



**2021/TDC/CBCS/ODD/  
CHMDSE-503T/296**

**TDC (CBCS) Odd Semester Exam., 2021  
held in March, 2022**

**CHEMISTRY**

**( 5th Semester )**

Course No. : CHMDSE-503T

**( Green Chemistry )**

Full Marks : 50

Pass Marks : 20

Time : 3 hours

*The figures in the margin indicate full marks  
for the questions*

**SECTION—A**

Answer any *fifteen* from the following as directed :

1×15=15

1. What is green chemistry?
2. Green chemistry focuses on a process that reduces the use and generation of \_\_\_\_\_.

( Fill in the blank )



( 2 )

3. Which act for the first time dealt with prevention of formation of pollutants?
4. Green syntheses were developed for existing products by using starting material that use \_\_\_\_\_ rather than petrochemicals.  
( Fill in the blank )
5. State any two of the listed twelve principles of green chemistry.
6. State the principle that talks about atom economy in the listed twelve principles of green chemistry.
7. A raw material of feedstock should be \_\_\_\_\_ rather than depleting wherever technically and economically practicable.  
( Fill in the blank )
8. Which of the following is not a principle of green chemistry?
- (a) Green solvent and auxiliaries
  - (b) Use of renewable feedstock
  - (c) Hazardous chemical synthesis
  - (d) Design for energy efficiency
- ( Choose the correct answer )

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( Continued )

( 3 )

9. Which of the following is a green solvent used for bleaching cloths?
- (a) Hydrogen peroxide
  - (b) Tetrachloroethene
  - (c) Benzene
  - (d) Toluene
- ( Choose the correct answer )
10. Benzene, a \_\_\_\_\_ substance, is an important industrial solvent used in the production of pharmaceuticals, plastics and dyes.
- (a) odorless
  - (b) non-flammable
  - (c) biodegradable
  - (d) carcinogenic
- ( Choose the correct answer )
11. A desirable green solvent should be
- (a) costly
  - (b) toxic
  - (c) readily available
  - (d) synthetic
- ( Choose the correct answer )

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( Turn Over )





( 4 )

12. We must use feedstock derived from annually renewable resources or from
- chemicals
  - organic compounds
  - abundant waste
  - plants

( Choose the correct answer )

13. How are energy requirements for chemical synthesis met in green chemistry?

14. How does a catalyst help to keep the energy requirement to a minimum?

15. Why are microwaves considered more efficient source of heating than conventional steam?

16. What is the frequency range of microwave?

17. Write the frequency range of ultrasound used in chemical synthesis.

18. Name the device by which electrical energy can be converted into sound energy.

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( Continued )

( 5 )

19. What is formed when elemental tellurium is reduced?

20. Write the name and structure of the reagent that can be selectively used to methylate-active methylene compounds.

SECTION—B

Answer any five from the following questions :

2×5=10

21. How can the goals of green chemistry be achieved?

22. Write any two novel green innovations that have been implemented by the industries.

23. Give one example each of a (a) chemo-selective and (b) regioselective reaction.

24. Carry out the cycloaddition of 1,3-butadiene and ethene, and also calculate the percentage atom economy of the reaction.

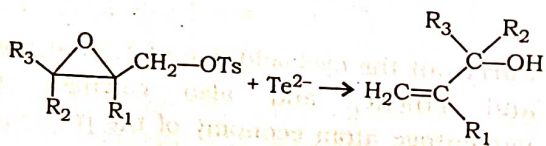
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( 6 )

25. Write a few uses of chlorofluorocarbons and also discuss how it adversely affects the environment.
26. What do you mean by dry ice? What happens when dry ice is placed at room temperature and pressure?
27. Write a green method for the synthesis of benzyl bromide from toluene that gives 100% yield.
28. Carry out the hydrolysis of benzamide by a green method. How is this method superior to usual hydrolysis?
29. How can you carry out esterification of carboxylic acids at ambient temperature? What are the advantages of this process?
30. Write the mechanism of the following reaction :



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( Continued )

( 7 )

SECTION—C

Answer any five from the following questions :

5×5=25

31. (a) Write the mechanism of depletion of ozone layer by  $\text{NO}_x$  (oxides of nitrogen). 3  
(b) Why is Bhopal Disaster considered most tragic in the history of mankind? 2
32. Write a note on 'metathesis method' in organic synthesis.
33. Which of the following four types of reactions is environmentally preferable? Explain with reasons and example :  
(a) Substitution reaction  
(b) Elimination reaction  
(c) Addition reaction  
(d) Rearrangement reaction
34. (a) "Wherever practicable synthetic methodologies should be designed to use and generate substances that possess little or no toxicity to human health and the environment." Justify the statement. 3

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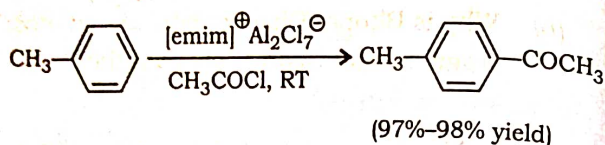




( 8 )

(b) "Chemical products should be designed to preserve efficacy of function while reducing toxicity." Explain.

35. (a) The following Friedel-Crafts acylation is carried out in ionic liquid :



Write advantages of this reaction over conventional method.

2½

(b) Write a few features of ionic liquids as green solvents.

2½

36. Explain 'supercritical carbon dioxide' state by a phase diagram. Why is supercritical carbon dioxide considered as green solvent?

3+2=5

37. Carry out the synthesis of the following compounds by green method and mention the advantages of these methods over conventional methods of synthesis :

2½×2=5

(a) Paracetamol

(b) *p*-cresol (4-hydroxytoluene)

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( Continued )

( 9 )

38. (a) Give an example of a decarboxylation reaction under microwave irradiation. Write how this method is superior to the conventional method of decarboxylation.

2½

(b) Convert *p*-cresylacetate ( $\text{CH}_3\text{-C}_6\text{H}_4\text{-OCOCH}_3$ ) into 2-hydroxy-5-methylacetophenone using microwave irradiation. What are the advantages of this method?

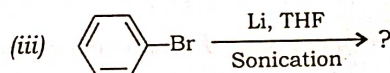
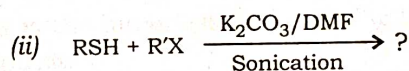
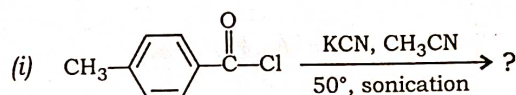
2½

39. (a) Write the advantages of using tellurium in chemical synthesis.

2

(b) Predict the product(s) of the following ultrasound-assisted reactions :

1×3=3



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( Turn Over )



40. (a) What are the limitations of conventional methylations of active methylene groups? How can active methylene compounds be selectively methylated by green method? Illustrate with an example. 1+2=3

(b) How can nitration of an arene be carried out in presence of clayan? Give an example. 2

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