

CHE 526, 527, 528

M.Sc. IV<sup>th</sup> SEMESTER EXAMINATION 2023-24

(CBCS MODE)

CHEMISTRY



Time : Three Hours ]

[Maximum Marks : 75

CHE 526

(Chemical Kinetics, Solid State and Reaction Dynamics)

**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 are the differences between elastic and inelastic collisions ?
  - (b) What are the weakness of studying a fast reaction by flow method ?
  - (c) What are the necessary conditions for the existence of schottky defect in crystals.
  - (d) What do you mean by the terms Brusselator and oregonator ?
  - (e) How are the collision cross-section and the reaction cross-section related to each other ?

## Section-B

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

2. (a) Discuss Frankel Defects. Obtain suitable expression for the number of Frankel defects.

Or

- (b) What are the factors affecting the reactivity of solid phase reactions.

3. (a) How does the oscillatory reaction depend on the nature of the system.

Or

- (b) Discuss the role of potential energy surfaces in studying the dynamics of chemical reactions.

4. (a) Derive a relationship between mean free path and collision cross-section.

Or

- (b) Discuss Lindemann theory of unimolecular reaction.

5. (a) Explain the term collision cross-section.

Or

- (b) Discuss the intermolecular potential.

### Section-C

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

6. Explain the Lotka Volterra mechanism.
7. Discuss Hinshelwood theory of unimolecular reaction and mention limitations of the theory.
8. Discuss the relaxation and flash photolysis techniques for the studies of fast reactions.
9. Classify and discuss different types of solid state reactions.

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## CHE 527

### (Bioinorganic 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) Give the structure and functions of carbonic anhydrase.
  - (b) Draw the structure of Chlorophyll.
  - (c) What is the role of Haemoglobin ? Draw the structure of heme unit.
  - (d) Give the toxic effects of cadmium and lead on living systems.
  - (e) Give an account of different types of siderophores.

#### Section–B

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

2. (a) Explain the role of zinc in carboxypeptidase. Draw the active site of carboxypeptidase - A.

Or

- (b) Give the essential features involved in binding of  $O_2$  to haemoglobin and myoglobin molecules.
3. (a) Describe the structure of Vitamin  $B_{12}$  and its coenzyme.

Or

- (b) Explain the effects of deficiencies of copper and cobalt in human body.
4. (a) Write the structure and functions of hemocyanine.

Or

- (b) Describe the role of metal complexes used in chemotherapy.
5. (a) Write a note on bacterial photosynthesis.

Or

- (b) What is Transferrin ? How does it work for metal transport ?

### Section-C

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

6. What are the basic differences between metalloenzymes and enzymes ? What is the role of copper in superoxide dismutase ? What is the

function of this enzyme in our body ? Discuss the reaction schemes for its course of action.

7. Discuss the role of photosynthetic pigments. Illustrate electron flow in photosystems I and II (Z-scheme). Give a detailed account of metal complexes in transmission of energy.
8. Draw the active site of cytochrome-C. Describe the mechanism of electron transfer in the reduction of  $O_2$  into  $H_2O$  through cytochromes. Mention the catalytic cycle for cytochrome  $D_{450}$  enzyme.
9. What do you understand by Oxygen Carrier Proteins ? Explain the porphyrin ring systems present in these proteins with suitable examples. What is the significance of Hill's equation in this context ?



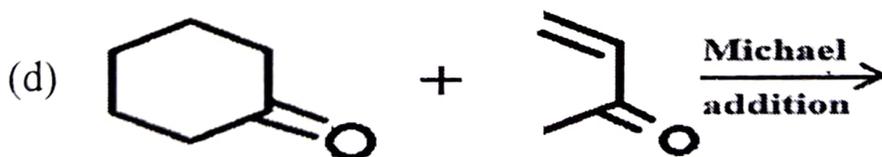
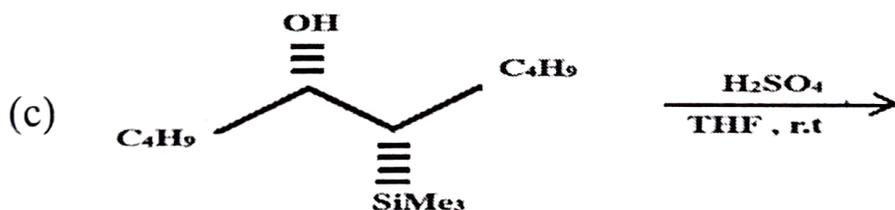
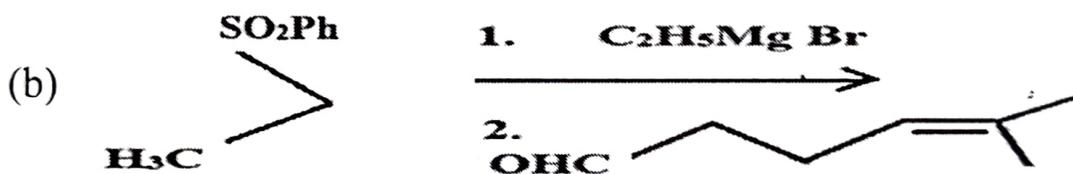
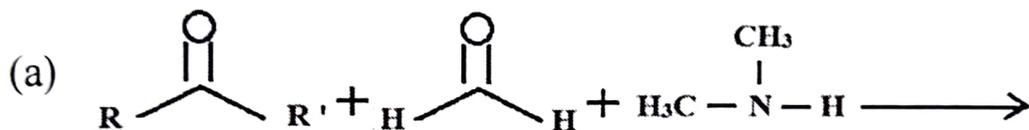
# CHE 528

## (Organic Synthesis)

**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  
Give the products and mechanism of their formation of the following reactions.



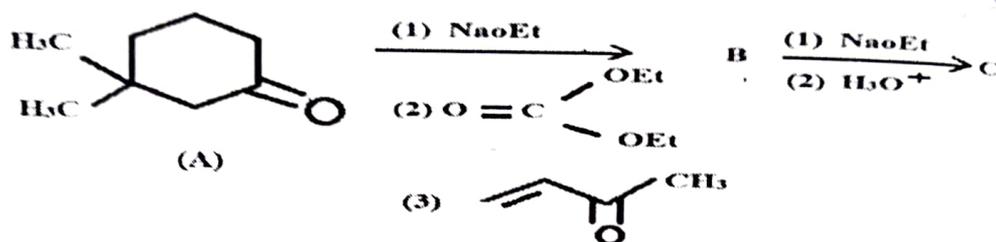
## Section-B

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

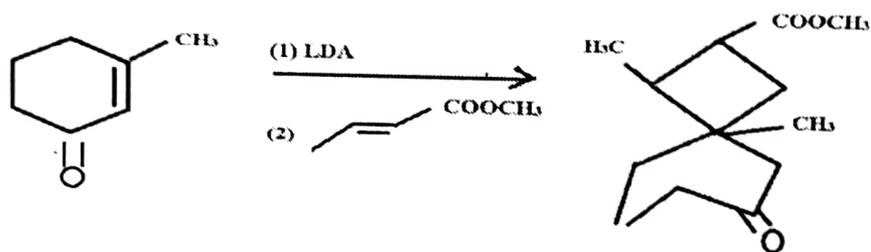
2. (a) Define Robinson annulation. What is significance of retero-Robinson annulation ?

Or

- (b) Give the products and mechanism of their formation in the following reactions.

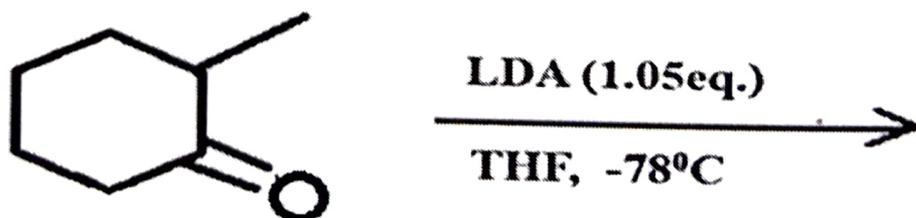


3. (a) Rationalize the following :



Or

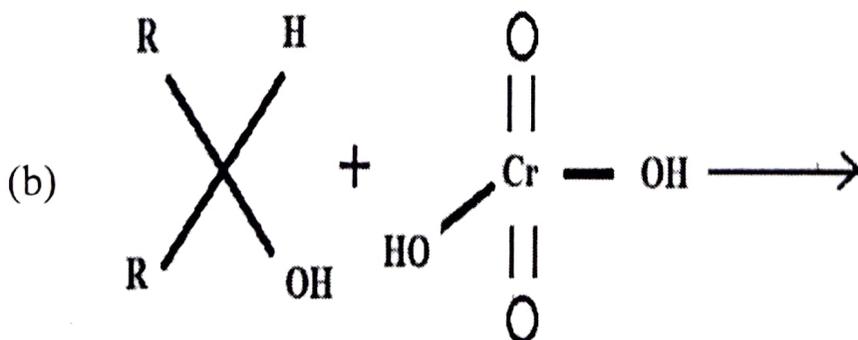
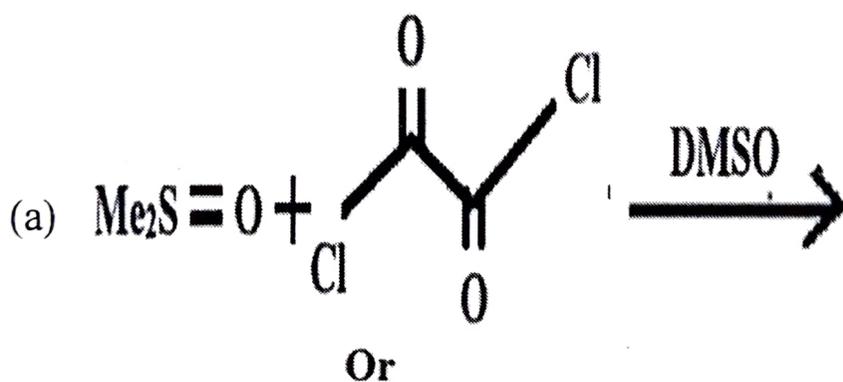
- (b) Give the mechanism of :



4. Give the mechanism of :
- (a) Oxidation of benzylic carbon to Ketone and Oxidative aromatization with DDQ.

Or

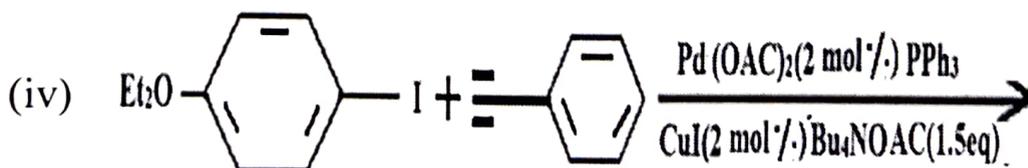
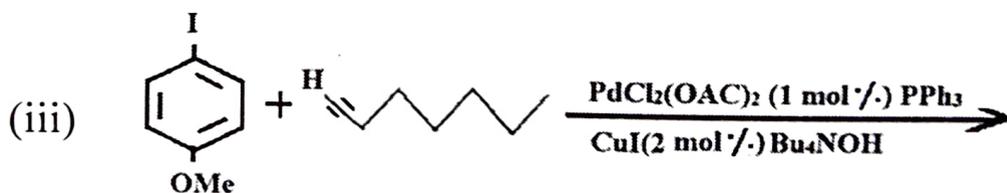
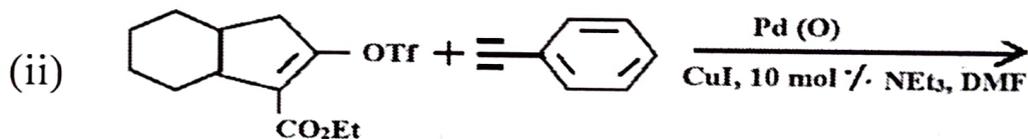
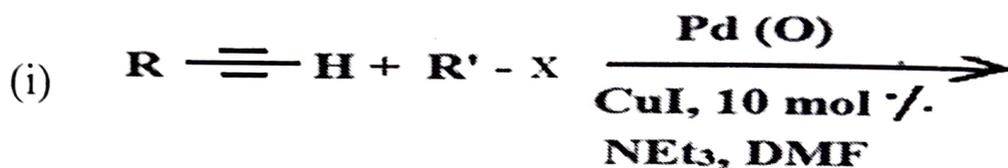
- (b) Allylic C-H fragment with  $\text{Se O}_2$ .
5. Give the products and mechanism of their formation in the following reactions.

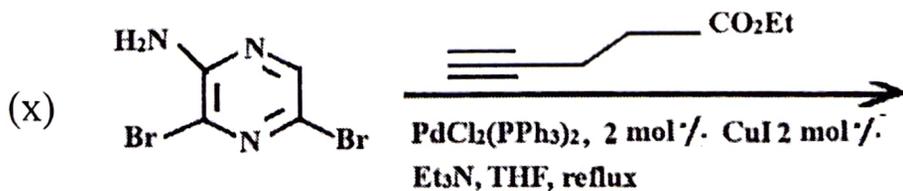
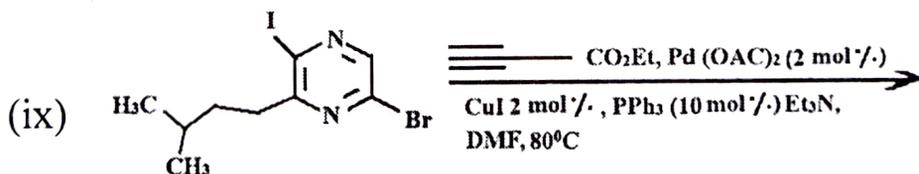
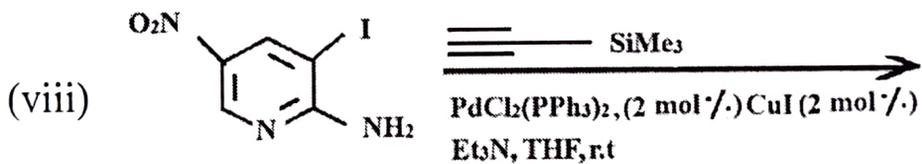
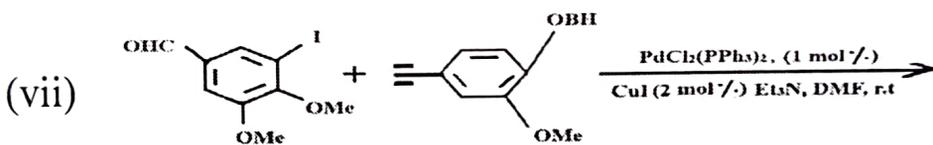
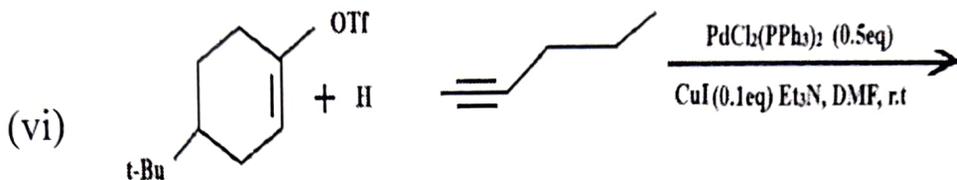
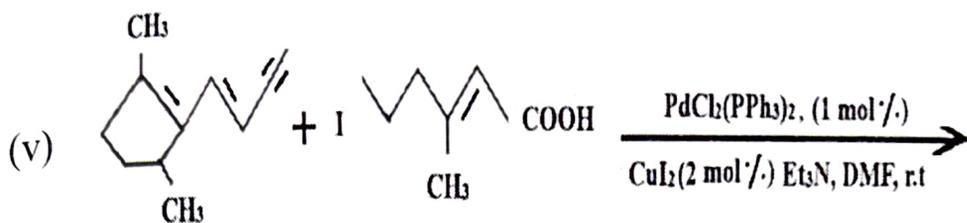


### Section-C

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

6. Describe Birch reduction. Discuss its mechanism and regioselectivity. Give its some applications in organic synthesis.
7. Give the major product and its stereo chemistry, where possible, of the following reactions.

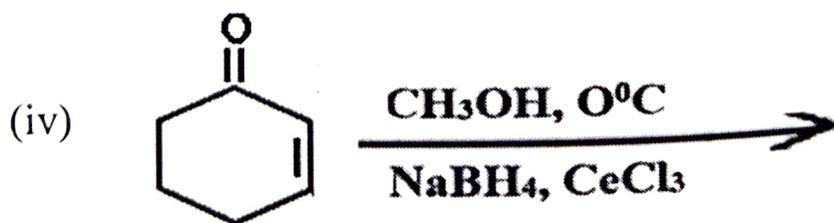
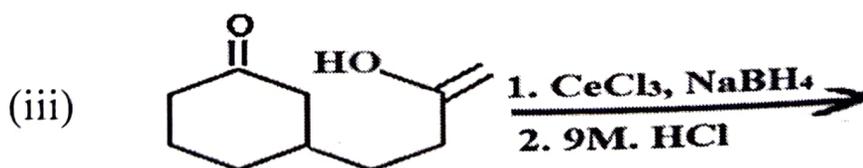
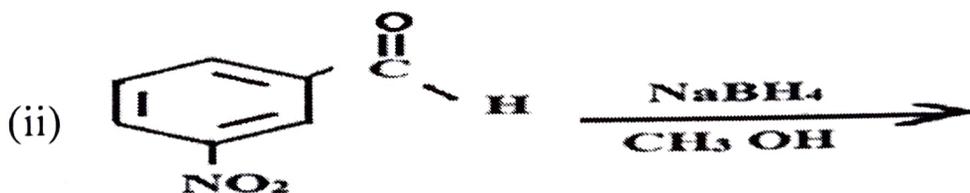
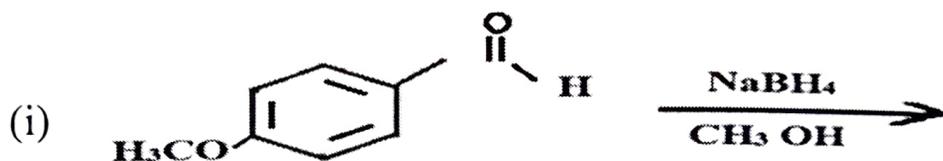




8. What is Heck reaction ? Describe it with reference to :

- (a) Mechanism
- (b) Regio Selectivity
- (c) Chemo Selectivity
- (d) Stereochemistry

9. Give the mechanism and product of the following reaction.



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