M.Sc.(Physics) Fourth Semester Old

MSC24108-Elective Paper-XI : Nanoscience

P. Pages : 2 **GUG/W/18/2426**

Time : Three Hours * 1 8 9 6 * Max. Marks : 80

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1. EITHER :-

a) Discuss the variation on Raman spectra of nanomaterials. **8**

b) What is quantum confinement? Explain the difference between quantum dots, wires and wells. **8**

OR

e) Explain the increase in width of XRD peaks of nanoparticles and hence determine of particle size. **8**

f) Discuss shift in photoluminescence peaks in case of nanomaterials. Illustrate your answer using suitable example. **8**

2. EITHER:-

a) Explain the basic difference between PVD and CVD process.
What are the basic chemical reactions involved in CVD process? **8**

b) Outline the microemulsion method of synthesis.
Discuss in detail its use to synthesize silver nanomaterials. **8**

OR

e) Explain an electric arc deposition technique useful for the preparation of nanomaterials. **8**

f) Discuss sputter deposition method for nanomaterials fabrication, what are the important sputter deposition parameters one should control precisely? **8**

3. EITHER:-

a) Discuss spectroscopy methods namely UV-VIS and Infrared spectroscopy used for the characterization of nanomaterials. **8**

b) What is TEM? Give its principle and discuss its working. Draw schematic diagram of a TEM. Discuss briefly the two images modes of TEM. **8**

OR

e) Explain the use of vibration sample magnetometer for ferromagnetic materials of nanoscales. **8**

f) Draw schematic diagram of atomic force microscope.
Discuss atomic force microscopy in detail. **8**

4. EITHER:-

a) Discuss modification in magnetic properties of a ferromagnetic material at nano-size. Discuss super-paramagnetism state applications of magnetic nanomaterials. **8**

b) Discuss metal and semiconductor nanoclusters. **8**

OR

e) Discuss structure and properties of carbon nanotubes. **8**

f) Write a note on Aerogels. Discuss qualitatively the reason behind the changes in optical properties of nanomaterials along with an example. **8**

5. Attempt all the questions.

a) Why do materials behave differently at nanoscale? **4**

b) State the advantages of combustion method. **4**

c) What is spintronics? **4**

d) What is magneto resistance of magnetic nanoparticles. **4**

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