

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86  
(For candidates admitted from the academic year 2009–10)

SUBJECT CODE: CH/PE/NN43

M. Sc. DEGREE EXAMINATION, APRIL 2011

BRANCH IV- CHEMISTRY

FOURTH SEMESTER

REG.NO .....

COURSE : ELECTIVE

PAPER : NANO CHEMISTRY

TIME : 30 MINUTES

MAX. MARKS: 20

SECTION – A

TO BE ANSWERED ON THE QUESTION PAPER ITSELF.

Answer all the questions:

(20 X 1 = 20)

I Choose the Correct answer:

(10 X 1 = 10)

- The principal element of a SEM is:  
a) Electron gun                      b) X-ray detector                      c) Cathode analyzer
- The nano object refers to:  
a)  $10^9$  m                                  b)  $10^{-9}$  cm                                  c)  $10^{-9}$  m
- Quantum dots are inorganic nano crystals of  
a) 100 – 1000 nm                      b) < 10 nm                                  c) 1 mm
- STEM images occur as a result of  
a) Tunneling through a few atoms                      b) Free electrons                      c) Cations and anions
- The working principle of AFM is  
a) Due to the variation of the oscillation characteristics  
b) Imaging of surface  
c) Variation in the tunneling current
- Molecular system is used as switches due to  
a) The concept of bistability and interconversion  
b) Covalent and non-covalent interactions  
c) Hydrogen bonding
- The unique features of silica and titania used as nano shells are  
a) Inert and easily available                      b) Inert and highly stable                      c) Inert and hollow inner hole
- The techniques to study the nano objects  
a) AFM    b) STM    c) Both
- Characterization of nano objects by photoelectron spectroscopy is based on  
a) Particle size                      b) Kinetic energy of electron                      c) Florescence properties of electron
- Nanocomposite materials can be prepared with  
a) Polymeric material                      b) Pure metallic particles                      c) Gold particles

**II. Fill in the blanks:**

**(5 x 1 = 5 marks)**

- 11. Two kinds of microscopic techniques used for characterizing nano particles are  
-----,
- 12. ----- provides a stable beam of electrons in SEM
- 13. The conductivity of nano wire is much ----- than that of bulk materials
- 14. ----- Property is measured by AFM.
- 15. The formation of self assembled mono layer does not require -----

**III. Answer in one or two lines**

**(5 x 1 = 5 marks)**

- 16. What is self assembled mono layers?
- 17. What is edge effect in nano wires?
- 18. What is density of states?
- 19. What are the factors influenced by the extent of deformation of surface charged density?
- 20. What is tunneling through atoms by STM analysis?



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**MAX. MARKS: 80**

**SECTION - B**

**I Answer any Five out of Seven Questions (5 x 8 = 40 marks)**

1. What are the factors affecting the stability of mono layers?
2. What is meant by nanografting? Explain any two techniques of lithography in producing SAM?
3. What are nano machines? Describe the functions of common nano machines.
4. What are the differences between photon, electron and scanning probe techniques?
5. Explain how is X-ray PES useful in characterizing nano particles?
6. Explain the various biological applications of gold nano particles. Why most of the nano particles are on gold particles?
7. Define the (following terms) and explain the unique properties with example
  - i) Nano wires.
  - ii) Nano machines
  - iii) Nano particles
  - iv) Nano clays

**SECTION - C**

**II Answer any Two out of Three Questions (2 x 20 = 40 marks)**

8. Describe the synthesis of nano particles by CVD and PVD techniques.
9. Describe the techniques involved in characterizing nano objects by SEM & TEM analysis.
10. Write a brief note on the formation of nano composites by SiO<sub>2</sub>, Titania and Zirconia.

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