



Date:  
Registration number:

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BENGALURU-27  
M.Sc. CHEMISTRY - IV SEMESTER  
SEMESTER EXAMINATION: APRIL 2023  
(Examination conducted in May 2023)

**CHDE 0321-Green chemistry and Diversity of its Applications**

Time- 2 ½ hrs

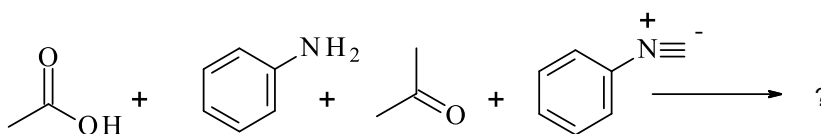
Max Marks-70

This question paper contains **FOUR** printed pages and **THREE** parts

**Part A**

Answer any **six** of the following **eight** questions. (2 X 6=12 M)

1. A particular chemical reaction was carried out in two steps. The first step was carried out in benzene and the second step in acetic acid. Do you consider this as a green process? If not, what change would you suggest?
2. Give an example of a Diels-Alder reaction under microwave conditions. What specific advantage of microwave would you highlight with respect to this reaction?
3. What is an 'eutectic melt? Which specific green method of chemical reaction involves eutectic melt?
4. Complete the following reaction. How many components are involved in this reaction?



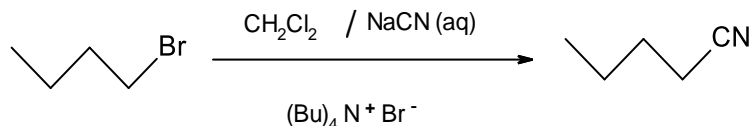
5. What do you mean by iminium catalysis? Give an example.
6. Give an example of (i) polymer and (ii) linker, that can be used for proline immobilization.
7. Mention any two limitations of flow chemistry.
8. Write the chemical reaction of Swern-Moffatt oxidation.

## Part B

Answer any **four** of the following **six** questions

(12 X 4=48 M)

9. (a) How are phase transfer catalysts for transfer of anions classified? Give an example each. Suggest a mechanism for the following reaction involving all the equilibria.

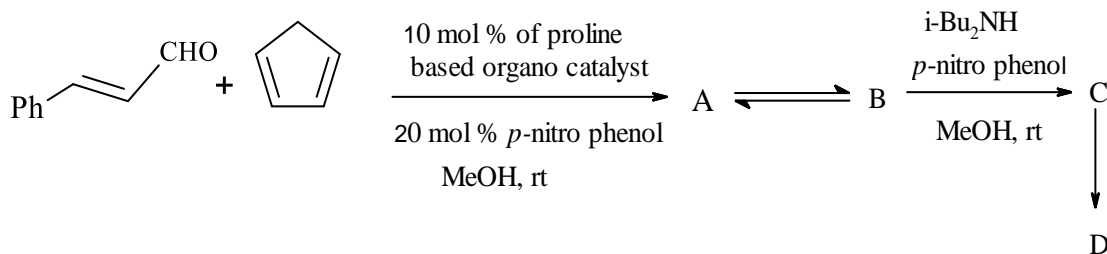


- (b) How do you prepare DB[18]-C-6? Assuming the cavity diameter of this molecule as 3.07-3.28 Å, which of the following cations would bind strongest,  $\text{K}^+$  (cation diameter 2.6-3.3 Å) or  $\text{Cs}^+$  (cation diameter 3.4-4.3 Å)? Justify. What is the type of interaction involved in this binding? (6+6)

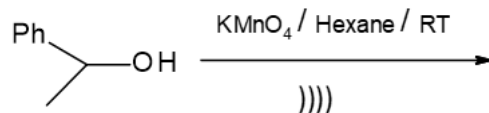
10. (a) Do you consider chromatographic method of separation as a green method? What are the different approaches to separation polymer supports offer? Explain briefly.

- (b) Give the scheme of polymer supported oligosaccharide synthesis. What is the significance of this method over general methods of oligosaccharide synthesis? (6+6)

11. (a) In the following successful one pot synthesis, the intermediates A and B are in equilibrium with each other. Explain the reactions involved by providing the structures of intermediates A,B,C and the end product D.

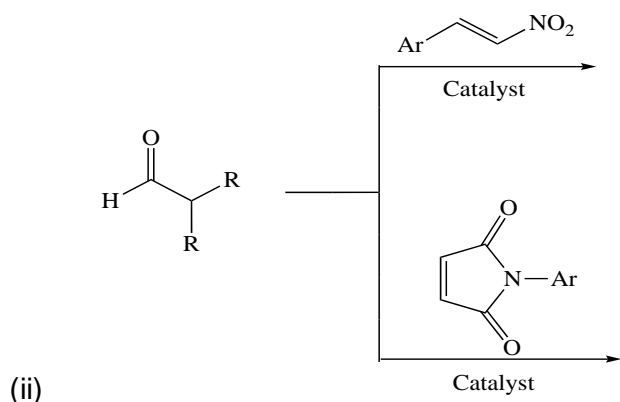
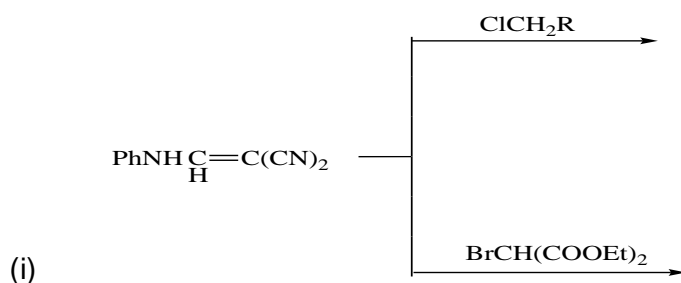


- (b) Complete the following reaction.  $\text{KMnO}_4$  has a specific disadvantage in the formation of a byproduct during the reaction. What is the byproduct? How does the following reaction condition help overcome this disadvantage?



- (c) Explain briefly various mechanisms by which microwave heating occurs. (6+3+3)

12. (a) Compare the routes between old and new methods of synthesis of Sertraline HCl.  
 (b) Explain the synthesis of Verubecestat.  
 (c) Complete the following reactions:



**(6+3+3)**

13. (a) Write the mechanism of the following:  
 (i) Direct conjugate addition  
 (ii) N-oxide promoted Baeyer Villiger oxidation  
 (b) Discuss the synthesis of quinapril without using hydroxybenzotriazole. **(8+4)**

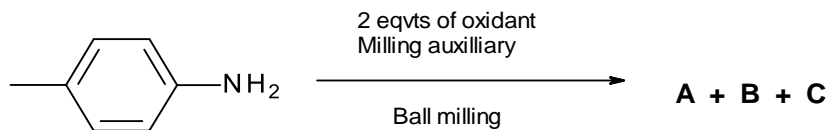
14. (a) Write the mechanism of cascade transfer hydrogen reaction using quinoline as an example.  
 (b) Draw the structure of any ionic liquid supported organocatalyst. Give an example of Diels-Alder reaction using this catalyst.  
 (c) Discuss the practical applications of flow chemistry using Fischer esterification as an example. **(4+4+4)**

## Part C

Answer any **two** of the following **three** questions

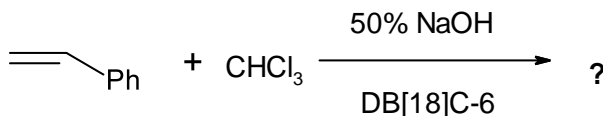
**(5 X 2=10 M)**

15. Complete the reaction of oxidation of *p*-methyl aniline and identify **A**, **B** and **C**. Analyze the data given in the table below and summarize the effect of the milling auxiliaries, Al<sub>2</sub>O<sub>3</sub> and SiO<sub>2</sub>.

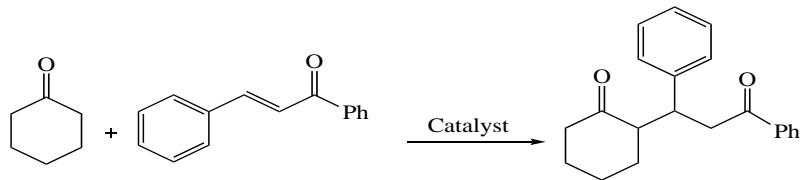


Oxidant	% Selectivity A		% Selectivity B		% Selectivity C	
	Al <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>
KMnO <sub>4</sub>	95	88	2	3	2	---
K <sub>2</sub> MnO <sub>4</sub>	98	94	-----	3	-----	-----
Oxone	3	2	88	10	6	85
H <sub>2</sub> O <sub>2</sub> /urea	1	20	92	45	4	----

16. (a) What is the product of the following reaction? What is the species generated in-situ during the reaction?



- (b) Identify the electrophile and nucleophile in the following reaction.



**(3+2)**

17. How does route selection (or altering the sequence of steps of synthesis) facilitates to obtain relatively pure product in a convergent synthesis? Explain using a suitable example.

.....end of questions.....