Use separate answer script for each group

B.Sc. (Honours) Examination, 2018

Semester-V

Chemistry (Honours)

Elective Course: BCHE-51

(Chemistry of Nanomaterials and Advanced Topics in Organic Chemistry)

Time: Three Hours **Full Marks: 40**

Questions are of value as indicated in the margin.

Group-A (Marks: 20)

(Chemistry of Nanomaterials)

Answer ***any two*** questions.

1. Attempt ***any five*** questions: 5x2
   a) Derive the relation between surface to volume ratio with the particle size (consider a real surface).
   b) Briefly discuss the processes involved in reduction of overall surface energy for nanoparticles.
   c) What do you mean by agglomeration? Why agglomeration takes place? How it is related to the particle size?
   d) Derive Young-Laplace equation and mention its implication.
   e) Comment on the van der Waals attraction potential between two identical particles suspended in a liquid medium. Justify your view.
   f) For fabrication of nanoparticles, a small size is not the only requirement. Justify the statement.

2. Attempt ***any five*** questions: 5x2
   a) Mention the advantages of polymeric stabilization over electrostatic stabilization of nanoparticles.
   b) Discuss sonochemical synthesis of amorphous Ag nanoparticle. What is the role of H_2-gas in this process?
   c) Comment on the influence of polymer stabilizer in the synthesis of metallic nanoparticle.
   d) Discuss the fundamental features of evaporation-condensation growth.
   e) What do you mean by spray pyrolysis? Give an example.
   f) Briefly state the requirements for VLS growth.

3. Attempt ***any five*** questions: 5x2
   a) Describe the influence of reducing agent on particle size distribution in nanoparticle synthesis.
   b) What is size selective precipitation? Mention its importance.
   c) What are the basic criteria for the growth of nanowires/nanorods?
   d) Briefly describe VLS growth of Si-nanowires.
   e) What do you mean by 2D nanostructure? What is lattice mismatch or misfit?
   f) What is CVD? Briefly describe the fabrication of diamond thin film by CVD process.

Group-B (Marks: 20)

(Advanced Topics in Organic Chemistry)

Answer ***any two*** questions.

1. a) Using proper chemical evidence how do you confirm that lemonene is a monocyclic compound? 2

P.T.O.

b) Outline the synthesis of the following compounds starting from the compounds as indicated: 4x2
   i) p-toluic acid → α-terpineol
   ii) Ethylacetoacetate → Terebic acid
   iii) Ethylacetoacetate → Terpenylic acid
   iv) Acetone → 6-Methyl-hept-5-en-2-one.

2. a) How do you prove that ephedrine contains two functional groups one of which is alcoholic and the other one is secondary amine in nature? 3
   b) Draw the structure of an alkaloid that could be extracted from *Papaver somiferum*. Discuss the biosynthesis from the amino acid tyrosine. 1+6

3. a) Describe with examples: 3x2
   i) Conjugated protein
   ii) Fibrous protein
   iii) Globular protein
   b) What do you mean by electrophoresis? How would you separate alanine, lysine and aspartic acid from a mixture of these three with the help of the technique of electrophoresis? 1+3

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