K24P 0270

Reg. No. : .....

Name : .....

IV Semester M.Sc. Degree (CBSS – Reg./Supple. – (One Time Mercy Chance)/Imp.) Examination, April 2024
(2014 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. How does the catalytic property of a material vary with the size (nano) of the material ?
2. Why quantum dots are called zero-dimensional nanomaterials ?
3. Give any two advantages of TEM over SEM in the analysis of nanomaterial.
4. Write down a method for the preparation of carbon nanotube.
5. What is meant by photolithography ?
6. What are conducting polymers ? Give an example.
7. What is the role of ligands in the chemical synthesis of nanoparticles ?
8. Give any two applications of nanotechnology in healthcare. **(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 carbon nanotube and Fullerene.
10. What are nanoclusters ? Give examples.

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11. What are the limitations of photolithography ?

12. Write down the advantages of the bottom-up approach over the top-down synthesis of nanostructures.

13. SEM cannot be an appropriate method to characterize nanoclusters. Why ?

14. Differentiate AFM and STM based on the characterization.

15. Metal nanoparticles are used as nanosensors. Why ?

16. Which nanomaterial is used for the application of LED devices ? Give an example.

17. Comment on the role of Raman Spectroscopy in characterizing carbon-based nanostructures.

18. How nanotechnology contributes to the miniaturization of devices ?

19. Why the optical microscopy is not helpful for the characterization of nanomaterials ?

20. What is meant by self-assembled monolayer ? Give an example. **(8×2=16)**

SECTION – C

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

21. Write a short note on carbon nanomaterials.

22. Explain the processes of physical vapour deposition of semiconductor nanomaterial preparation with two appropriate examples.

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

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

25. Write a short note on bottom-up synthetic strategies of nanomaterials.

26. Briefly discuss the principle and applications of NSOM. What is its advantage over a conventional microscope ?

27. What are magnetic nanoparticles ? Give a synthetic method with an example.

28. Compare the catalytic property of gold in bulk and in nano dimension. **(4×3=12)**

SECTION – D

(Answer **all** questions. **Each** question carries **6** marks.)

29. A) Explain briefly on Chemical synthesis (at least two examples) of
    i) Metal nanostructures
    ii) Semiconductor nanostructures.

    OR

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

30. A) Give a brief description about the characterization of nanomaterials by spectroscopic methods (Explain at least two methods).

    OR

    B) Explain in detail the usage of nanomaterials for the solar energy conversion and storage.

31. A) Discuss the principles and applications of TEM and XRD for characterization of crystalline and amorphous nanomaterials with examples.

    OR

    B) Briefly explain the following techniques :
    i) Contact angle measurements
    ii) FTIR and
    iii) ESR.

32. A) What are nanomaterials ? Explain the classification and significance of nanomaterials.

    OR

    B) Give a short note on the following :
    i) Quantum confinement and
    ii) Magnetic nanoparticles. **(4×6=24)**