

**B.Sc. CHEMISTRY**  
**FIFTH SEMESTER (SPECIAL REPEAT)**  
**GREEN CHEMISTRY**  
**BSC-505 A**

(Use separate answer scripts for Objective & Descriptive)

Duration : 3 hrs.

Full Marks : 70

( PART-A: Objective )

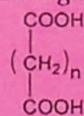
Time : 20 min.

Marks : 20

Choose the correct answer from the following:

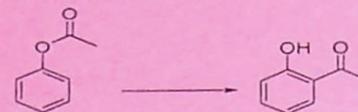
1X20=20

- The fundamental advantage of sono chemistry in organic synthesis without using any solvent is to provide
  - High yield of desired product
  - High energy requirement
  - High waste
  - None of these
- One of the principles of Green Chemistry says is to produce \_\_\_\_\_ products.
  - Harmful
  - Commercial
  - Safer
  - Most use
- Green synthetic method is \_\_\_\_\_ than the conventional method.
  - More costlier
  - More efficient
  - Slower
  - Less efficient
- Diels-Alder reaction between furan and maleic acid in presence of benzene under reflux condition is not an example of
  - Greener approach
  - Non-green approach
  - Conventional procedure
  - Harmful method
- Which of the following is among the 12 Principles of Green Chemistry?
  - Design of costly products
  - Design benign Chemicals
  - Use of toxic reagent as catalyst
  - Use of toxic reagent as solvent
- In green synthetic methods, the high quality product with no \_\_\_\_\_ are produced.
  - Good products
  - Catalyst
  - Reaction
  - Contamination
- The atom economy for the following reaction is  
 $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) = 2\text{H}_2\text{O}(\text{g}) + \text{CO}_2(\text{g})$ 
  - 54%
  - 44%
  - 70%
  - 50%
- What will be the value of 'n' of the following structure for adipic acid?

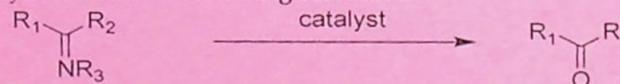


- n = 1
- n = 2
- n = 3
- n = 4

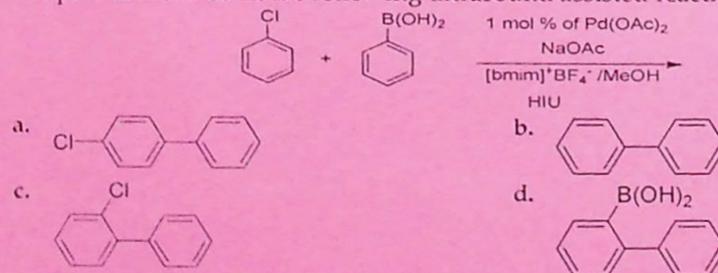
9. Which is the most suitable reaction condition for the following reaction?



- a.  $\text{Al}_2\text{O}_3 / \mu\text{W}$   
 b.  $\text{AlCl}_3 / \mu\text{W}$   
 c.  $\text{Al}(\text{OH})_3 / \mu\text{W}$   
 d.  $\text{AlCl}_3 / \text{heat (conventional)}$
10. Benzaldehyde can be converted to cyanobenzene by  
 a.  $\text{NH}_3 / \mu\text{W}$   
 b.  $\text{NBS} / \mu\text{W}$   
 c.  $\text{NH}_2\text{OH} / \mu\text{W}$   
 d.  $\text{MeNH}_2 / \mu\text{W}$
11. The most suitable reagent for  $-\text{CH}_2\text{COOH}$  group addition is  
 a. Diethyl oxalate  
 b. Diethyl maleate  
 c. Diethyl malonate  
 d. Diethyl succinate
12. BHT is highly important compound as it can act as  
 a. Oxidant  
 b. Sunscreen  
 c. Coagulant  
 d. Antioxidant
13. The green synthesis of methyl methacrylate involves  
 a. Iron as catalyst  
 b. Reductive addition reaction  
 c. Oxidative elimination reaction  
 d. Insertion reaction
14. In green chemistry, DMC is used as:  
 a. A oxidizing agent  
 b. A reducing agent  
 c. Selective methylating agent  
 d. A polymer
15. The green catalyst used in the following reaction is



- a. CLAYAN in presence of DCM  
 b. PTC in presence of DCM  
 c. Ultrasound in presence of  $\text{KMnO}_4$   
 d. DMC in presence of DCM
16. A very known example of biomimetic synthesis is  
 a. Claisen rearrangement  
 b. Suzuki coupling reaction  
 c. Reformatsky reaction  
 d. Robinson synthesis of the alkaloid tropinone
17. The product formed in the following ultrasound assisted reaction is



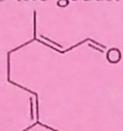
18. Which of the following is used as a monomer in the formation of polycarbonates?
- a. Dimethyl carbonate
  - b. Diethyl carbonate
  - c. Diphenyl carbonate
  - d. Di-isopropylcarbodiimide
19. 'KA' oil is the mixture of
- a. hexanone & hexanol
  - b. cyclohexanone & cyclohexanol
  - c. petanone & pentanol
  - d. cyclopentanone & cyclopentanol
20. Which of the following type of synthesis can be considered as "Future aspects in green chemistry?"
- a. Non-Covalent Derivatization
  - b. Biomimetic synthesis
  - c. Combinatorial synthesis
  - d. All of these
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( PART-B : Descriptive )

Time : 2 hrs. 40 min.

Marks : 50

[ Answer question no.1 & any four (4) from the rest ]

1. a. "Green Chemistry is sustainable chemistry" - Explain the statement. 3  
b. Mention the role of ultrasonic irradiation in organic synthesis with one chemical reactions 2  
c. Write the structure of ibuprofen and show its green chemical synthetic approach. 5
2. a. Discuss the advantages of microwave irradiation in organic synthesis over the conventional method. Justify your answer with suitable chemical reactions. 5  
b. Why catalytic routes are always preferred in Green Chemistry rather than using in stoichiometric amount in performing a chemical reaction. 3  
c. Write the example of one green and non-green solvent. 2
3. a. Define atom economy of a chemical reaction with appropriate example. What is the percentage of atom economy for any [4+2] cycloaddition reaction? 3  
b. Write the structure of methylmethacrylate. Discuss its green chemical synthesis. 3  
c. What is the principle behind ultrasonic wave? 2  
d. What are the advantages of solvent free synthesis over conventional synthesis? 2
4. a. Discuss the green synthesis of Citral. 5  
  
b. What is orthoester? Discuss the Orthoester Claisen rearrangement reaction and the role of green chemistry on it. 5
5. a. What are ionic liquids? Write two advantages of ionic liquids used in synthesis over conventional methodology. Justify your answer with example of chemical reaction both in presence of ionic liquids and for the conventional method. 5  
b. Why protection-deprotection chemistry is not considered as Green Chemistry? 3  
c. Among the two different types of catalysts, homogeneous and heterogeneous catalyst which one of them can be considered as green catalyst. Justify with suitable explanation. 2

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| 6. | a. Discuss the general or industrial synthesis of Catechol, highlighting the drawbacks of these synthetic routes and depict its green chemical synthetic route. | 6 |
|    | b. Discuss the green chemical oxidation reactions of different substrates.  | 4 |
| 7. | a. What is Non Covalent Derivatization? Why it is considered as a green technique over conventional method of synthesis?  | 3 |
|    | b. What is biomimetic synthesis? Explain.   | 2 |
|    | c. Give the examples of two syntheses which are considered as solvent free synthesis.   | 3 |
|    | d. What do you mean by combinatorial synthesis? Explain briefly.  | 2 |
| 8. | a. What is DMC? What is the role of DMC in green chemistry? Explain with examples.  | 4 |
|    | b. Write a short note on the role of CLAYAN as a green reagent.   | 3 |
|    | c. What is the role of ultrasound in Reformatsky reaction? Explain with suitable chemical reaction.   | 3 |

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