MANIPAL UNIVERSITY

Reg No										

DEPARTMENT OF SCIENCES

III SEMESTER M. Sc. (CHEMISTRY) END SEMESTER EXAMINATIONS, NOV/DEC 2016

SUBJECT: GREEN CHEMISTRY [CHM 705]

REVISED CREDIT SYSTEM

Time: 3 Hours Date: 28/12/2016 MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Draw diagrams and write equations wherever necessary.

1A. Define bioavailability. Explain the ways to reduce the bioavailability with a suitable illustration/case study. **(2)**

1B. List out the green chemistry principles that are related to energy. **(3)**

1C. Calculate the E-factor, atom efficiency, effective mass yield, reaction mass efficiency and carbon efficiency for the following chemical processes. Given: At. wt. of C, O, H, S, N, K, Br are 12, 16, 1, 32, 14, 39 and 80 respectively.

(i) $CH_3CH_2CONH_2 + Br_2 + 4KOH \longrightarrow CH_3CH_2NH_2 + 2KBr + K_2CO_3 + 2H_2O$
The yield of the product obtained is 76 %.

(ii) $C_6H_6 + HNO_3 + \text{Conc. } H_2SO_4 \longrightarrow C_6H_5NO_2 + H_2O$
The yield of the product obtained is 68 %. **(5)**

2A. Discuss high-throughput syntheses with examples. **(2)**

2B. Why water is considered as a green solvent in organic synthesis? Write the oxidation and reduction reactions of carbonyl compounds in aqueous media. **(3)**

2C. i. Explain three different factors involved in calculating the measure of a greenness of an organic reaction.

ii. Describe, how various chemicals are produced from biomass. **(5)**

3A. Describe the different stages of life cycle considerations of a chemical product **(2)**

3B. Differentiate between the India's CLP and REACH in Europe. **(3)**

3C. Discuss the different methods of heterogenization of catalysts used for sustainable chemical processes. **(5)**

4A. What are crown ethers? Explain two reactions using crown ethers by green chemical aspect. **(2)**

4B. How the volatile organic compounds (VOC) produce photochemical smog in the atmosphere? Explain the reduction of VOCs in atmosphere by thermal oxidation. **(3)**

4C. i. What are ultrasounds? Explain any two types of sonochemical reactions.

ii. Discuss with a mechanism, how to overcome the problems due to strong base reagents in chemical reactions by using a phase transfer catalyst? **(5)**

5A. Explain the conventional and green methods of preparation of Aziridines **(2)**

5B. Describe a pollution causing incident in your neighborhood or in the society and suggest the green methods to prevent it. **(3)**

5C. i. Explain the difference between severity of a toxic effect and potency of a toxic chemical.

ii. Why is real-time, in-progress analysis beneficial to green chemistry? **(5)**

6A. Justify with a suitable example, "Less production is a green alternative" **(2)**

6B. Describe the green processes that can be implemented in the polymer industry. **(3)**

6C. i. Write important properties of ionic liquids. Explain two chemical reactions carrying out in Ionic liquid media.

ii. Write the advantages of biocatalysts. Explain any one oxidation and reduction reactions using biocatalysts. **(5)**

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