CHE 520/ CHE 521/ CHE 522

M.Sc. (III[rd] SEMESTER) EXAMINATION, 2024-25

1582

(CBCS MODE)

CHEMISTRY

Time : Three Hours] [Maximum Marks : 75

CHE 520

Thermodynamics and Intermolecular Forces

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 lamda point ?
   - (b) Give the relation between fluxes and forces.
   - (c) What is regular and athermal solution ?
   - (d) Explain charge transfer forces.
   - (e) What is advantages of excess thermodynamic function ?

Section-B

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

2. (a) Explain inter and intra molecular hydrogen bonding with example.

Or

(b) Explain effect of hydrogen bonding on solubility with example.

3. (a) Discuss phase diagram of water system.

Or

(b) Explain non-random two liquid (NRTL) activity coefficient model.

4. (a) Discuss minimum entropy production in non-equilibrium process.

Or

(b) Prove that $L_{11}. L_{22} \geq L_{12}^2$

5. (a) What is configurational entropy ? Differentiate between configurational and thermal entropy.

Or

(b) Write a short note on critical solution mixing.

Section-C

Note: Answer any <u>two</u> questions of the following : 2×20=40

6. Discuss about ASOG and UNIFAC method.
7. Discuss phase diagram of a system having congruent melting point.
8. Explain thermodynamic treatment of thermo-osmosis and reverse osmosis.
9. Explain Liquid crystal and its classification with example.

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CHE 521

Supramolecular Chemistry

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) Name the factors on which the stability of a supramolecular system depends.

   (b) Explain hydrophobic interaction taking at least one example in supramolecular system.

   (c) Give one example of each for cationic, anionic and neutral binding hosts along with respective structures.

   (d) What are spherands ? Give examples also.

   (e) What do you understand by molecular wires? Give one example of naturally occurring molecular wires.

Section-B

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

2. (a) Explain chelate and macrocyclic effects with suitable examples.

   Or

   (b) What are crown ethers ? Give one method for its synthesis and some important applications also.

3. (a) What are the factors responsible for designing a particular type of host.

Or

(b) What do you understand by the term molecular recognition ? Differentiate between static and dynamic molecular recognition.

4. (a) Discuss molecular self-assembly. Describe its different types also.

Or

(b) What do you understand by cryptands ? Discuss its properties and applications.

5. (a) What are the basic differences between supramolecular catalysis and molecular catalysis ? Give one example of supramolecular catalysis where host bears a reactive functional group.

Or

(b) Describe the applications of zeolite in petroleum industries as molecular sieves.

Section-C

Note: Answer any <u>two</u> questions of the following : 2×20=40

6. Give a detailed account of supramolecular chemistry. Describe different types of supramolecular interactions with suitable examples.

7. What are photoresponsive molecular switches ? Explain with suitable examples. How are they different from Redox-responsive molecular switches.

8. Discuss the role of expanded porphyrins in ion transport through the membrane. Explain with suitable illustrations.

9. What do you understand by clathrate hydrates ? How many types of clathrate hydrates are known ? Discuss their structures and applications also.

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CHE 522

Biomolecules

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) Ascorbic acid does not contain a carboxylic group but possess keto-enol system. Explain this statement with suitable reactions.

   (b) How would you establish that retinol contains β–ionone nucleus ?

   (c) Give the structure of oestrone and oestradiol.

   (d) How would you establish that epinephrine is catechol derivative ?

   (e) Give the structure of cholesterol.

Section-B

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

2. (a) What are main products when ascorbic acid is boiled with hydrochloric acid ? How will you establish that ascorbic acid does not contains carboxylic group ?

Or

(b) How is riboflavin synthesized from dimethylaniline ?

3. (a) What are main sources of vitamin A ? Give some important properties of this vitamin.

Or

(b) How is vitamin K synthesized ?

4. (a) What are main biochemical functions of progesterone ?

Or

(b) Give anyone synthesis of oestrone.

5. (a) Give anyone synthesis of adrenaline.

Or

(b) Give the synthesis of cholesterol from cholestenol.

Section-C

Note: Answer any two questions of the following : 2×20=40

6. Establish the structure of the compound having molecular formula C_6H_9NOS.

7. Vitamin E on chromic acid oxidation gives mainly a lactone $C_{21}H_{40}O_2$. How is the structure of this lactone related with vitamin E ? Give anyone synthesis of vitamin E.

8. What are hormones ? Establish the structure of oestrone.

9. How would you establish the structure of threonine?

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