

## Supporting Information file

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### Dual-target ligand discovery for Alzheimer's disease: Triphenylphosphoranylidene derivatives as inhibitors of acetylcholinesterase and $\beta$ -Amyloid aggregation

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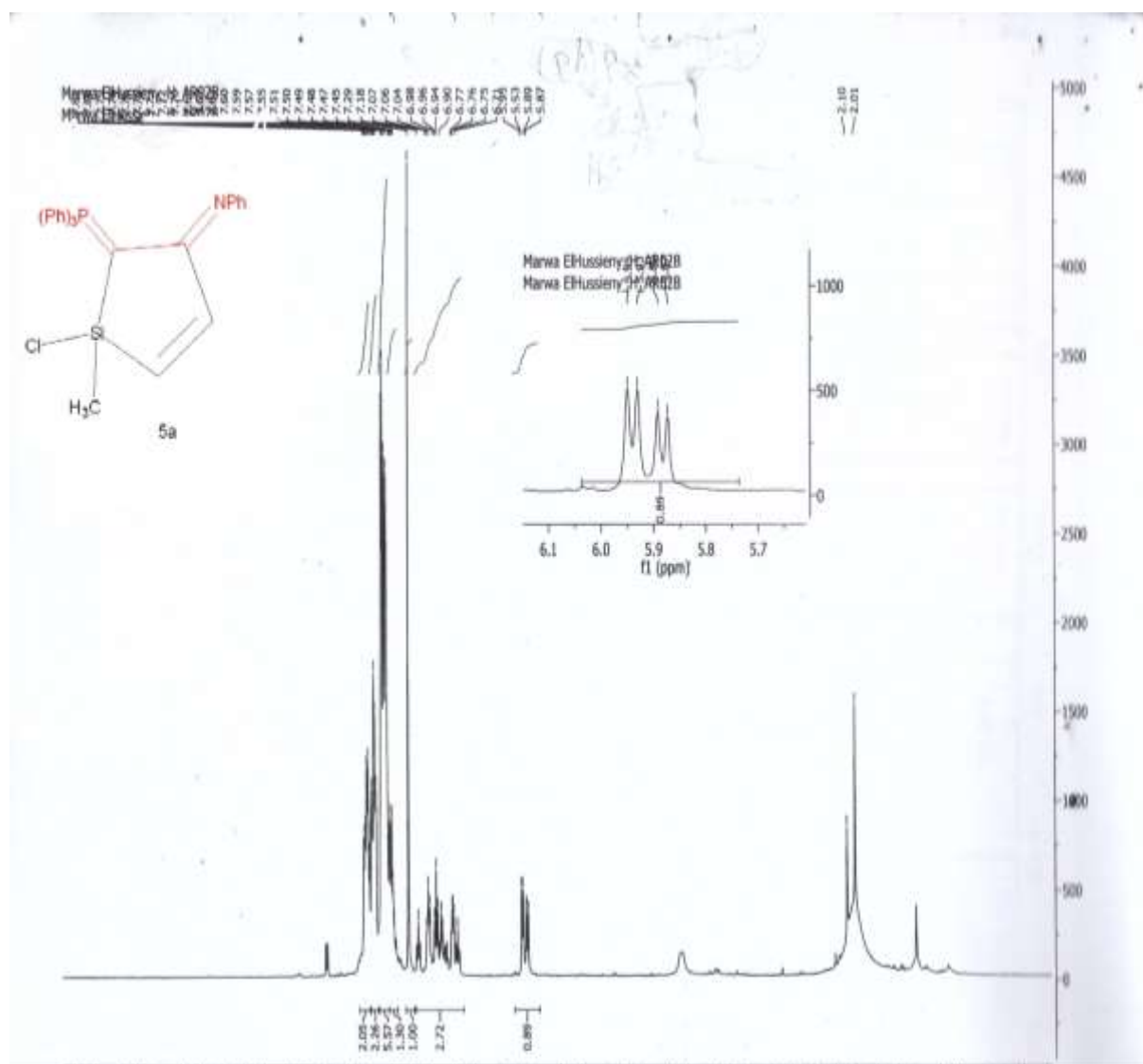
### ***S1. Experimental***

#### ***S1.1. Chemistry***

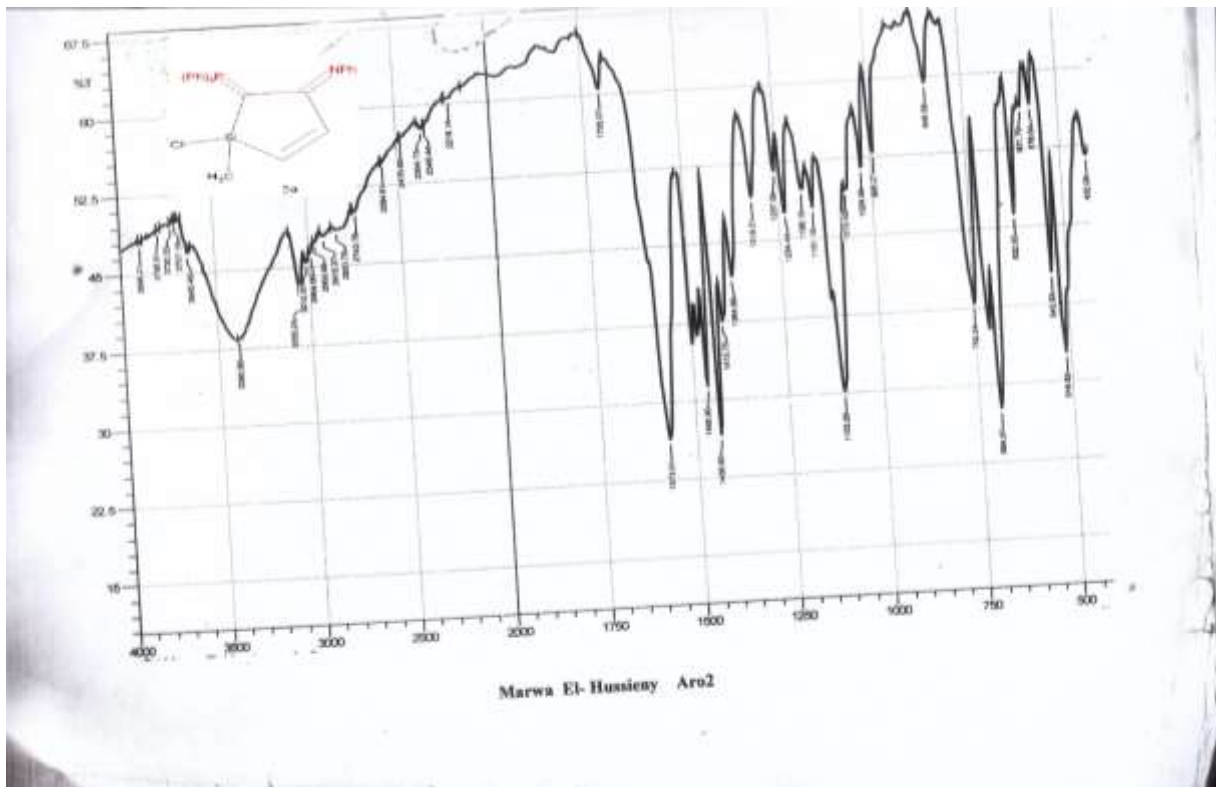
Melting points were determined with an electro thermal digital melting point apparatus (Electro-Thermal Engineering Ltd., Essex, United Kingdom). The IR spectra were recorded in KBr disks on a Pye Unicam SP 3300 and Shimadzu FT IR 8101 PC Infrared Spectrophotometers (Pye Unicam Ltd. Cambridge, England and Shimadzu, Tokyo, Japan, respectively). <sup>1</sup>H and <sup>13</sup>C NMR spectra were obtained from a Jeol ECA 500 MHz NMR Spectrometer (Tokyo, Japan) using deuterated dimethylsulphoxide (d<sub>6</sub>-DMSO) as a solvent and (TMS) as an internal reference at 500, 125 MHz, respectively and <sup>31</sup>P NMR spectra were obtained from a Jeol ECA 500 MHz NMR Spectrometer at 200 MHz. Mass spectra (EI-MS) were obtained with ISQ (Single Quadrupole MS, Thermo Scientific). Elemental analyses (C, H, N) results were recorded with Elementar Vario EL Germany, phosphorus was measured by spectrophotometric methods. The recorded yields are of pure isolated materials obtained by column chromatography silica gel 60 (Merck) and thin layer chromatography (TLC) which was performed on Merck Kiesel gel F254 precoated plates (Merck, Darmstadt, Germany).

*S2. Copies of IR, <sup>1</sup>H NMR, <sup>13</sup>C NMR and <sup>31</sup>P NMR spectra of final compounds*

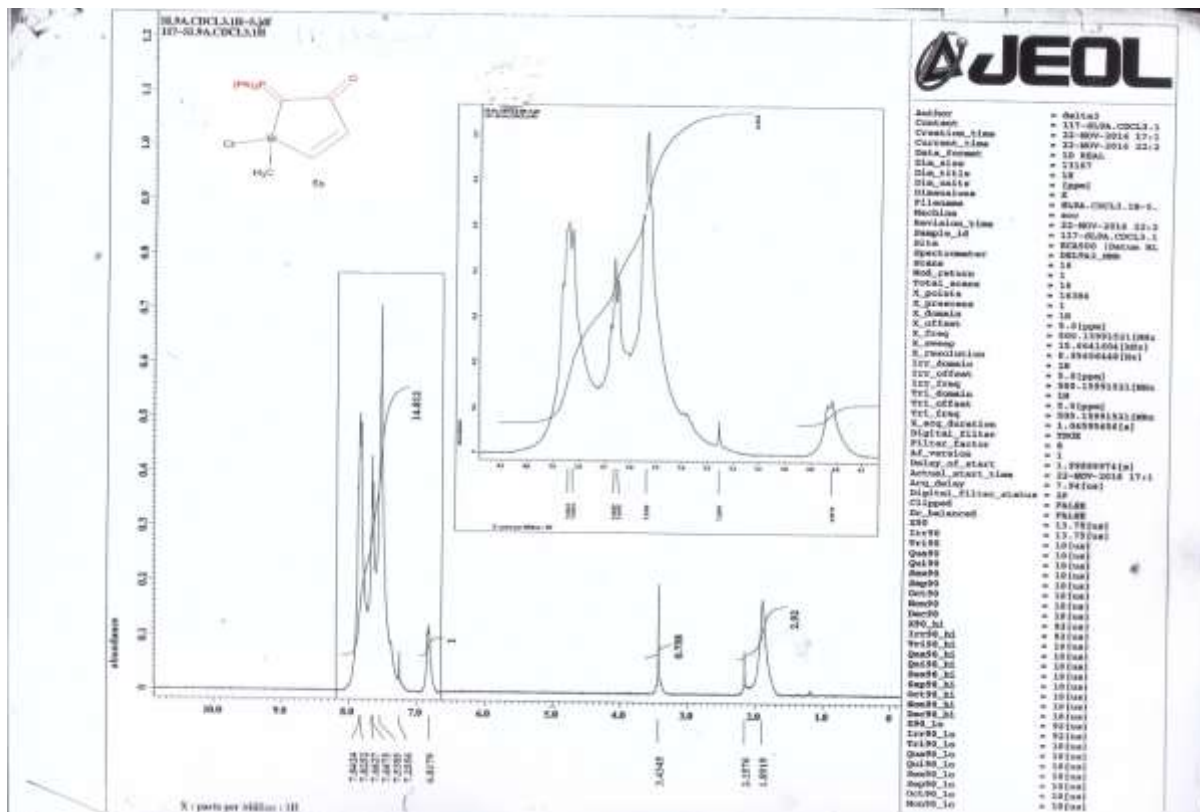
*<sup>1</sup>H NMR, <sup>13</sup>C NMR, <sup>31</sup>P NMR and IR compound 5a*



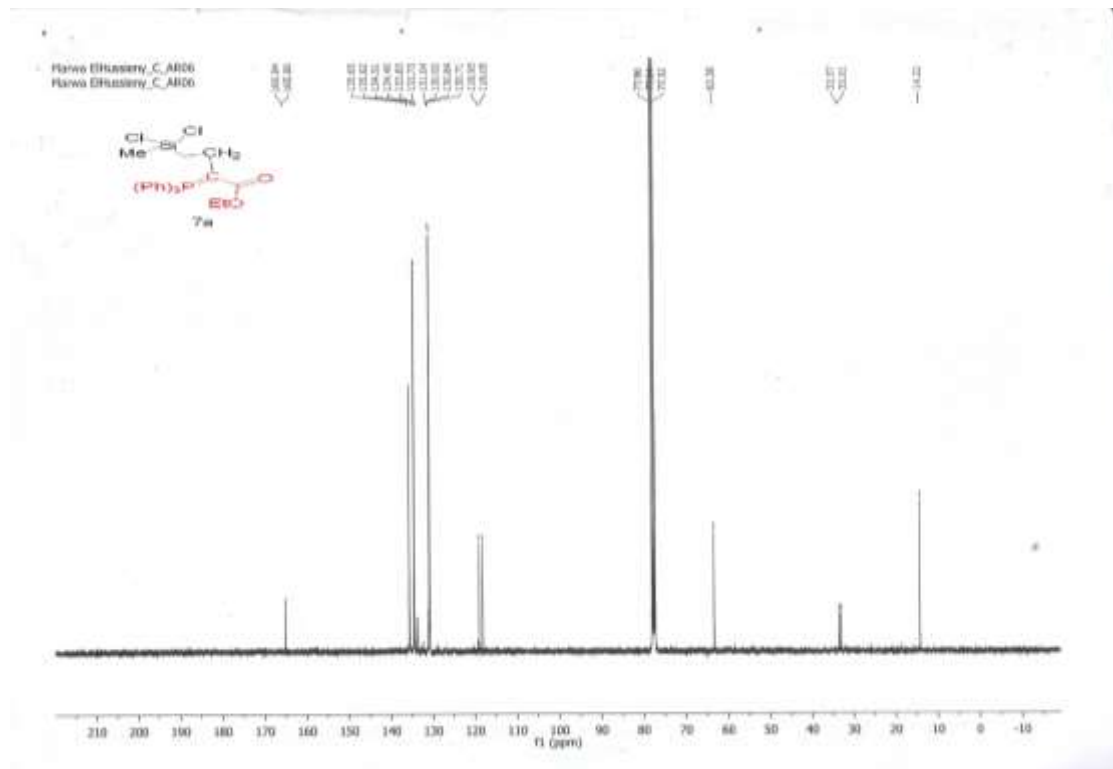
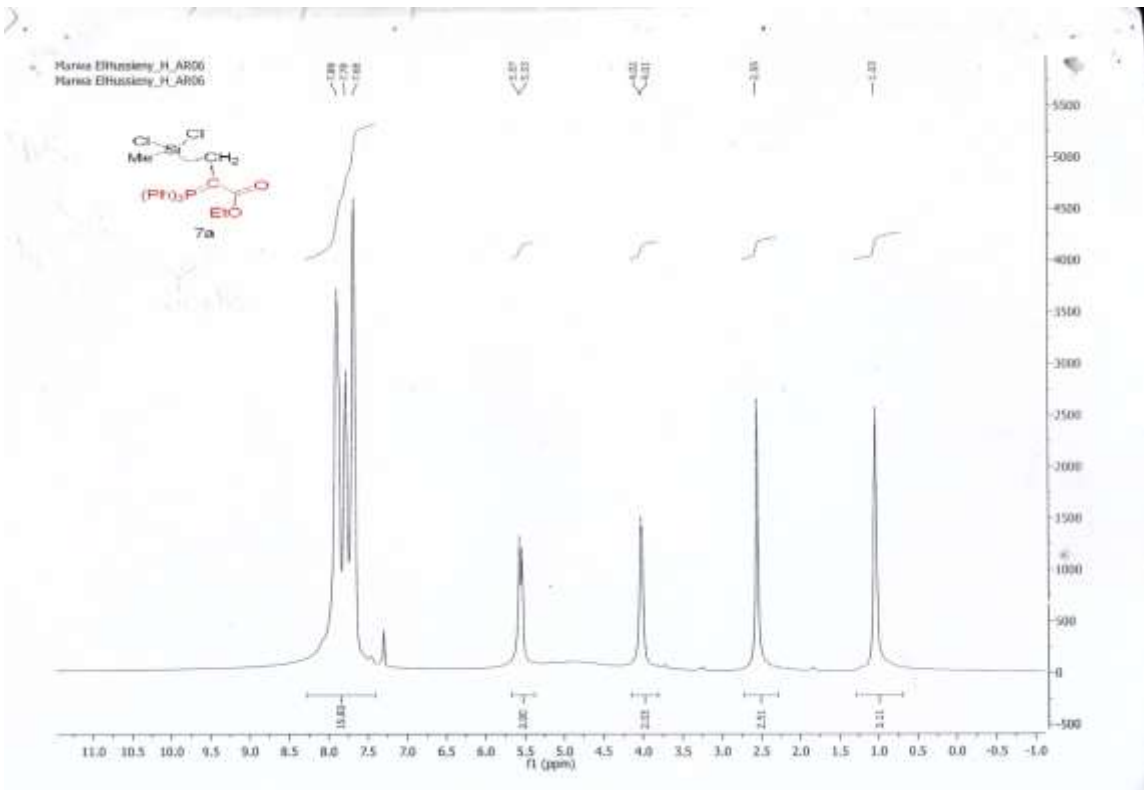


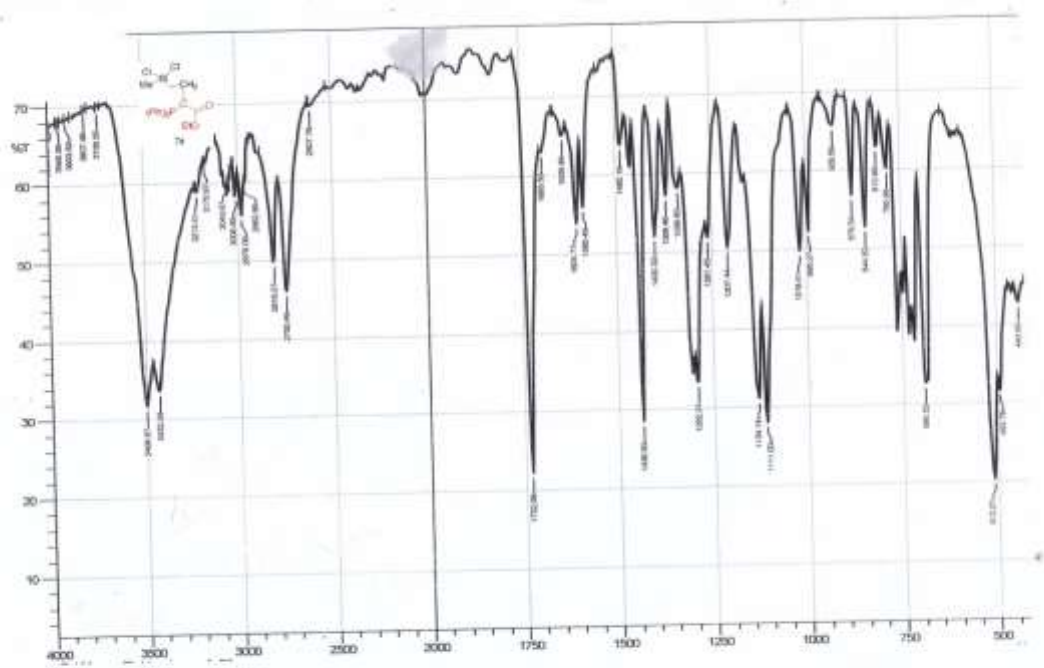


*<sup>1</sup>H*NMR, *<sup>31</sup>P*NMR and IR compound 5b



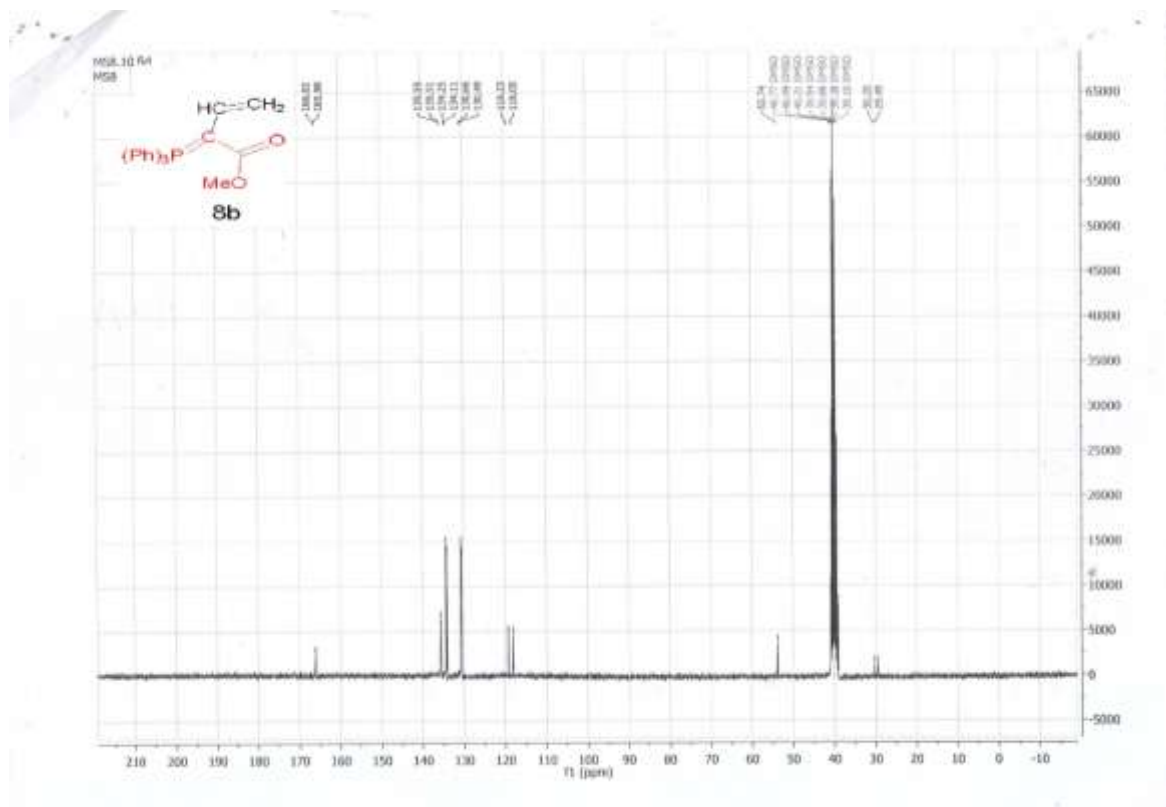
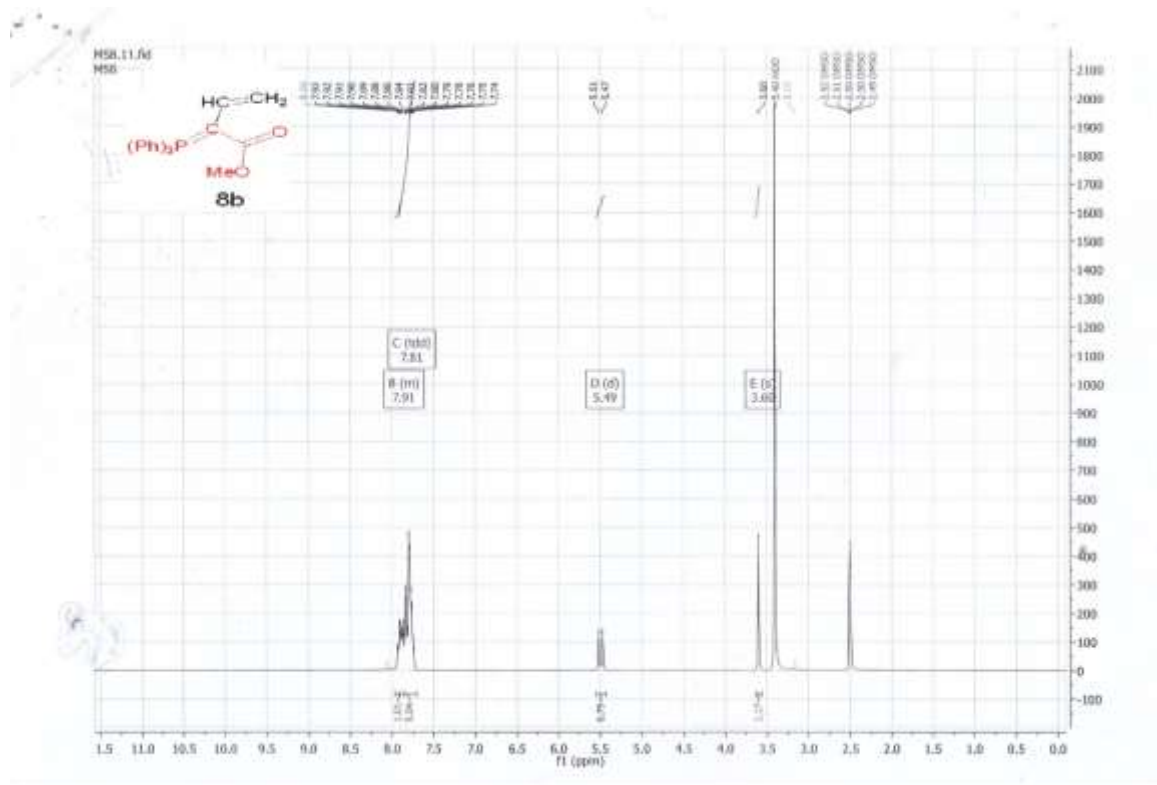






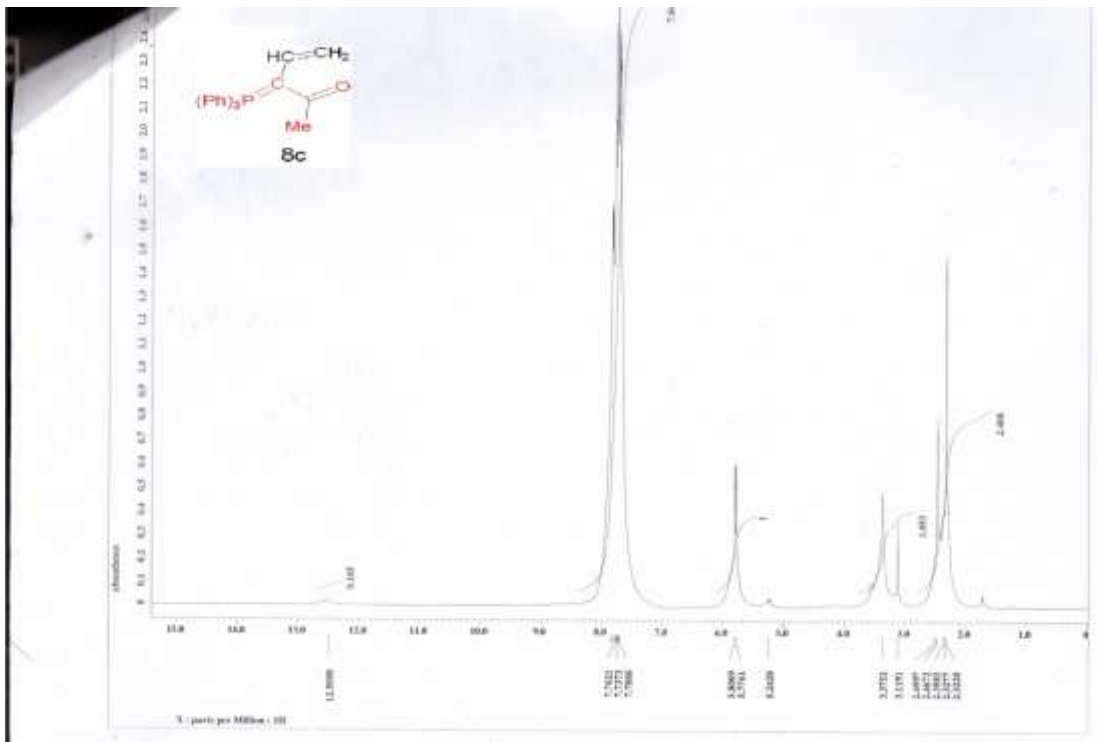
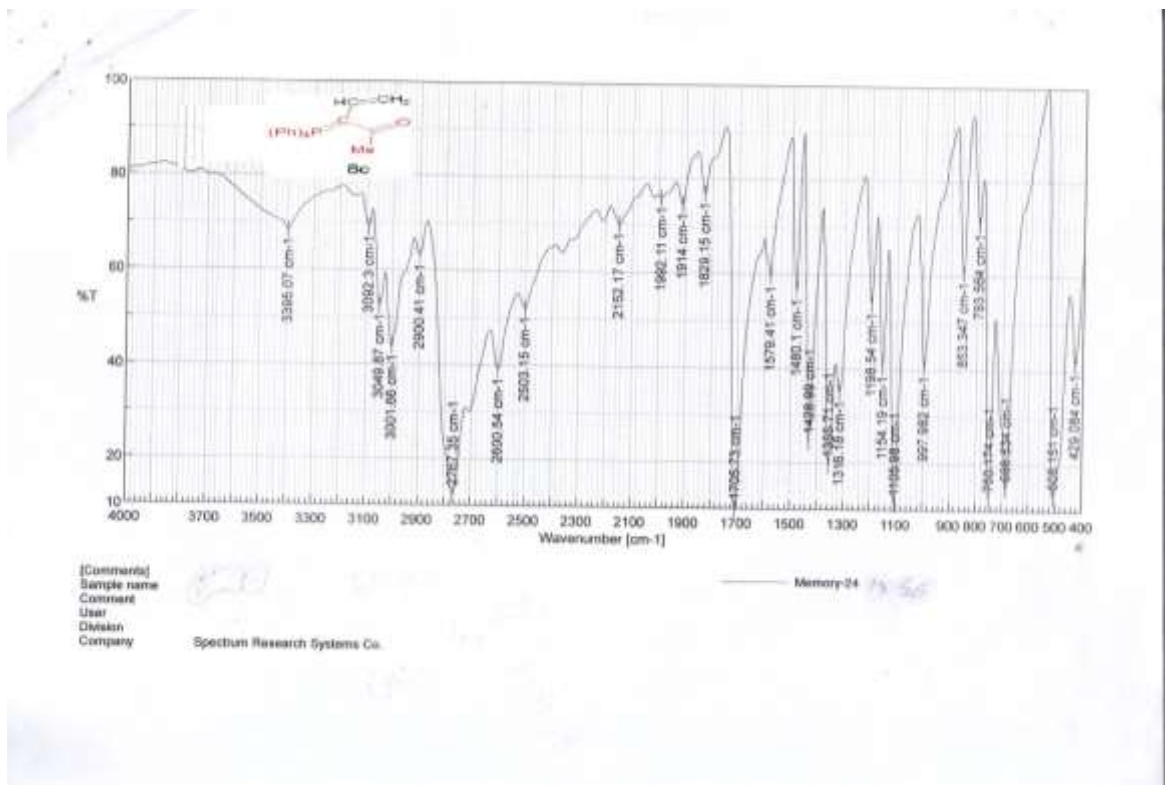
Marwa El-Hussieny ArO6

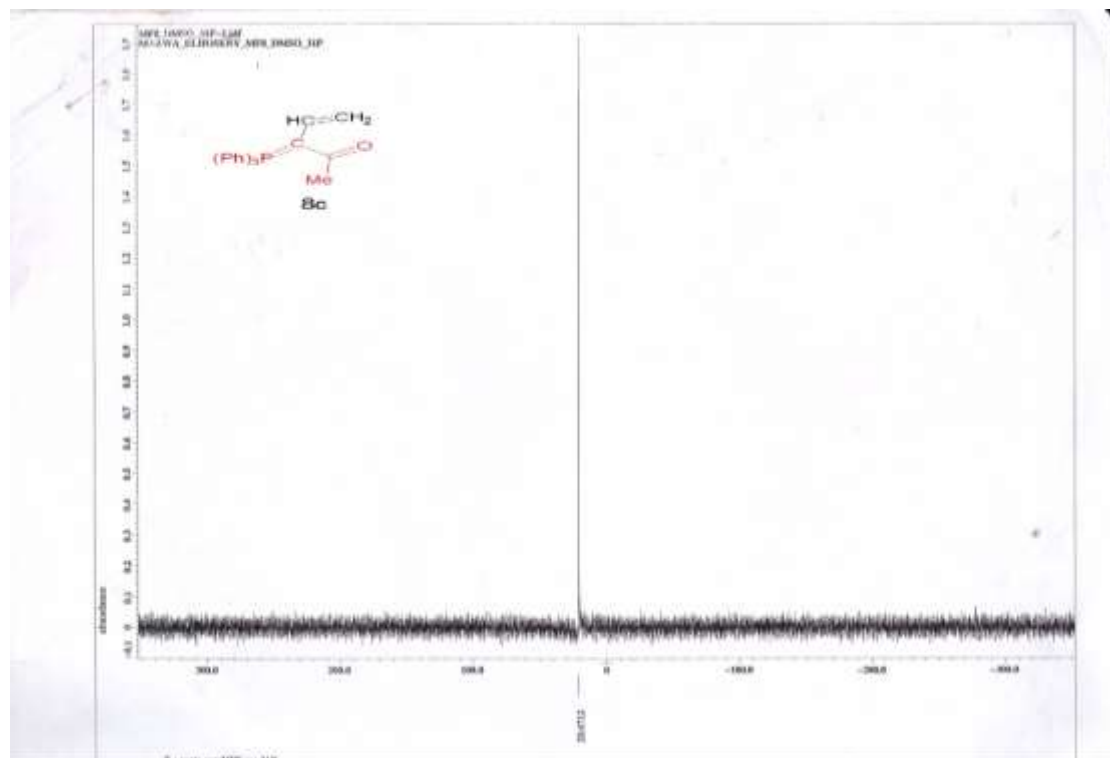
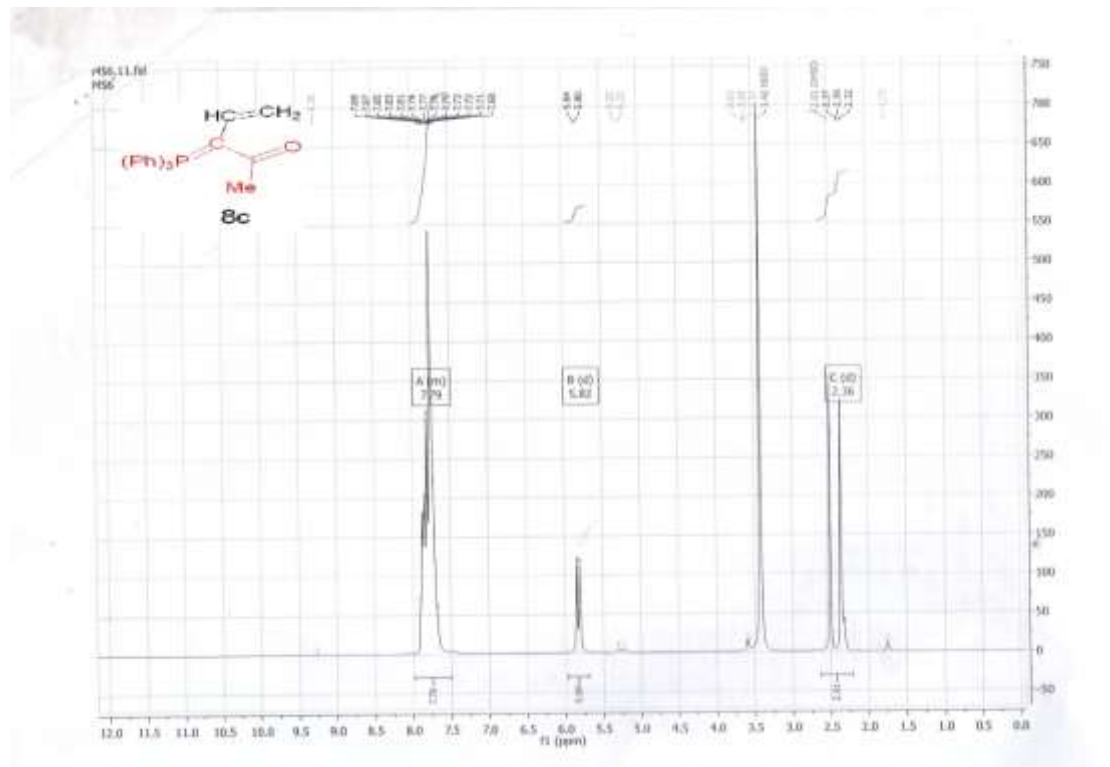
***<sup>1</sup>H NMR, <sup>13</sup>C NMR, <sup>31</sup>P NMR and IR compound 8b***



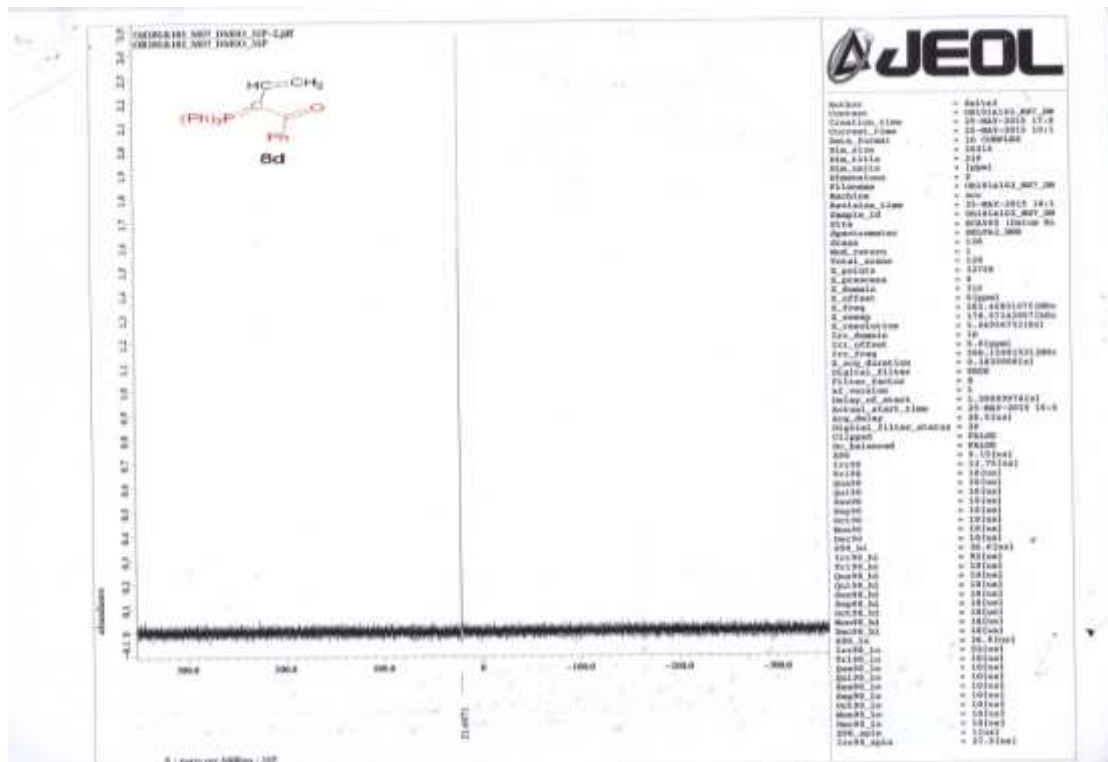
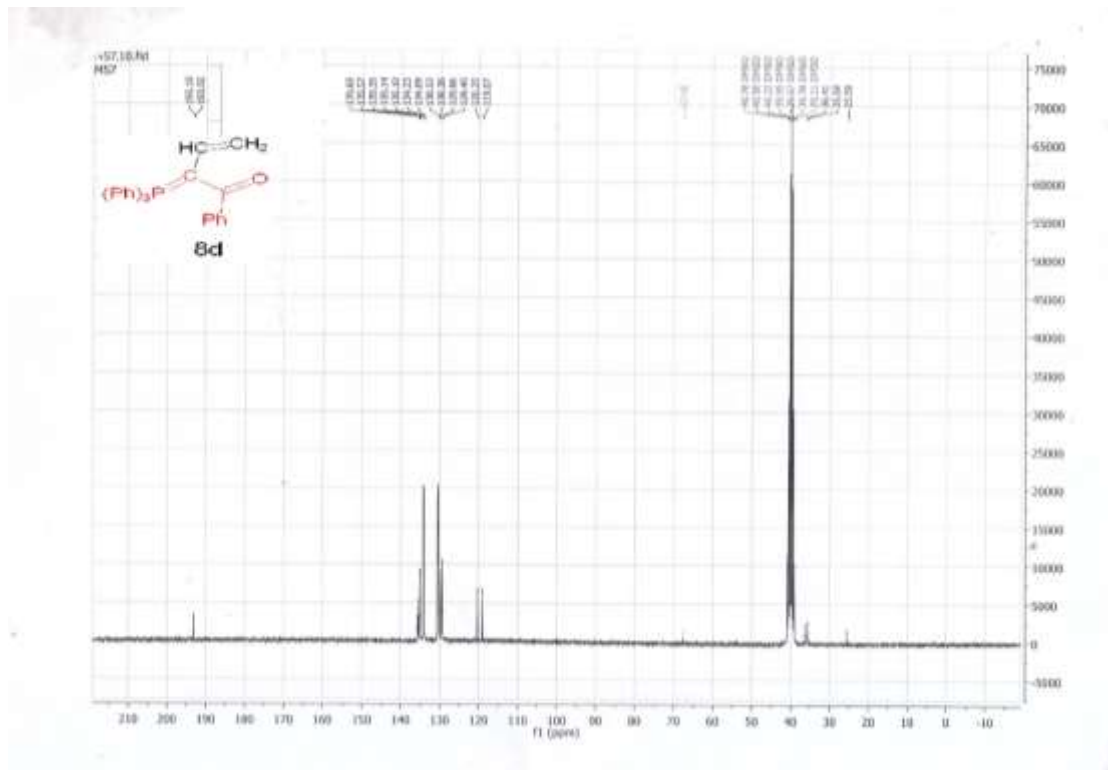


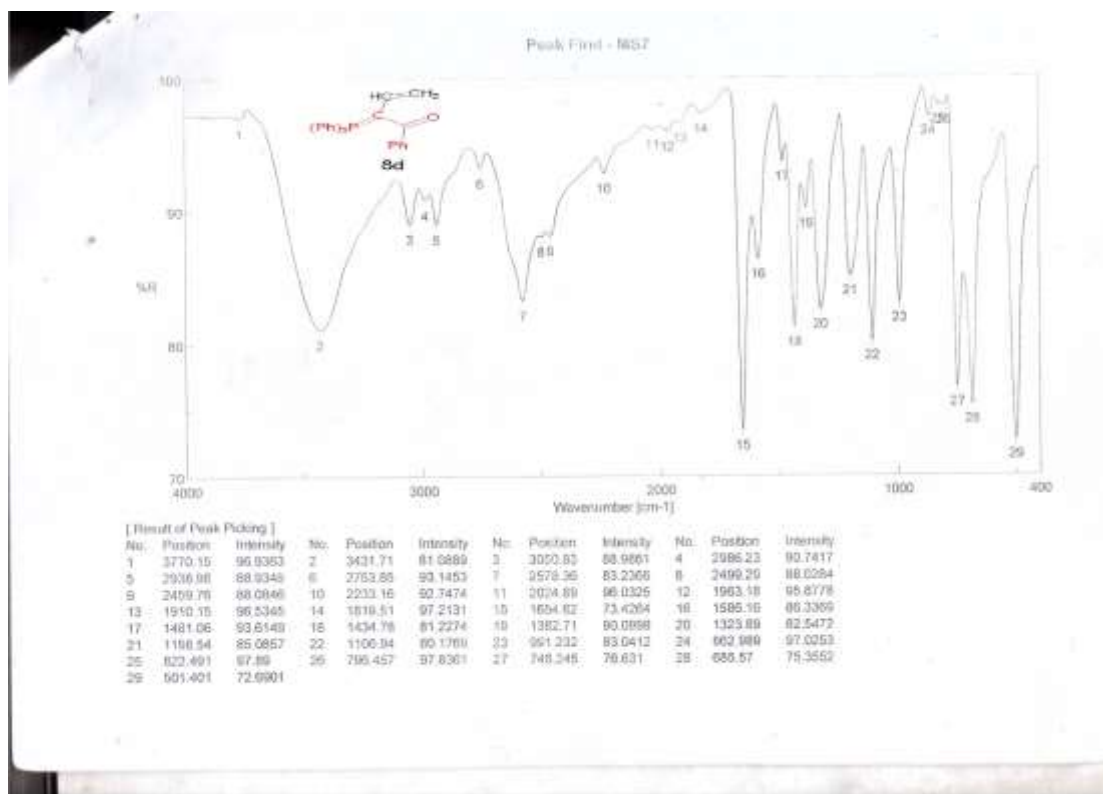




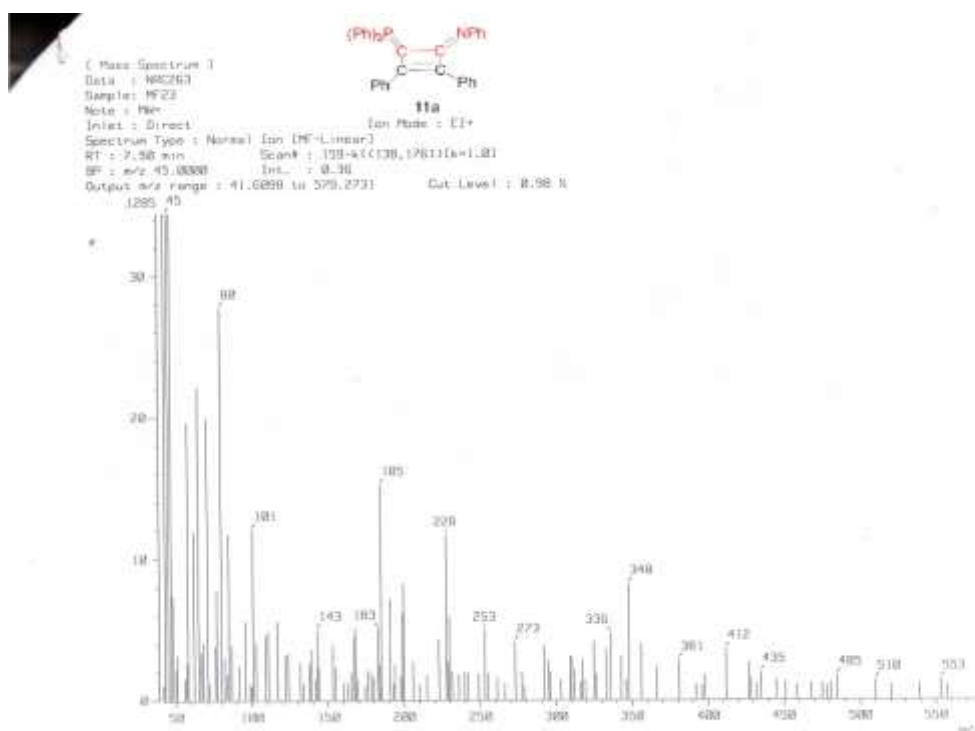


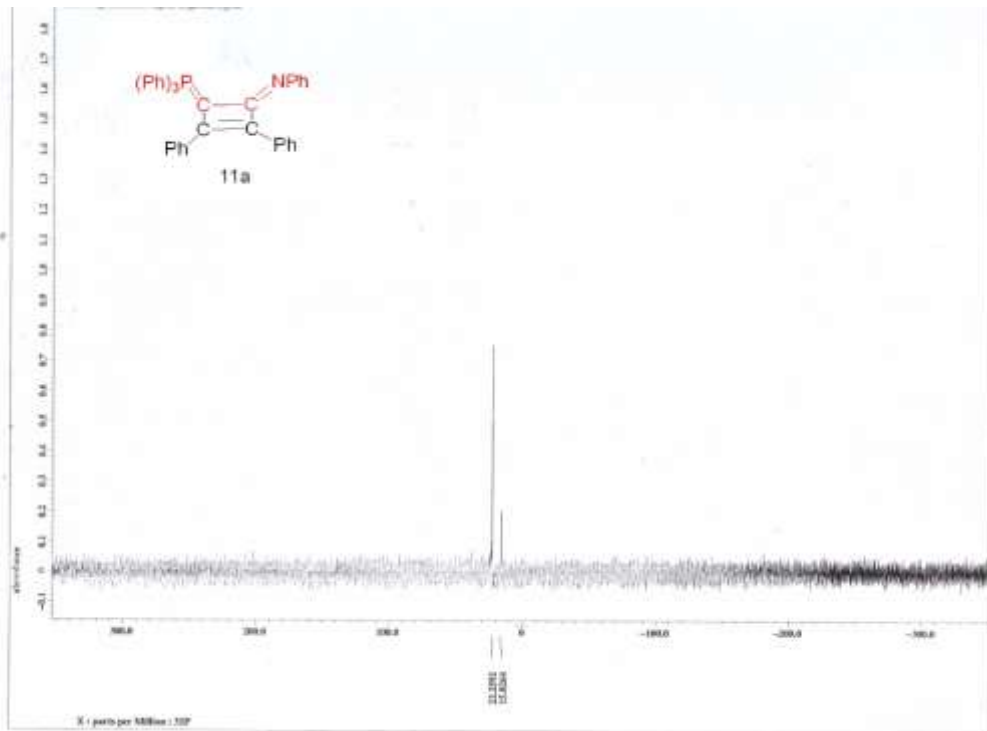




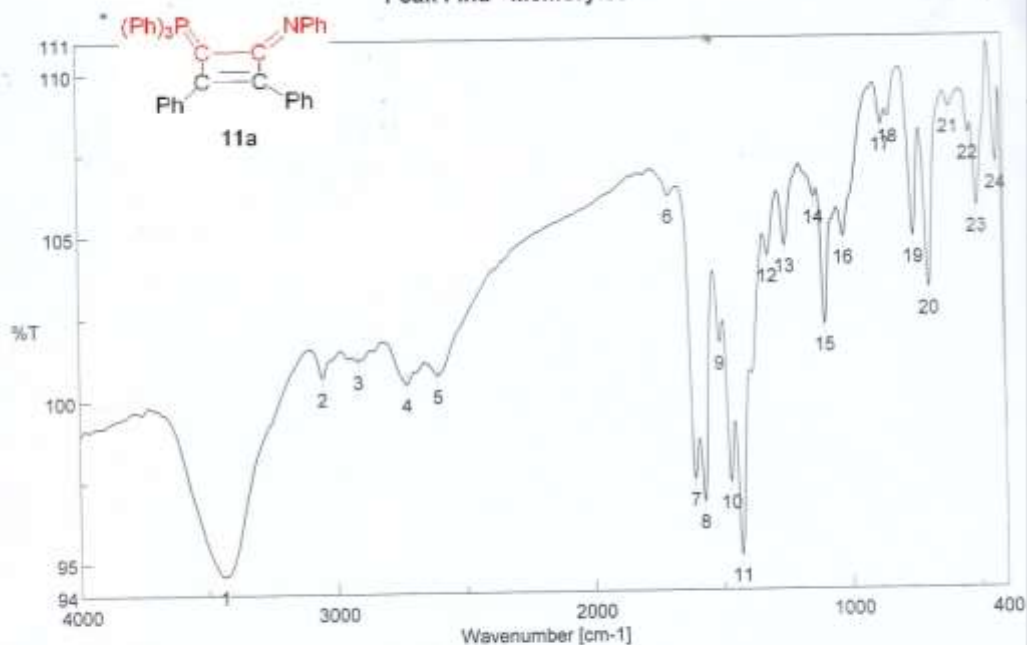


**MS, <sup>31</sup>P NMR, and IR compound 11a**





Peak Find - Memory-30



[Comments]  
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 Comment 10/2019  
 User IR  
 Division IR  
 Company MAC

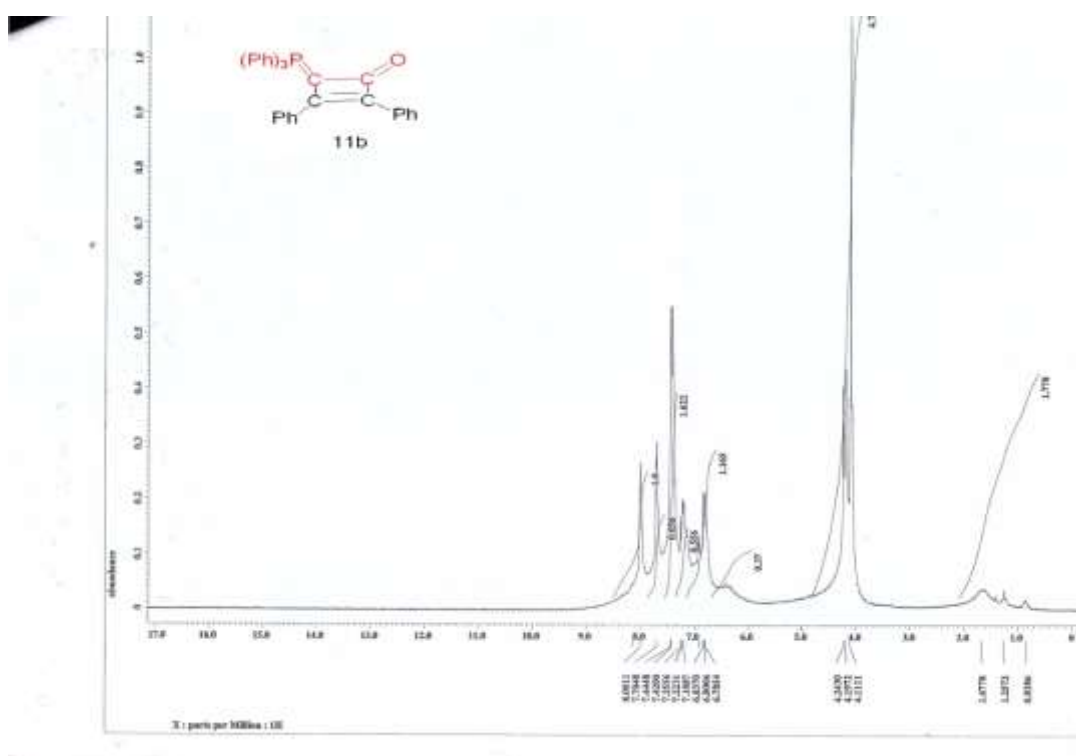
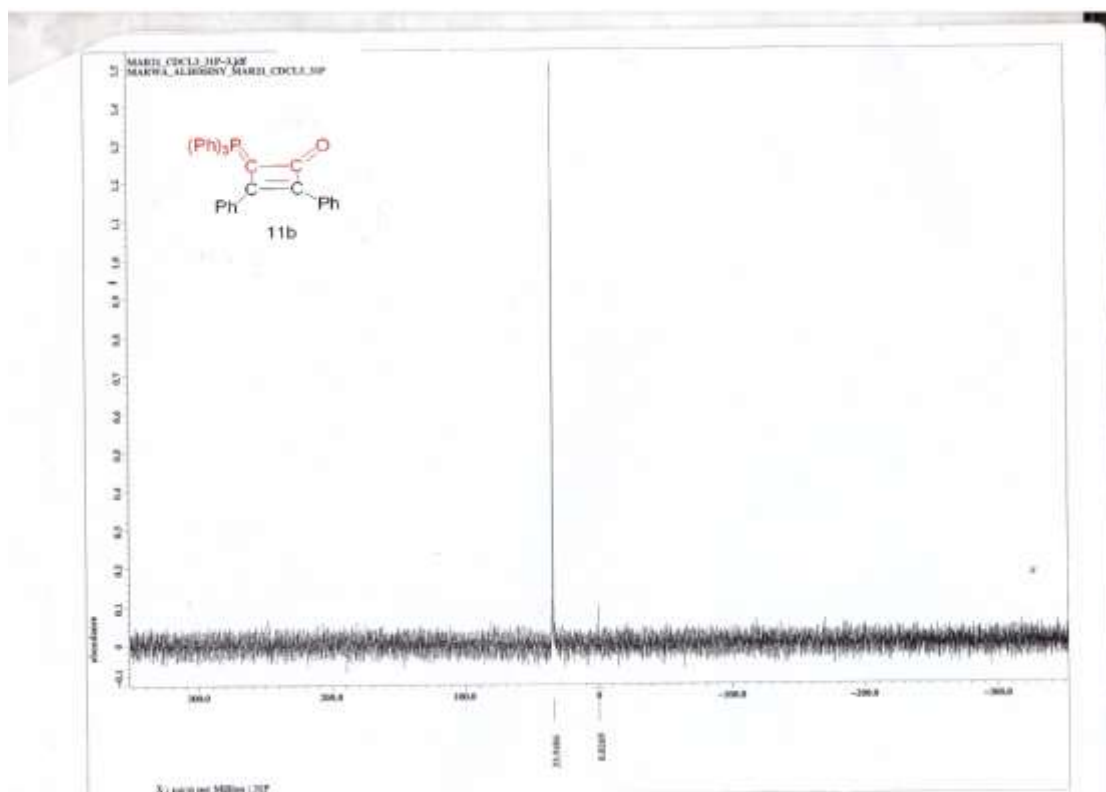
[ Result of Peak Picking ]

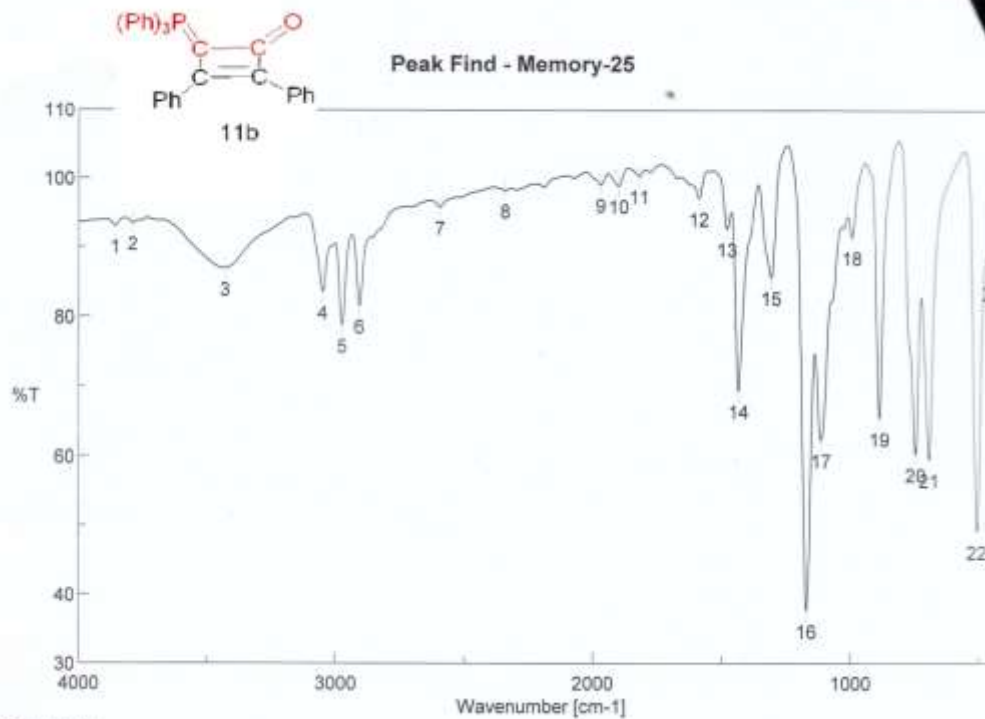
No.	Position	Intensity	No.	Position	Intensity
1	3439.42	94.5902	3	2915.84	101.162
4	2726.85	100.45	6	1705.73	106.12
7	1609.31	97.4286	9	1511.92	101.615
10	1472.38	97.3367	12	1323.89	104.27
13	1257.36	104.565	15	1102.12	102.15
16	1027.87	104.812	18	848.525	108.493
19	754.031	104.816	21	611.324	106.779
22	536.114	107.958	24	429.084	107.046





**<sup>31</sup>PNMR, <sup>1</sup>HNMR, IR, MS compound 11b**



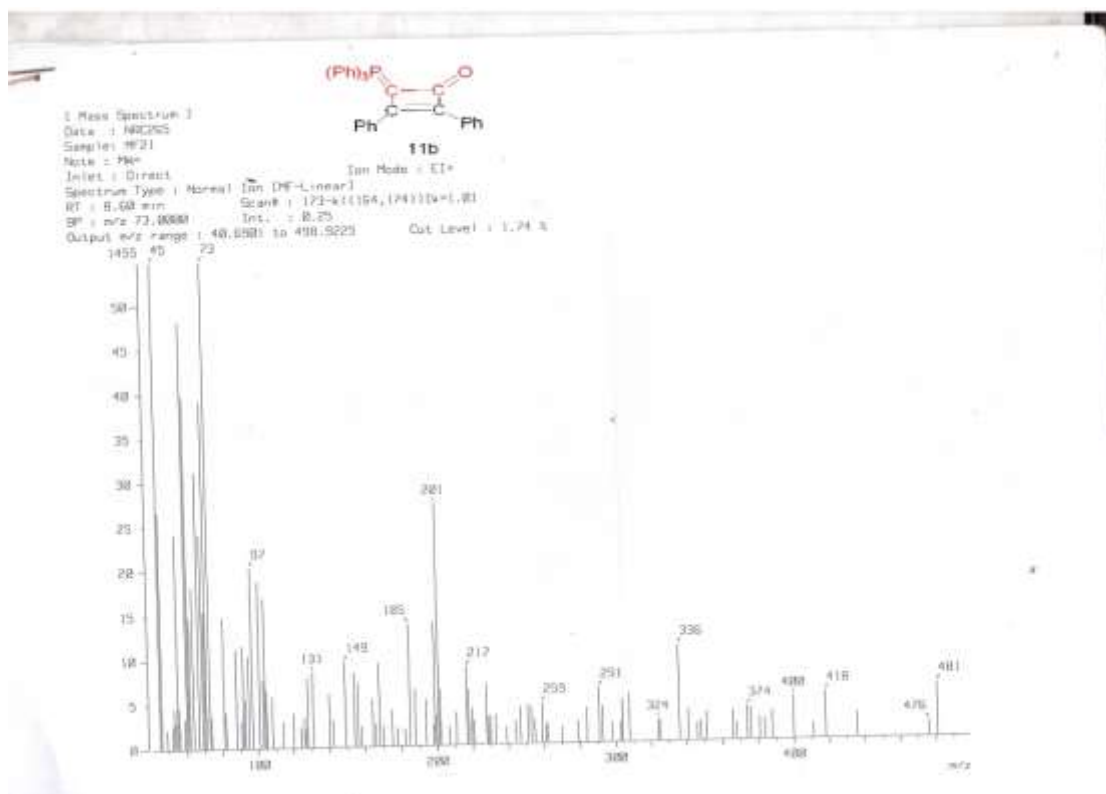


[Comments]  
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 Comment 10/2019  
 User IR  
 Division IR  
 Company MAC

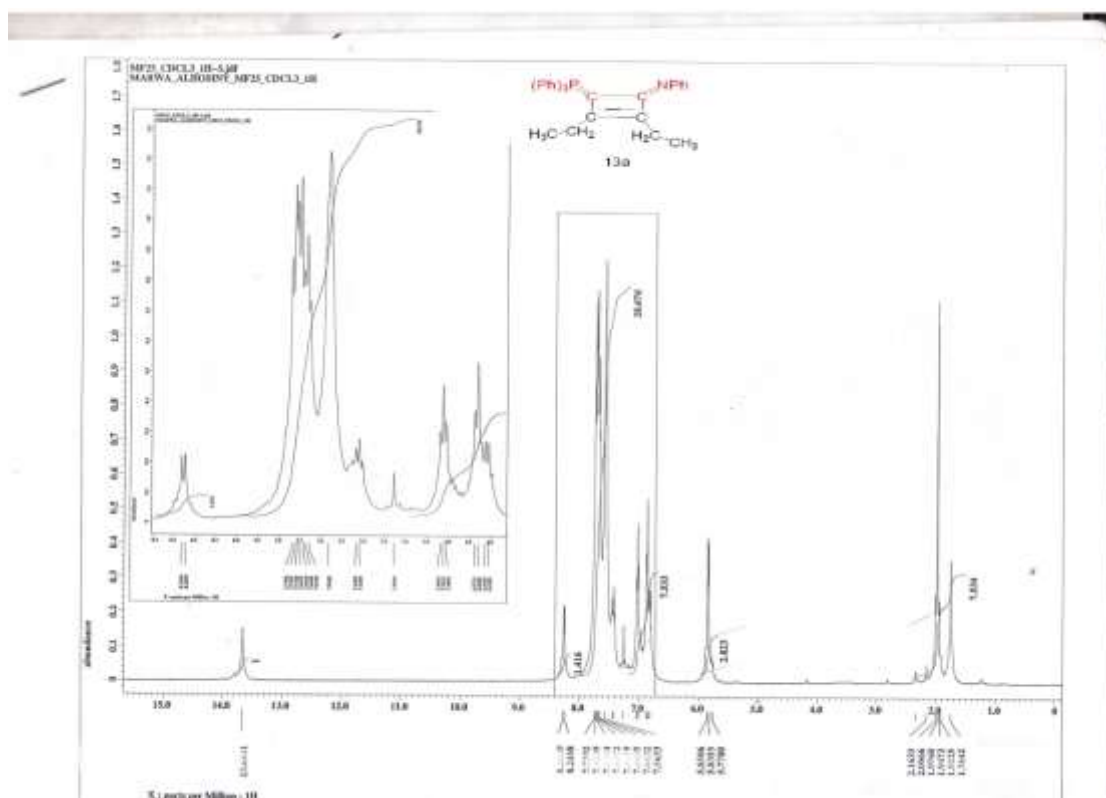
[ Result of Peak Picking ]

No.	Position	Intensity	No.	Position	Intensity	No.	Position	Intensity
1	3856.93	93.0963	2	3787.51	93.4636	3	3429.78	86.9325
4	3051.8	83.5958	5	2977.55	78.7948	6	2910.06	81.6099
7	2596.68	95.7891	8	2342.12	98.2094	9	1969.93	99.064
10	1901.47	98.9149	11	1820.47	100.367	12	1590.02	97.0905
13	1482.03	92.706	14	1436.71	69.3914	15	1309.43	85.6952
16	1173.47	37.6221	17	1116.58	62.3573	18	996.053	91.4988
19	888.059	65.4595	20	747.281	60.325	21	694.248	59.5265
22	507.187	49.0883	23	445.476	86.3573			

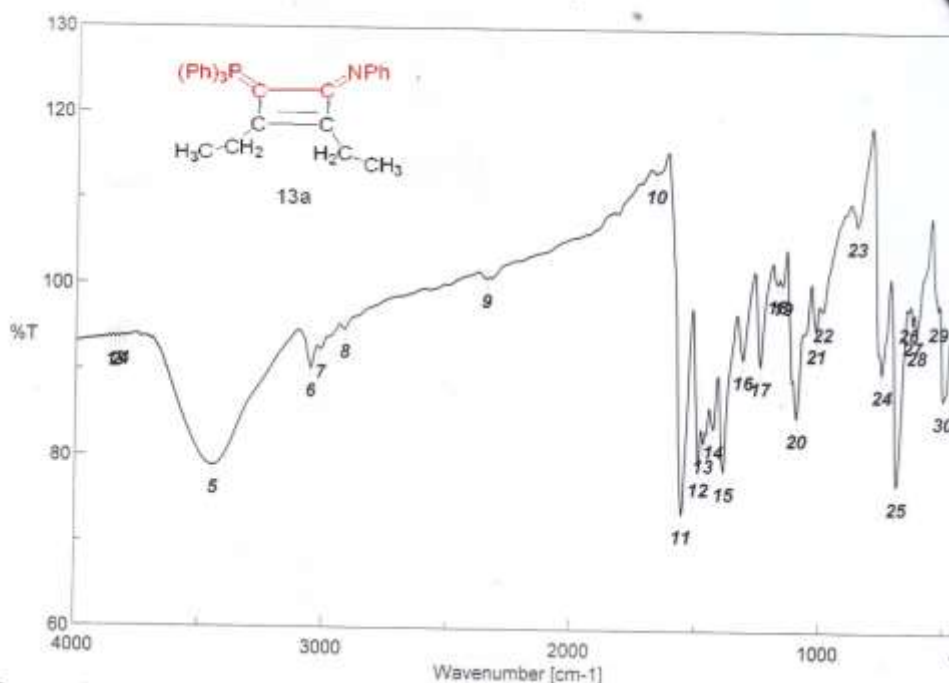




**<sup>1</sup>HNMR, IR, MS compound 13a**



Peak Find - Memory-60

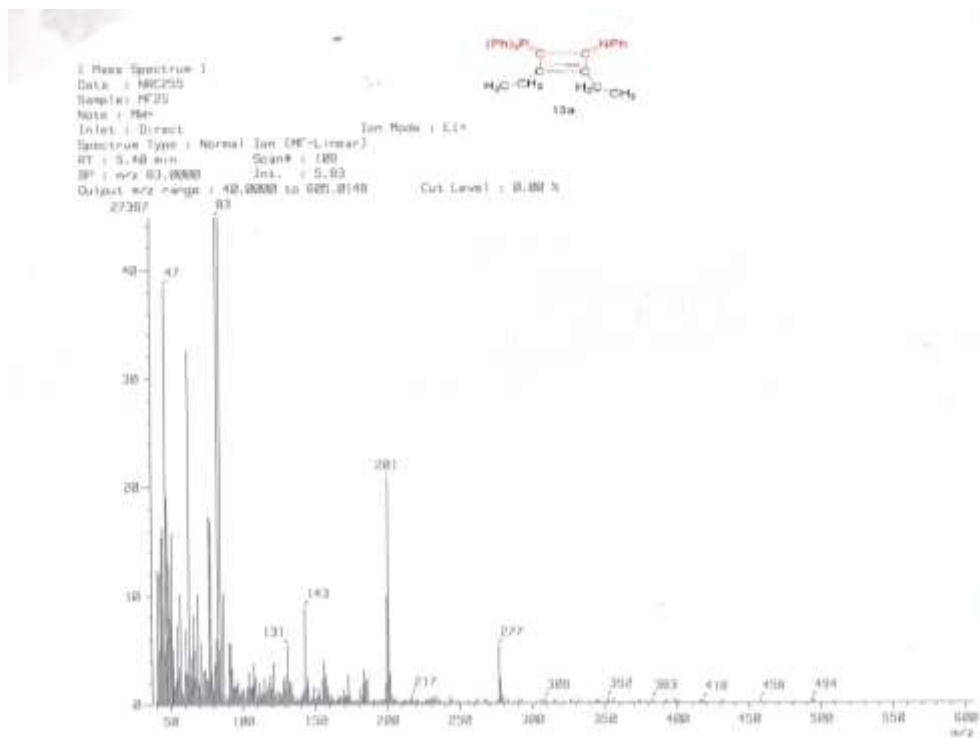


[Comments]  
 Sample name MF25  
 Comment 13/11/2013  
 User IR  
 Division IR  
 Company Micro Analytical Center

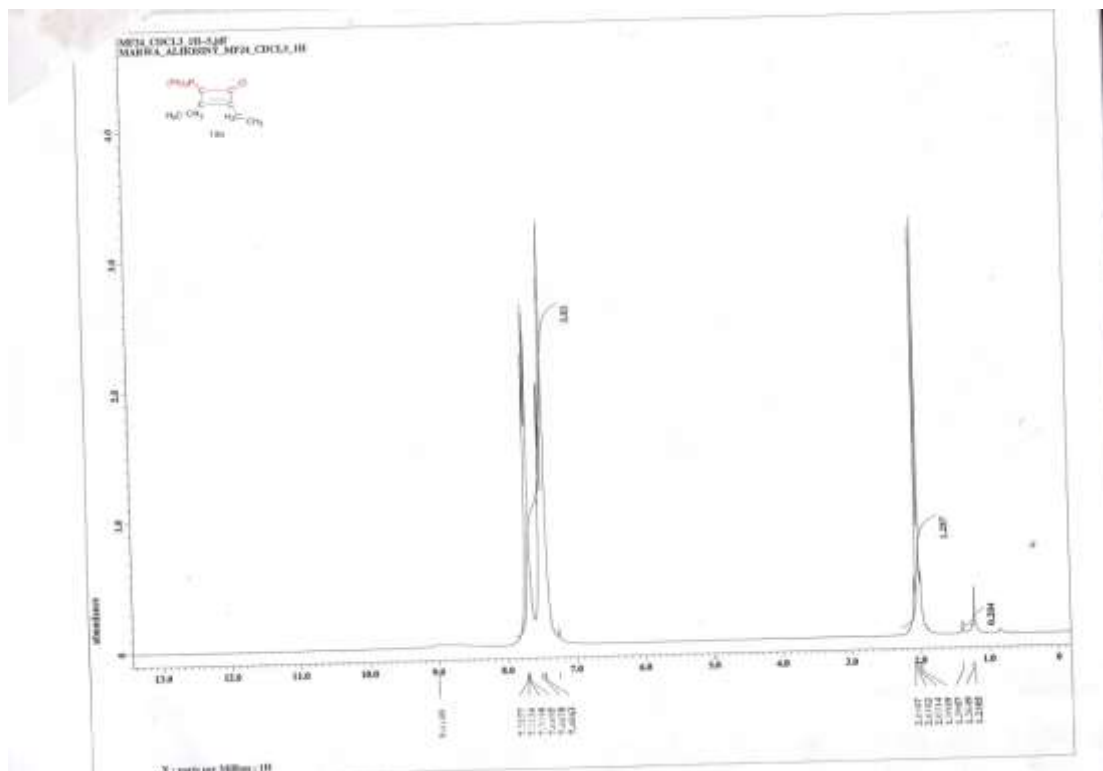
[ Result of Peak Picking ]

No.	Position	Intensity	No.	Position	Intensity	No.	Position	Intensity
1	3858.86	93.5882	2	3840.54	93.5541	3	3824.15	93.6599
4	3806.79	93.7308	5	3443.28	78.8591	6	3054.69	90.2689
7	3016.12	92.4751	8	2918.73	94.8319	9	2348.87	100.858
10	1671.02	113.302	11	1555.31	73.659	12	1490.7	79.1841
13	1471.42	81.9433	14	1430.92	83.6306	15	1399.46	78.6746
16	1314.25	91.7219	17	1244.83	91.0199	18	1178.29	100.631
19	1159.97	100.483	20	1098.26	84.9915	21	1020.16	94.8983
22	995.089	97.4497	23	860.096	107.452	24	754.031	90.2023
25	691.355	77.1458	26	647.965	97.5221	27	630.609	95.9965
28	614.217	94.8493	29	528.4	97.6579	30	505.258	87.1903
31	408.835	92.7586						

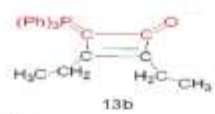




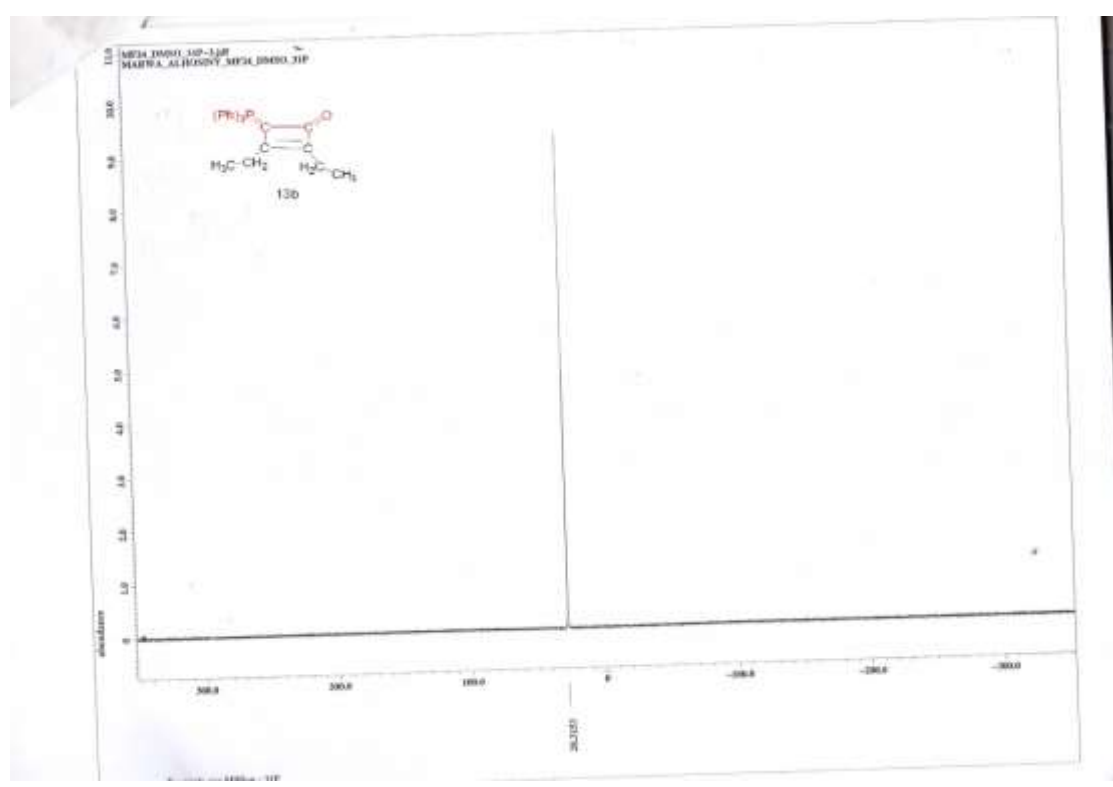
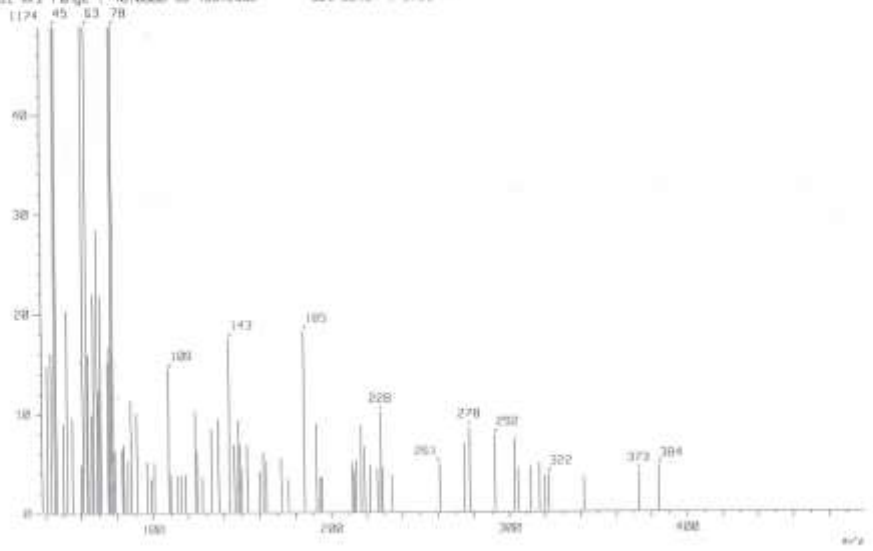
***<sup>31</sup>PNMR, <sup>1</sup>HNMR, MS compound 13b***



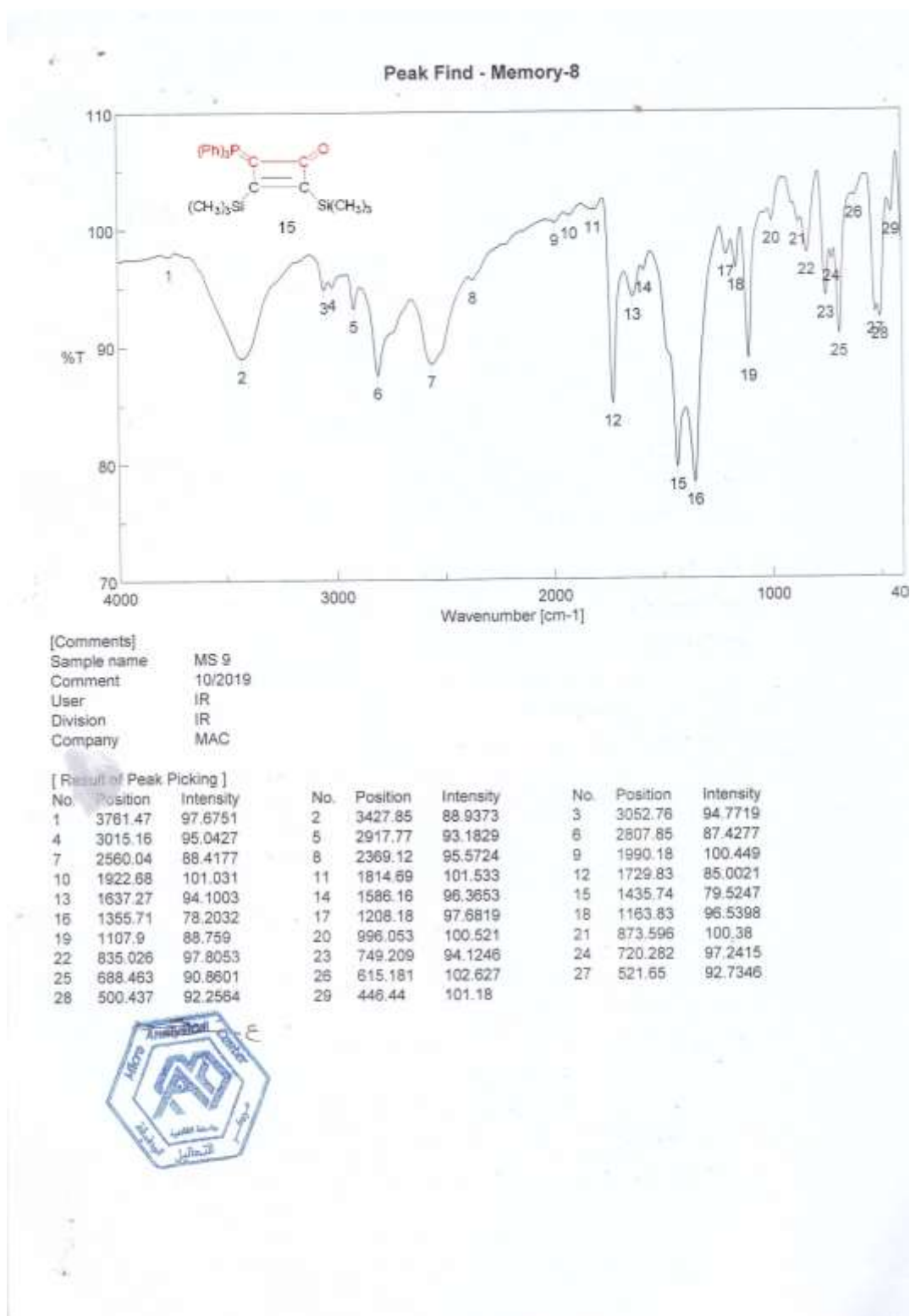
11

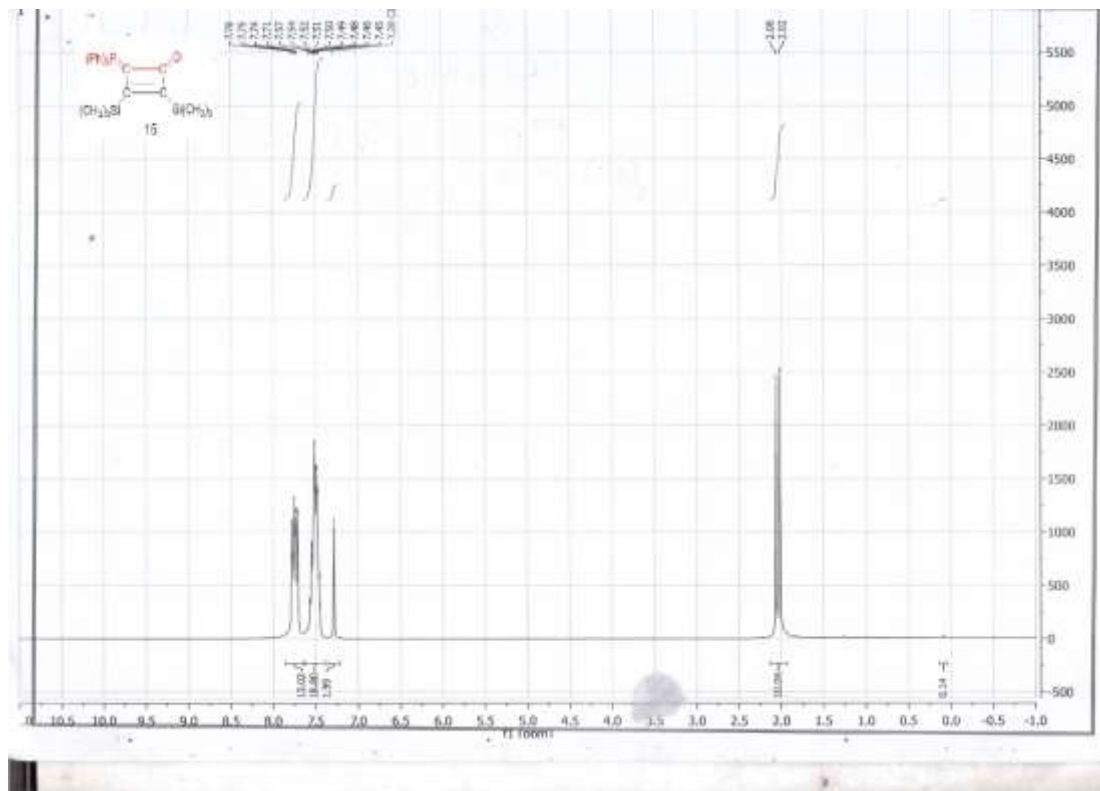
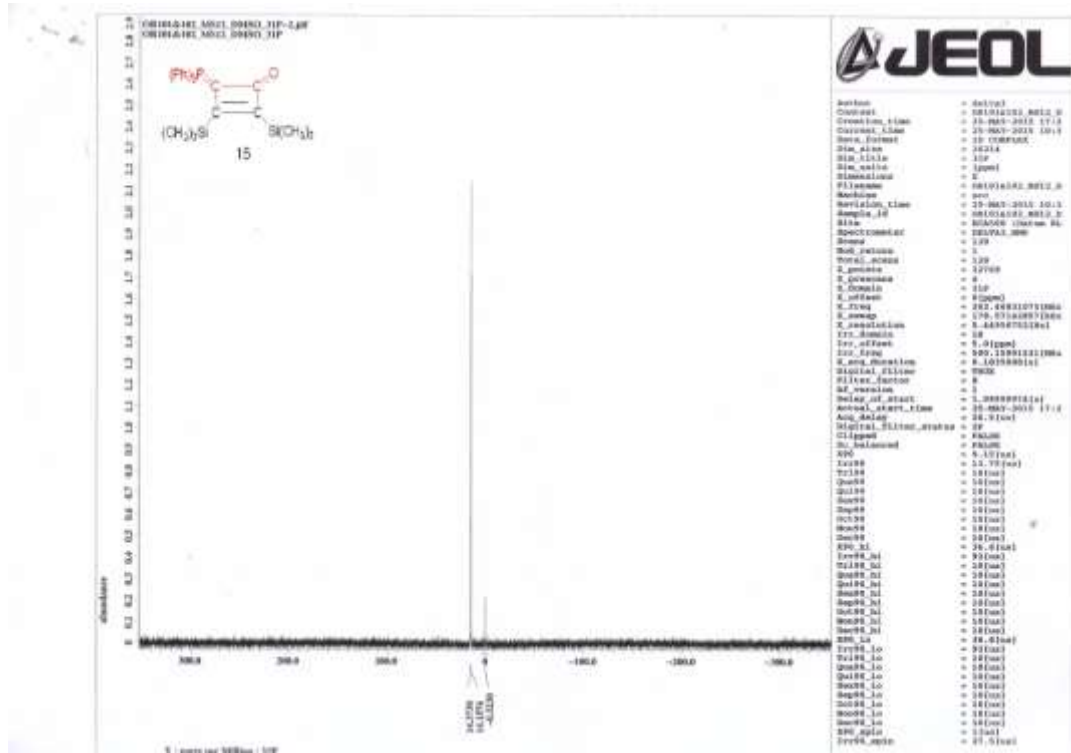


Mass Spectrum  
Data : NRC256  
Sample: MF24  
Note : Me+  
Inlet : Direct Ion Mode : EI+  
Spectrum Type : Normal Ion (PF-Linear)  
RT : 3.78 min Scan# : 25-41(72,76)(k+1.0)  
SP : v/v 70.0000 Int. : 8.27  
Output v/z range : 40.0000 to 400.2500 Cut Level : 3.30 %



**<sup>31</sup>PNMR, <sup>1</sup>HNMR, IR compound 15**







S2. Graphs for  $IC_{50}$  calculation of AChE inhibition

