

Sr of the question paper:

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

Semester: V

Name of the paper: DSE-8: Green Chemistry

Unique Paper Code: 32177908

Duration: 3 hrs

Maximum Marks: 75

Instruction for the candidates

1. Write your Roll no on the top immediately on the receipt of the question paper
2. Attempt *four* questions. All parts of a question should be attempted together
3. Each question carries 18.75 marks

1. (a) Fill in the blanks with the appropriate word(s): 6
 - (i) Traditional wood preservatives use toxic heavy metals such as _____ and _____.
 - (ii) _____ is fulfilling the needs of the present generation without compromising the ability of future generations to meet their needs.
 - (iii) A chemical process with an E-factor of 100 produces _____ waste than a process with E-factor of 10.
 - (iv) Technology developed by EcoWorx™ is related to _____.
 - (v) A chemical which causes the depletion of the ozone layer is _____.

(b) Define Green Chemistry. List any four aspects a chemist can include to develop the “ideal green synthesis”. 6

(c) Outline green synthesis of Carbaryl. Which principles of green chemistry are involved in the alternate method? 6.75
2. (a) Correct the following statements:
 - (i) Use of Methyl Iodide is the greener substitute to conventional methylation methods.
 - (ii) Versatile organic compounds, VOCs, such as formaldehyde, have been replaced and banned in paints.
 - (iii) Potato, corn and molasses are examples of non-renewable feedstocks.
 - (iv) According to the Pollution Prevention Act by US EPA, $\text{risk} = f(\text{safety} \times \text{exposure})$.
 - (v) Saponification is the process used for the preparation of biodiesel from used cooking oil.

(vi) The first principle of the twelve principles of green chemistry is use of benign solvents. 6

(b) Compare homogeneous catalysis and heterogeneous catalysis giving examples. 6

(c) What are the advantages of microwave assisted reactions over conventional heating in organic synthesis? Also write the reaction involved in the following microwave assisted reactions:

(i) Hoffman Elimination reaction

(ii) Hydrolysis of methyl benzoate. 6.75

3. (a) Provide one example of the following:

(i) Greener alternative to Pesticide

(ii) Essential oil isolated using liq. CO₂

(iii) Green detergent

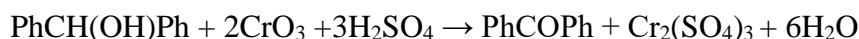
(iv) Auxiliary Substance

(v) Green alternative to tetrahydrofuran

(vi) Environmentally friendly biomaterial which stimulates plant growth 6

(b) What are trans-fats? Highlight the role of enzymes in interesterification for production of non-trans fats and oils. What are the advantages over chemical interesterification 6

(c) What precautions a chemist should keep in mind while designing a reaction? Based on the discussion, justify which is the green route to synthesize acetophenone?



OR



4. (a) What is the Strecker Synthesis of Disodium iminodiacetate? What are its drawbacks? What is the green alternative to this synthesis? 6

(b) Provide the conventional and green method of synthesis of the following:

(i) Adipic acid

(ii) Copper phthalocyanine 6

(c) What is super critical CO₂? Discuss the advantages of compressed CO₂ over conventional organic solvents. 6.75

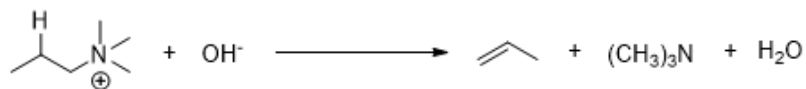
5 (a) Explain the following briefly

(i) Water as a green reaction medium

(ii) Advantages of using ionic liquids as a solvent over typical organic solvents.

(iii) Barriers in the pursuit of Green Chemistry 6

(b) Define Atom Economy. How is atom economy superior to percentage yield?
Calculate the atom economy for the production of propene in the given reaction:



6

(c) Outline the synthesis of poly lactic acid from corn starch. List four principles of Green Chemistry that are involved in this synthesis. 6.75

6. (a) Briefly discuss the role of the following *in* green chemistry:

(i) Ultrasound assisted reactions

(ii) Co crystal controlled solid state synthesis.

6

(b) What are the main postulates of Pollution Prevention Act of 1990? What is pollution prevention hierarchy? 6

(c) What are Biocatalysts. Discuss the role of biocatalyst in green chemistry.

6.75