

M.Sc. (Physics)(with Credits)-Regular-Semester 2012 Sem IV (Old)
MSc24108 - Elective Paper-XI : Nanoscience

P. Pages : 2

Time : Three Hours



GUG/S/18/5796

Max. Marks : 80

1. Either
- a) What are density of states? **8**
 Explain the density of states for zero, one, two and three dimensional materials.
- b) Discuss free electron theory for the behaviour of valence electrons in a crystal structure of **8**
 metallic solid.

OR

- e) How particle size is determined at nano level? **8**
 How the width of XRD peaks of nanomaterials is related with its particle size?
 How it helps in determination of particle size?
- f) Discuss shift in photoluminescence peaks in case of nanomaterials. Illustrate your answer **8**
 using suitable example.

2. Either
- a) Discuss Sol-Gel technique for synthesis of nanomaterials, such as state the types of **8**
 precursors generally used, important steps involved general process, factor affecting the
 particle size of synthesized material, chemistry involved with suitable example.
- b) What is Sputter deposition? **8**
 Explain the difference between DC sputtering and RF sputtering.

OR

- e) Discuss chemical bath deposition technique. **8**
 Design an experiment to deposit CdS thin film on glass substrate via this method.
- f) What are colloids? **8**
 Explain the synthesis of semiconductor nanoparticles by colloidal route.

3. Either
- a) Explain optical properties of semiconductor nanoparticles indicating clearly the blue shift **8**
 in absorption spectra.
- b) Draw a schematic representation of transmission electron microscope. Explain the **8**
 function of each part.

OR

- e) Discuss working of VSM. 8
Draw schematic diagram of VSM.
Explain the use of VSM for ferromagnetic materials at nano scale.
- f) Discuss Atomic Force Microscopy in detail. 8
- Either
4. a) What are carbon nanostructures? 8
Describe three types of carbon nanotubes with the help of neat diagram.
- b) Discuss the mechanical properties of carbon nanotubes. 8
- OR**
- e) Define metal nanoclusters. 8
Explain the formation of metal nanoclusters.
- f) Discuss self assembly of nano particles using organic materials. 8
Discuss the effect of temperatures and pressure on the structural properties of the nano materials.
5. Attempt all the questions.
- a) What are nanomaterials? 4
- b) What do you understand by Photolithography? State very brief. 4
- c) What do you mean by spintronics? 4
- d) What is porous silicon? 4
