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(ii) Goals of Green Chemistry

(iii) Mechanochemistry and its role in Green Chemistry

(iv) Zeolites

(b) Provide example of :

(i) Visible light induced reaction

(ii) Reaction using electrocatalysis (12,3)

(1500)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1183

I

Unique Paper Code : 2173010003

Name of the Paper : DSE : Green Chemistry in
Organic Synthesis

Name of the Course : B.Sc. (Hons) Chemistry

Semester : V

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

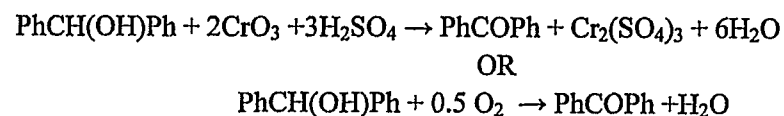
1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **six** questions.
3. Each question carries **15** marks.
4. Attempt all parts of a question together.

1. (a) Fill in the blanks with the appropriate word(s):

- (i) A chemical process with an E-factor of 100 produces _____ waste than a process with E-factor of 10.

P.T.O.

- (ii) The synthesis of chemicals using _____ materials can minimize the depletion of non-renewable resources.
- (iii) A key goal of green chemistry is to avoid the production of _____, which require additional resources for treatment and disposal.
- (iv) The use of _____ reagents, which are safer and less toxic, is a fundamental approach in green chemistry to minimize risks.
- (b) In the context of green chemistry, briefly explain any two of the following :
- Design for degradation.
 - Avoiding protecting/de-protecting groups in a chemical synthesis
 - Inherent Safer Design with example of Carbaryl
- (c) Provide the synthesis of biodegradable polymer PLA from corn and highlight the green aspects of this process.



- (b) In a chemical industry, strengthening analytical techniques helps to avoid accidents. Explain.
- (c) Suggest a green method of synthesis of copper phthalocyanine. How is this method superior to the conventional method?
- (d) Correct the following statements:
- Saponification is the process used for the preparation of biodiesel from used cooking oil.
 - The first principle of the 12 principles of green chemistry is use of benign solvents.
 - Potato, corn and molasses are examples of non-renewable feedstocks. (4,4,4,3)

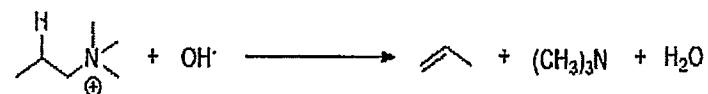
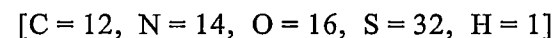
8. (a) Write short notes of any three of the following:

- Green Synthesis of Vitamin C

- (d) The Pollution Prevention Act of 1990 emphasizes reducing pollution at its source. Discuss how this aligns with the green chemistry principle of waste prevention. (4,4,4,3)

6. (a) What is biomass, and why is it considered a renewable resource? Explain the role of glycerol as biomass-derived solvents.
- (b) Design a green route towards the synthesis of benzoin from benzaldehyde. What advantages does this method have compared to the traditional method?
- (c) What led to Flixborough accident? Give the Asahi route to cyclohexanol.
- (d) State the relation between, risk, hazard and exposure. Explain each term. (4,4,4,3)
7. (a) What precautions should a chemist keep in mind while designing a reaction? Based on the discussion, justify which is the green route to synthesize acetophenone?

- (d) How is atom economy superior to percentage yield? Calculate the atom economy for the production of propene in the given reaction :



(4,4,4,3)

2. (a) Define green chemistry and explain its importance in sustainable development.
- (b) Illustrate how the popular anti-tuberculosis drug, Paramycin maybe synthesized from aromatic sulphonic acids present in waste water.
- (c) Write the biocatalytic synthesis of adipic acid.
- (d) Provide an example of:

(i) Ultrasound assisted Simmons Smith reaction

(ii) Ultrasound assisted Diel-Alder reaction (4,4,4,3)

3. (a) Explain the following :

(i) Advantages of using water as a reaction medium over traditional organic solvents

(ii) Limitations in the pursuit of Green Chemistry

(b) Analyze the role of asymmetric catalysis in green chemistry with specific example of L-DOPA.

(c) Which metals are used in the preparation of Englard's Rightfit Pigments. What are the advantages of these pigments over traditional heavy metal-based pigments?

(d) Provide examples of the following reactions in water :

(i) Heck reaction

(ii) Synthesis of terpinol (4,4,4,3)

4. (a) What are ionic liquids and why are they considered as green solvents? Give an example of a Diels-Alder reaction using ionic liquids.

(b) What is syngas? What are the advantages of using syngas in Eastman Chemicals' synthesis of methyl methacrylate?

(c) Disodium iminodiacetate is a key intermediate in Monsanto's herbicide Roundup. Describe both the traditional and green synthetic routes for its production.

(d) In the context of catalysis, define :

(i) Turnover frequency

(ii) Turn over number (4,4,4,3)

5. (a) What is interesterification? What are the advantages of enzymatic interesterification over chemical interesterification?

(b) Explain the steps in the catalytic cycle for heterogeneous catalysis. How is heterogeneous catalysis different from homogeneous catalysis?

(c) Highlight the importance of supercritical carbon dioxide in the chemical industry. What are the advantages of carbon dioxide as a solvent over traditional solvents?