

2025

## CHEMISTRY — HONOURS

Paper : DSE-A-3

(Green Chemistry and Chemistry of Natural Products)

Full Marks : 50

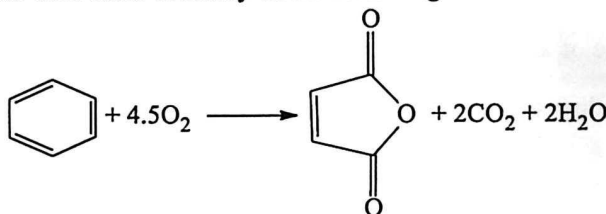
*The figures in the margin indicate full marks.**Candidates are required to give their answers in their own words as far as practicable.*Answer *question no. 1* and *any eight* questions from the rest (*question nos. 2 to 13*).1. Answer *any ten* questions :

1×10

- What is the principle regarding waste management in green chemistry?
- What is isoprene rule?
- What is the frequency range for microwave radiation?
- Fill in the blank :  
Green Chemistry is also called \_\_\_\_\_ Chemistry.
- Write the full name of PEG.
- Among substitution and rearrangement reactions, which one is more atom economical?
- Write the full name of [emim]Cl and draw its structure.
- Mention one area on which the future trend of Green Chemistry depends.
- Give one example of a biocatalyst.
- What are sesquiterpenes? Give one example.
- Give one medicinal use of morphine.
- Write down the names of two alternative energy sources other than thermal energy used in chemical reactions.

2. (a) What is a phase transfer catalyst? Discuss the role of PTC in nucleophilic substitution reaction. Give one example.

(b) Calculate the per cent atom economy of the following reaction :

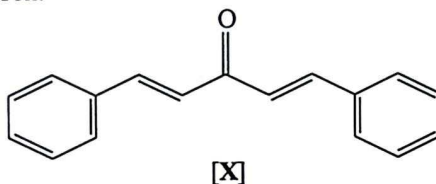


3+2

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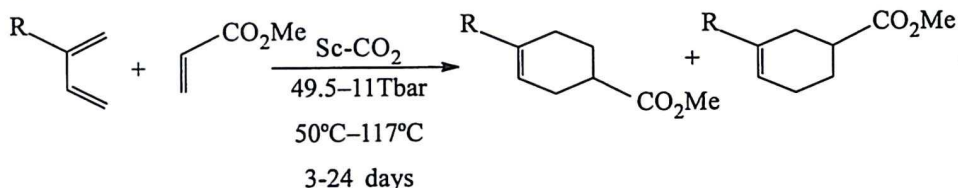
(1914)

3. (a) Outline the synthesis of hygrine alkaloid.  
 (b) What are the advantages of green method over conventional one (*any two*)? 3+2
4. (a) Suggest a convenient synthesis of the following compound [X] using Aldol Condensation/Claisen-Schmidt reaction.  
 (b) Suggest one alternative greener approach of Aldol condensation for the synthesis of compound [X] mentioning the reason.



3+2

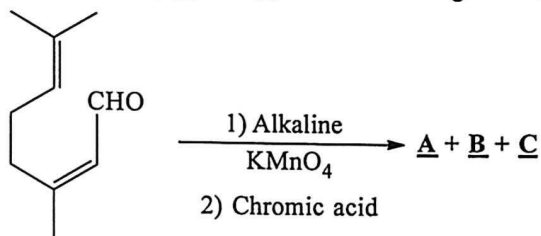
5. (a) Consider the following reaction :



What is the role of  $\text{Sc-CO}_2$  in the above reaction? How is its use advantageous over the conventional solvent?

- (b) Mention the reaction condition for oxidation of toluene under microwave irradiation (MWI). Write the reaction. 3+2
6. (a) Compare and contrast between the conventional method and any one green method of Claisen rearrangement.  
 (b) What are the utilities of PEG as a solvent in green synthesis? 3+2
7. (a) Write down the disadvantages of the conventional method of Beckmann rearrangement. Elaborate with one example about the green approach of the reaction.  
 (b) Mention two advantages of using ultrasonics in the medical field over other techniques. 3+2
8. (a) What is hydrophobic effect? How does it help to get the activation energy necessary for the substrate molecules to react?  
 (b) What are alkaloids? Give one example. 3+2
9. (a) Mention three limitations of Green Chemistry.  
 (b) Give an example of an eco-friendly methylating agent and also show its structure. 3+2
10. (a) Give a brief outline of the green synthesis of adipic acid. State two advantages of the green procedure.  
 (b) Write the reaction of the enzyme-catalysed Baeyer-Villiger oxidation. 3+2

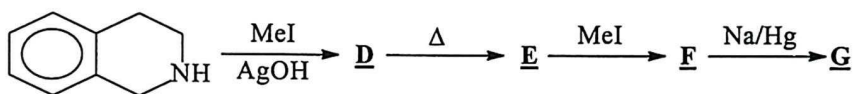
11. (a) Write the products A, B, and C of the following reaction :



- (b) State two differences between ionic compounds and ionic liquids.

3+2

12. (a) Identify D to G in the following transformation :



- (b) Write one medicinal use each of quinine and reserpine.

3+2

13. (a) How can combinatorial chemistry be beneficial in context of Green Chemistry?

- (b) What are susceptors in microwave process? Give an example.

3+2