

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86
(For candidates admitted during the academic year 2019-20& thereafter)

SUBJECT CODE: 19CH/PC/RM34

M.Sc. DEGREE EXAMINATION, NOVEMBER 2022
BRANCH IV - CHEMISTRY
THIRD SEMESTER

COURSE : MAJOR CORE

PAPER : RESEARCH METHODOLOGY (THEORY)

TIME : 90 Mins

MAX. MARKS : 50

SECTION-A

Answer any TEN of the following

(10x2=20 Marks)

1. Give any two applications of foot note in a research article.
2. What is the purpose of bibliography in thesis writing?
3. Expand and give the meaning for the following: (i) *ibid.* (ii) *ISBN*
4. Distinguish between graphical abstract and the abstract in chemical science journals.
5. Expand the names of the following journals:
(i) *Adv. Heterocycl. Chem.* (ii) *Anal. Bioanal. Chem.*
6. List out the rules for writing SI units in a scientific writing.
7. Give any two web sources to find out structure of the compound.
8. Define H-index?
9. What is Beilstein database?
10. Mention any two secondary sources used in chemical literature.
11. Give the application of bar graph in scientific writing.
12. Write any two disadvantages of tertiary sources of literature.

SECTION-B

Answer any five of the following:

(5x6=30 Marks)

13. What are the guidelines for preparing figures in thesis writing.
14. Discuss the steps involved in publishing an article in a scientific journal.
15. What are patents? Explain the basic requirements for patentability in detail.
16. Write a short note on Plagiarism.
17. Explain the following online literature search (i) *Web of Science* and (ii) *Scopus*

18. Identify the errors in the given table, and give the corrected table

Tab 1 Kinetic data of a reaction

Experiment No	[A] (mol dm ⁻³)	[B] (mol dm ⁻³)	[C] (mol dm ⁻³)
1	0.215	0.15792	0.00245 X10 ²
2	0.27	0.212	0.346
3	3X10 ⁻¹	0.143	0.49879

19. Explain the role of Cheminformatics in drug discovery.

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PAPER : RESEARCH METHODOLOGY (PRACTICALS)

TIME : 90 Mins

MAX.MARKS : 50

SECTION-A

Answer any TEN of the following (10x2=20 Marks)

1. Convert the given IUPAC name to a 3D structure in Chem Draw

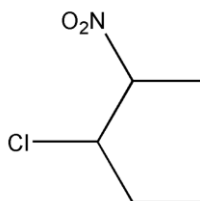
1-chloro-3-[2-methoxyethyl]-2-nitrohexane

2. In a class of 15 students a volumetric analysis test was conducted and their endpoints are as follows:

17.7, 17.4, 17.3, 17.5, 17.1, 17.6, 17.6, 17.5, 17.5, 17.4, 17.3, 17.5, 17.6, 17.5, 17.1

Find the mean and median for the above values.

3. Give the IUPAC name and the C-Cl, C-N bond lengths of the given molecule using Chem Draw.



4. A compound has been prepared by four different methods. Calculate the % yield of the product in each method and draw a bar chart by plotting different methods vs % yield of the product, where % Yield = [Actual yield / Theoretical yield] * 100

Yield of the product	A	B	C	D
Theoretical yield	48	67	85	96
Actual yield	32.5	61	65	40

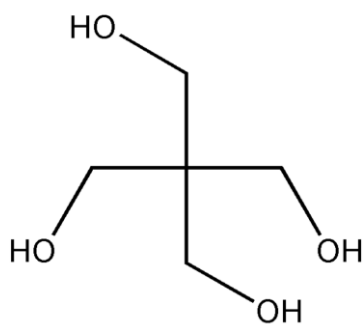
5. Draw a pie chart for the following data:

Pollutant	Percentage presence
Particulate Matter	32%
CO	1%
NO ₂	36%
SO ₂	8%
O ₃	23%

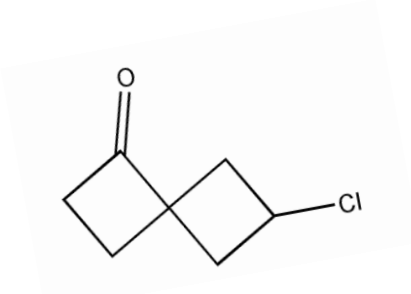
6. Give the elemental analysis of Ethoxybenzene using Chem Draw

7. Draw the labelled ball and stick model of [10]-annulene using Chem Draw

8. Find the IUPAC name of the compound given below using Chem Draw



9. Find the Cl-C-H bond angle and C=O bond length in the following molecule



10. Draw the distribution curve for the molecular weight of polymer vs the number of moles of chains present in the polymer

Molecular weight of polymer	No. of moles of chain
10000	22
15000	36
20000	59
25000	85
30000	120
35000	78
40000	56
45000	34
50000	30

11. Plot a graph for the following data in Excel:

C (ms ⁻¹)	P(C) at 27°C	P(C) at 227°C
0	0	0
1	2.84	1.35
2	9.6	4.88
3	16.3	9.27
4	19.6	13.02
5	18.5	15.02
6	14.3	14.64
7	9.4	10.34
8	5.3	4.81
9	2.6	3.02
10	1.1	2.55
11	0.41	1.57
12	0.13	0.37

12. Find the standard deviation of the amount of Ca (mg/L) present in water samples collected from different areas of the city:

41, 192, 104, 156, 102, 147, 94, 92, 35, 184, 56, 88, 80, 104, 72

SECTION-B

Answer any FIVE of the following (5 x 6 = 30 Marks)

13. Calculate the first order rate constant for the given data.

Time (sec)	20	32	40	60	80	100	120	140
[A]	5.5	4.6	4	2.9	2.1	1.5	1.05	0.75

Draw the graph of log [A] versus time and determine k for the reaction.
(k = - slope * 2.303)

14. The percentage composition (by weight) of a solution is 45% X, 15% Y and 40% Z. Calculate the mole fraction of each component in the solution.

Molecular mass of X = 18, Y = 60 and Z = 60

Where, Mole fraction = Number of moles / Total number of moles;
 Number of moles = Weight % / Molecular mass

15. The experimental data for the decomposition of nitrogen pentoxide in the gaseous phase at 300 K is as follows: $E_a = 100,000 \text{ J mol}^{-1}$, $A = 10^{10} \text{ s}^{-1}$. What is the half life period of the reaction at 300 K?

$$\log(k) = \log(A) - \frac{E_a}{2.303RT} \quad t_{\frac{1}{2}} = \frac{0.693}{k}$$

16. The wave function for the particle in 1D- box is given as

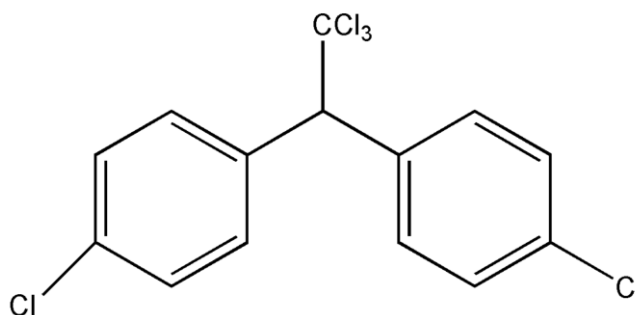
Formula

$$\psi_n = \sqrt{\frac{2}{a}} \sin \frac{n_x \pi_x}{a}$$

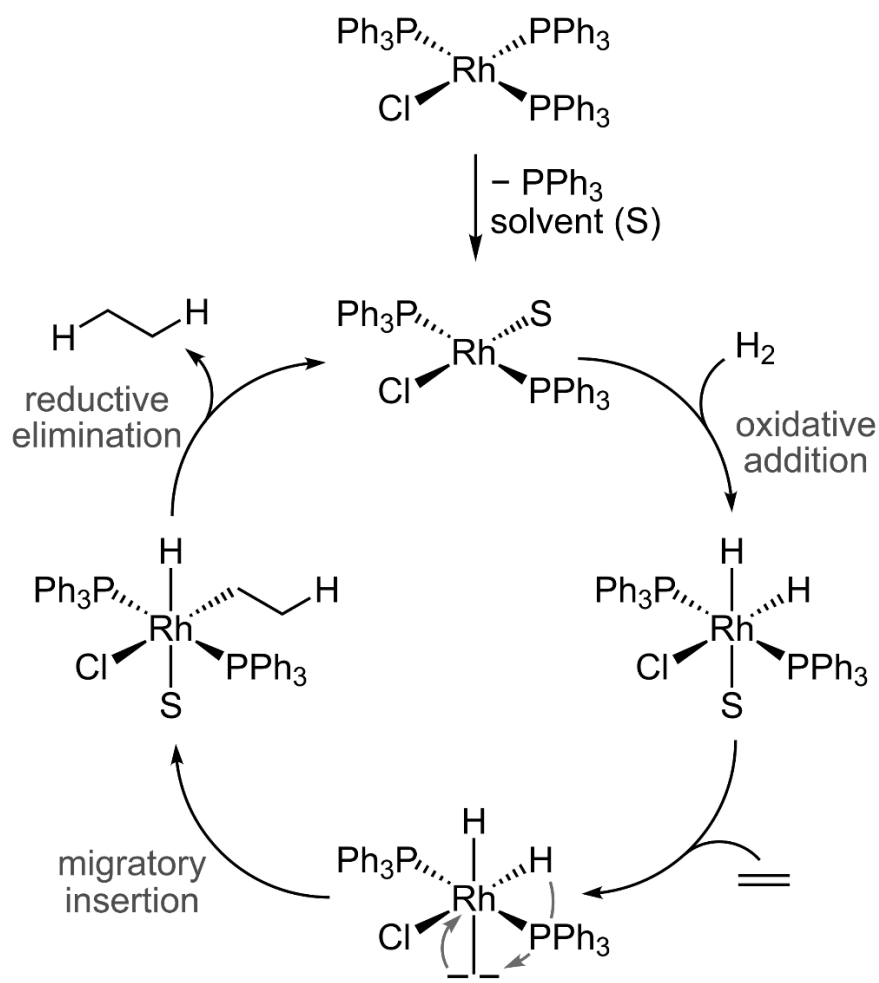
$$\psi_n = \sqrt{\frac{2}{a}} \cos \frac{n_x \pi_x}{a}$$

Where $a = 1$; $n_x = 1$; $\pi_x = 0, 5, 10, 15, 20, 25, 30 \text{ \& } 35$. Calculate ψ for sine wave and cosine wave. Draw sine wave and cosine wave graph by plotting π_x vs ψ . (3+3)

17. (a) Determine the spectral data (H-NMR and C13 NMR) for the following using Chem Draw (3)
 (i) 1-Methoxy-7-bromonaphthalene
 (ii) 3-Chloro-2-nitropentane
 (b) Give the IUPAC name and 3D structure of the following molecule (3)



18. Draw the given catalytic cycle using Chem Draw.



19. Draw the following reaction using Chem Draw.

