TM244498V

Reg. No :.....

Name :.....

MASTER'S DEGREE (C.S.S) EXAMINATION, MARCH 2024

2022 ADMISSIONS REGULAR

SEMESTER IV - Physics

PH4E03TM20 - Nanostructures and Materials Characterisation

Time : 3 Hours **Maximum Weight : 30**

Part A

I. Answer any Eight questions. Each question carries 1 weight **(8x1=8)**

1. Briefly outline any three size effects observable in the formation of nanostructures from bulk materials.
2. Write a short note on superfluid clusters.
3. Define the two approaches for the synthesis of nanoparticles.
4. Briefly explain the structure of fullerene and superconductivity exhibited by them.
5. Briefly explain various nanostructured thermal devices.
6. Illustrate hypsochromic and bathochromic shift.
7. Give an account of the theory of chemiluminescence. List out the factors that affect the rate of reaction.
8. Outline the principle of pH measurements.
9. Explain how x-rays and electrons give rise to diffraction patterns from crystals.
10. While electron beam strikes any material, a variety of processes can take place. Explain any three of them.

Part B

II. Answer any Six questions. Each question carries 2 weight **(6x2=12)**

11. Illustrate an experiment used to estimate the magic numbers of metal nano clusters.
12. Briefly explain sol gel method of preparation for nanoparticles. Also mention the factors affecting the process.
13. Explain the vibrational and mechanical properties of CNT.
14. Illustrate the structure of SWNT with the help of circumferential vector.
15. Illustrate various transitions and phenomenon using Jablonski diagram.
16. Describe the various factors that affect fluorescence.
17. Using a schematic diagram, explain the working principle of the technique used in identifying the magic numbers of nanoclusters of copper.
18. Give a detailed account of Potentiometry.

Part C

III. Answer any Two questions. Each question carries 5 weight **(2x5=10)**

19. Outline the relevant theory that depicts how quantum mechanics is applied to nanoscience.
20. Explain the principle of GMR and hence illustrate spin valve transistors.
21. Explain the relevance of each component in a spectrophotometer and its types and advantages.
22. Write an essay on XRD as a characterization tool in nanoscience.