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: 29/11/2016 MAX. MARKS: 50

Instructions to Candidates:

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

1A. Define cleaner production. List out the benefits of cleaner production. Explain different steps involved it. **(2)**

1B. Differentiate between solid phase organic synthesis (SPOC) and fluorous biphasic organic synthesis, with a flow chart. **(3)**

1C. i. Explain in detail, the necessary green processes adopting in paper and pulp industry

ii. Write different reactions involved in the photochemical degradation of waste treatment. **(5)**

2A. Illustrate the following with suitable examples:
Chemoselectivity, shape selectivity, enantio selectivity and regio selectivity. **(2)**

2B. What are trihalomethanes (THMs)? How are the THMs forming in water? Suggest the green methods of removing the THMs in drinking water. **(3)**

2C. Explain the twelve principles of green chemistry. **(5)**

3A. Explain, how is SC-CO_2 act as an alternative green dry-clean agent? **(2)**

3B. What is environmental management system (EMS)? Explain the control and monitoring chemical processes of the aspects of EMS. **(3)**

3C. i. Differentiate between chemical and electrochemical syntheses and explain the electrochemical synthesis of adiponitrile.

ii. Explain the asymmetric synthetic methods by green chemistry approach. **(5)**

4A. Describe the conventional and green methods of synthesis of adipic acid. **(2)**

4B. What are the advantages of biological and renewable feed stocks? What are the most atom economical feed stocks? **(3)**

4C. Maleic anhydride is prepared by oxidation of benzene with an yield of 65% and by an oxidation of but-1-ene with an yield of 55%. Assume that the reactions are carried out in gas phase and the CO_2, H_2O and O_2 are non-toxic. Calculate the atom economy and effective mass yield of both the reactions. Which route would you recommend to industry? Outline the factors which might influence your decision. **(5)**

5A. Define polar, non-polar, protic and aprotic solvents. How the dielectric constant is useful to select the solvents to carry out green chemical reactions. **(2)**

5B. With a neat sketch of flow diagram, explain how the phosphate is precipitated by chemical method. **(3)**

5C. i. Explain the environmentally benign reactions with examples.

ii. Discuss the principle and mechanism of microwave synthesis and discuss the microwave assisted reactions in solid state. **(5)**

6A. Explain the role of selective catalysts in sustainable development. **(2)**

6B. Discuss the three oxidation reactions that can be carried out using TS-1 catalyst in presence of H_2O_2. **(3)**

6C. What are nanomaterials? List out the methods of preparation of nanomaterials. What are the advantages of green methods over the conventional methods of their preparation? **(5)**

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