

(Supramolecular Chemistry)

1. Name the three supramolecular chemists who shared the Noble Prize for Chemistry in 1987 and discuss their seminal contributions. 2+2+2=6

Or

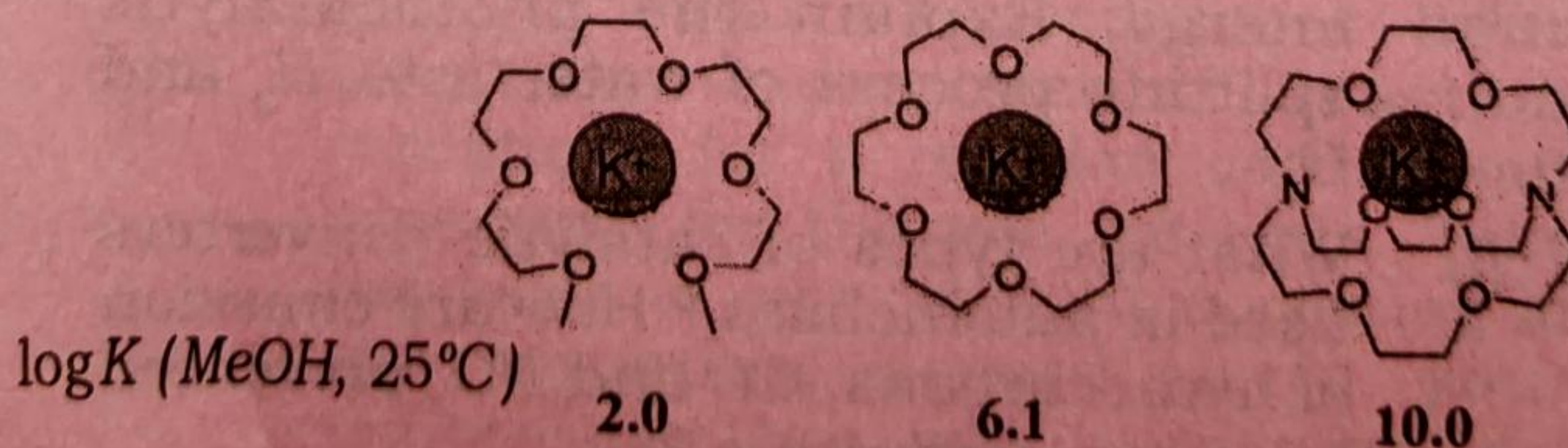
What are the differences among α , β and γ -cyclodextrin ? Discuss their selectivity towards guest binding. Discuss about various possible packing patterns of cyclodextrin reported in literature.

3+3=6

2. Answer **any four** questions : 5×4=20

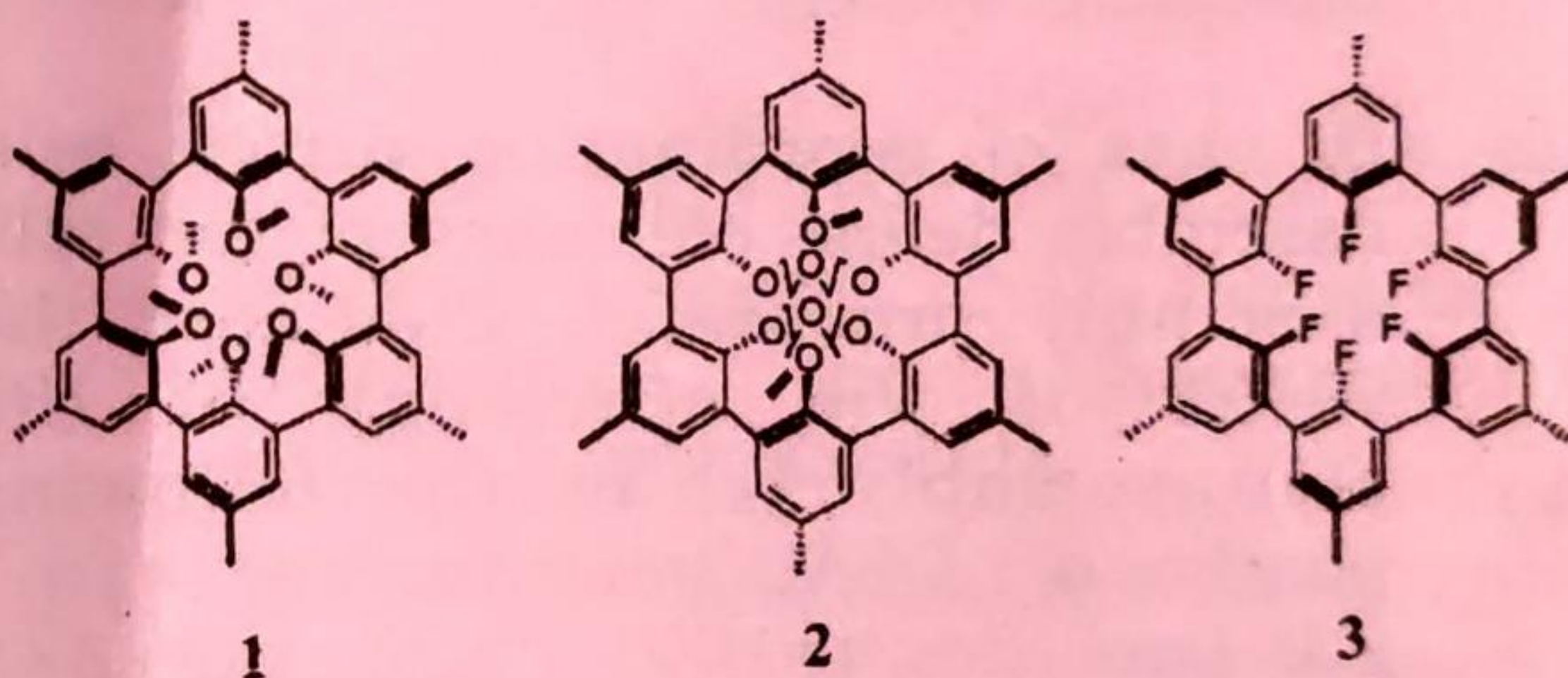
(a) Discuss the host-guest interactions possible in crown ether system. Write a synthetic route of a simple crown ether system. How can the cation binding ability of a crown ether system be tuned based on cation size ?

(b) For the three host systems, log K values are given :



Discuss the reason of increasing order of binding constant ($\log K$) for K^+ cation binding with possible explanation.

- (c) Considering a suitable example, discuss the synthesis of a cryptand host system. How is the cryptand system different from bibrachial lariat ether host?
- (d) Among the three spherand systems



compound 3 does not have affinity to bind metal cation. Explain the reason behind the selectivity of binding for the three host molecules.

- (e) How are the hemicarcerand hosts different from carcerand system? Discuss the nature of host binding ability of hemicarcerand system.

(f) What do you mean by supramolecular chiral recognition? How can it be achieved for chiral guest molecule using a suitable host system?

3. Answer **any four** questions : $5 \times 4 = 20$

(a) What is self-assembly? Briefly describe different types of self-assembly processes. Give an appropriate example of the strict self-assembly process in biological system. $1+2+2=5$

(b) In case of coordination driven self-assembly define efficiency of the self-assembly process (ϵ). Calculate the value of the efficiency of the self-assembly (ϵ) in the following condition : CSAC (mol dm^{-3}) = 2×10^{-7} ; EM (mol dm^{-3}) = 100 $2+3=5$

(c) Describe the construction of a molecular square and a cube from the molecular library approach. What will be the result of reaction between a divergent metal and a divergent ligand during the co-ordination driven self-assembly approach? $2+2+1=5$

(d) Briefly describe the synthesis of catenanes by auxiliary linkage approach. How can you synthesize a rotaxane by clipping approach? $3+2=5$

(e) What is a trefoil knot? Briefly describe a suitable method for the construction of a trefoil knot. $2+3=5$

(f) Briefly describe a suitable method for construction of a self-assembled monolayer. Give suitable examples of any two of the following :

(a) A reverse micelle

(b) Liquid crystal

(c) Bilayer

$2+3=5$

4. Answer **any two** questions : $4.5 \times 2 = 9$

(a) Briefly describe the construction of artificial ion channels by modified cyclodextrins.

(b) Briefly describe the role of a chiral corand in the stereoselective transacylation reaction.

(c) Establish the rate of a Diels-Alder reaction using a catalyst. How can you define the efficiency of catalysis?

5. Answer **any five** from the following : $5 \times 5 = 25$

(a) Discuss briefly the mechanisms of electron and energy transfer in supramolecular photophysics.

- (b) Discuss briefly a supramolecular device containing a bimetallic system.
 - (c) What are excimer and exciplex? Explain by taking suitable examples.
 - (d) What do you mean by supramolecular semiochemistry? Mention the criteria for the construction of useful sensor.
 - (e) Write a short note on 'supramolecular electrochemical sensor'.
 - (f) What is molecular wire? Explain with a suitable example.
 - (g) What do you mean by molecular logic gates? Discuss briefly.
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