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RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (Special) Degree in Chemistry
Fourth Year – Semester I Examination -- October/November 2017

CHE 4206 – NANOCHEMISTRY

Answer all questions   Time: Two (2) hours

The use of non-programmable calculator is permitted

1.

a) I. Define the terms "Nanomaterials", "Nanoscience" and "Nanotechnology".

   II   How National Nanotechnology Initiative (NNI) has defined the Nanotechnology?

   III   What are the main approaches available for designing of nanomaterials?

b) Write an account on "Nature Nanotechnology".

c) You are provided with a sample of calcium carbonate crystalline nanoparticles having spherical shape. Explain, how you would calculate the mean crystallite size of these calcium carbonate nanoparticles.

d) Explain the basic principle of SEM. What are the main components of SEM instrument?

2.

a) Explain the two basic mechanisms involved in the stabilization of nanocolloidal dispersions?

b) Describe briefly, the three possible mechanisms· available to explain the growth of homogenous nucleation of spherical nanoparticles?

c)   The interfacial energy for magnesium carbonate nanocrystals in saturated solution is 1.2×10^{-4} J/ m^2. If the critical radius is 4 nm, calculate the value of the Gibbs free energy barrier.

3.

    a) Briefly discuss the basic steps of photolithography technique.

    b) With the help of schematic diagrams, describe the contact and proximity printing processes. Discuss their advantages and drawbacks.

    c) Draw a labeled schematic diagram showing the pattern creation on positive and negative resist materials used in photolithography. List out the performance factors of photoresist.

4.

    a) Define the term "self-assembly". What are the distinctive features of self assembly?

    b) Write an account with suitable examples on "self-assembled monolayers.

    c) What are the driving forces which involve in the process of self-assembly?