PG Odd Semester (CBCS) Exam., December—2016

PHYSICS

(3rd Semester)

Course No. : PH–303 (C)

(Nanophysics)

Full Marks : 75
Pass Marks : 30

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. *(a)* Elucidate the importance of nano-technology. Discuss some of the difficulties that the technology is facing. How nanomaterials are classified in terms of dimensions? 5+4+3=12

(b) What do you mean by stabilizing agent? What in its role in the synthesis of nano-materials? 1+2=3

2. *(a)* What is quantum confinement? Discuss strong and weak confinements in detail. 2+8=10

(b) How do reducing agents influence the synthesis process of metal nano-particles? 5

UNIT—II

3. *(a)* What do you mean by top-down and bottom-up approaches for the synthesis of nanomaterials? What are their advantages and disadvantages? 4+4=8

(b) Discuss sol-gel method of synthesis. What are the advantages of this technique? 5+2=7

4. Discuss the following techniques : 5×3=15

(a) Molecular beam epitaxy

(b) Chemical vapour deposition

(c) Laser ablation

UNIT—III

5. Write the construction and principle of working of a UV-visible spectrophotometer. What are the similarities and differences between this instrument and photo-luminescence spectrometer? 10+5=15

6. *(a)* How does atomic force microscope work? Describe its different modes of operation. 4+6=10

(b) Write the working principle of scanning electron microscope. 5

UNIT—IV

7. *(a)* Discuss the phenomena of nuclear stopping and electronic stopping when heavy ions pass through a material. 4+4=8

(b) How are micropores generated in polymers by swift heavy ions? What are the potential applications of micropores? 2+5=7

8. *(a)* How are columnar defects produced due to SHI irradiation? Discuss ion beam mixing. 4+4=8

(b) Discuss Coulomb explosion and thermal spike. 3+4=7

UNIT—V

9. *(a)* How can nanoscale devices be utilized for improved therapy and diagnostics? 8

(b) Discuss carbon nanotube-based drug delivery system. 7

10. *(a)* What are the potential applications of nanotechnology in pollution control and nanofiltration? 8

(b) How can quantum dots improve the efficiency of photovoltaic cells? 7

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