

2021

CHEMISTRY — HONOURS

Paper: DSE-A-3

(Green Chemistry and Chemistry of Natural Products)

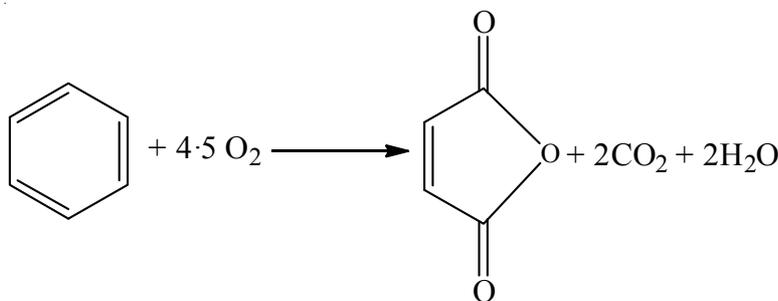
Full Marks : 50

*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** (compulsory) and **any eight** questions from the rest (question nos. 2 to 13).1. Answer **any ten** questions:

1×10

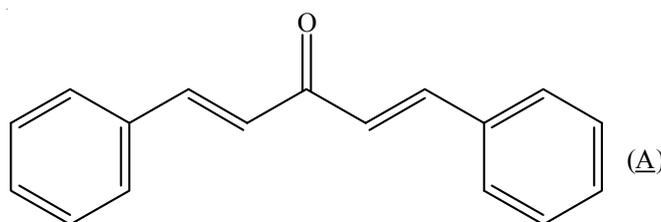
- (a) What is CCS in green chemistry?
- (b) What is the green chemistry principle regarding waste management?
- (c) What do you mean by the term PEG-400?
- (d) Write down one advantage of using biomimetic synthesis.
- (e) What is the source of microwave irradiation?
- (f) Give an example of a “susceptor”.
- (g) Why is an ionic liquid called green solvent?
- (h) Define the term percent atom economy.
- (i) Which type of “cavitation” is mainly responsible for a chemical reaction?
- (j) What is isoprene rule?
- (k) Mention one medicinal use of reserpine.
- (l) Give example of one green reagent which can be used in Friedel-Crafts reaction instead of AlCl_3 .

2. (a) (i) Calculate the % atom economy of the following reaction:



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- (ii) Give an example of a reaction having 100% atom economy. 3
- (b) What is the basic difference between “% Atom Economy” and “E-Factor”? 2
3. (a) Decomposition of H_2S over $\gamma\text{-Al}_2\text{O}_3$ or $\text{MoS}_2\text{-}\gamma\text{-Al}_2\text{O}_3$ by MW irradiation is an efficient process due to formation of hot spots. How can you justify it? 3
- (b) What is the difference between a “susceptor” and a “catalyst”? 2
4. (a) What is the main principle of “combinatorial chemistry”? 3
- (b) Write two advantages of solventless reactions. 2
5. (a) Suggest a convenient synthesis using aldol condensation for the following compound (A). (No mechanism required.) 3
- (b) Suggest one alternative greener approach of aldol condensation for the synthesis of compound (A). 2



6. (a) Give one example of decarboxylation reaction using microwave irradiation (MWI). Write the green context of the reaction. 3
- (b) Can microwave irradiation (MWI) affect the structure of an organic molecule? Explain. 2
7. (a) Reaction between cyclopentadiene and methyl vinyl ketone shows decrease in activation energy from changing the reaction medium from gaseous phase to aqueous solution by 2.8 kcal/mol and reaction between cyclopentadiene and isoprene shows decrease in activation energy by 4.5 kcal/mol. What factors are responsible for this observation? 3
- (b) Give an example of Claisen rearrangement in water. 2
8. (a) How do the structures of cations and anions control the property of ionic liquids (IL)? 3
- (b) What type of gas molecules are prone to sonoluminescence and why? 2
9. (a) Write down the disadvantages of the conventional method of Beckmann rearrangement. Elaborate with one example about the green approach of the reaction. 3
- (b) Mention two disadvantages of the conventional method to carry out Fries rearrangement. 2
10. (a) What are the new areas on which future trends of green chemistry depend? 3
- (b) Write two disadvantages of commonly used oxidising agents. Name one green oxidising agent. 2

11. (a) How can adipic acid be synthesised following green procedure? Write down the steps involved. 3
(b) Write down Diels-Alder reaction between anthracene and dimethyl fumarate under microwave irradiation. Mention how the reaction is improved under MWI compared to traditional Diels-Alder reaction. 2
12. (a) Write down the structures of two geometrical isomers of citral. How will you synthesise citral starting from 6-methyl-hept-5-ene-2-one? 3
(b) What is multifunctional reagent? Give an example. 2
13. (a) How can you detect the functional nature of oxygen present in an alkaloid chemically? 3
(b) Define alkaloids. 2
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