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(Pages : 2)

Name.....

Reg. No.....

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2018

(CUCSS—PG)

Chemistry

CH 3E 03—GREEN CHEMISTRY AND NANO CHEMISTRY

(2015 Syllabus Year)

Time : Three Hours

Maximum : 36 Weightage

Section A

Answer all questions.

Each question carries 1 weightage.

1. Between benzene and 1-butene, which one is a greener starting material for the manufacture of maleic anhydride and why ?
2. For each molecule of glucose fermented, two molecules of ethanol and two molecules of CO₂ are formed. What is the atom economy of this enzymatic reaction ?
3. Explain why green chemistry promotes the use of alternative starting materials for chemical manufacture ? Give examples.
4. Write an example of a multi component reaction promoted by microwave energy input.
5. Which are the common solid supports used in microwave chemistry ?
6. Write an example of wherein CH₃-O-CO-O-CH₃ is used for methylations. What is its advantage over methyl iodide ?
7. What are rotaxanes and catenanes ?
8. How can nano TiO₂ be prepared ?
9. Explain the technique of surface plasmon spectroscopy.
10. Which are the various types of fullerenes that are now known ?
11. Which are the methods available for obtaining single walled carbon nanotubes ?
12. Comment on the superconductivity of Buckminsterfullerene.

(12 × 1 = 12 weightage)

Turn over

Section B

*Answer any eight questions.
Each question carries 2 weightage.*

13. What are ionic liquids? Why are these considered to be green solvents? Explain with examples, their use in chemical manufacture.
14. Describe the advantages of microwaves as an energy source to drive chemical reactions.
15. Write a brief description of microwave assisted multi component reactions.
16. Discuss the specific and non-specific effects of microwave activation.
17. Write the synthesis of a typical (i) phase transfer catalyst; and (ii) an ionic liquid.
18. Describe, with examples, Wittig and Friedel-Crafts reactions in ionic liquids ILs, stating the specific structure of the ILs used in these cases.
19. Explain how sol gel method could be used to prepare inorganic nano oxides and sulfides.
20. Write a brief note on condensation based nano material synthesis.
21. Illustrate, with suitable examples, the use of (i) sonochemical; and (ii) microwave assisted methods for the synthesis of nano materials.
22. Describe the principle of the method based on surface plasmons for nano material characterization.
23. Explain the principle of (i) TEM; and (ii) STM and illustrate their applications in nanoscience.
24. How can carbon nano tubes be chemically modified? What are the uses of such materials?

(8 × 2 = 16 weightage)

Section C

*Answer any two questions.
Each question carries 4 weightage.*

25. Describe the concepts which have led Paul Anastas to formulate the principles of green chemistry. State and explain the important ones among these.
26. Discuss with examples the use of (i) supercritical CO₂; and (ii) green oxidants in synthesis.
27. Write brief notes on (i) atomic force microscopy; (ii) scanning ion conductance microscopy; (iii) Scanning thermal microscopy; and (iv) Scanning near field optical microscopy.
28. Illustrate the methods available for the synthesis of nanowires. What are their properties and applications?

(2 × 4 = 8 weightage)