



CHE 520/CHE 521/CHE 522

M.Sc. (IIIrd SEMESTER) EXAMINATION, 2023-24

(CBCS Mode)

CHEMISTRY

Paper : IV-A/ IV-B /IV-C

Time : Three Hours]

[Maximum Marks : 75

CHE 520 : Thermodynamics and Intermolecular

Forces

Paper : IV A

Note: There are **three** sections (A, B and C) and candidate has to attempt questions from all sections. Marks are indicated against each section.

SECTION-A

1. Answer all questions. 5×3=15
 - (a) Distinguish between inter and intra hydrogen boiling.
 - (b) What is meant by regular solution ?
 - (c) Explain 'Fluxes' and 'Forces' and their linear phenomenological relationship .

- (d) What is meant by eutectic composition in a binary mixture ?
- (e) Describe the difference between liquid state from gaseous and solid state in terms of intermolecular forces.

SECTION-B

Note: Answer all questions of the following. $4 \times 5 = 20$

2. (a) Discuss in detail about charge transfer forces.

OR

- (b) Discuss in detail about short range forces and long range forces.

3. (a) Illustrate ASOG Method.

OR

- (b) Describe non-equilibrium stationary state for irreversible thermodynamics.

4. (a) Discuss phase diagram of Nicotine Water System.

OR

- (b) Define congruent melting point, incongruent melting point, triple point and eutectic point.
5. (a) What are reversible and irreversible processes? Define Clearly.

OR

- (b) Find out an expression for entropy production during heat flow.

SECTION-C

Note: Answer any two questions of the following. $2 \times 20 = 40$

6. What are different types of intermolecular forces? Discuss in detail.
7. What is meant by non-ideal solution? What are model parameters in the UNIFAC model for the activity measurement of a species? Briefly discuss the role of this model in the activity determination of a non-ideal solution.
8. Describe cell theory of liquid state in detail.

9. What is Onsager's Reciprocal Relation ? Discuss the entropy production in Thermo Osmosis and reverse osmosis.

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CHE 521 : Supramolecular Chemistry

Paper : IV B

Note: There are **three** sections (A, B and C) and candidate has to attempt questions from all sections. Marks are indicated against each section.

SECTION-A

1. Answer all questions : 5×3=15
- (a) What is the basic difference between molecular and supramolecular interactions ?
- (b) Draw the structure of any self assembled supramolecule.
- (c) What is the basic difference between α - phase, β_0 - phase and β - phase of clathrate crystals ?
- (d) How many sets of double hydrogen bonds are present in "Arginin Fork Motif" ? give its diagram also.

- (e) Write down the names of carriers used for transport of K^+ and Na^+ ions in carrier mediated mechanism for ion transport.

SECTION-B

Note: Answer all questions of the following. $4 \times 5 = 20$

2. (a) Explain the term “molecular Recognition” with suitable examples. Differentiate between static and dynamic molecular recognition.

OR

- (b) Explain the term “Chelate Effect” and “Macrocyclic Effect”. What are the factors responsible for these effects ?
3. (a) Distinguish between the following two sets.
- (i) Podants and Corands
 - (ii) Cavitand and Caviate

OR

- (b) Explain factors responsible for designing a particular type of host.

4. (a) What is the role of anion transport experiment in study of expanded porphyrins ? Explain with suitable example.

OR

- (b) What is the most significant capability of bis (Guanidinium) receptors ? How is it utilized in important biological systems ?
5. (a) Why are the urea channel clathrates truly porous material ? How are they different from thiourea clathrates ?

OR

- (b) Describe the applications of zeolites in petroleum industries as molecular sieves with suitable examples.

SECTION-C

Note: Answer any two questions of the following. $2 \times 20 = 40$

6. Explain the term 'Template Effect' with suitable examples. How many types of template effects are observed in supramolecules ? Give the advantages and disadvantages of template reactions. How demetallation reactions are carried out ?

7. What are Crown Ethers ? How are they named ? Give Pedersen's method for their synthesis. Discuss the crown ether selectivity towards complexation with alkali metals and alkaline earth metals.
8. How many types of basic structural units are formed in clathrate hydrates ? Discuss Type-I, Type-II and Type-H Clathrates. Give at least five significant applications of clathrate hydrates.
9. How is supramolecular catalysis different from enzyme catalysis ? Discuss the functions of supramolecular catalysts with reactive functional groups.



Note: There are **three** sections (A, B and C) and candidate has to attempt questions from all sections. Marks are indicated against each section.

SECTION-A

1. Answer all questions : 5×3=15
- (a) How will you establish that Vitamin C possess at least five carbon atoms in straight chain ?
 - (b) How will you establish that Vitamin-A possess β -ionone nucleus ?
 - (c) How is oestrone obtained from oestriol ?
 - (d) How is adrenaline synthesized from catechol ?
 - (e) What is Diel's Hydrocarbon ? Give one method for its synthesis.

SECTION-B

Note: Answer all questions of the following. 4×5=20

2. (a) How is ascorbic acid synthesized by Haworth and Hirst method ?

OR

- (b) How would you confirm that riboflavin contains four hydroxyl groups, a terminal- $CH_2 OH$ and a five carbon side chain at N-9 ?

3. (a) Establish that Vitamin A :

OR

(i) Has one primary alcoholic group.

(ii) Contains five double bonds.

- (b) How is vitamin K concerned with blood clotting process?

4. (a) How is progesterone synthesized from pregnanediol ?

OR

- (b) What are main biochemical functions of progesterone ?

5. (a) What are main deficiency problems of Vitamin A ?

OR

- (b) What are Steroids ? What happens when steroids are heated at 360°C and 420°C in presence of Selenium ?

SECTION-C

Note: Answer any two questions of the following. $2 \times 20 = 40$

6. The ring of Vitamin C is five membered and not six. Explain this with suitable chemical reactions.
7. What are Hormones ? Establish the structure of Oestrone.
8. Establish the structure of thyroxine.
9. How would you establish that cholesterol contains a secondary hydroxyl group at position-3 ?

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