Total number of printed pages–6

4 SEM PG CHM (CBCS) GAR 407

2025

(June)

CHEMISTRY

Paper : 407 (C)

(General Approaches to Research)

Full Marks : 60

Time : Three hours

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

UNIT–I

Marks : 30

1. Describe the major steps involved in the research process, explaining the significance of each step in ensuring a systematic study. 4

2. Answer ***any two*** of the following : 2×4=8

   (a) Discuss the role of motivation in initiating and sustaining a research project.

(b) Elaborate on the different objectives of research, giving suitable examples.

(c) Analyze the relationship between research and the scientific method with relevant illustrations.

(d) Define the criteria of good research and explain their importance in evaluating research quality.

3. What is the purpose of conducting a literature survey in research ? Describe the key steps involved in preparing an effective literature review. 4

4. What are the essential features of an effective research design ? Justify whether a single design can suit all research problems or not. 4

5. (a) Define standard deviation. Calculate the standard deviation of the following data : 1+2=3

S. No.	1	2	3	4	5
X	2	3	3	6	8

(b) What is the impact factor of a journal and how is it calculated ? 2

Or

How does cite score differ from the impact factor ?

(c) Explain the difference between a journal's impact factor and an author's h-index. 2

Or

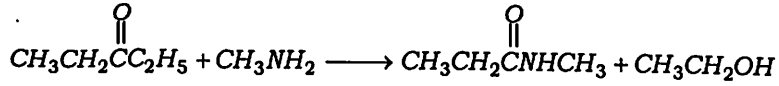
Name *at least two* scientific journals found in chemistry. Also mention their publishing houses.

(d) Define skewness. Describe how skewness indicates the direction and degree of asymmetry. 1+2=3

UNIT–II (A)

Marks : 15

6. Define atom economy. With example discuss atom economy in elimination reactions. Calculate the percentage atom economy of the following reaction : 1+2+2=5



$$CH_3CH_2\overset{O}{\overset{\|}{C}}C_2H_5 + CH_3NH_2 \longrightarrow CH_3CH_2\overset{O}{\overset{\|}{C}}NHCH_3 + CH_3CH_2OH$$

7. Discuss he advantages of using Supercritical CO_2 as a solvent in place of organic solvents. 5

Or

What are ionic liquids ? Discuss the role of ionic liquids and PEGs as green solvents. 1+2+2=5

8. How to synthesize Carbaryl by green method ? Justify your answer. 5

Or

What are the advantages of green synthesis ? How can adipic acid be synthesized using green method ? 2+3=5

UNIT–II (B)

Marks : 15

9. Answer the following questions :

   (i) How can ibuprofen be synthesized using green method ? 2

   (ii) Describe in brief why the use of microwave for synthesis is considered as green technique. 2

   (iii) Explain the working principle of a sonicator. 2

Or

"Use of ultrasound is considered as a green technique in chemical synthesis." Explain this statement with the help of examples.

10. Describe the following processes : ***(any two)*** 2×2=4

    (i) Michael addition reaction under microwave irradiation

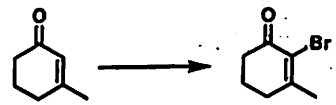
    (ii) Cannizzaro reaction under sonication

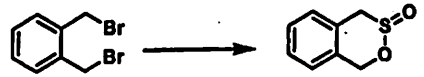
    (iii) Green synthesis of adipic acid

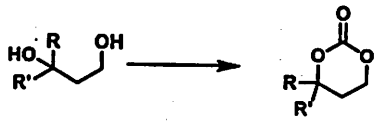
11. Describe the biomimetic multifunctional reagents with example. 2

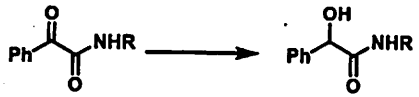
12. Answer ***any one*** of the following : 3

    (a) Give the green reagent for the following conversions : *(any three)* 1×3=3

    (i) 

    (ii) 

(iii) 

(iv) 

Or

(b) Answer the following questions : 1½+½=3

(i) Explain the use of Rongalite in organic synthesis.

(ii) Explain the concept of combinatorial green chemistry and how it is useful in pharmaceutical industries.
