Name:

Enrolment No:

UPES

End Semester Examination, May 2025

Course: Green Chemistry & Sustainably **Semester : IV**

Program: M.Sc. Chemistry **Time : 03 hrs.**

Course Code: CHEM8058 **Max. Marks: 100**

Instructions:

- Write your name and enrolment no. at the top of the question paper. ·
- Do not write anything else on the question paper except your name and roll number. ·
- Attempt all the parts of a question at one place only. ·
- CO in the last column stands for course outcomes and it is for official use only.
- Internal choice has been given for Q 9 and Q 11. ·
- Schematic representations are highly encouraged during answering the questions.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Define Green Chemistry and explain its necessity in modern chemical practices.	**4**	**CO1**
Q 2	Calculate the atom economy for the synthesis of water from hydrogen and oxygen.	**4**	**CO2**
Q 3	List and briefly describe any four principles of Green Chemistry.	**4**	**CO1**
Q 4	Elucidate the role of supercritical fluids as green solvents in organic reactions.	**4**	**CO2**
Q 5	Exemplify the use of carbohydrates as green starting materials in chemical synthesis.	**4**	**CO3**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Discuss the limitations and challenges faced in the implementation of Green Chemistry principles.	**10**	**CO1**
Q 7	Explain the design of a green synthesis for paracetamol, highlighting the principles applied.	**10**	**CO3**
Q 8	Compare and contrast the use of water and ionic liquids as green solvents.	**10**	**CO2**
Q 9	Describe the microwave-assisted oxidation of toluene to benzoic acid, emphasizing its green aspects. **OR** Elaborate on the use of solid acid catalysts like zeolites in green chemical reactions.	**10**	**CO3**

SECTION-C (2Qx20M=40 Marks)			
Q 10	Discuss the integration of ultrasound and microwave technologies in green chemical reactions, highlighting their advantages and potential limitations.	**20**	**CO3**
Q 11	Critically evaluate the application of the 12 principles of Green Chemistry in designing a sustainable chemical synthesis, using specific examples. **OR** Discuss the possibility of environmental CO_2 as a starting material in polymer industry, food industry, and energy application(s).	**20**	**CO2**