K23P 0161

Reg. No. : .....

Name : .....

IV Semester M.Sc. Degree (C.B.S.S. – Reg./Supple./Imp.)
Examination, April 2023
(2019 Admission Onwards)
CHEMISTRY
CHE4E.05 : Nanomaterial Chemistry

Time : 3 Hours Max. Marks : 60

SECTION – A

Answer **all** questions in **one** word or **one** sentence. **Each** carries **one** mark.

1. What are carbon nanomaterials ?
2. What are 2D nanomaterials ? Give an example.
3. Give any one method for the preparation of zero-dimensional nanomaterial.
4. What is meant by Electron beam lithography ?
5. What is the minimum size of a nanomaterial that is to be characterized by SEM ?
6. What are fullerenes ? Give one application of fullerenes.
7. What is the role of solvents in chemical synthesis of nanoparticles ?
8. Give any two applications of nanotechnology in nanoelectronic devices. **(8×1=8)**

SECTION – B

Answer **any 8** questions. Answer may be **two** or **three** sentences. **Each** question carries **2** marks.

9. Differentiate the electronic and structural properties of isotropic and anisotropic nanomaterials.
10. Differentiate between nanoclusters and nanoparticles.
11. Give any two methods for the top down synthesis of nanostructures.

P.T.O.

12. Differentiate between TEM and SEM technique for the characterization of nanomaterials.

13. Explain the principle and instrumentation of optical microscope.

14. Explain the technique STM.

15. Semiconductor nanoparticles are used for LED applications. Why ?

16. How the UV-Vis spectroscopy is useful to characterize the size of gold nanoparticle ?

17. Comment on the role of Raman Spectroscopy for characterizing nanomaterials.

18. How the catalytic activity of material is enhanced in nano dimension ?

19. Why NSOM is better than optical microscopy for characterization of nanomaterials ?

20. Comment the applications of nanotechnology in batteries. **(8×2=16)**

SECTION – C

Short paragraph questions. Answer **any 4** questions. **Each** carries **3** marks.

21. How the optical property of a metal nanoparticle varies with their size (nano) and shape ? Briefly explain the reason.

22. Explain the processes physical vapour deposition of semiconductor nanomaterials with examples.

23. Explain the principle and applications of transmission electron microscopy.

24. Explain briefly on the i) Ellipsometry and ii) Confocal microscope.

25. Write a short note on top down synthetic strategies of nanomaterials.

26. Briefly discuss the principle and applications of NSOM.

27. Comment about the crystallinity of metal nanoparticles as compared to bulk material. How will you characterize it ?

28. Explain briefly about the application of nanomaterials for nanosensor applications. **(4×3=12)**

SECTION – D

Answer **any four** questions. **Each** question carries **6** marks.

29. A) Explain briefly on chemical synthesis (atleast two examples) of a) metal nanostructures b) Semiconductor nanostructures.

OR

B) Explain briefly on physical methods for the synthesis Carbon nanostructures.

30. A) Give a brief description about the characterization of inorganic and organic nanomaterials by microscopic methods (atleast two methods).

OR

B) Briefly discuss how spectroscopic methods are useful to characterize metal nanostructures (atleast three methods).

31. A) Give a short note on a) Nanocomposites and b) Photonic band gap materials.

OR

B) Discuss the principle and applications of a) XPS and b) Neutron scattering.

32. A) Briefly explain the following methods for device fabrication a) Layer by layer assembly b) Nano imprint lithography.

OR

B) Comment on the application of semiconductor nanoparticles in electronics, LED devices and health care with appropriate examples. **(4×6=24)**
