Total number of printed pages–6

14 (CH-4) 407

2020

CHEMISTRY

Paper : CH-407

(Supramolecular Chemistry)

Full Marks : 40

Time : Two hours

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

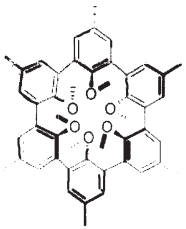
1. What do you mean by "supramolecular chemistry" ? Who defined the concept of "supramolecular chemistry" ? Name *any two* supramolecular chemists who received Noble prize in chemistry. 1+1+1=3

Or

Discuss about the concept of "host-guest chemistry". What is the difference between a "host" and a "guest" molecule? Discuss with a suitable example. 1½+1½=3

Contd.

2. Name the broad category of following supramolecular host systems : ***(any two)*** 1



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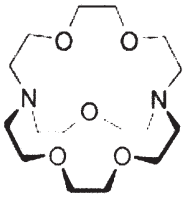

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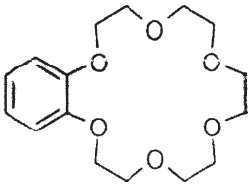

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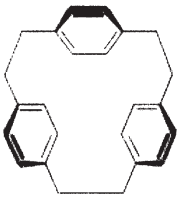

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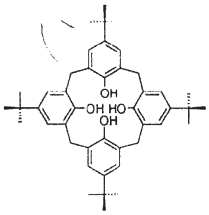

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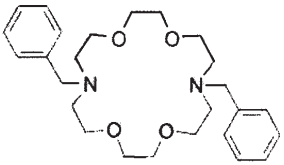

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3. Answer ***any two*** of the following questions : 4½×2=9

(a) What is the difference between 'crown-ether' and 'lariat ether' system ? Discuss with suitable examples.

(b) Discuss the host-guest interactions possible in crown ether system. Write a synthetic route of a simple crown ether system. How the cation binding ability of a crown ether system can be tuned-based on cation size ?

(c) Write a synthetic method for the preparation of calixarene host. Discuss about the possible conformations of the calixarene host.

(d) What do you mean by cyclophane host? Discuss the binding nature of cyclophane host. How are they different from the cryptophane host? Discuss using suitable examples.

(e) Discuss about the synthesis of carcerand host considering a suitable example. Write a short note on the binding nature of carcerand host.

(f) Name *two* host frameworks that will be suitable for binding neutral guest molecules with appropriate reason.

4. Answer ***any one*** of the following questions : 2+2=4

(a) What is self-assembly? Draw the structure of a naturally occurring supramolecular self-assembly.

(b) What is liposome? Give a pictorial representation of the role of liposomes in membrane transport.

(c) Describe *two* methods of synthesizing metal organic frameworks.

(d) Explain how the surface tension of a solution changes with the increase in the concentration of micelles.

(e) Describe the change in the thermodynamic parameters during micelles formation.

5. Answer ***any two*** of the following questions : 5×2=10

(a) What are the photochemical and electrochemical criteria used to classify a complex chemical species as a supramolecular device ? Discuss briefly.

(b) Write the mechanisms of energy and electron transfer in supramolecular devices.

(c) Discuss bimetallic system-based molecular devices with suitable examples.

(d) Discuss non-covalently bonded molecular device system with a suitable example.

(e) What is 'Supramolecular Semiochemistry' ? Discuss briefly.

(f) Write a short note on molecular logic gate.

6. Answer ***any one*** question : 6

(a) What are the basic features of supramolecular catalysis that differentiate it from molecular catalysis ?

Or

(b) How will you differentiate between a 'supramolecular species' and a 'large molecule' ?

(c) Discuss the basic requirements for a supramolecular species to act as a sophisticated biological model system.

Or

(d) Define the following terms with suitable examples :

(i) Structural Model

(ii) Functional Model

7. Discuss the various structural features of cyclodextrins that make them attractive as potential enzyme mimics. 6

Or

Discuss the role of cyclodextrins as adenylate cyclase and phosphodiesterase enzyme mimics.

Or

What are the corands ? Explain their advantageous structural features. Discuss the role of corand as ATPase mimic.

8. What are the major challenges with the model metalloporphyrin-O_2 complexes ? 1

Or

What are the advantages of using 'picket fence' porphyrins as a model for oxygenated myoglobin ?