

2017**M.Sc.****2nd Semester Examination****CHEMISTRY****PAPER—CEM-204***Full Marks : 40**Time : 2 Hours**The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.**Illustrate the answers wherever necessary.***(CBCS)**

1. (a) What are the advantages and disadvantages of w/o microemulsion technique in the synthesis of otherwise water insoluble inorganic material? 3
- (b) Graphically show the size dependence of a property on the number of atoms (x) in the nano dimension. 2
- (c) What are the driving forces for the stabilization of nanoparticle synthesis in organic medium or in aqueous medium? What are the driving forces for the stabilization of organo sols and hydro sols? 3

(Turn Over)

- (d) How does a ligand shell stabilize the nanoparticles ? 2

Or

- (a) What is Ostwald Ripening process ? How does it play a role in synthesis of nanoparticle ? 2
- (b) Write down the expression used to estimate the fraction of atoms only surface of the particle (P_s) ? 2
- (c) What is the relation between the numbers of atoms (n) to form a cluster with 'L' geometric shells ? 2
- (d) What do you mean by surface Plasmon resonance band for Ag/Au nanoparticles ? How does it vary with the size of nanoparticles ? 3
- (e) Why do you observe red shift in the absorbance maxima of nanoparticles with its increasing size ? 1
2. (a) Of a particular shell how can you use the Scherrer formula in determining the size of a nanoparticle ? 2
- (b) How does the ionization energy of Na cluster vary with its nuclearity in the nano dimension ? Why do we observe a non smooth variation in the ionization energy with respect to its nuclearity for nanoclusters of sodium ? 3
- (c) Write a short note on the Coulomb-staircase behaviour in the I-V plot of the nanoparticle ? 3

- (d) What is critical size after which a material behaves like a perfect metal? 2

Or

- (a) Why the x-ray diffractogram for nanoparticles are less defined than the corresponding bulk material? 2
- (b) Why Au nanoparticles in combination with metal oxide act as a better catalyst? 2
- (c) How one can control the size of nanoparticle in w/o microemulsion? 2
- (d) Why thiols are considering as better capping agent? 2
- (e) What do you mean by dampening of spectra of nanoparticles with its increasing size? 2
3. (a) What are the solid and fluid lipids? 2
- (b) What are unilamellar and multilamellar vesicles? 2
- (c) What are the advantages of nanostructured lipid carriers over solid lipid nanoparticles? 3
- (d) What is the typical height of a membrane bilayer? How can one measure it? 3

Or

- (a) What are the limitations of naturally occurring phospholipids in terms of liposome stability? 2

- (b) Describe in brief, the method of hot homogenization technique in preparing the nanostructured lipid carriers. 3
- (c) Why the release of drugs are sustained in case of liposome and nanostructured lipid carriers? 3
- (d) Why are the drug efficacy increased in NLC or liposomes? 2
4. (a) Write down environmental applications of nanotechnology with special emphasis on water purification. 3
- (b) Define the antibacterial mode of action of silver nanoparticle. 2
- (c) How nanotechnology is applied in medicine care? 3
- (d) What are the advantage of nanoscience in molecular and cell biology? 2

Or

- (a) Write down ten applications of nanomaterials to biology. 3
- (b) Give one example of nanoparticle for each where nanoparticle is used in Sunscreens and Cosmetics. 2
- (c) What is nanotechnology? What are the areas of nano science research in agriculture and food science? 2+3