Total No. of printed pages = 5

63/2 (SEM-3) CHM 304

2021

(held in 2022)

CHEMISTRY

(Theory Paper)

Paper Code : CHM-304

(Advanced Topics in Chemistry)

Full Marks – 80

Time – Three hours

The figures in the margin indicate full marks for the questions.

1. Answer any *five* of the following : 5×5=25

   (a) Explain the term nanochemistry. Explain its social aspects in view of health and environment. 2+3=5

   (b) Describe sol-gel method for preparation of nanoparticles. 5

   (c) Discuss optical and electrical properties of metal nanoparticles. 5

[Turn over

(d) What is quantum well ? Discuss its properties. 2+3=5

(e) What is quantum confinement ? Explain the energy gap in nanomaterials due to quantum confinement effect. 2+3=5

(f) What are the different processes that control the subsequent growth of nuclei during the nanoparticle synthesis ? Discuss any one of them in terms of growth of uniform sized particles. 3+2=5

2. Answer any *five* of the following : 5×5=25

(a) Explain the type of interactions used in supramolecular chemistry and write example for each interaction. 5

(b) Briefly explain cyclodextrins. How can they be used as catalyst in organic synthesis ? 2+3=5

(c) What are cyclophane ? Discuss the catalysis of cyclophane type of receptors. 2+3=5

(d) What are the roles of dendrimer in supramolecular chemistry ? 5

(e) What is molecular recognition ? Explain the concept of host-guest in supramolecular chemistry. 1+4=5

(f) Write short notes on switching devices. 5

3. Answer any *three* of the following : 5×3=15

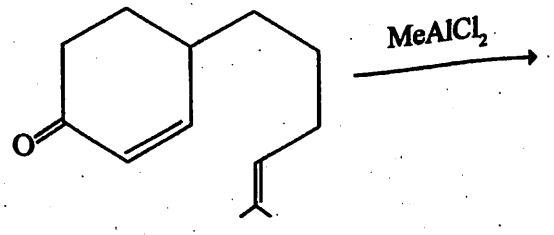
(a) Explain dyotropic rearrangement. 5

(b) What are Cheletropic reactions ? Explain HOMO-LUMO interaction and stereo-chemistry of the reaction. 2+3=5

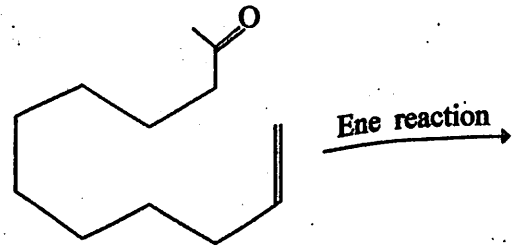
(c) Explain 1, 3-dipolar cycloaddition reactions on the basis of FMO theory. 5

(d) What will be the products of the following reactions ? 1×5=5

(i)



(ii)



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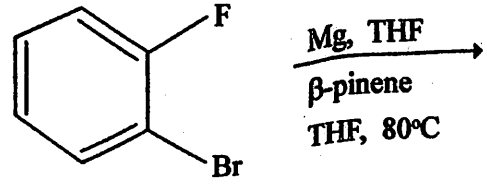

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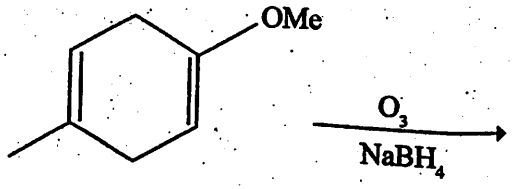
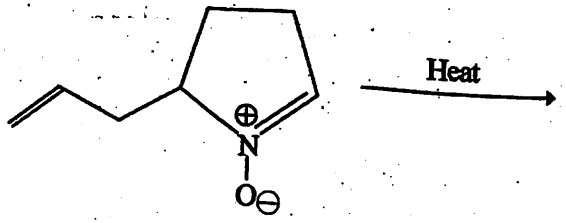


(v)



4. Answer any *three* of the following : 5×3=15

(a) Explain 2-D NMR COSY spectrum with an example. 5

(b) Determine the structure of the compound having the molecular formula $C_5H_{10}O$ using ^{1}H-NMR spectral data. ^{1}H-NMR δ (ppm) : 2.52 (hept, 1H), 1.96 (s, 3H), 1.18 (d, 6H). 5

(c) Determine the structure of the compound having the molecular formula $C_5H_{12}O_2$ using ^{1}H-NMR spectral data. ^{1}H-NMR δ (ppm) : 4.1 (s, 6H), 1.8 (s, 6H). 5

(d) Determine the structure of the compound having the molecular formula $C_{12}H_{16}$ using ^{1}H-NMR spectral data. ^{1}H-NMR δ (ppm) :

7.22 (d, 2H), 7.14 (dd, 2H), 6.8 (t, 1H), 5.88 (t, 1H), 2.18 (q, 2H), 2.04 (s, 3H), 1.42 (sext, 2H), 0.96 (t, 3H). 5