

M.Sc. (Physics) (CBCS Pattern) Semester-III  
**PSCPHYT12-2 - Paper-XII - Fundamentals of Nanoscience and Nanotechnology**

P. Pages : 2

Time : Three Hours



**GUG/S/25/11303**

Max. Marks : 80

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- Notes : 1. All questions are compulsory.  
2. Draw neat and well labelled diagrams wherever necessary.

**Either:**

1. a) Explain in detail the qualitative idea of free electron theory and state its features. 8  
b) Explain the term - 8  
i) Quantum well ii) Quantum dots

**OR**

- e) Explain the density of states for zero, one, two and three dimensional materials. 8  
f) State and explain Heisenberg's uncertainty principle. 8

**Either:**

2. a) Describe briefly magnetic and structural properties of nanomaterials. 8  
b) Write the importance of optical and thermal behaviour of nanomaterial compared with bulk material. 8

**OR**

- e) What is carbon Nanotubes? Describe the types of CNT with the help of neat diagram. 8  
f) Explain the electrical properties of carbon nanotubes. 8

**Either:**

3. a) Describe the Bottom up approach for synthesis of nanomaterials. 8  
b) What is chemical vapour Deposition? Explain it in detail. 8

**OR**

- e) Explain wet chemical method of synthesis of nanoparticles. 8  
f) Describe PVD technique for the synthesis of nanoparticles. 8

**Either:**

4. a) Explain the importance of protein nanoparticle and also describe the advantage of nano protein over bulk protein particle. 8
- b) Explain the terms- 8
- i) Bioelectronics ii) Biosensors

**OR**

- e) Describe the structure of DNA double nanowire. 8
- f) Discuss Micelles, Vesicles. 8
5. Attempt all the following.
- a) What are the factors affecting the particle size? 4
- b) Discuss the mechanical properties of carbon nano tubes. 4
- c) Explain the combustion method of nanomaterials state its advantages and disadvantages. 4
- d) Explain Bilayers. 4

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