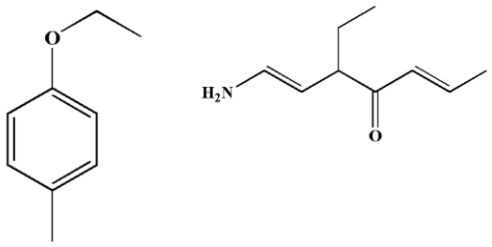
STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86
(For candidates admitted during the academic year 2023-24 & thereafter)

SUBJECT CODE: 23CH/PC/RM34

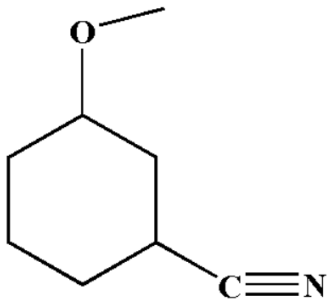
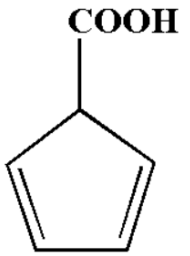
M.Sc. DEGREE EXAMINATION, NOVEMBER 2024
BRANCH IV - CHEMISTRY
THIRD SEMESTER

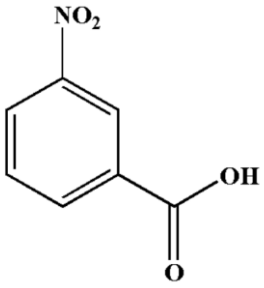
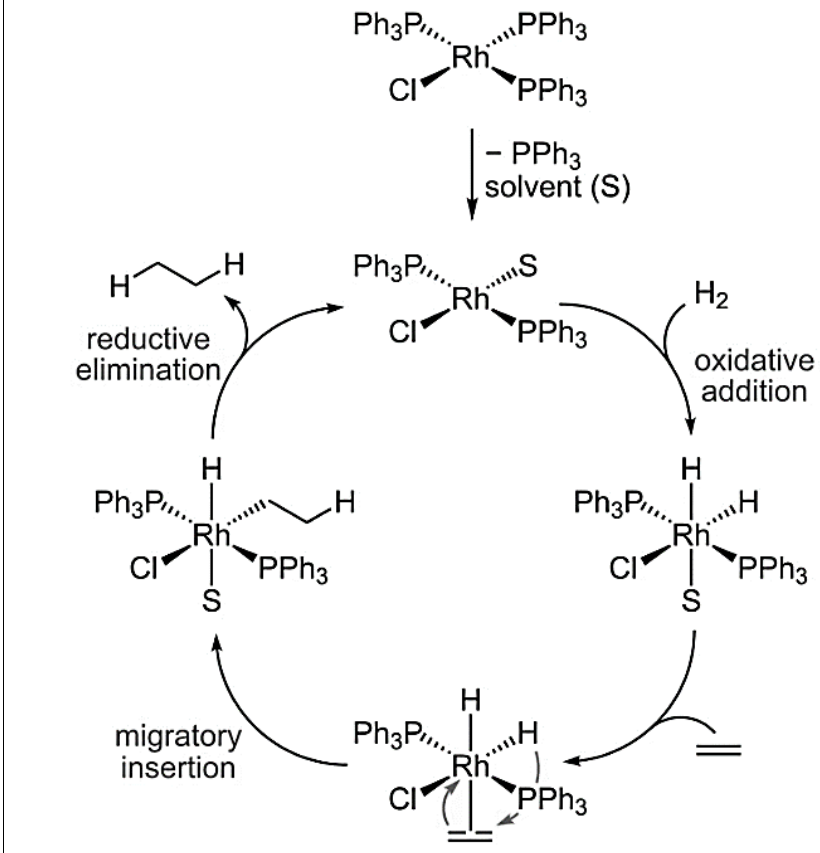
COURSE : MAJOR CORE
PAPER : RESEARCH METHODOLOGY (PRACTICAL)
TIME : 90 Mins **MAX. MARKS : 50**

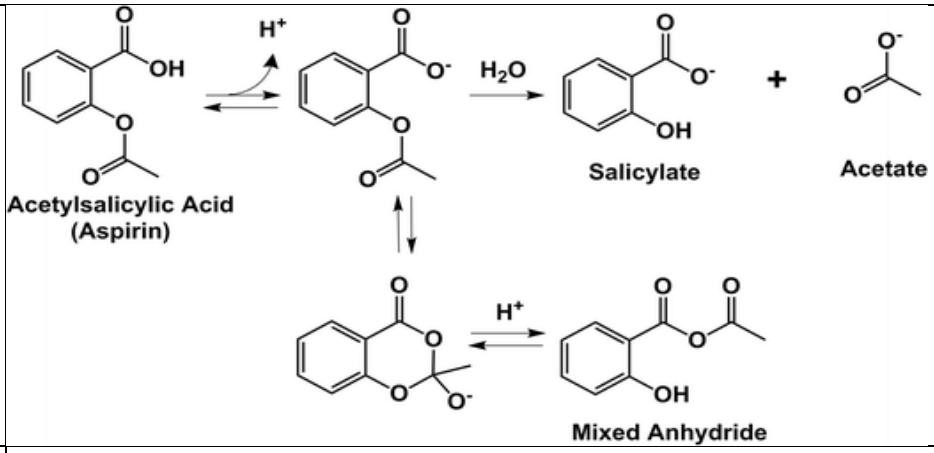
Q. No	SECTION A	CO	KL
1	**Answer all Questions (2x 2=4)**		
(i)	The composition of an alloy is 18% Chromium, 8 % Nickel, 66% ,Iron, 5% Manganese, and 3% Silicon. Draw a Pie chart for the following data.	CO1	K1
(ii)	Give the IUPAC name of the following compounds (a) (b) 	CO1	K1
2	**Answer all Questions (4x 2=8)**		
(i)	The following data gives the percentage efficiency of an organic synthesis by different methods. Draw a bar chart for the data and infer the best method for this preparation.	CO2	K2
(ii)	Draw an X-Y graph for the following data and compare the slopes of the two lines obtained.	CO2	K2

Method	Percentage yield
Chemical	80
Electrochemical	67
Microwave-assisted	95
photochemical	45
Solvent less green synthesis	25

Time	Volume of NaOH for reaction 1, ml	Volume of NaOH for reaction 2, ml
5	10.2	8.1
10	14.5	9.2
15	17.7	10.6
20	19.6	11.5
25	22.3	12.4
30	27.4	13.1

<table>
<tr><td>(iii)</td><td>Compare the C-O-C and C-N-C bond angles of the following molecule
  </td><td>CO2</td><td>K2</td></tr>
<tr><td>(iv)</td><td>Outline the mass spectral data for the following molecule using ChemDraw
  </td><td>CO2</td><td>K2</td></tr>
<tr><td>3</td><td>Answer all Questions (4x 2=8)</td><td></td><td></td></tr>
<tr><td>(i)</td><td>Calculate the mean, median and mode for the following data using excel.
<table>
<tr><th>Sample No.</th><th>Concentration of lead in ppb</th></tr>
<tr><td>1</td><td>5</td></tr>
<tr><td>2</td><td>12</td></tr>
<tr><td>3</td><td>7</td></tr>
<tr><td>4</td><td>15</td></tr>
<tr><td>5</td><td>8</td></tr>
<tr><td>6</td><td>7</td></tr>
<tr><td>7</td><td>9</td></tr>
<tr><td>8</td><td>14</td></tr>
<tr><td>9</td><td>10</td></tr>
<tr><td>10</td><td>7</td></tr>
</table></td><td>CO3</td><td>K3</td></tr>
<tr><td>(ii)</td><td>Draw the distribution curve for the molecular weight of the polymer vs the number of moles of chains present in the polymer.
<table>
<tr><th>Molecular Weight of polymer</th><th>No. of moles of chains</th></tr>
<tr><td>10000</td><td>20</td></tr>
<tr><td>20000</td><td>58</td></tr>
<tr><td>35000</td><td>90</td></tr>
<tr><td>15000</td><td>35</td></tr>
<tr><td>45000</td><td>100</td></tr>
<tr><td>40000</td><td>112</td></tr>
<tr><td>50000</td><td>94</td></tr>
<tr><td>25000</td><td>78</td></tr>
<tr><td>30000</td><td>82</td></tr>
<tr><td>55000</td><td>85</td></tr>
<tr><td>70000</td><td>40</td></tr>
<tr><td>60000</td><td>80</td></tr>
<tr><td>65000</td><td>55</td></tr>
</table></td><td>CO3</td><td>K3</td></tr>
</table>

(iii)	Make use of Chemdraw and produce the ^{13}C and ^{1}H NMR for the following molecule 	CO3	K3
(iv)	Draw the three-dimensional ball and stick model of 2,5-dimethyl-1,3-dinitrobenzene and calculate its dipole moment using ChemDraw.	CO3	K3
	SECTION B Answer all the questions (6 x 5=30)		
4(a)	Draw the following chemical reaction using ChemDraw 	CO4	K4
	(or)		
4 (b)	Draw the following chemical reaction using ChemDraw	CO4	K4

			
5 (a)	The following table gives the equilibrium constant at different temperatures for the reaction $2NO(g) + O_2 == 2NO_2(g)$ T/K: 600 | 700 | 800 | 900 | 1000 K_p/atm^{-1}: 140 | 5.14 | 0.437 | 0.0625 | 0.0131 Calculate the standard enthalpy change (ΔH) for the reaction in this temperature range by plotting a graph for the following equation. (Log Kp = - ΔH/2.303 RT + Constant), R = 8.314 J/mole/K	CO5	K5
	(or)		
5(b)	The rate constants of a chemical reaction are $1x10^{-3}$ s^{-1} and $2x10^{-3}$ s^{-1} at 30^0C and 40^0C respectively. Calculate the energy of activation of the reaction using the formula given below:	CO5	K5
6(a)	The wave function for the particle in a one-dimensional box is given as: $\psi n = (\sqrt{(2/a)})\sin[(nx\prod x)/a];$ where, a = 3; nx = 1,2,3; ∏x = 0,5,10,15,20,25,30 & 35; Calculate, ψ1, ψ2, ψ3 Draw sine wave by plotting ∏x vs ψ1, ψ2, ψ3	CO6	K6
	(or)		
6(b)	The wave function for the particle in a one-dimensional box is given as: $\psi n = (\sqrt{(2/a)})\cos[(nx\prod x)/a];$ where, a = 5; nx = 1,2,3,4; ∏x = 0,2,4,6,8,10,12 & 14; Calculate, ψ1, ψ2, ψ3, ψ4 Draw cosine wave by plotting ∏x vs ψ1, ψ2, ψ3, ψ4	CO6	K6