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Name:	
Roll No.:	In Physical Will Security 2nd Staffard
Invigilator's Signature :	

CS / B.TECH (CHE-NEW) / SEM-8 / CHE-804A / 2011 2011

NANOTECHNOLOGY

Time Allotted: 3 Hours Full Marks: 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP - A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any <i>ten</i> of th	e following
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 $10 \times 1 = 10$

i)	Size of a nanoparticle is				
	a)	$10^{-10} \mathrm{m}$	b)	10^{-9}m	
	c)	$10^{-10}{ m cm}$	d)	10^{-9} mm.	

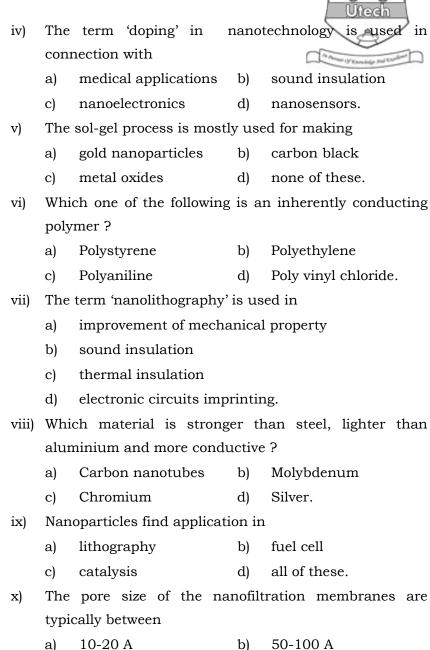
- ii) A silver nanoparticle solution absorbs light in the region
 - a) visible
- b) UV
- c) near IR
- d) IR.
- iii) Fullerenes are
 - a) C₆₀

b) C₁₀₀

c) C₁₀

d) C_{500} .

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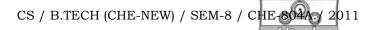


c)

100-500 A

1-2A.

d)



- xi) Hardness of copper nanoparticles increases with
 - a) decrease of particle size
 - b) increase of particle size
 - c) first increase and then decrease of particle size
 - d) first decrease and then increase of particle size.
- xii) Compared to bulk, melting temperature of 3-4 nm size gold nanoparticles
 - a) drastically reduced b) drastically increased
 - c) slightly increased d) not affected at all.

GROUP - B

(Short Answer Type Questions)

Answer any three questions.

 $3 \times 5 = 15$

- 2. What is a microemulsion ? How can you prepare a microemulsion ?
- 3. What are core-shell nanoparticles? Give a typical UV spectra for Ag-Au core-shell nanoparticle.
- 4. What is an Aerogel? How can you prepare silica Aerogel?
- 5. Explain with a schematic diagram the principle of measuring the size of nanoparticles using Atomic Force Microscopy.

 Name three different modes for operating AFM.

GROUP - C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

- 6. a) What do you mean by nanolithography? Write down the principle of 'dip pen lithography'.
 - b) Explain with schematic diagram, the various steps involved in photolithography.

- 7. What is carbon nanotube? What are the special properties of this material? Discuss two important types of carbon nanotube. Write down in brief three important processes for making carbon nanotubes.
- 8. Explain the term nanoclay. Write down the important properties that are improved when a nanoclay is added to make nanocomposites. Explain the terms 'intercalation and exfoliation'. Discuss three important methods by which clays are appropriately mixed to form nanocomposites.
- 9. a) Describe a chemical method for synthesizing metal oxide semiconductor, giving a suitable Chemical Reactor setup.
 - b) Discuss the principle of Chemical Vapour Deposition method.
- 10. a) Explain the term Nanomedicine. Why is it so important now?
 - b) What do you mean by sol-gel process? Write down the basic steps in a sol-gel process.

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