxial layers of Ge.	5
24.	1	Show the thermal decomposition of silane to obtain epitaxial layers of Si.	5
25	2	Discuss the resistive heating method of preparing thin films.	5
26	2	Explain how thin films are prepared using magnetron sputtering technique.	5
27	2	Calculate the frequency of the fundamental resonance of the thickness mode for an AT cut crystal. Given: N = 1,670 mm kc/sec and d = 1.67 mm.	5
28	2	The resistivity of a specimen of infinite volume is found to be 10^{-3} ohm-cm. The current passing through the outer leads of four probe is 1mA. Calculate the potential drop V between the inner points of the probe with spacing s = 0.159cm.	5
29	2	Describe how quartz crystal can be used as thin film thickness monitor.	5
30	2	Discuss the measurement of thickness of thin films by capacitance monitoring.	5
31	2	Discuss the role of thin films in hard coatings, decorative coating and anti-reflection coating.	5
32	2	Discuss the role of thin films in preparing solar cells.	5
33	2	The full width half maximum of apeak in the powder XRD packing of CdS nanoparticle has an angular spread from $2\theta_1 = 25.3^0$ to $2\theta_2 = 29.1^0$. Estimate the size of the nanoparticle. Given: $l\lambda = 1.5418$Å	5
34	2	Discuss how thin films are prepared employing spray pyrolysis method.	5
35	2	Calculate the Hall co-efficient of p-type $CdTiO_3$ thin film. Given: Hall mobility = 88.67 cm^2 /V s and Resistivity = 8.86 x 10^{-4}/ohm-cm.	5
36	2	Calculate the resistivity of n-type CdS thin film. Given: Hall mobility = 46.1 cm^2 /V s and Hall co-efficient = -23.0 cm^3/C.	5
37	1	Discuss the preparation of nanomaterials by employing (i) precipitation method and (ii) solvothermal method	10
38	1	Describe how lithography can be achieved using electron and ion-beams	10
39	1	Discuss the hydrothermal and solvothermal method of preparing nanomaterials.	10
40	1	In detail describe the preparation of nanomaterials by chemical vapour deposition method.	10

41	1	Describe the Langmuir-Hinshelwood and Elay-Riedal mechanism of growth in chemical vapour deposition method.	10
42	1	Discuss in detail how an atomic force microsope can be used for the purpose of nanolithography.	10
43	1	Explain what is nanolithography and describe in detail the X-ray based Lithography.	10
44	1	Discuss how xerogels and aerogels can be obtained employing sol-gel method.	10
45	1	What is ferritin ? Discuss the procedure to convert ferritin into apoferritin and how it can be used to synthesize CdS nanoparticles.	10
46	1	Explain the role of X-ray diffraction in characterizing nanomaterials and obtain Scherrer formula.	10
47	1	With a neat labelled diagram describe the working of Scanning Electron Microscope.	10
48	1	Discuss the principle and working of Scanning Tunnelling Microscope.	10
49	1	Describe the principle and working of optical microscope with a neat labelled diagram.	10
50	1	Discuss the principle and working of Atomic Force Microscope.	10
51	1	Outline the preparations of CdS nanoparticles when [Cd $(NO_3)_2$] salt is treated with yeast?	10
52	1	Explain the following techniques used in characterizing nanomaterials: i) EXAFS and ii) Neutron diffraction	10
53	1	How is spectroscopy helpful in characterizing nanomaterials? Discuss the working of photoluminescence spectroscopy.	10
54	1	Explain the principle and working of UV-visible-IR absorption spectroscopy.	10
55	2	Explain what is sputtering and describe how thin films are prepared employing RF sputtering.	10
56	2	Elucidate the method of preparing thin films employing (i) laser beam and (ii) electron bombardment methods	10
57	2	Explain what is sputtering and discuss how thin films are prepared employing DC sputtering technique.	10
58	2	Discuss the process of preparing thin films using (i) electron bombardment and (ii) resistive heating methods.	10
59	2	Describe the types of Chemical Vapour Deposition methods used in preparation of thin films	10
60	2	Explain Chemical Vapour Deposition and describe PECVD method of preparing thin films.	10
61	2	List various thin film deposition techniques and compare their characteristics.	10
62	2	Discuss the preparation of thin films by MOCVD and LPCVD methods.	10
63	2	Describe the electrolytic deposition and electroless deposition methods of preparing thin films. Mention the advantages of chemical route of synthesizing nanomaterials over physical methods of synthesis.	10
64	2	Discuss the process of determining thickness of thin films employing electrical methods.	10

65	2	Describe the method of determining thickness of thin films by optical absorption.	10
66	2	Outline the method of characterizing thickness of thin films by optical interference.	10
67	2	Discuss in detail how thickness of thin film is measured using quartz crystal monitor?	10
68	2	What is EDAX? Describe how it is useful in understanding property of thin films.	10
69	2	Discuss different chemical analysis techniques used to characterize thin films.	10
70	2	Discuss how X-ray diffraction technique is useful in characterizing thin films.	10
71	2	What is XPS? Discuss how it is useful in characterizing thin films?	10

For 2 credit soft core courses

St. Philomena's College(Autonomous), Mysuru		
I/II/III/IV Semester M.Sc. Examination Month – Year		
Subject:		
Title:		
Time: 3 hours		**Max. Marks:70**
Instruction: Answer any four full question from Section – A and any of the five questions from Section – B.		
Section - A		
1.	Question to be asked from unit I	**05**
2.	Question to be asked from unit I	**05**
3.	Question to be asked from unit I	**05**
4.	Question to be asked from unit II	**05**
5.	Question to be asked from unit II	**05**
6.	Question to be asked from unit II	**05**
Section - B		
7.	Question to be asked from unit I	**10**
8.	Question to be asked from unit I	**10**
9.	Question to be asked from unit I	**10**
10.	Question to be asked from unit II	**10**
11.	Question to be asked from unit II	**10**
12.	Question to be asked from unit II	**10**

Note : Marks of Section A and B can be any combinations of 5 and 10 respectively. For example in section – A we may have (3+2). In section-B we may have (6+4) and (5+5).