



## WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2023

## CEMADSE04T-CHEMISTRY (DSE3/4)

## GREEN CHEMISTRY

Time Allotted: 2 Hours

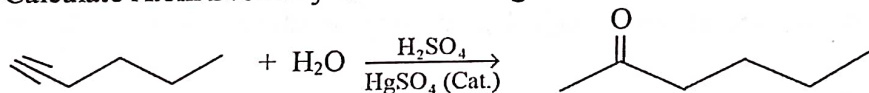
Full Marks: 40

*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.  
All symbols are of usual significance.*Answer any *three* questions taking *one* from each Group

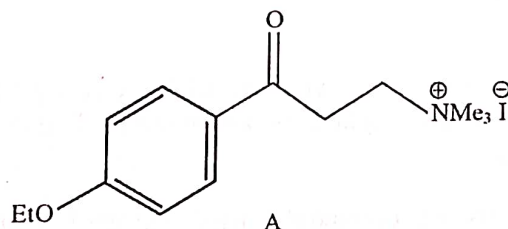
## GROUP-A

(Unit 1 and 2)

1. (a) Why the green chemistry is known as sustainable chemistry? 2
- (b) What is the need for derivatisation of a compound? Why unnecessary derivatisation should be avoided? 1+2
- (c) What do you mean by the term inherent safer design? Write the subdivisions of ISD and discuss in brief. 2+3
- (d) Calculate Atom Economy of the following reaction. 2

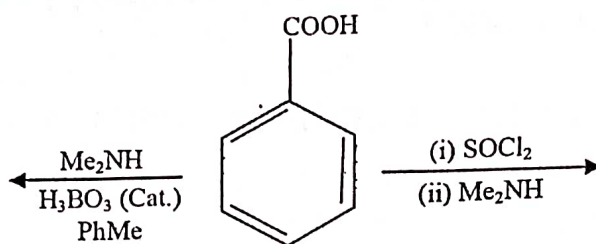


- (e) Which compound was responsible for Bhopal gas tragedy? For which purpose this compound was used? 1+1
- (f) When the following compound A is heated in water at 105°C, it undergoes extensive polymerization. However, heating of A in chloroform-water mixture under microwave irradiation gives  $\alpha$ ,  $\beta$ -unsaturated ketone in good yield. Explain. 2



- (g) Sonochemical reactions proceed through radicals. Explain. 2
- (h) Why ionic liquids are called designer solvent? Ionic liquid facilitates transition metal catalyzed reactions — Explain the observation. 2+2

2. (a) Define 'in water', 'on water' and 'with water' reactions. 3
- (b) Which of the following methods of synthesizing *N,N*-dimethyl benzamide is green? Explain your choice. 3



- (c) Reaction between cyclopentadiene and methyl vinyl ketone is ~2.5 times more *endo* selective in water than in ethanol. Explain. 2
- (d) What are the differences between atom economy and E-factor? 3
- (e)  $C_2H_4 + \frac{1}{2} O_2 \longrightarrow C_2H_4O$  (Ethylene oxide). This reaction will take place in the presence of catalyst. Find out the % atom economy. 3
- (f) Microwave energy is too weak to break a chemical bond, still microwave-assisted reactions occur faster than conventional reactions. Explain. 3
- (g) Replacement of liquid carbon dioxide by halogenated solvent will result in less harm to ground water. Explain the observation. 2
- (h) Give one example each of biocatalyst, photocatalyst and asymmetric catalyst. 3

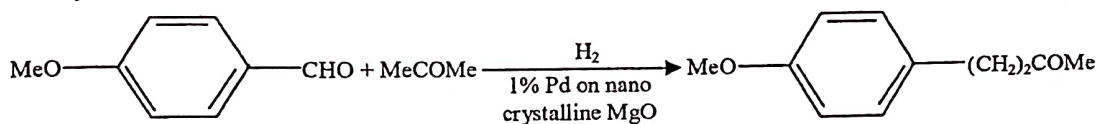
**GROUP-B**  
(Unit 3)

3. (a) Mention the enzymes involved in the biological production of adipic acid from 2×5 = 10 glucose. 10
- (b) Outline one green and one non-green synthesis of disodium imino diacetate.
- (c) Between *N,N*-dimethyl formamide and toluene which one will you prefer for microwave assisted reactions? Explain your choice.
- (d) What happens when anthracene is heated with maleic anhydride in diglyme?
- (e) Briefly explain the method for isolation of product from a reaction in supercritical carbon dioxide.
4. (a) What are biopolymers? Discuss the green synthesis of PLA (Poly Lactic Acid) from corn. Why use of PLA in medical implants is safe in human body? 1+2+2
- (b) What are healthier fats and oils? 2
- (c) What are the main ingredients of commonly used carpets? Mention some disadvantages of PVC backing carpets. 1+2

**GROUP-C**

**(Unit 4)**

5. (a) Identify the multifunctional catalyst in the following reaction and explain why the catalyst is called multifunctional? 2



- (b) What is solvate? Mention the different interactions responsible for the formation of pharmaceutical co-crystals between an active pharmaceutical ingredient and a suitable coformer. 1+2
- (c) What are chemoenzymatic reactions? Mention some advantages of chemoenzymatic reactions. 1+2
6. (a) Briefly explain the basic principles of combinatorial green chemistry. 3
- (b) Mention one green catalyst for conversion of benzaldehyde into benzoin. Also suggest a plausible mechanism for the reaction. 1+2
- (c) Briefly explain a mechanism by which elastin transfers energy. 2