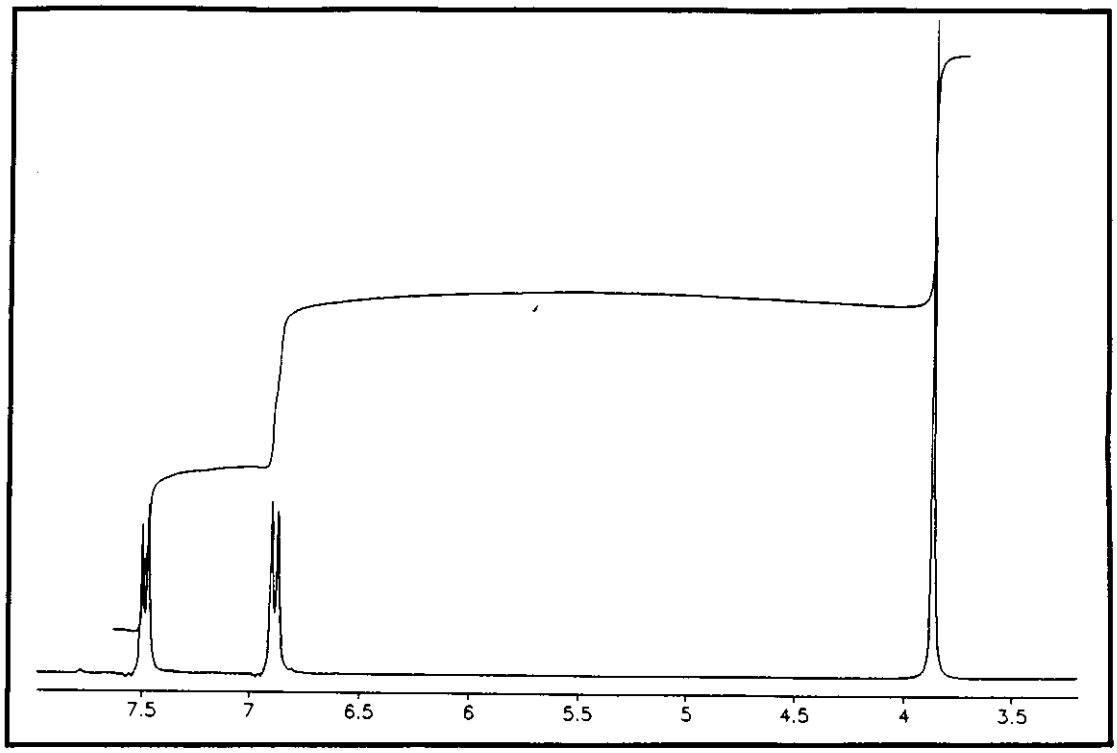
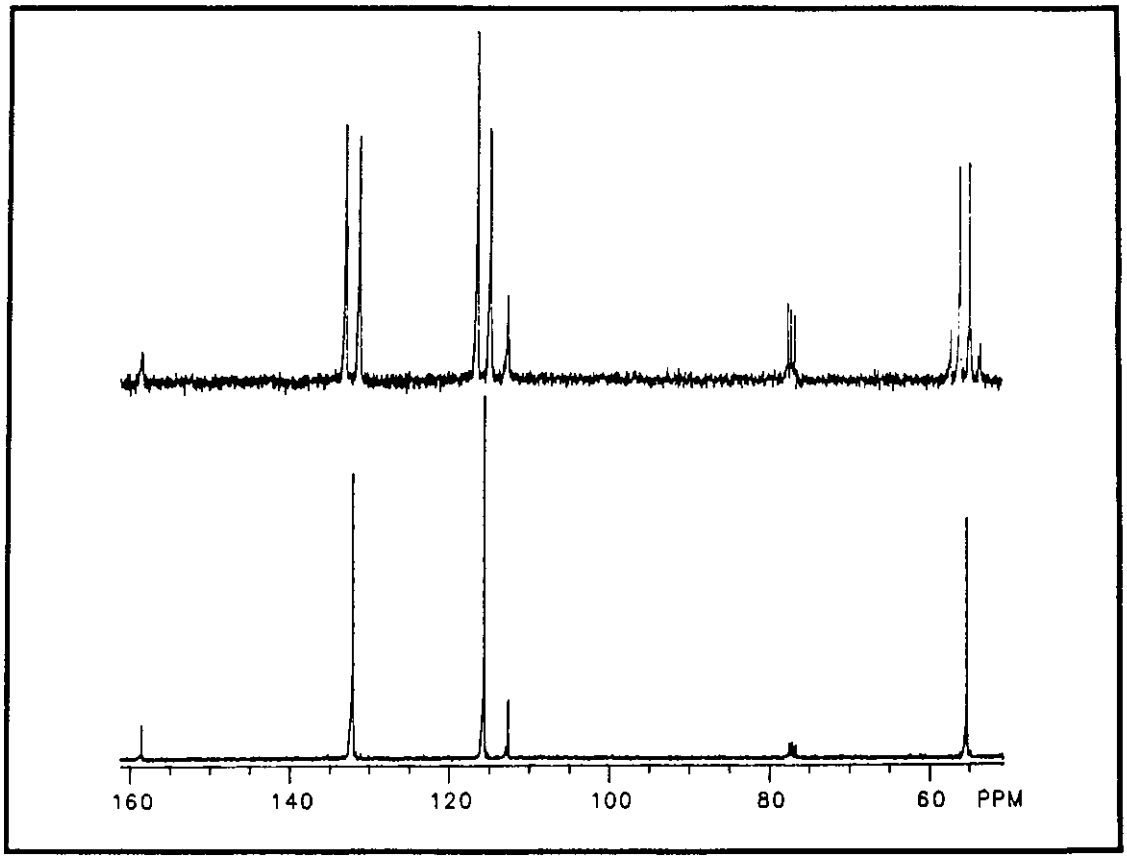
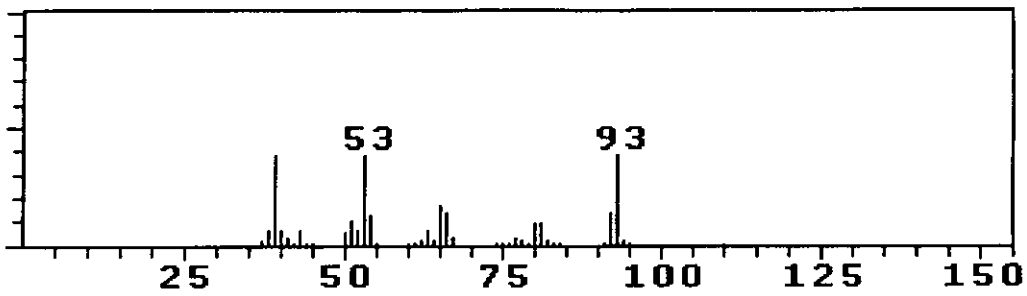
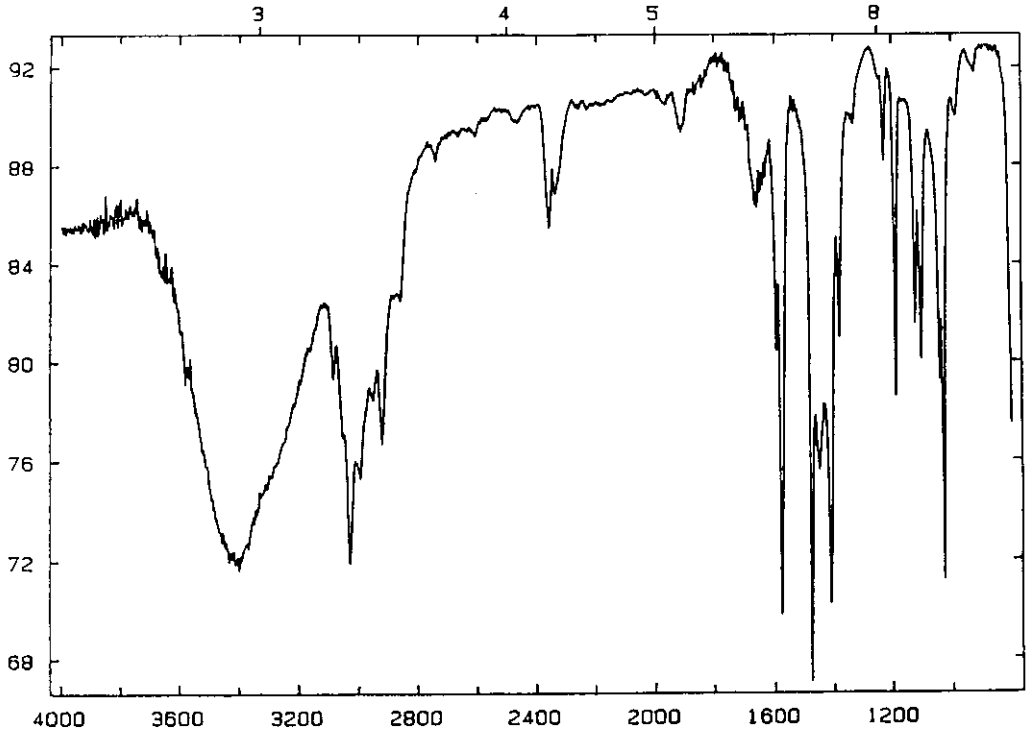

7.5
7
6.5
6
5.5
5
4.5
4
3.5

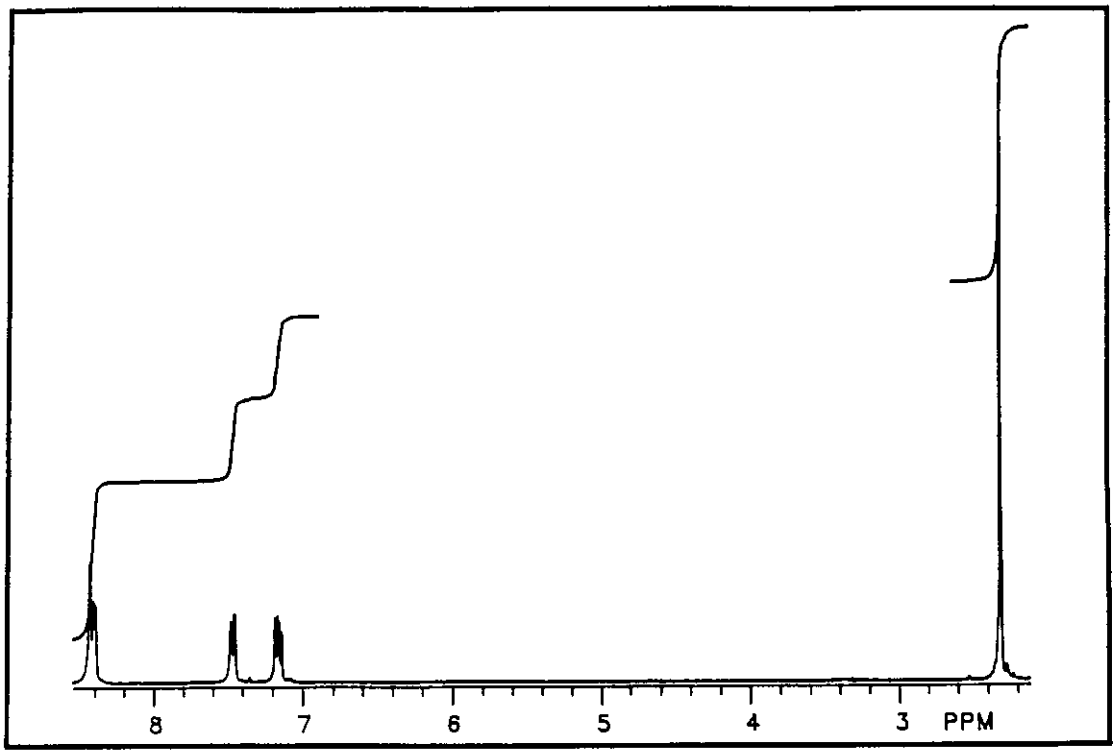

160
140
120
100
80
60
PPM

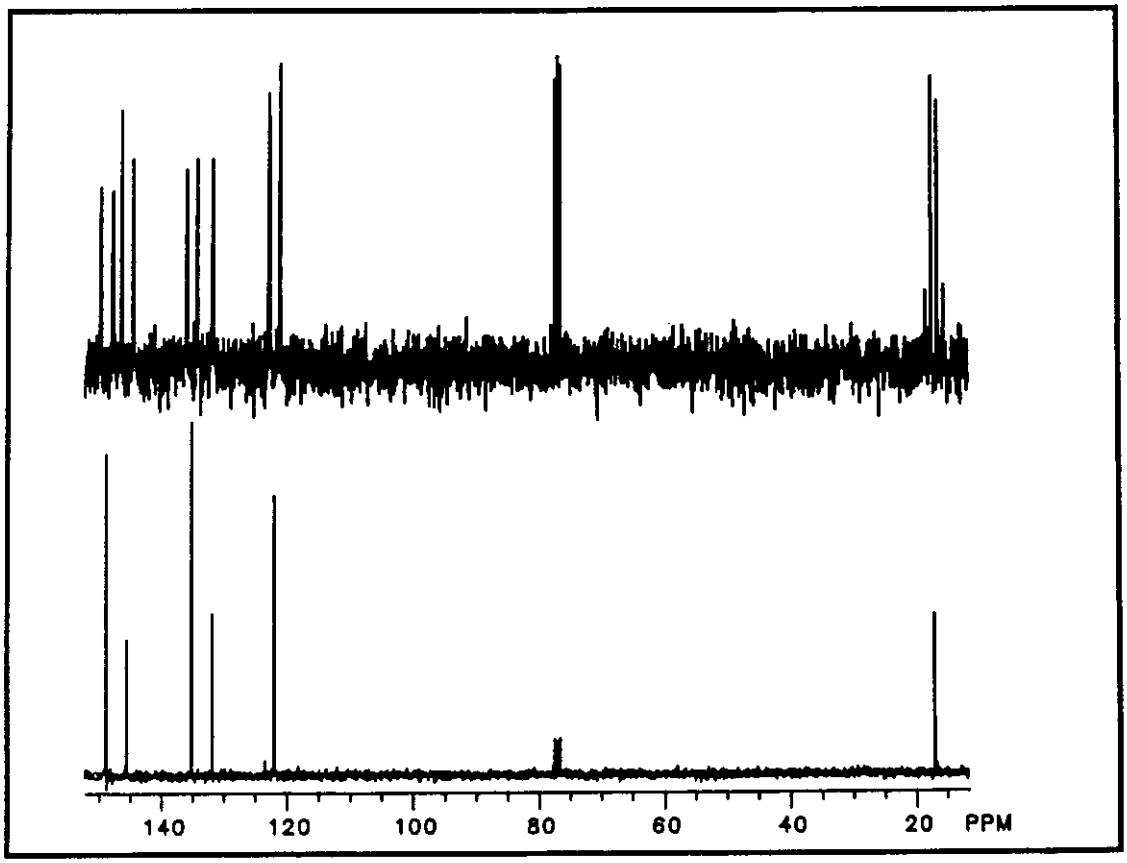
Problem 63

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na



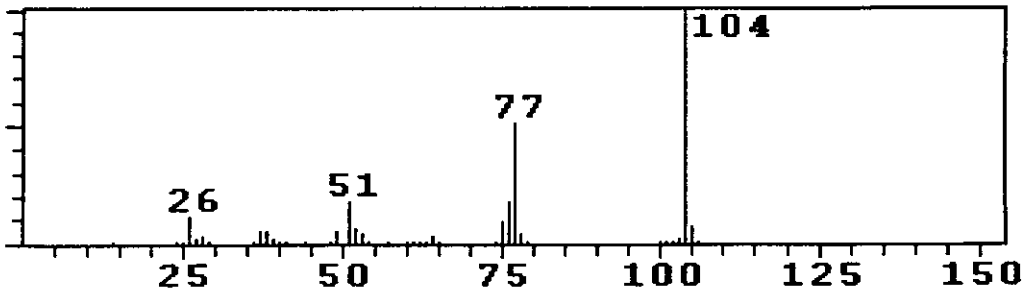


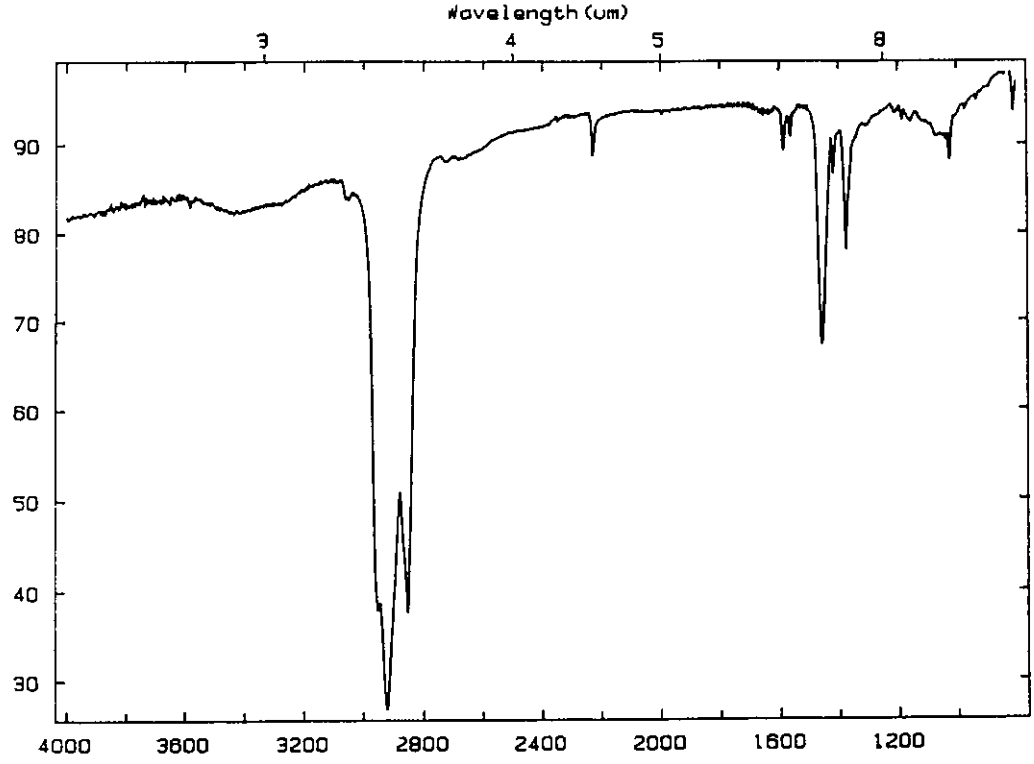

8
7
6
5
4
3
PPM

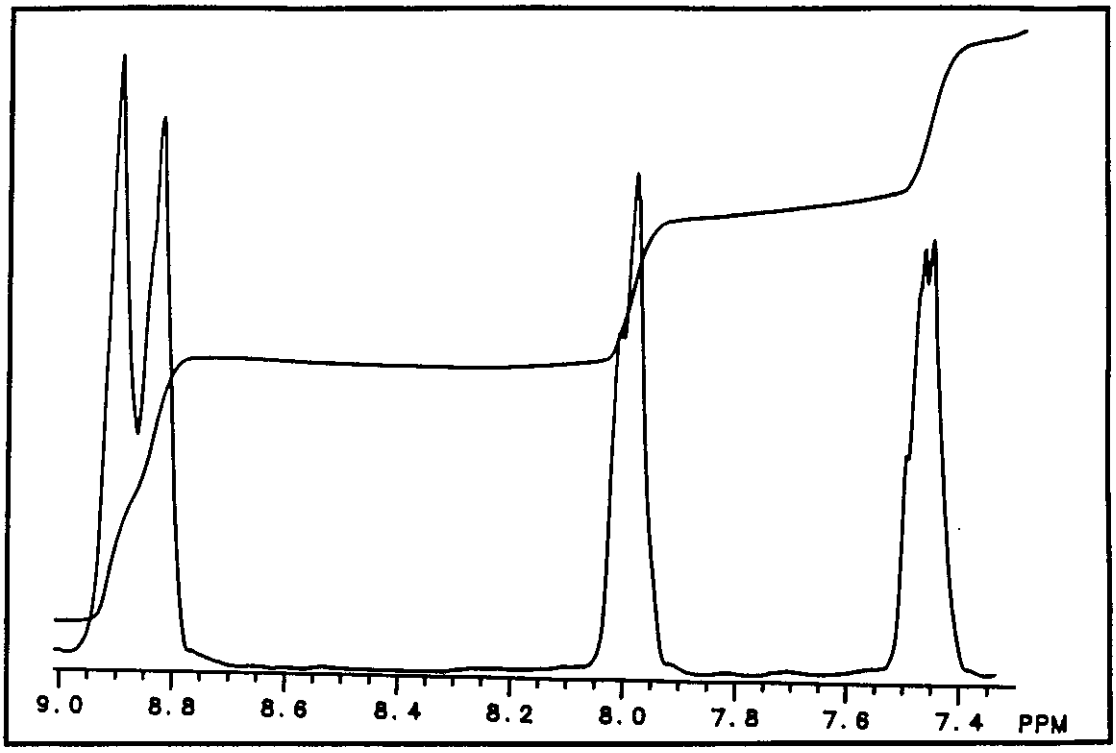

140
120
100
80
60
40
20
PPM

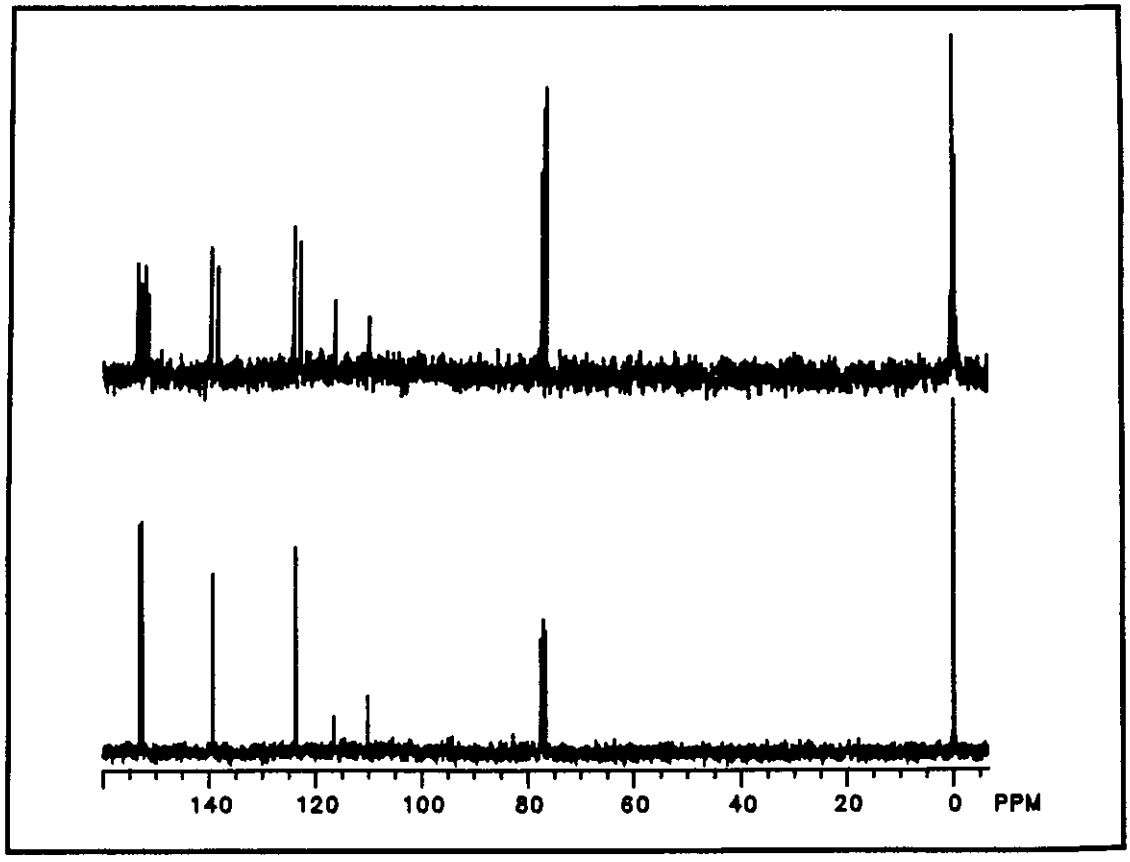
Problem 64

Exact Mass: na
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na



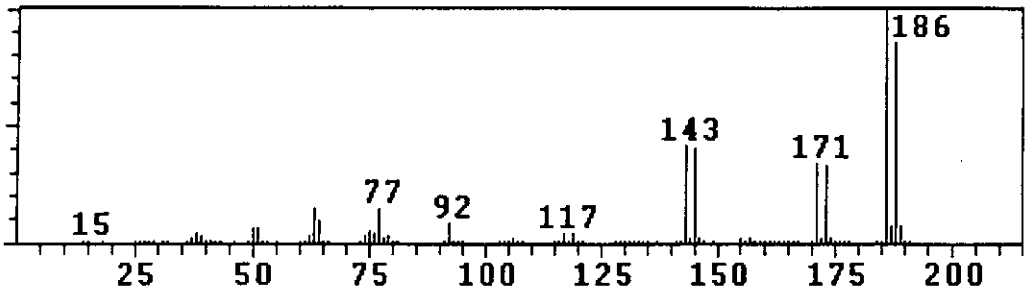


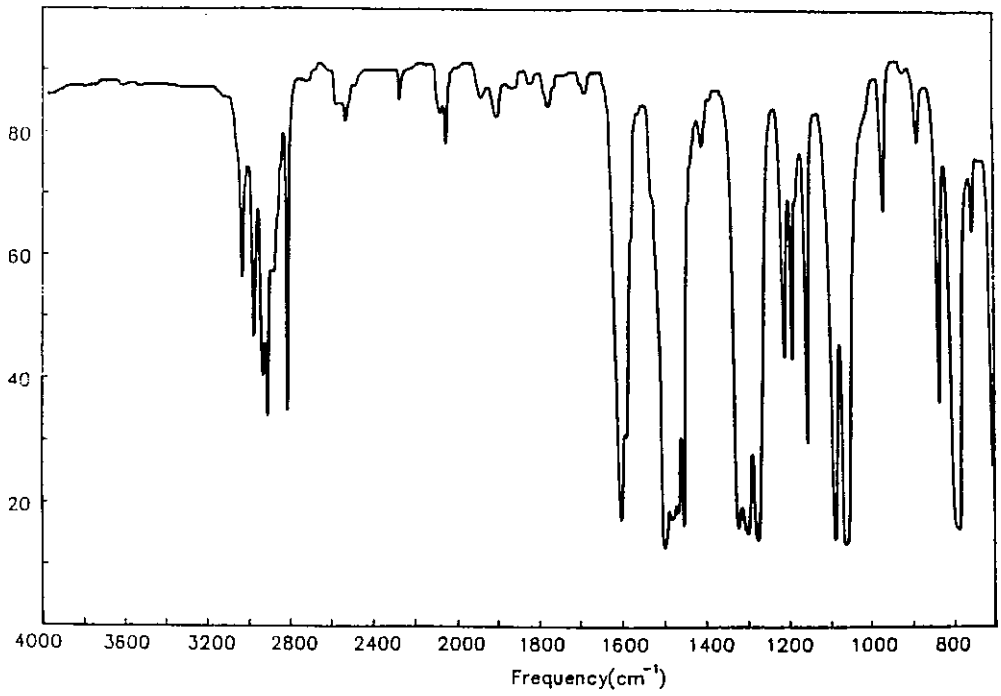

9.0
8.8
8.6
8.4
8.2
8.0
7.8
7.6
7.4
PPM

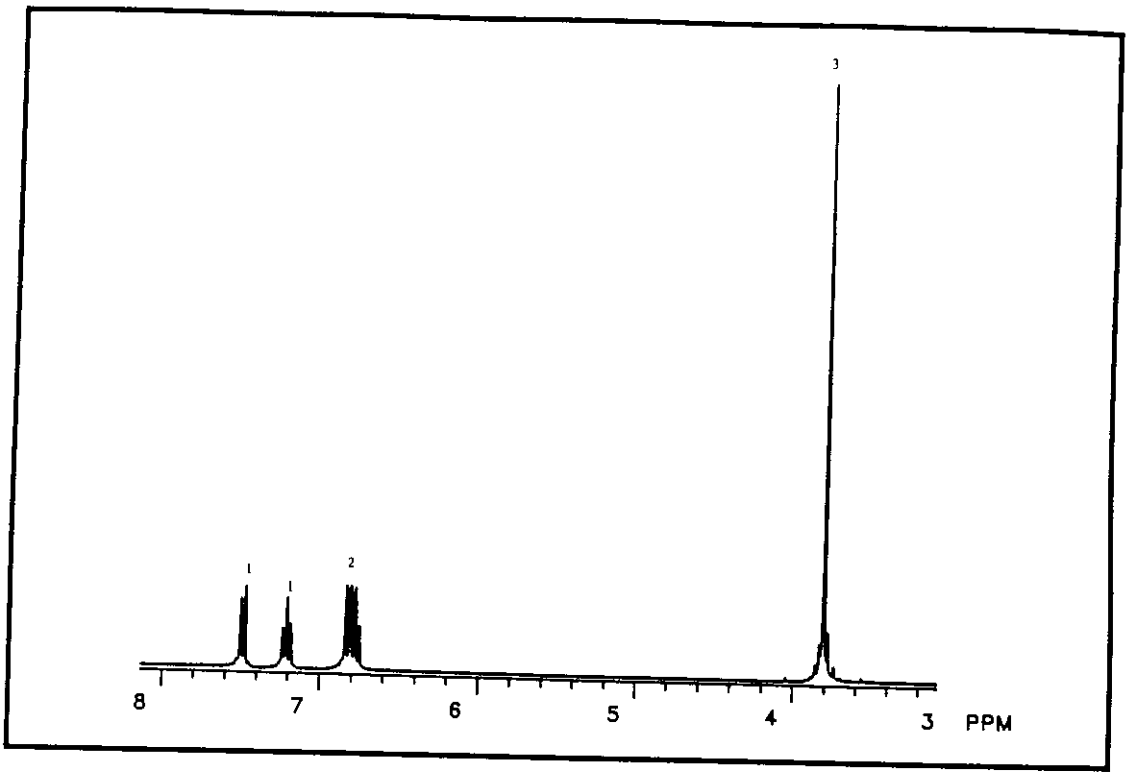

140
120
100
80
60
40
20
0
PPM

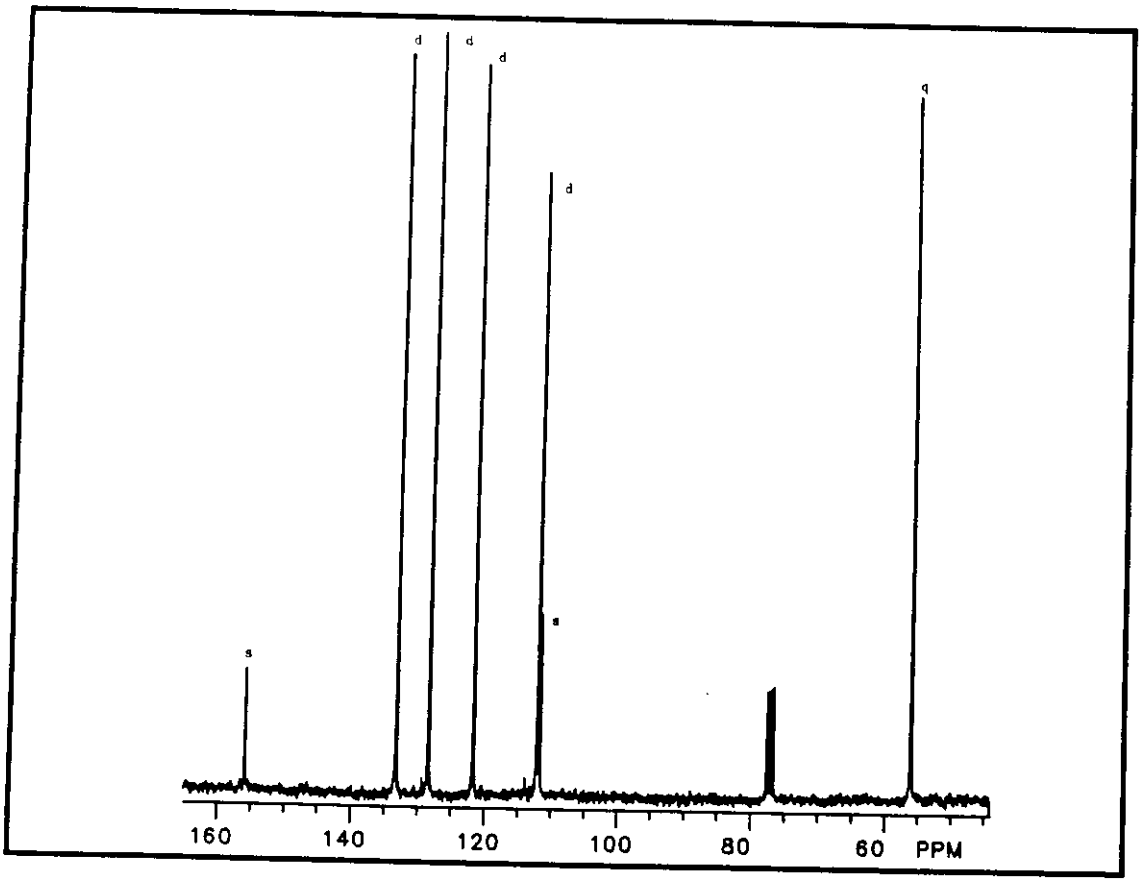
Problem 65

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na



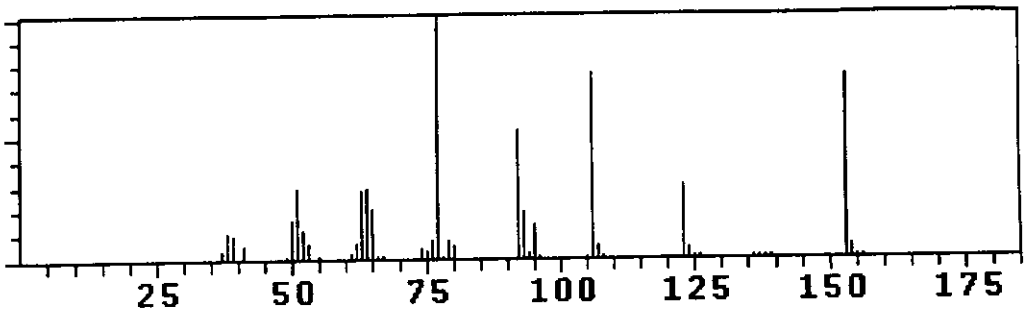


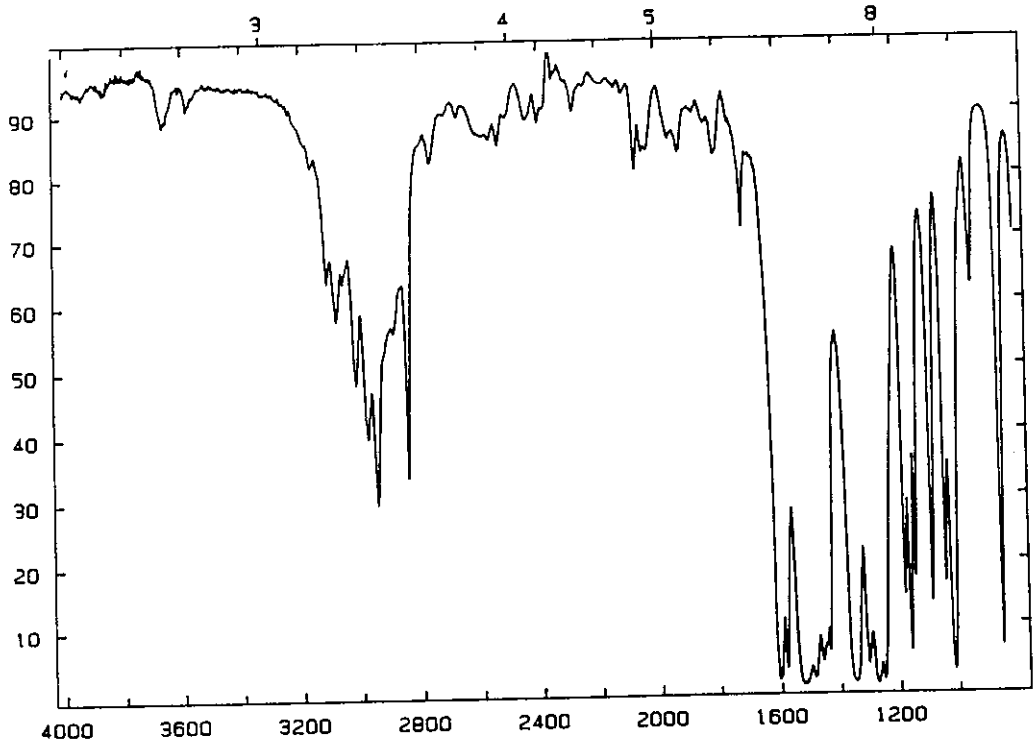

3
1
1
2
8
7
6
5
4
3
PPM

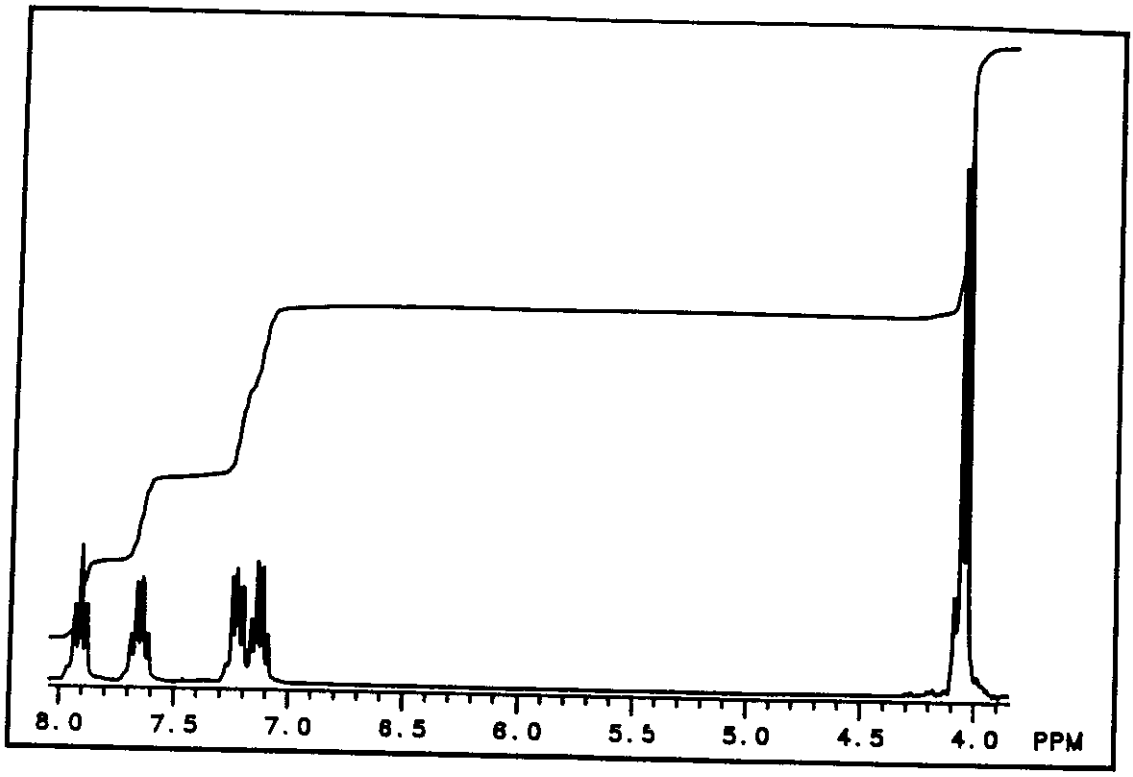

d
d
d
d
q
s
t
160
140
120
100
80
60
PPM

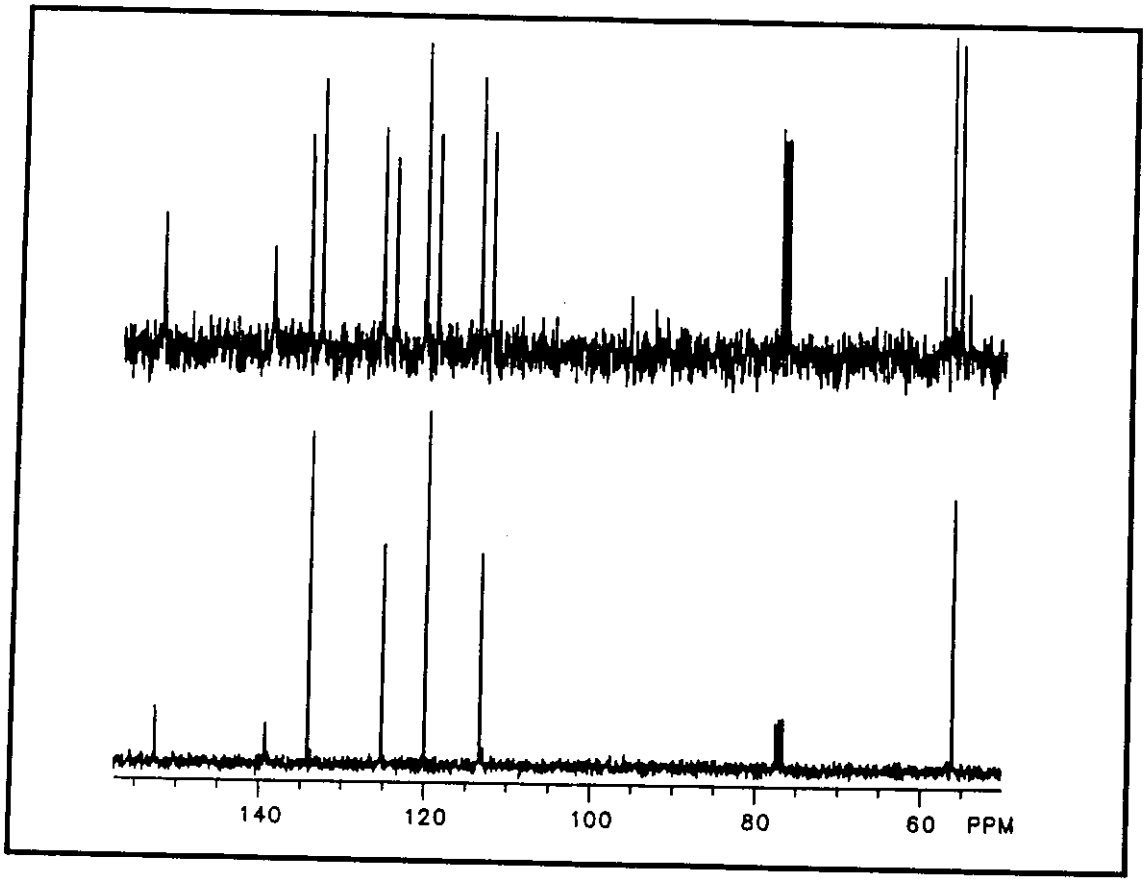
Problem 66

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 54.9 % C; 4.6 % H; 9.2 % N






8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
PPM

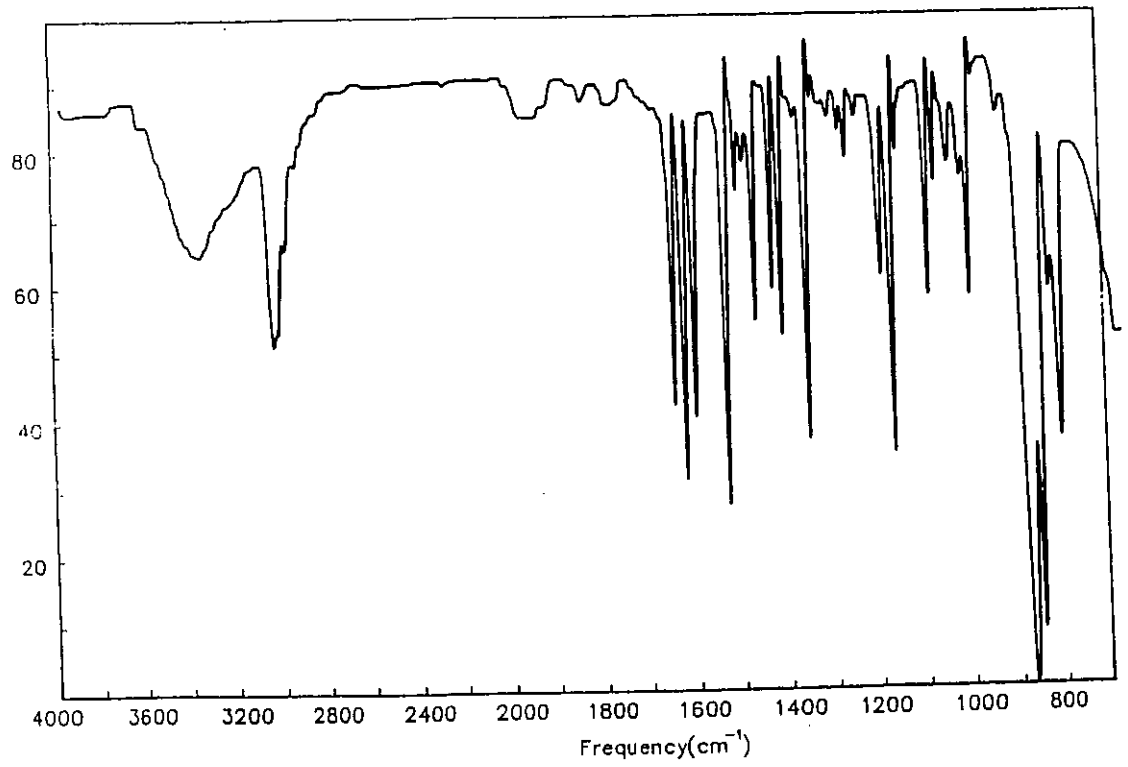

140
120
100
80
60
PPM

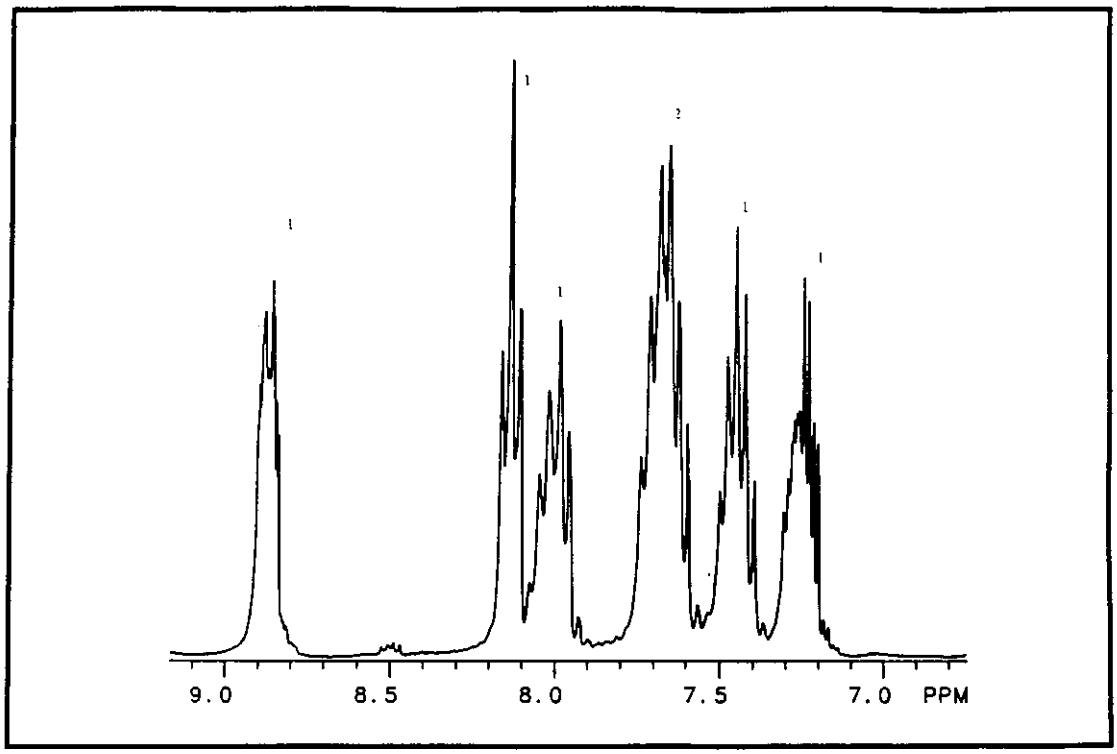
Problem 67

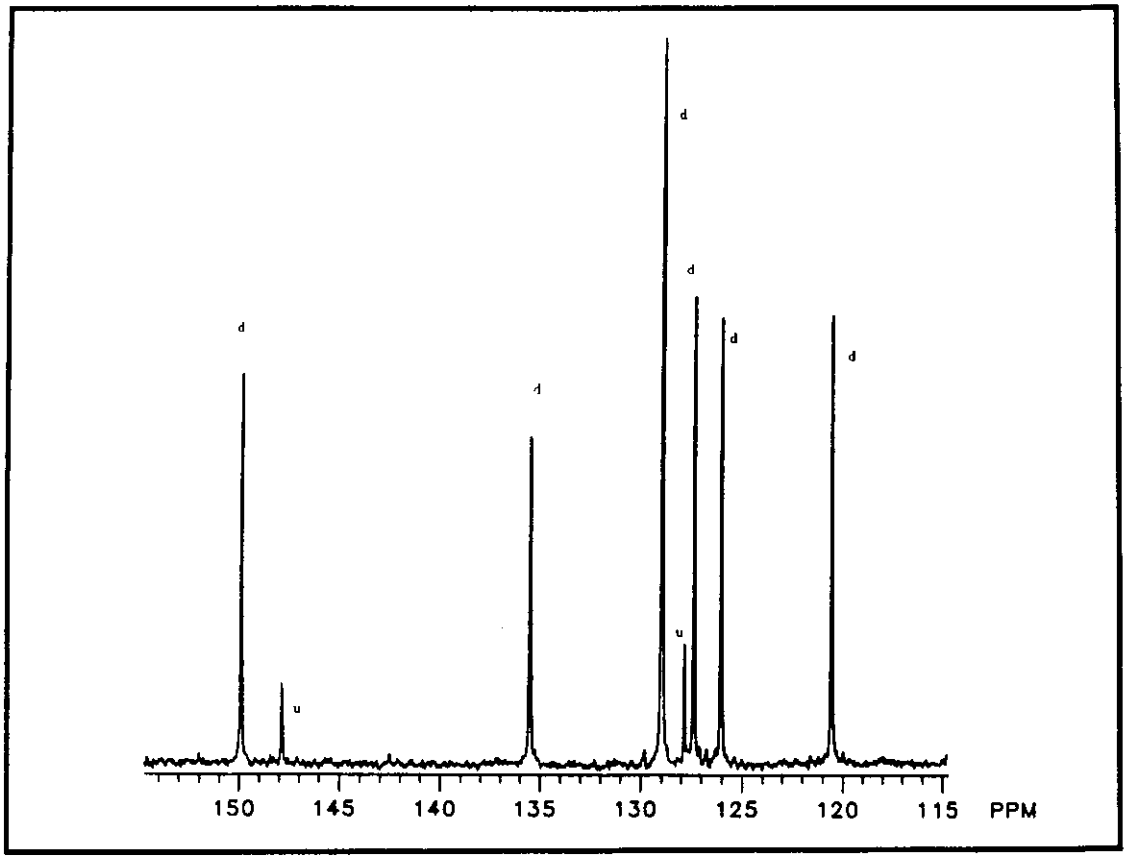
Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
36	0.35	50	18.91	65	0.06	89	1.12	104	0.91	127	0.45
37	3.73	51	22.54	66	0.14	90	0.25	115	0.79	128	22.04
38	5.44	52	6.68	67	0.05	91	0.30	116	0.12	129	100.00
39	8.04	53	0.64	78	5.00	97	0.43	117	0.21	130	12.08
40	0.76	54	0.13	79	1.17	98	1.81	118	0.22	131	0.74
41	0.28	60	0.40	84	0.16	99	1.65	119	0.07		
42	0.10	61	3.10	85	0.50	100	2.01	120	0.54		
43	0.13	62	5.37	86	0.96	101	9.23	121	0.11		
48	0.25	63	9.67	87	1.77	102	38.03	122	0.03		
49	2.53	64	4.43	88	0.69	103	11.28	123	0.13		



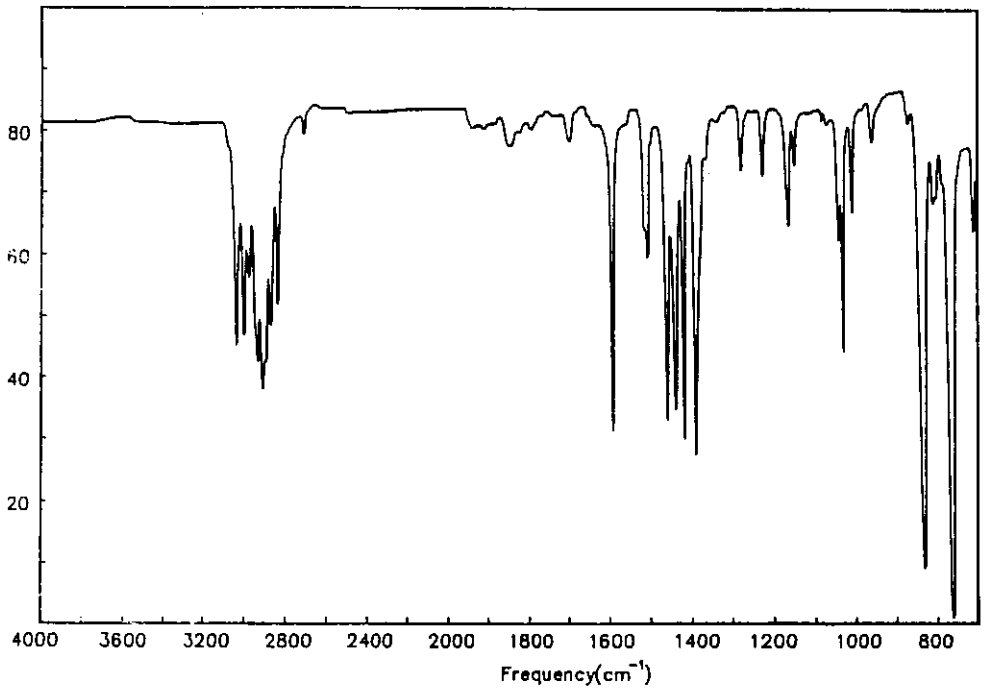

9.0
8.5
8.0
7.5
7.0
PPM

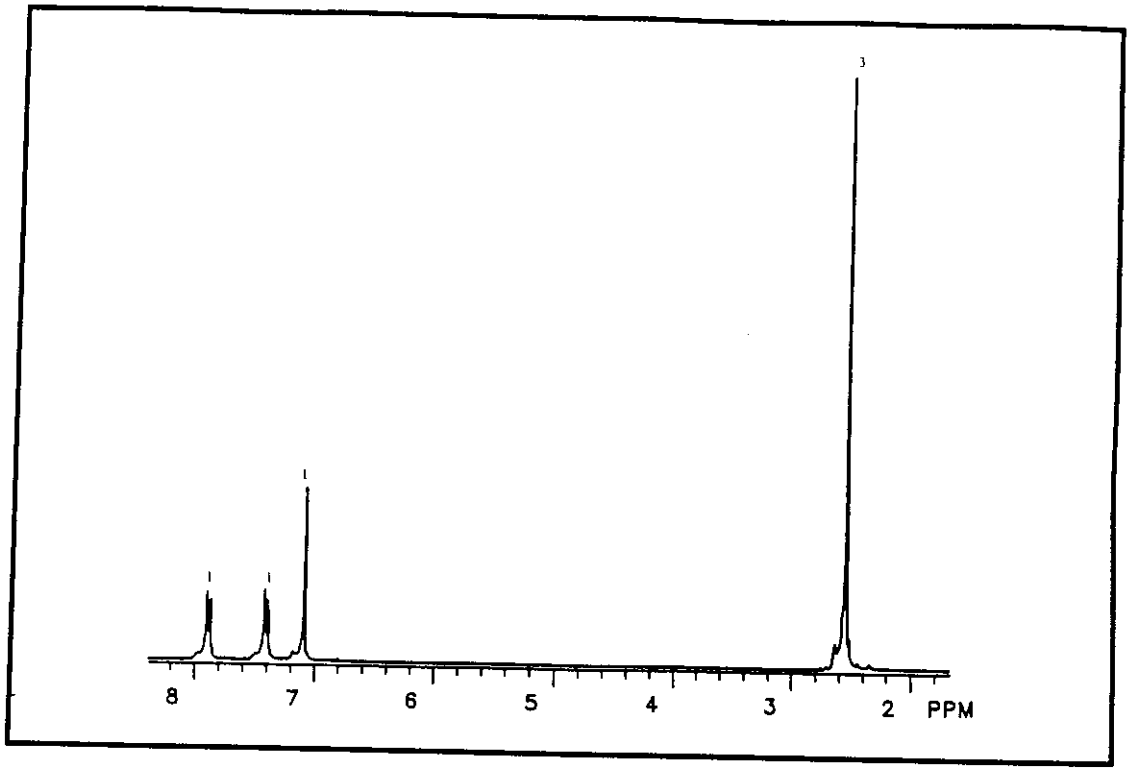

150
145
140
135
130
125
120
115
PPM

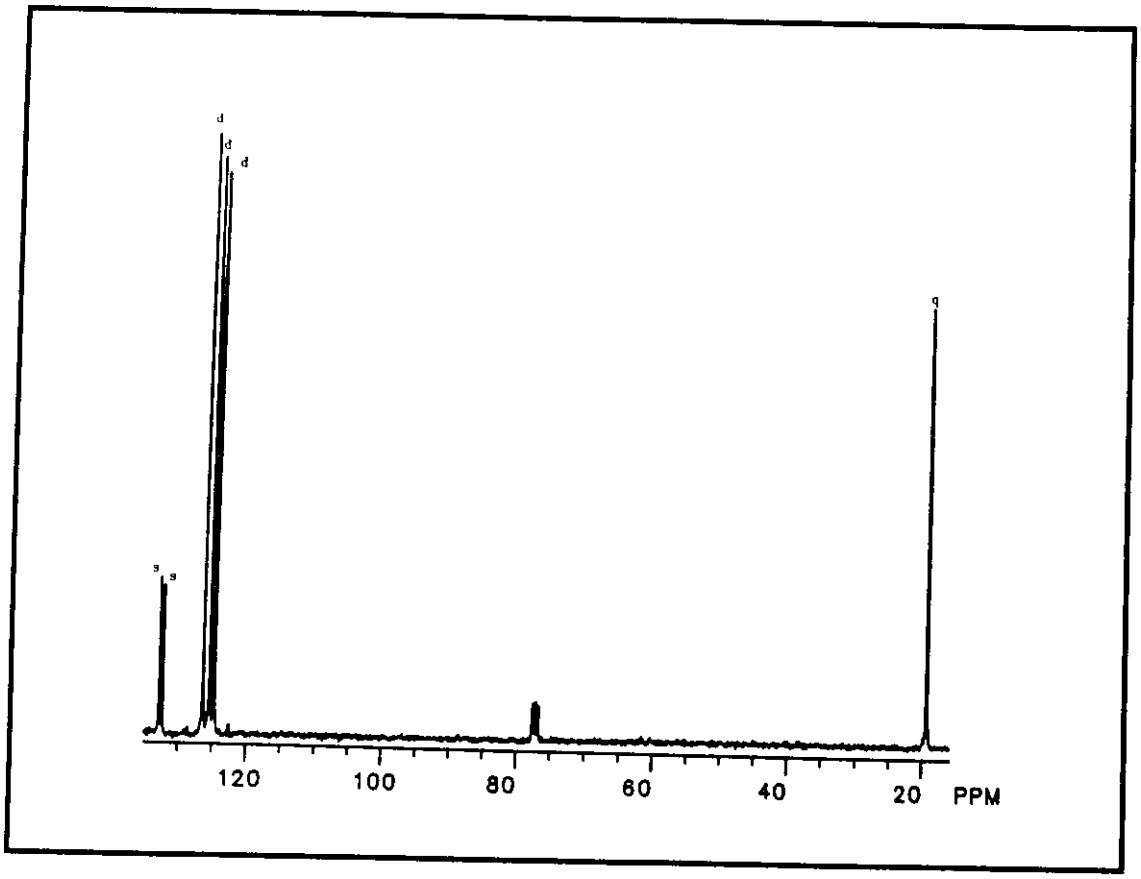
Problem 68

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na

Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A
26, 0.76	65, 0.92	89, 1.21	110, 0.03	131, 0.10	146, 0.06
27, 0.70	69, 0.07	90, 0.16	112, 0.03	132, 0.10	147, 0.36
29, 0.04	70, 1.02	91, 1.00	113, 0.46	133, 0.08	148, 0.15
39, 0.75	71, 0.10	92, 0.08	114, 0.47	134, 0.10	149, 0.22
40, 0.14	73, 0.05	93, 0.08	115,16.33	135, 0.08	150, 0.44
41, 0.15	74, 0.07	94, 0.12	116, 2.19	136, 0.07	151, 2.52
45, 0.03	75, 0.46	95, 0.09	117, 0.13	137, 0.16	152, 9.01
50, 0.25	76, 0.95	100, 0.05	123, 0.03	138, 0.37	153,11.51
51, 1.21	77, 5.43	101, 0.43	124, 0.05	139, 5.78	154, 5.56
52, 0.27	78, 3.17	102, 1.06	125, 0.20	140, 2.16	155,22.29
53, 0.60	79, 0.12	103, 0.65	126, 0.96	141,74.94	156,100.0
57, 0.13	85, 0.07	104, 0.12	127, 6.76	142, 9.02	157,12.95
62, 0.09	86, 0.03	105, 0.08	128,10.59	143, 0.70	158, 0.76
63, 0.92	87, 0.12	107, 0.06	129, 5.63	144, 0.08	
64, 0.55	88, 0.18	108, 0.08	130, 0.54	145, 0.07	



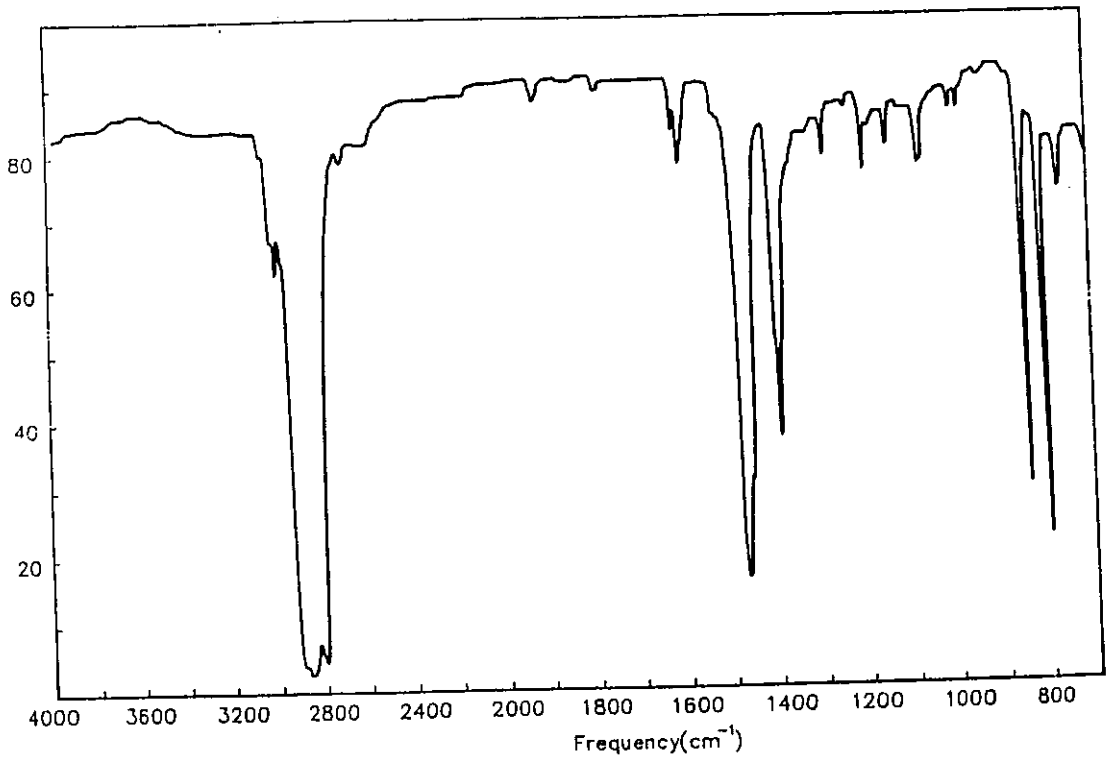

3
1
1
1
8
7
6
5
4
3
2
PPM

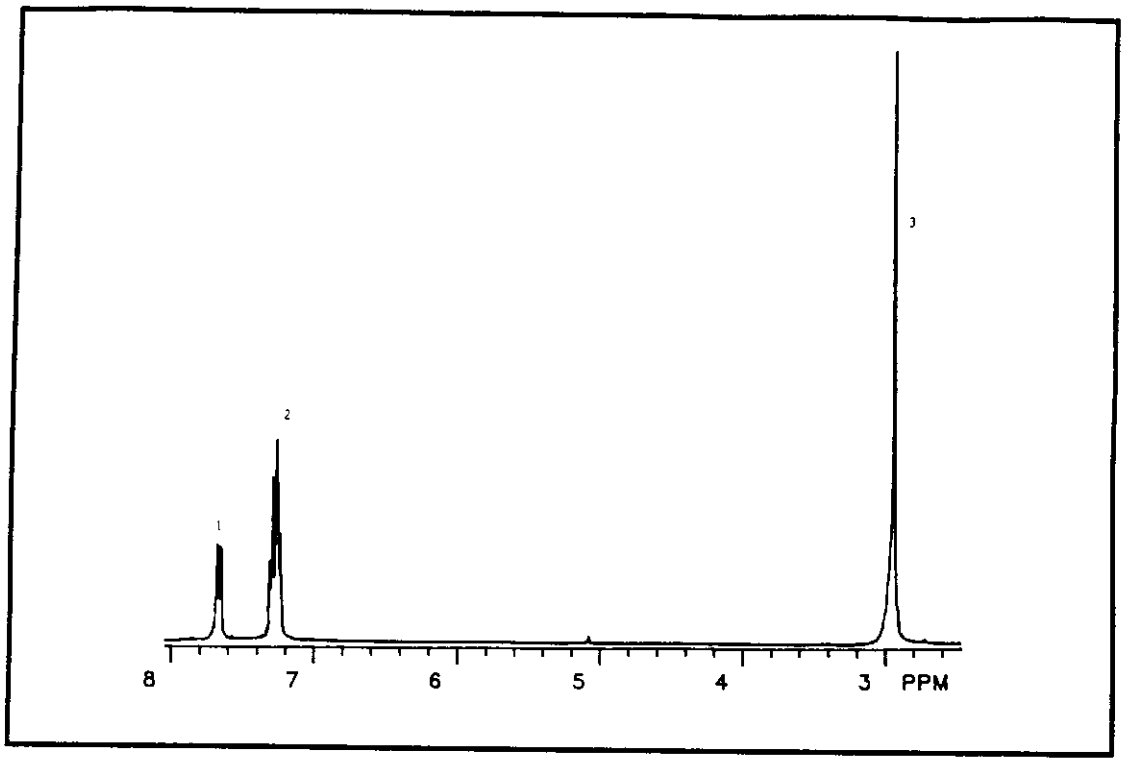

d
d
d
s
s
q
120
100
80
60
40
20
PPM

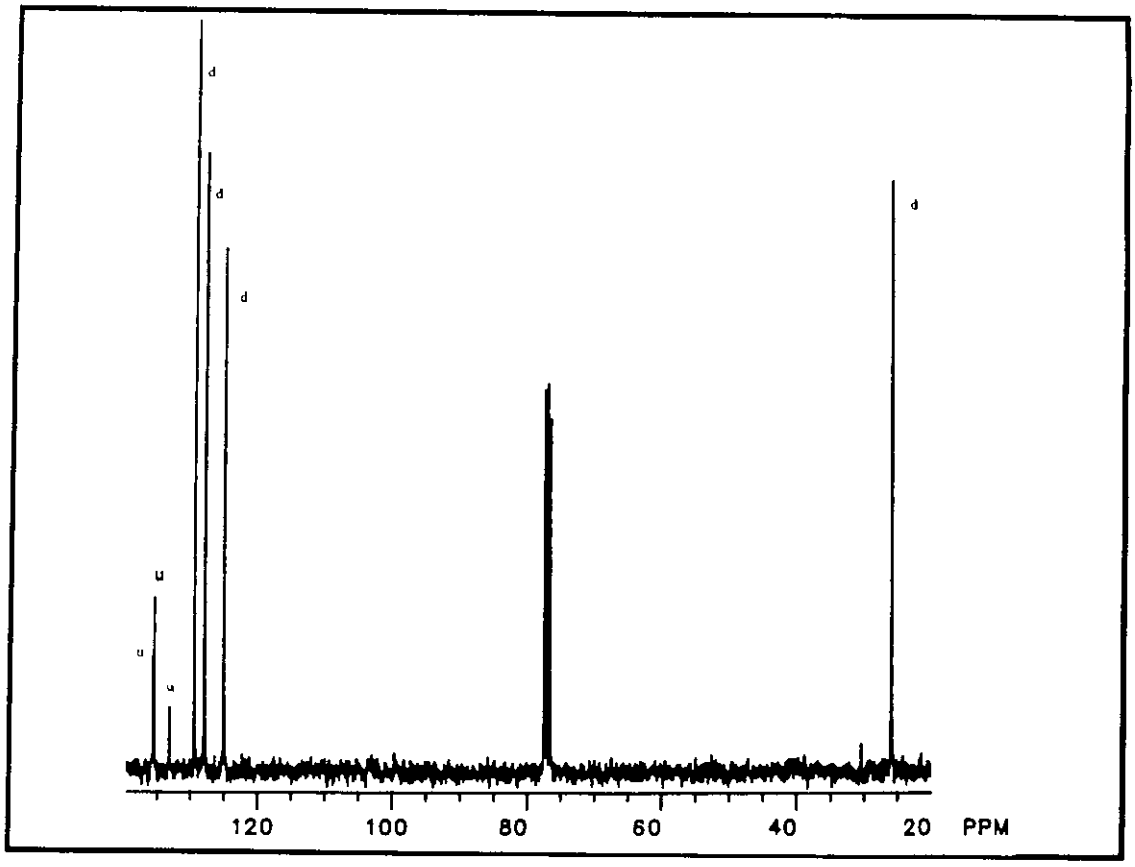
Problem 69

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na

Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A
40, 0.10	70, 0.20	92, 0.10	109, 0.10	127, 5.50	143, 0.40
44, 0.10	71, 2.30	93, 0.10	110, 0.10	128, 8.21	145, 0.10
47, 0.10	73, 0.10	94, 0.20	111, 0.10	129, 3.90	146, 0.10
49, 0.10	74, 2.40	95, 0.10	113, 0.90	130, 0.40	147, 0.10
50, 2.40	75, 3.20	96, 0.10	114, 0.70	131, 0.10	148, 0.10
51, 6.01	76,11.21	98, 0.40	115,12.31	132, 0.10	149, 0.20
52, 0.90	77,11.11	99, 0.60	116, 1.60	133, 0.10	150, 1.20
53, 0.40	78, 4.80	100, 0.30	117, 0.10	134, 0.10	151, 4.10
58, 1.60	79, 0.50	101, 0.70	118, 0.10	135, 0.10	152,10.51
59, 0.10	85, 0.30	102, 1.80	120, 0.10	136, 0.10	153,14.31
61, 0.50	86, 0.90	103, 0.70	121, 0.10	137, 0.20	154, 4.40
62, 2.00	87, 1.50	104, 0.10	122, 0.10	138, 0.50	155,26.02
63, 7.91	88, 0.70	105, 0.10	123, 0.10	139, 5.40	156,100.0
64, 5.00	89, 2.10	106, 0.10	124, 0.10	140, 1.50	157,12.51
65, 1.40	90, 0.50	107, 0.10	125, 0.30	141,61.57	158, 0.70
66, 0.20	91, 0.70	108, 0.10	126, 1.50	142, 7.51	

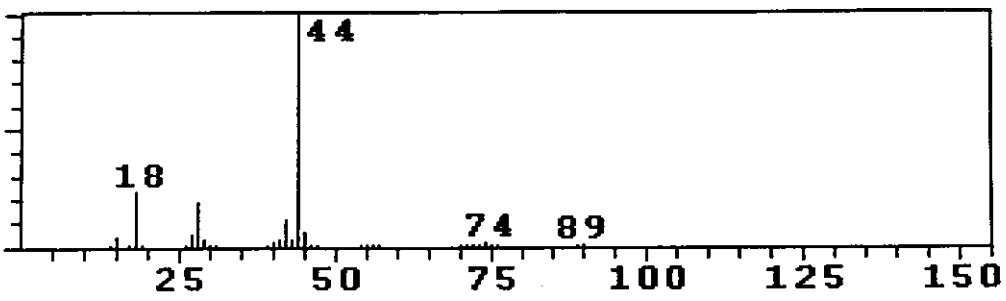


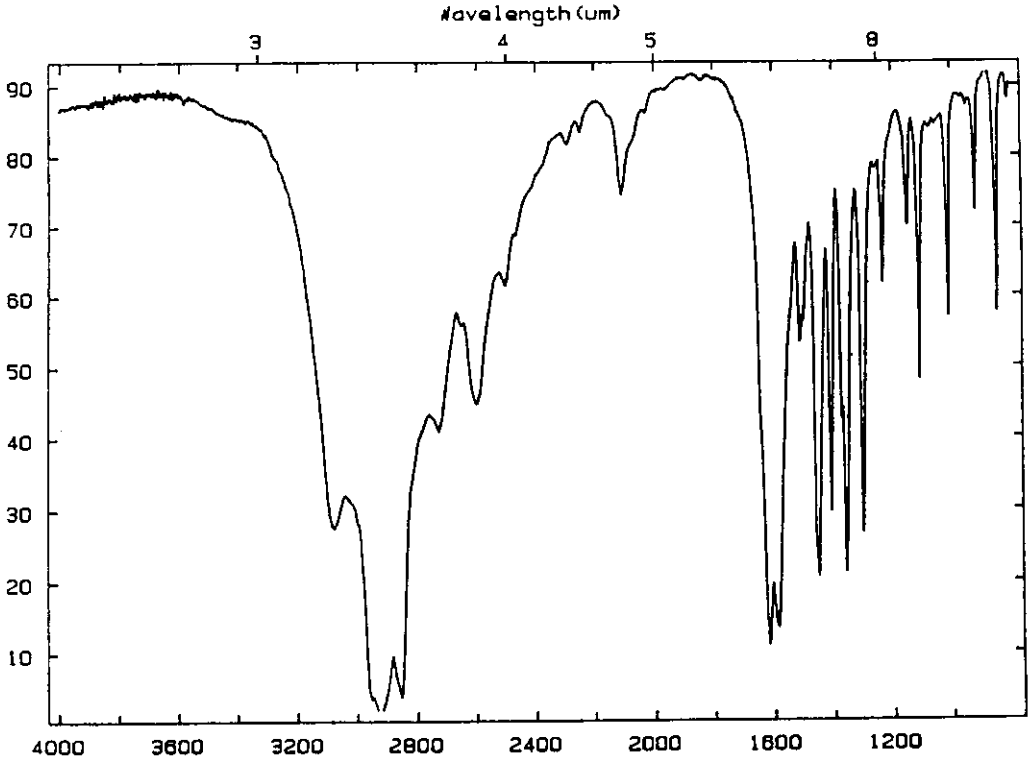

1
2
3
8
7
6
5
4
3
PPM

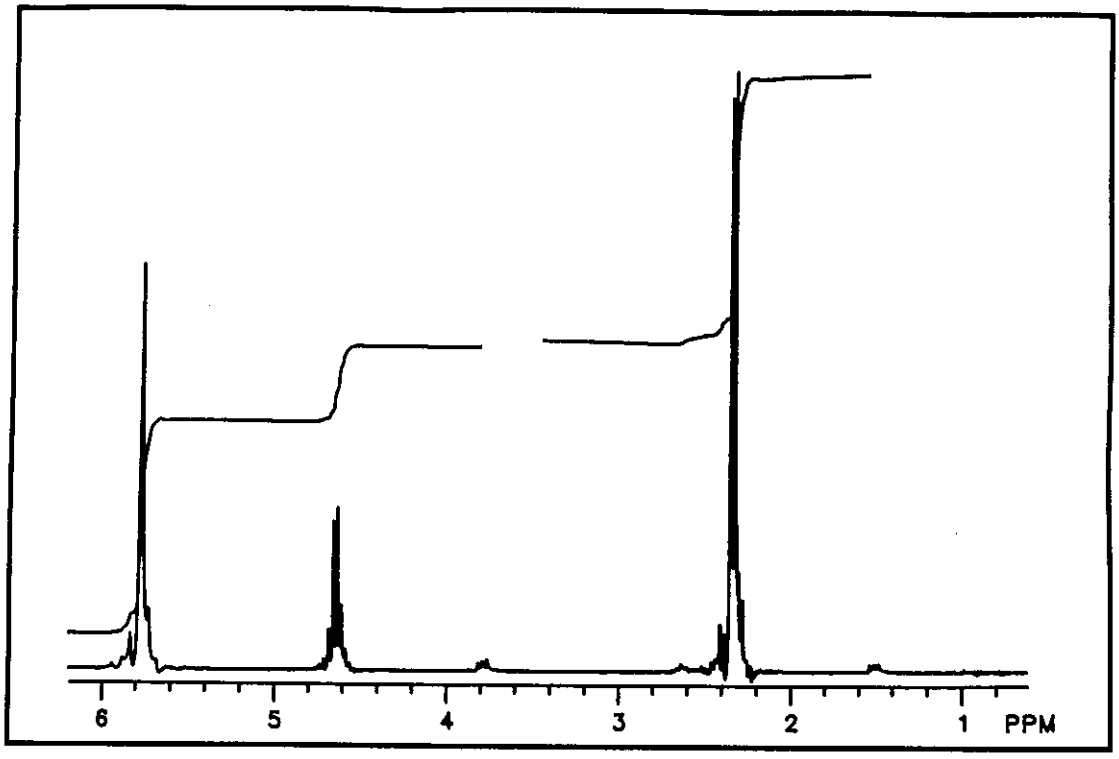

d
d
d
d
120
100
80
60
40
20
PPM

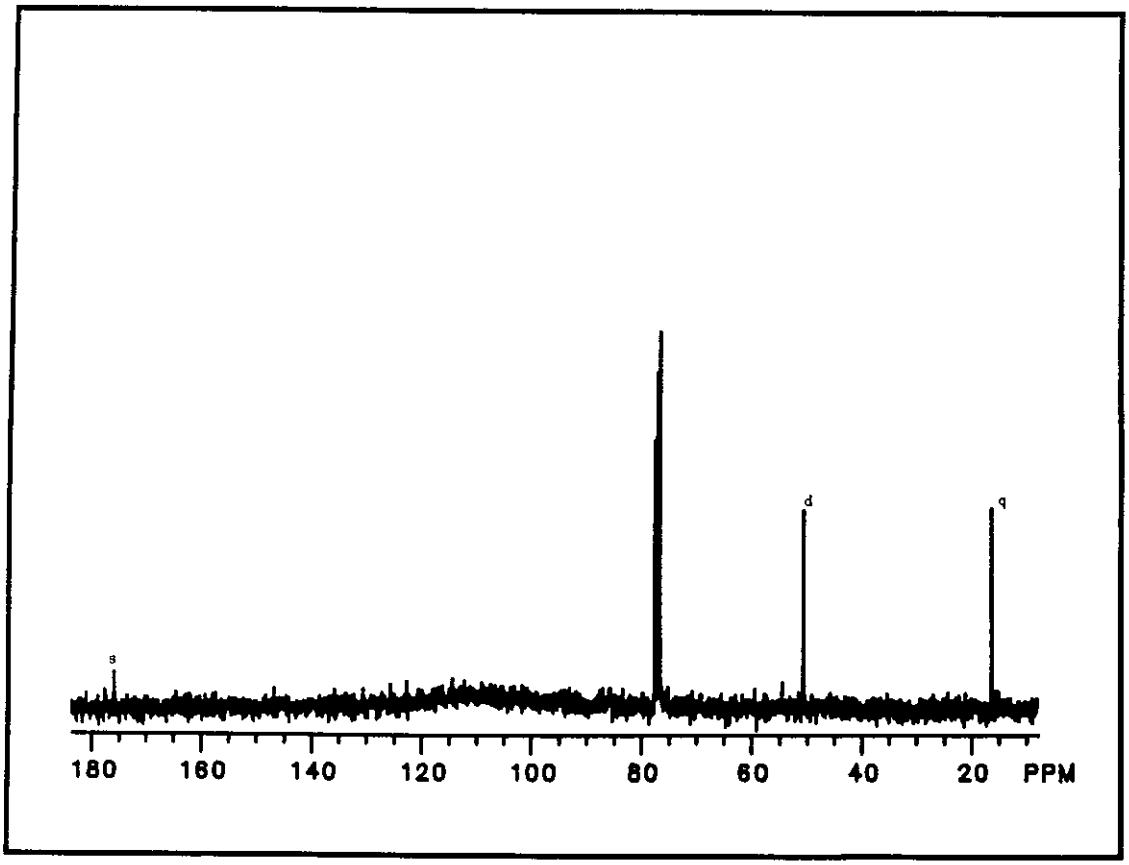
Problem 70

Exact Mass: na
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na



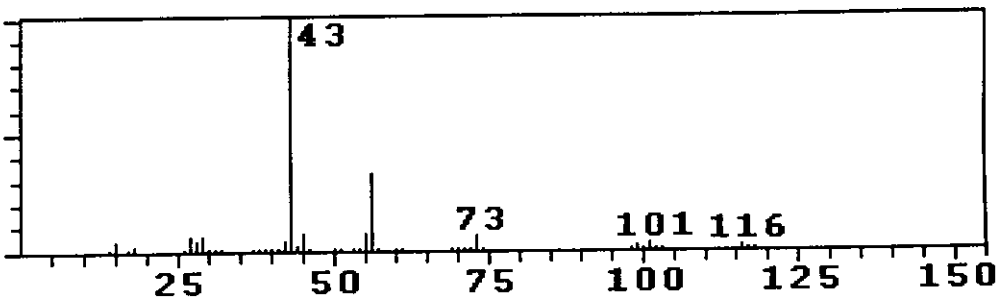


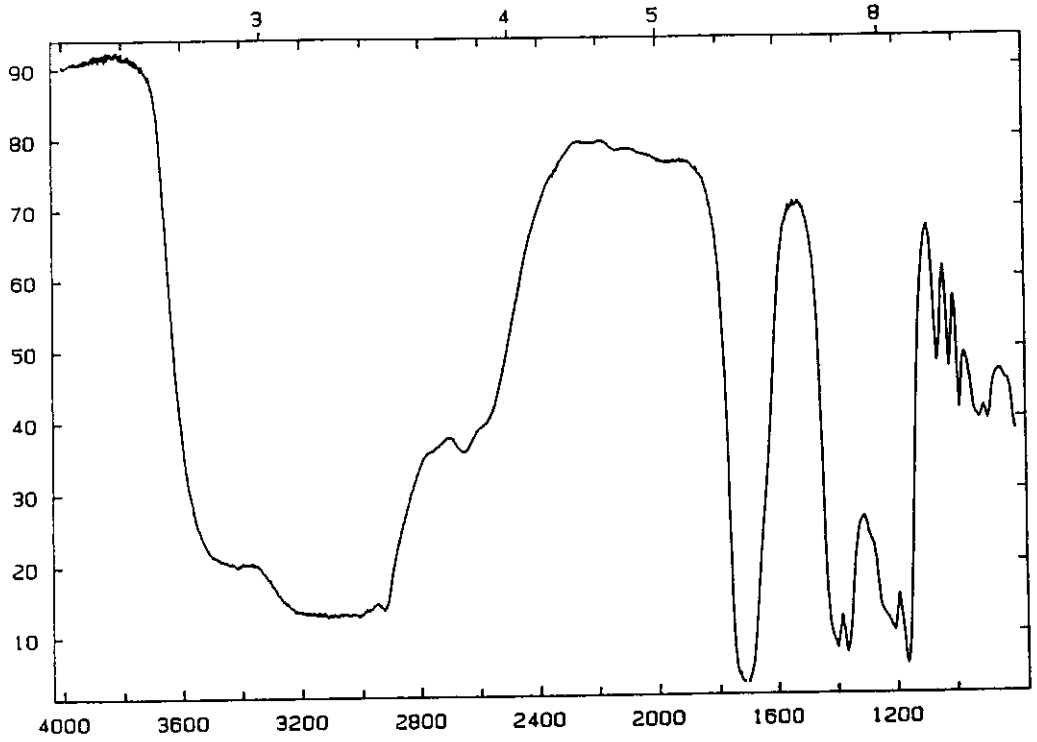

6
5
4
3
2
1
PPM

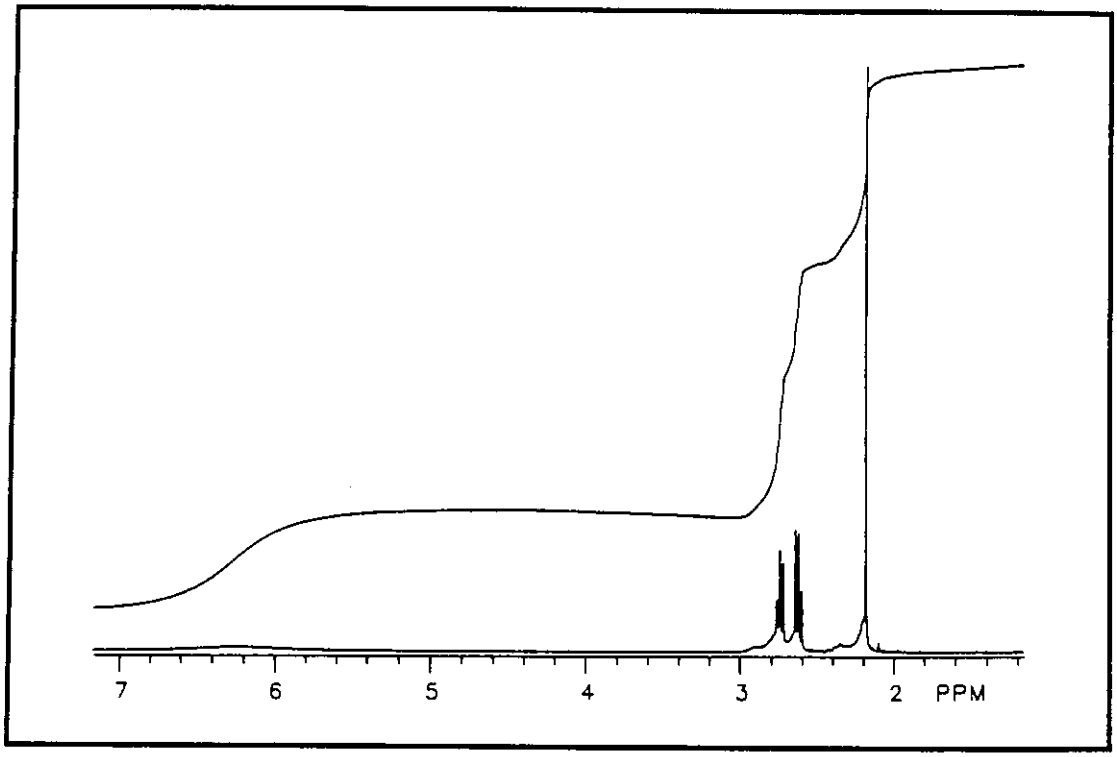

s
d
q
180
160
140
120
100
80
60
40
20
PPM

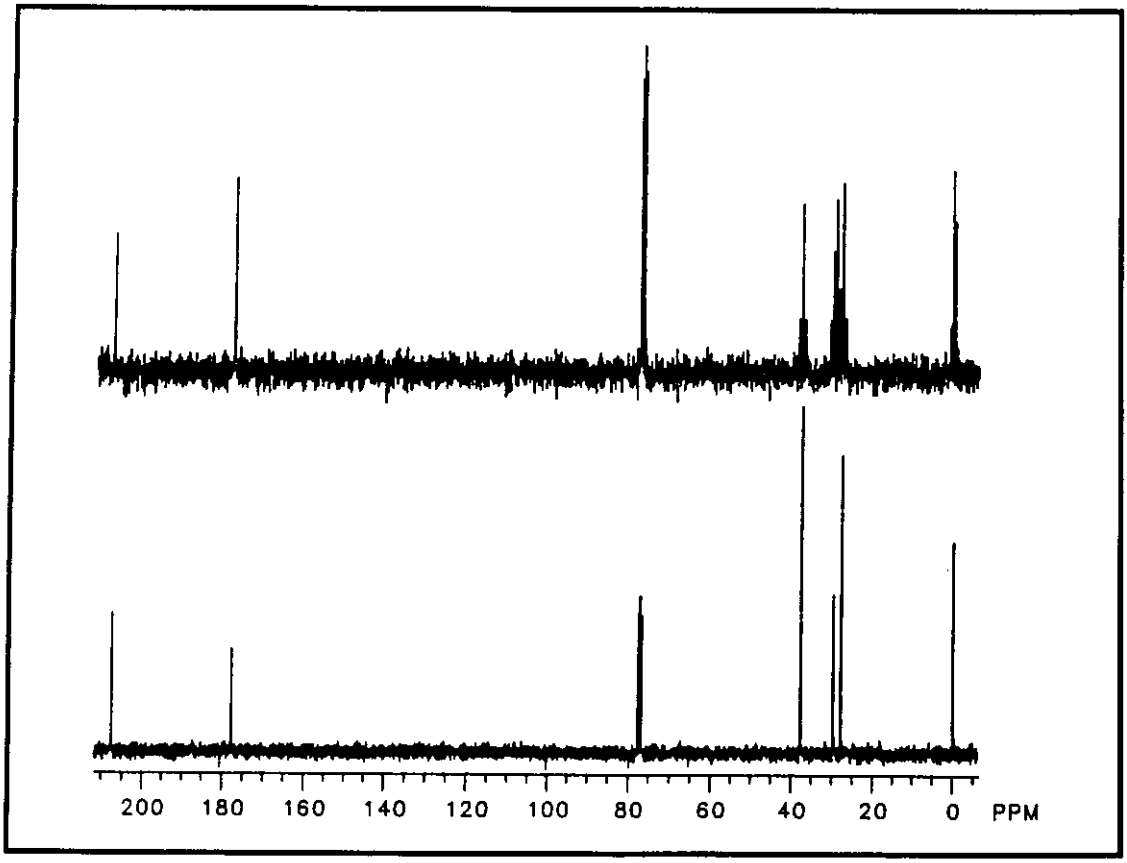
Problem 71

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na



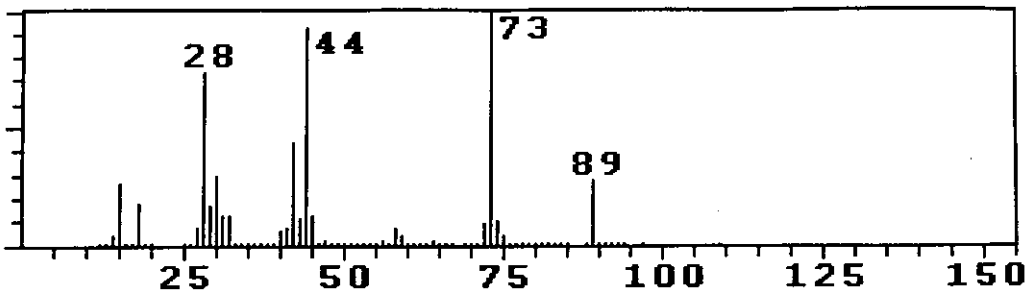


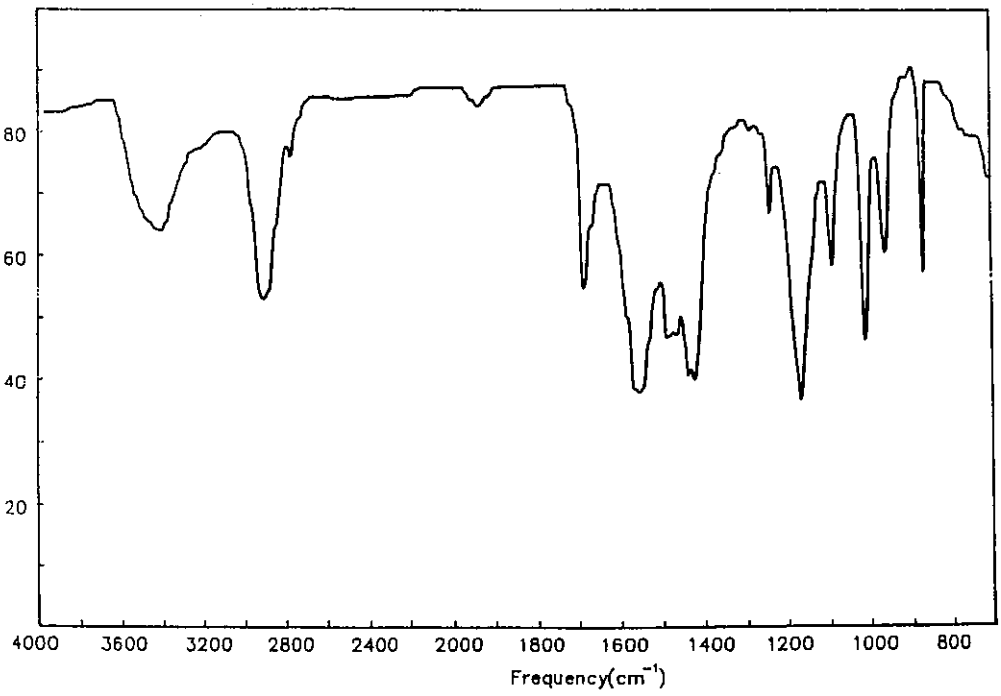

7
6
5
4
3
2
PPM

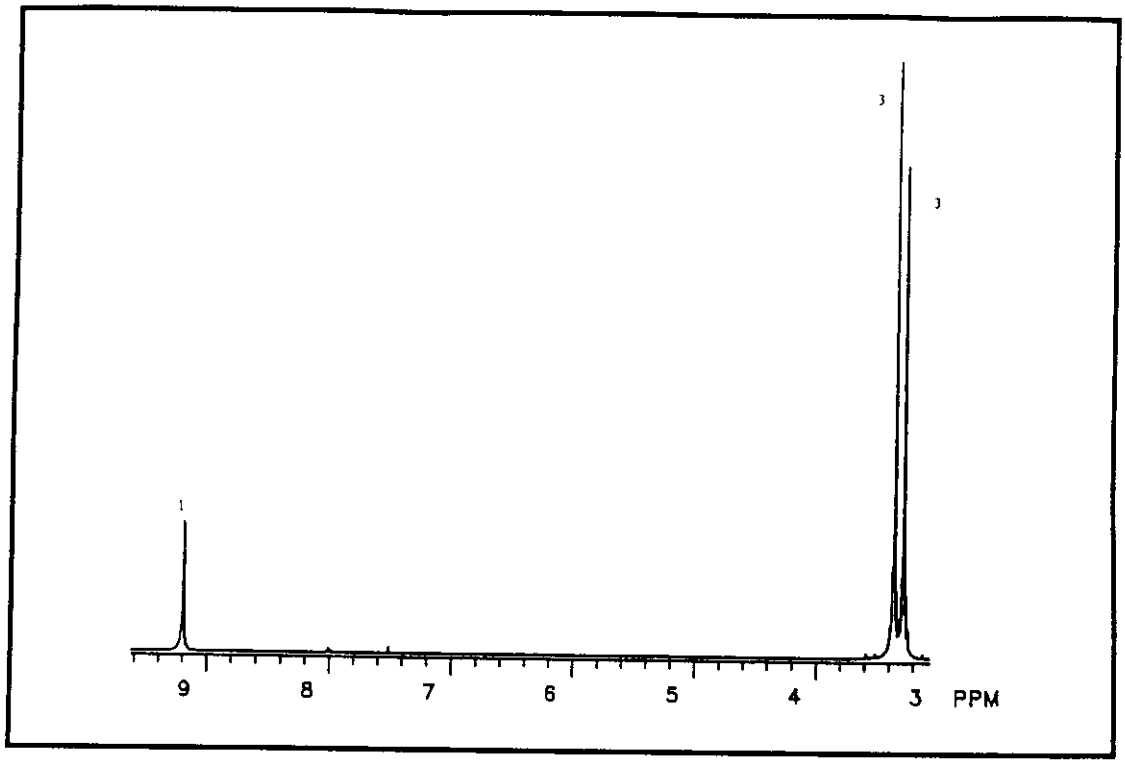

200
180
160
140
120
100
80
60
40
20
0
PPM

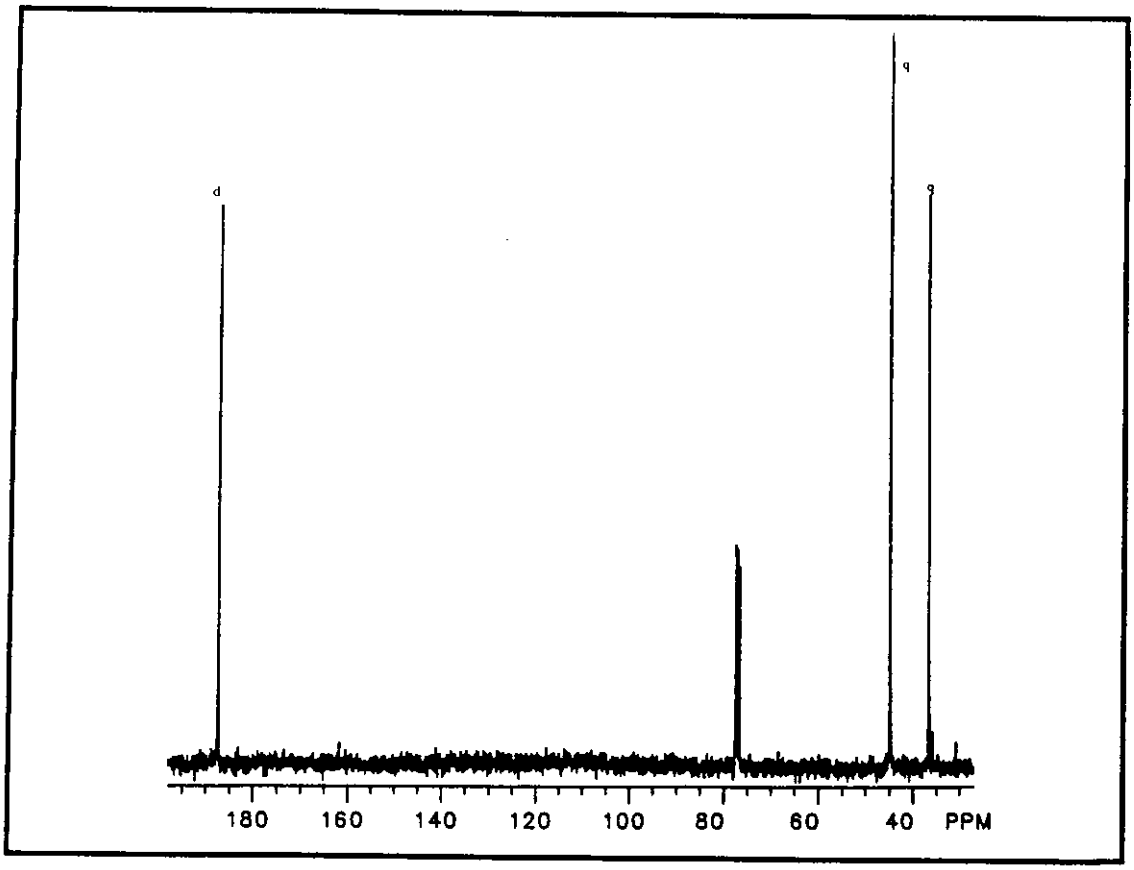
Problem 72

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na



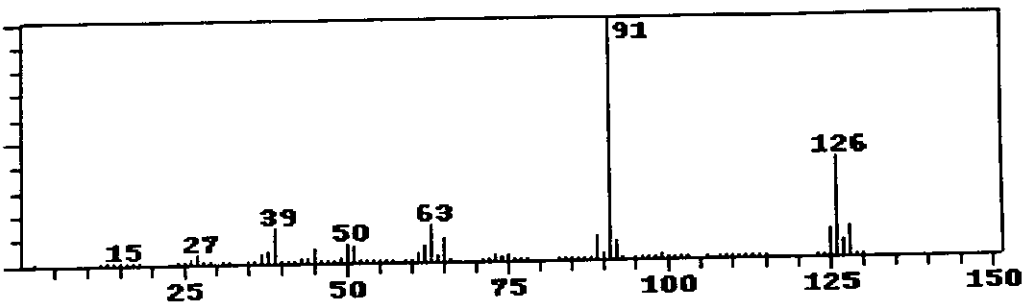


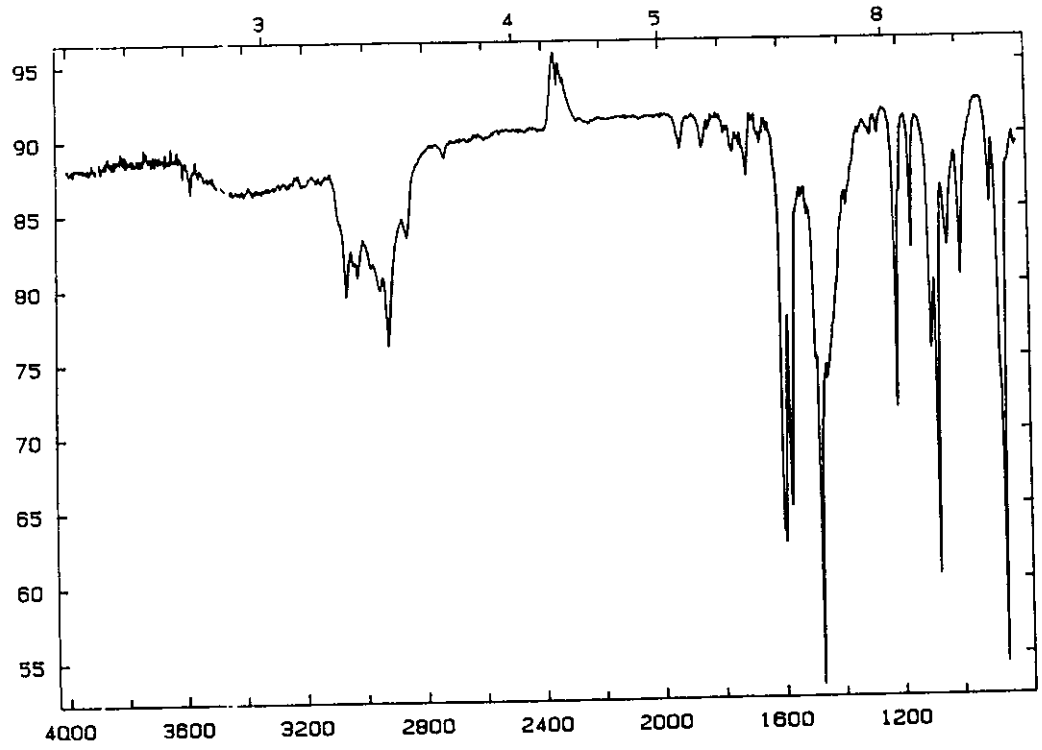

3
3
1
9
8
7
6
5
4
3
PPM

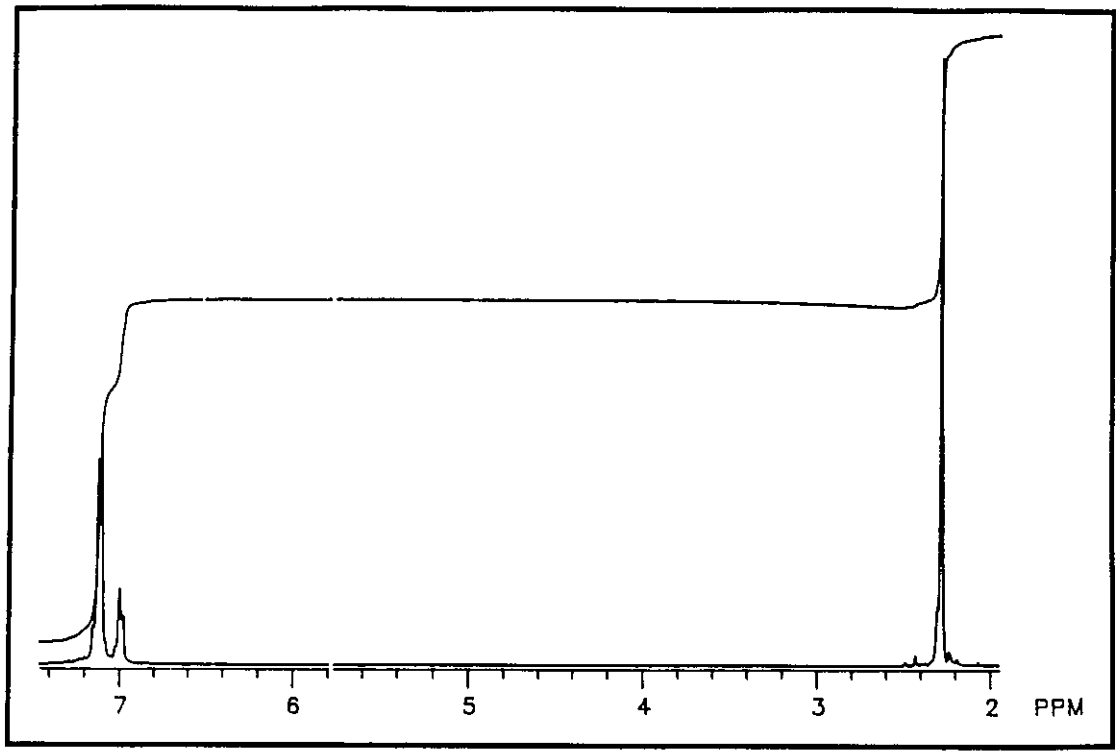

q
d
q
180
160
140
120
100
80
60
40
PPM

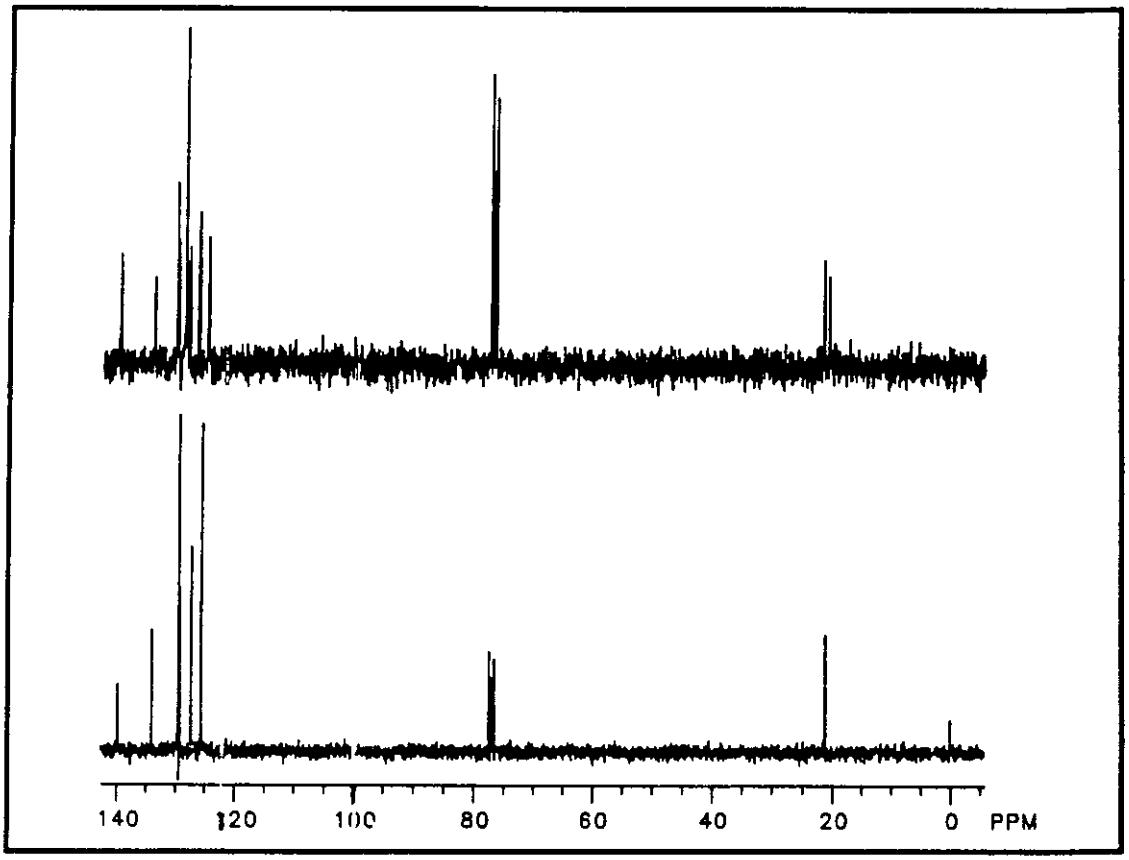
Problem 73

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na





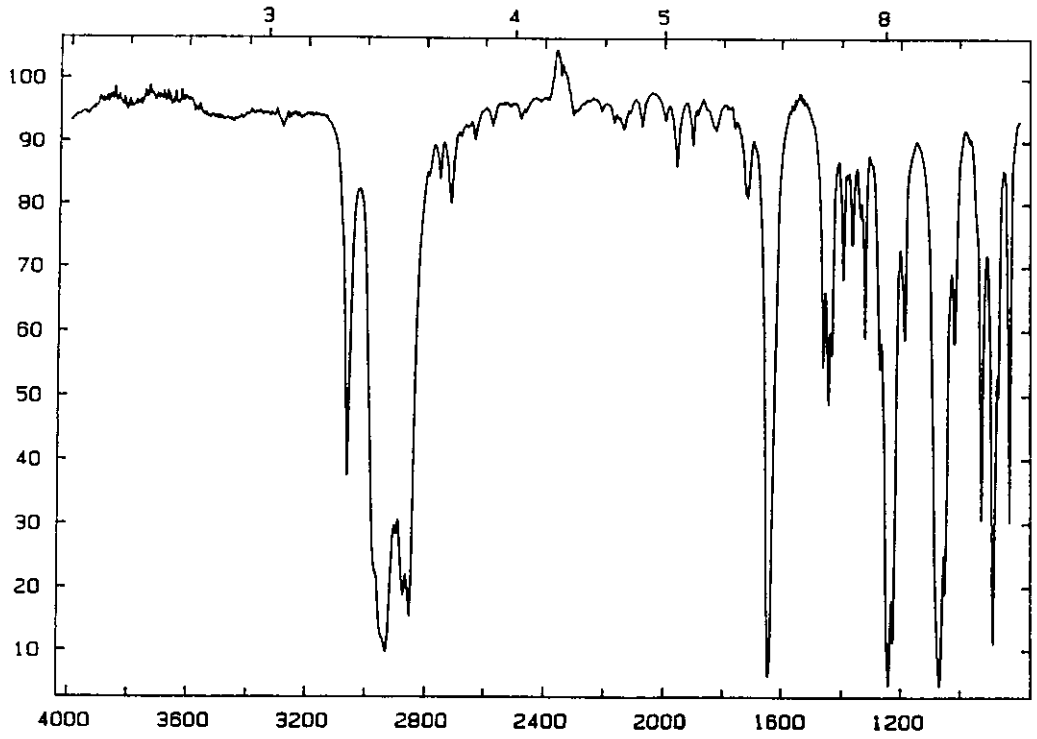

7
6
5
4
3
2
PPM

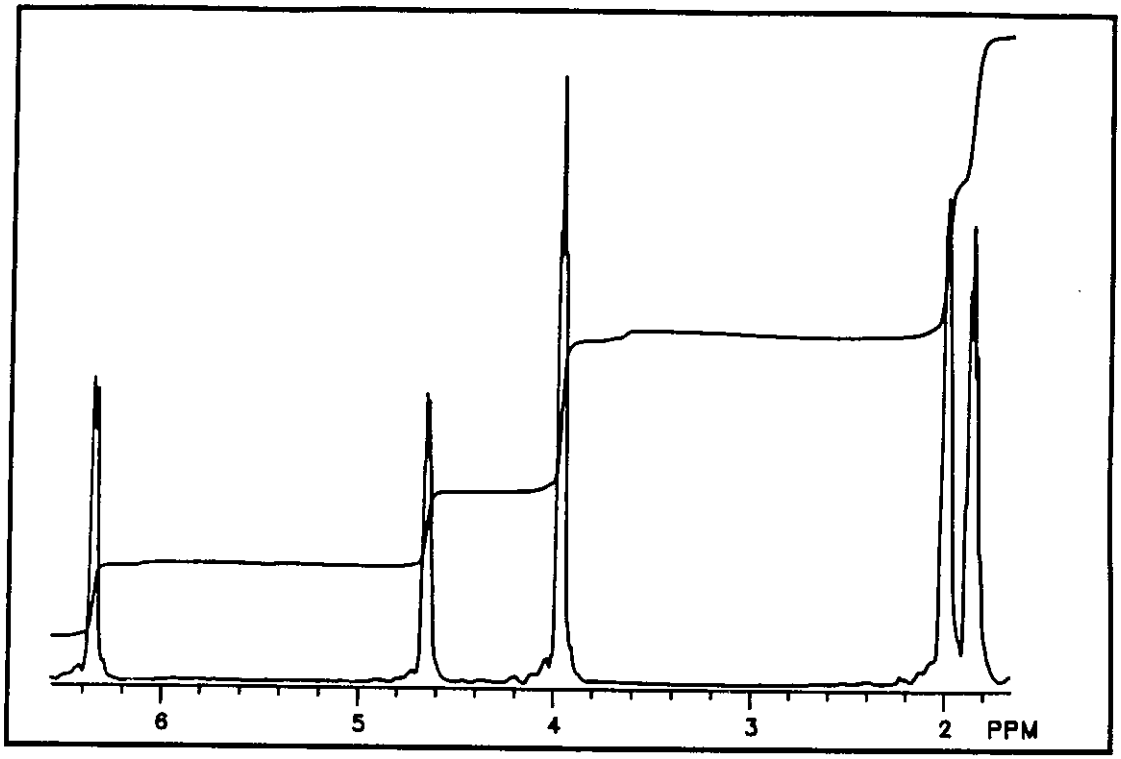

140
120
100
80
60
40
20
0
PPM

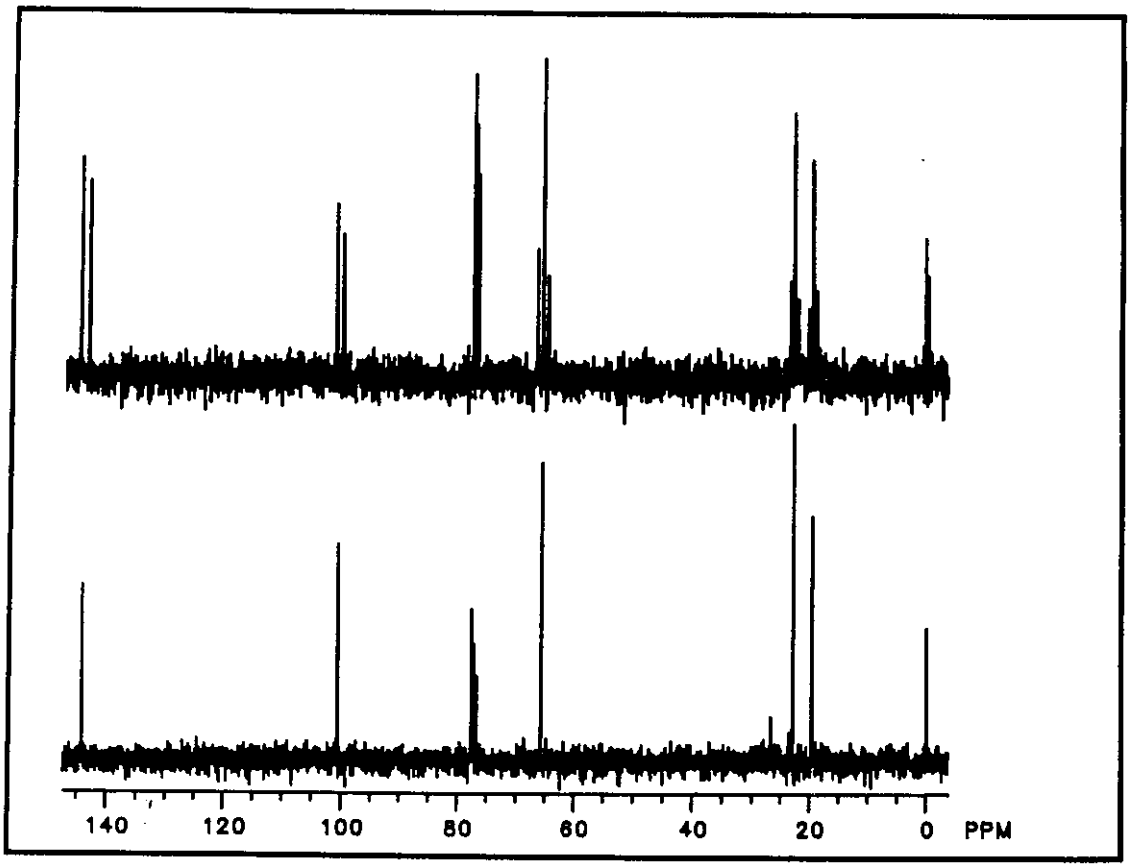
Problem 74

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na

Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A
28,53.81	38, 4.43	44, 2.69	53,15.19	65, 2.37	81, 1.90
29,43.35	39,32.12	45, 4.27	54,26.90	66, 2.37	82, 1.58
30, 2.21	40, 3.16	49, 1.27	55,100.0	67, 1.11	83,31.64
31, 3.16	41,28.48	50, 4.43	56,22.94	69,10.60	84,66.15
32, 2.37	42, 4.75	51, 4.75	57,11.39	70, 1.58	85, 6.64
37, 2.06	43, 6.80	52, 1.27	58, 1.27	71, 1.11	86, 1.90

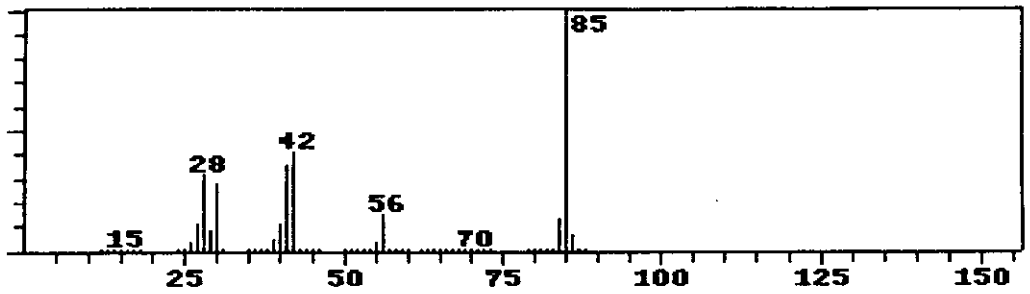


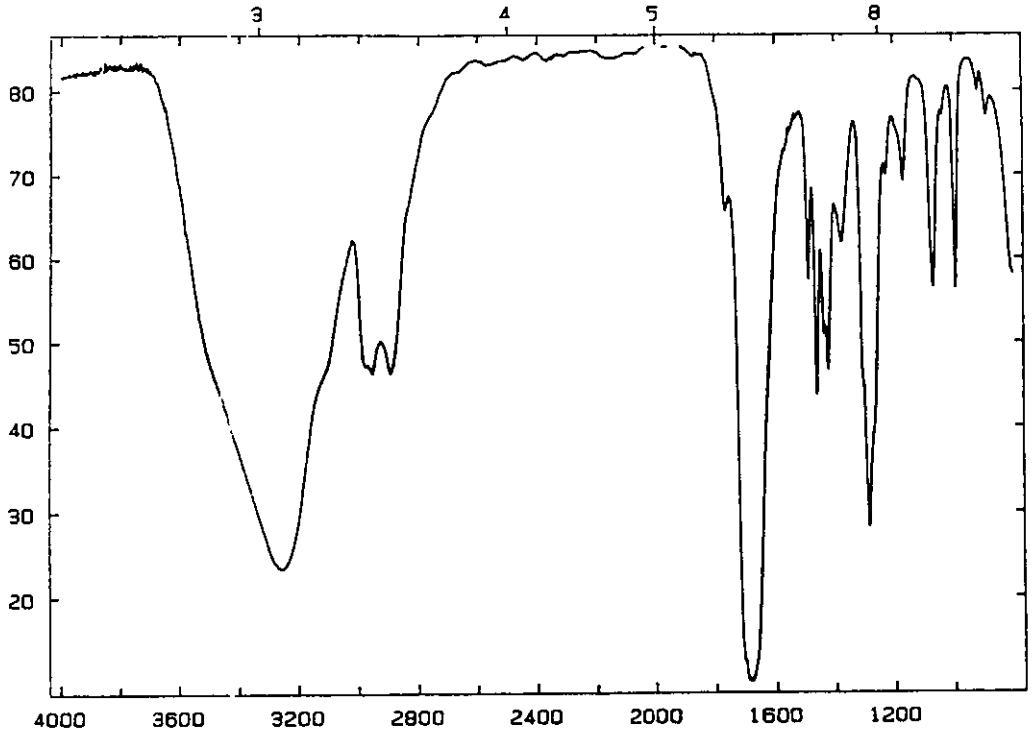

6
5
4
3
2
PPM

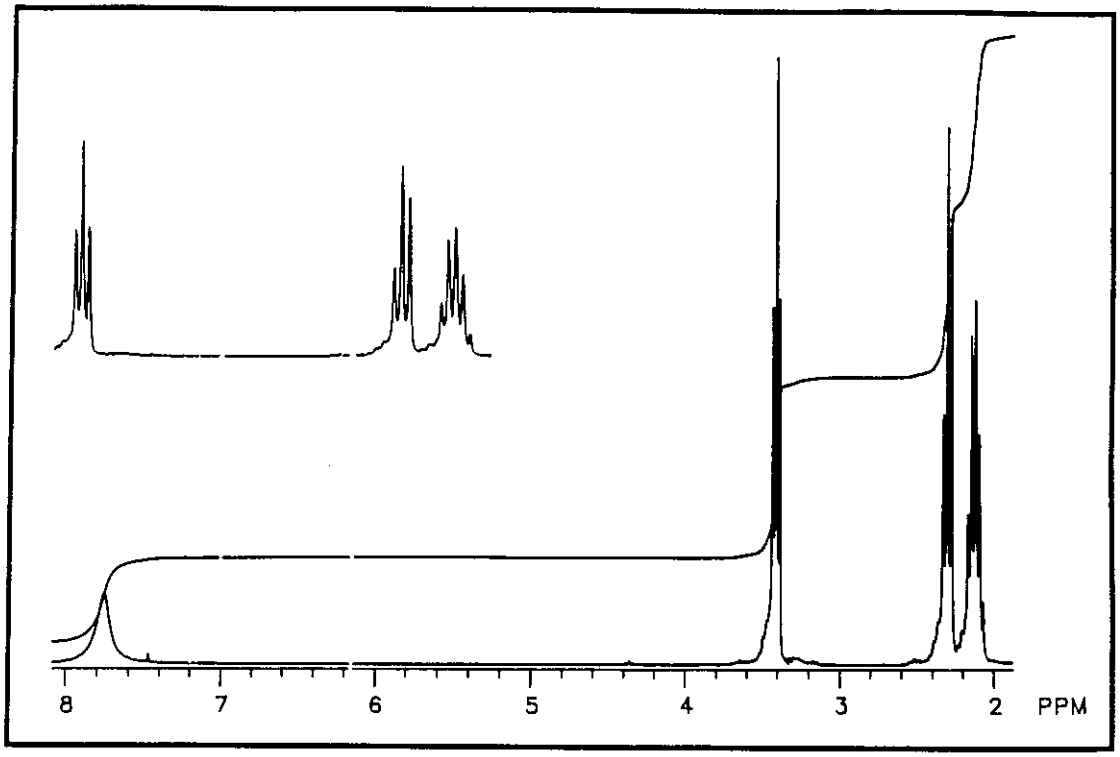

140
120
100
80
60
40
20
0
PPM

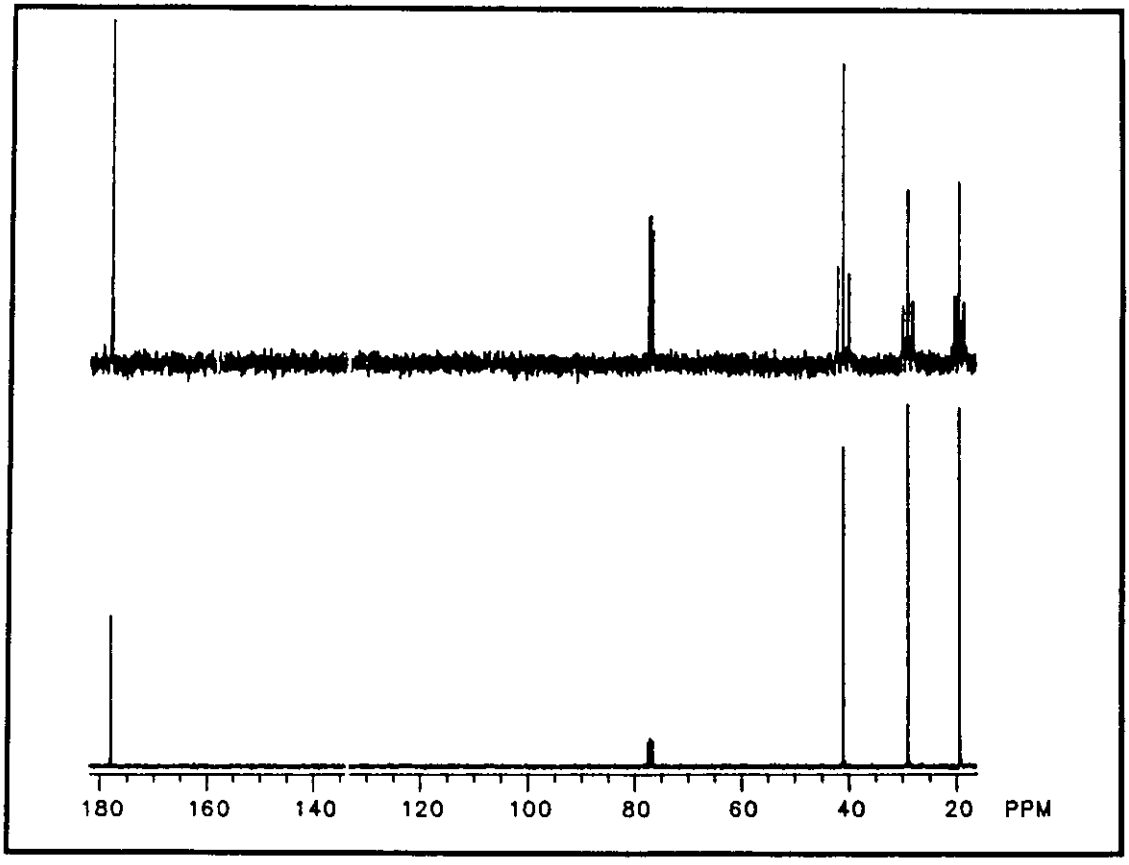
Problem 75

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na



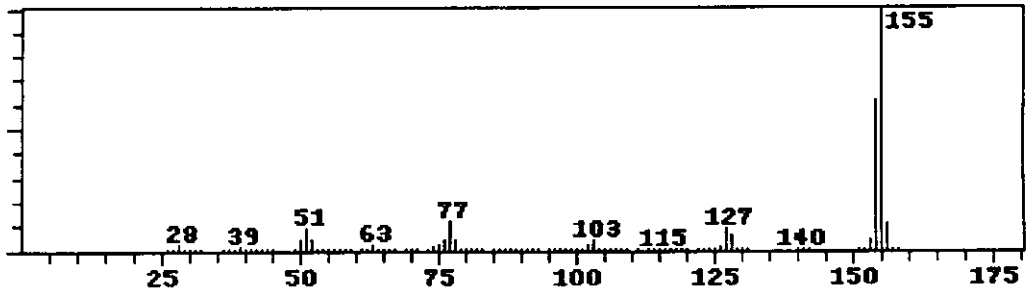


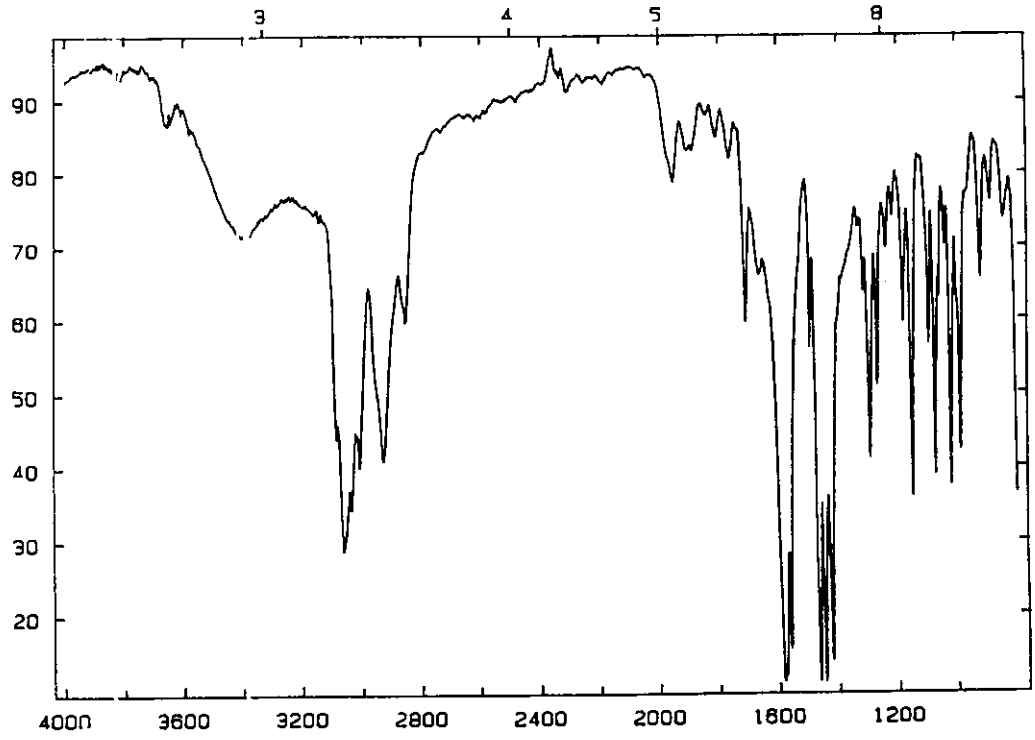

8
7
6
5
4
3
2
PPM

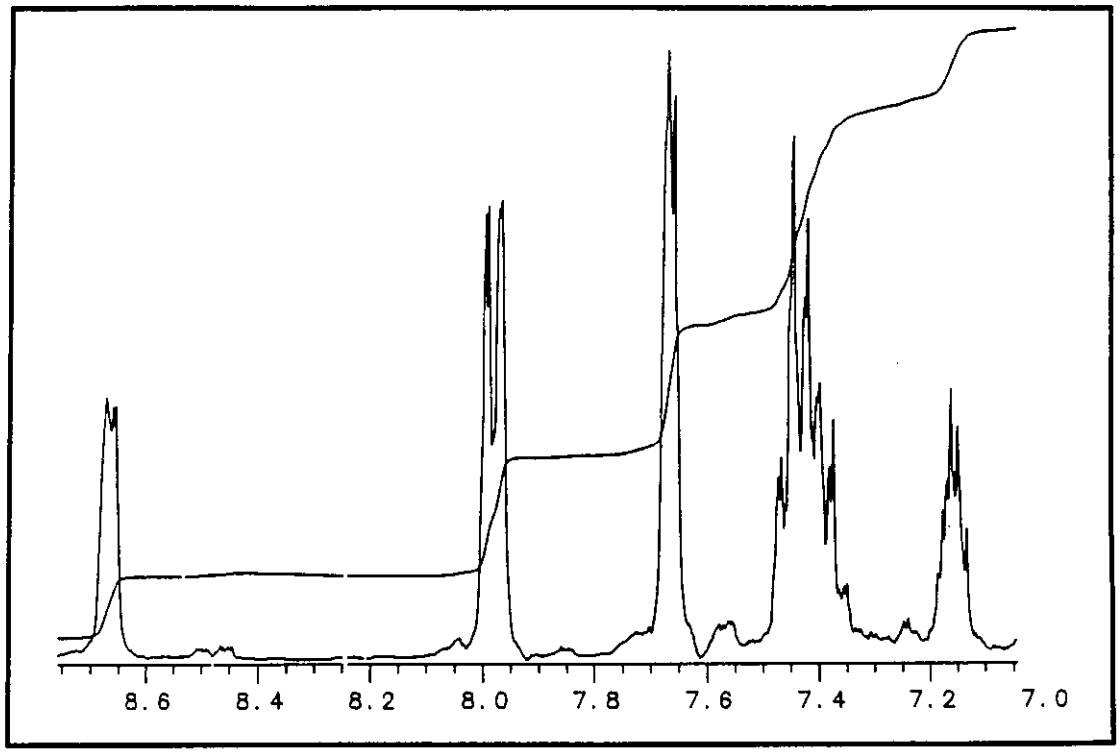

180
160
140
120
100
80
60
40
20
PPM

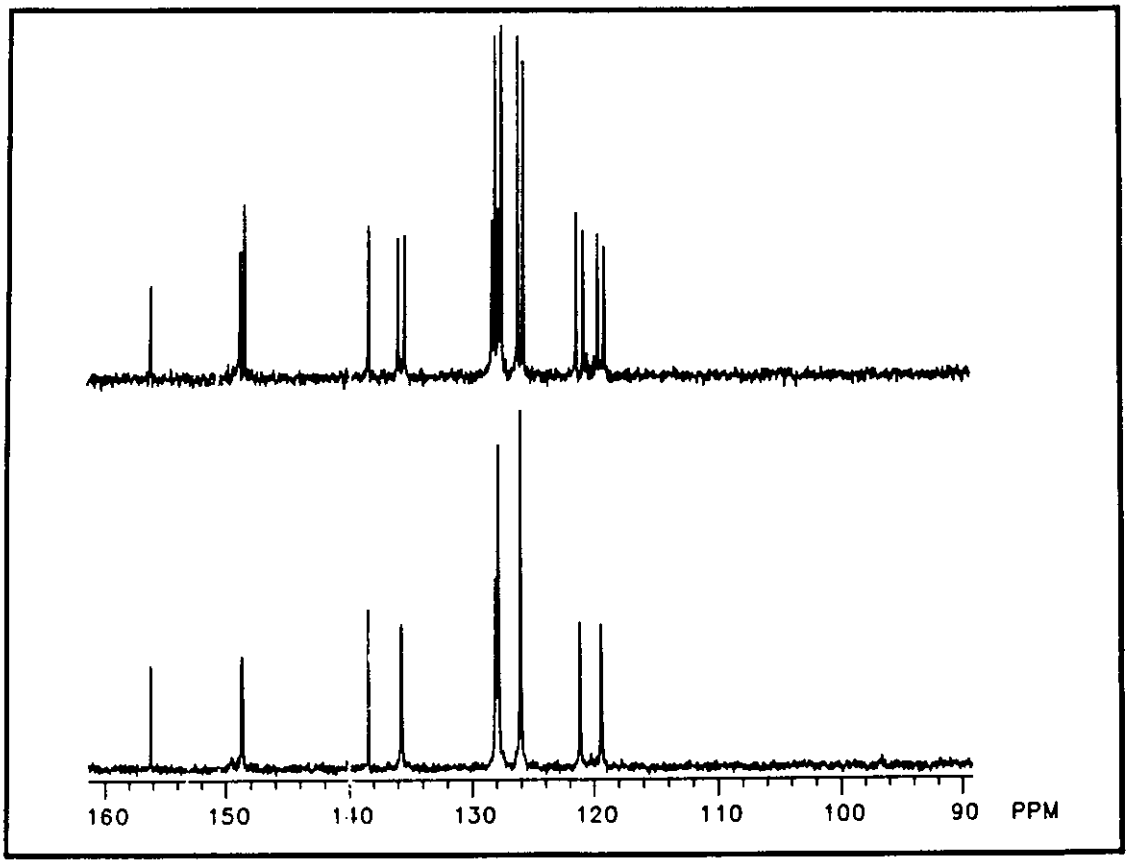
Problem 76

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na



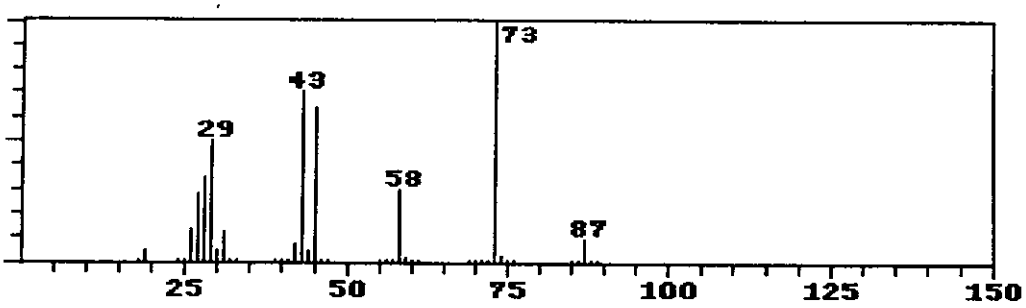


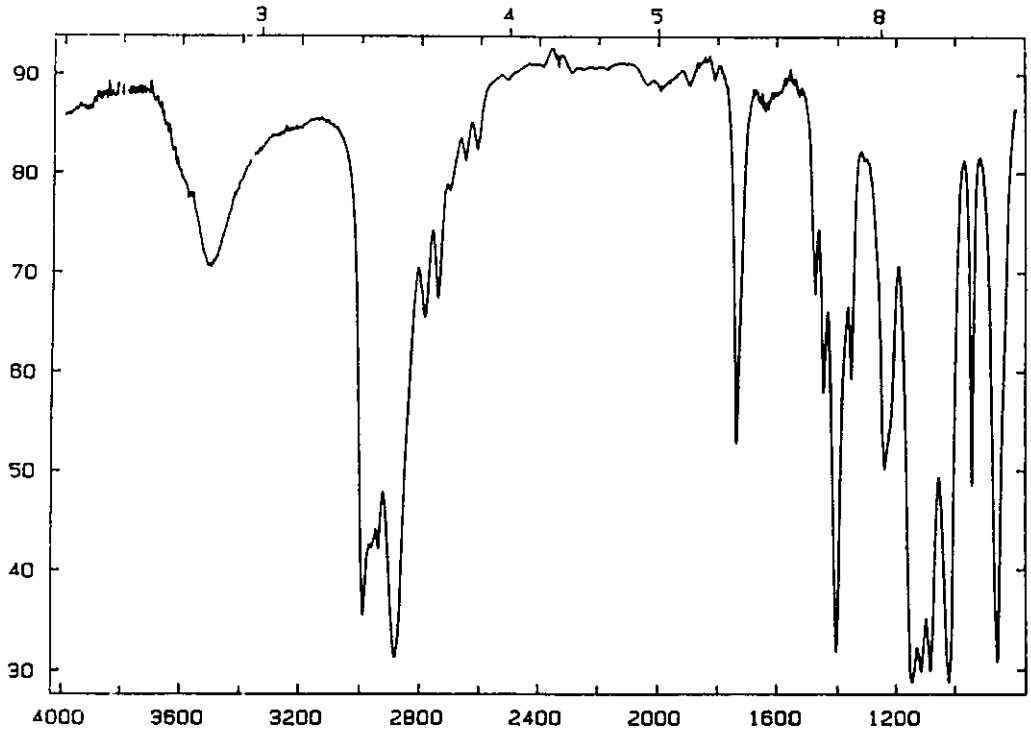

8.6
8.4
8.2
8.0
7.8
7.6
7.4
7.2
7.0

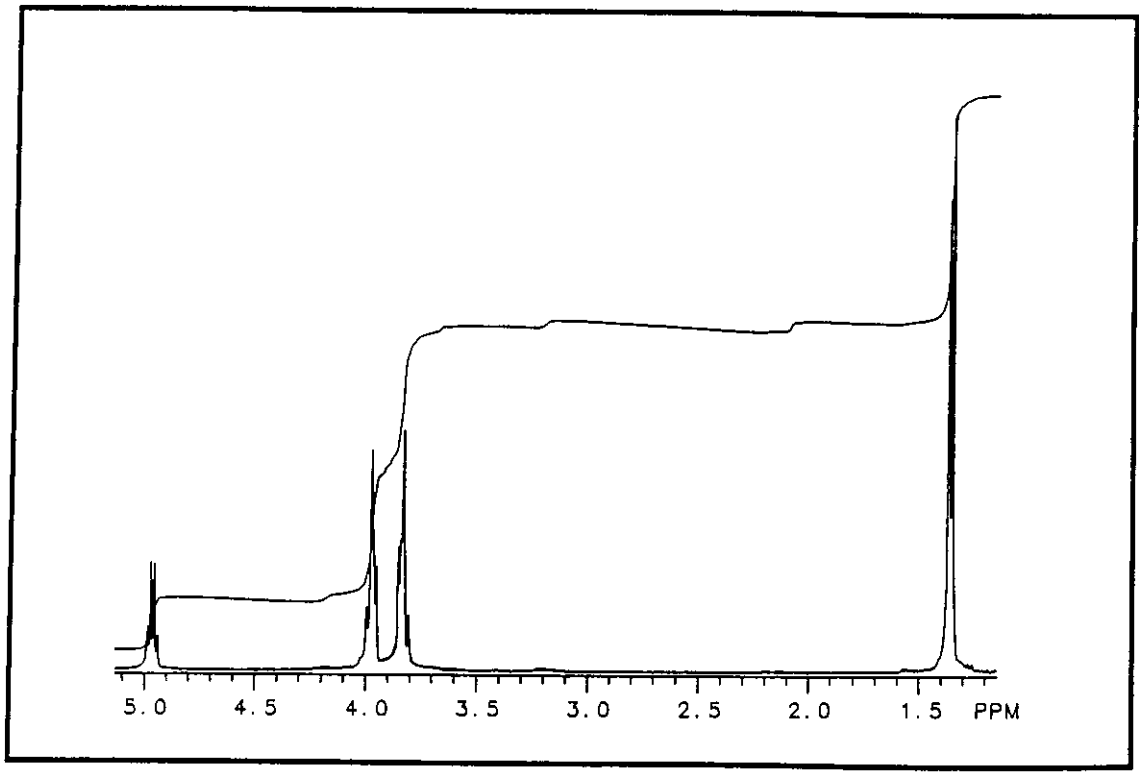

160
150
140
130
120
110
100
90
PPM

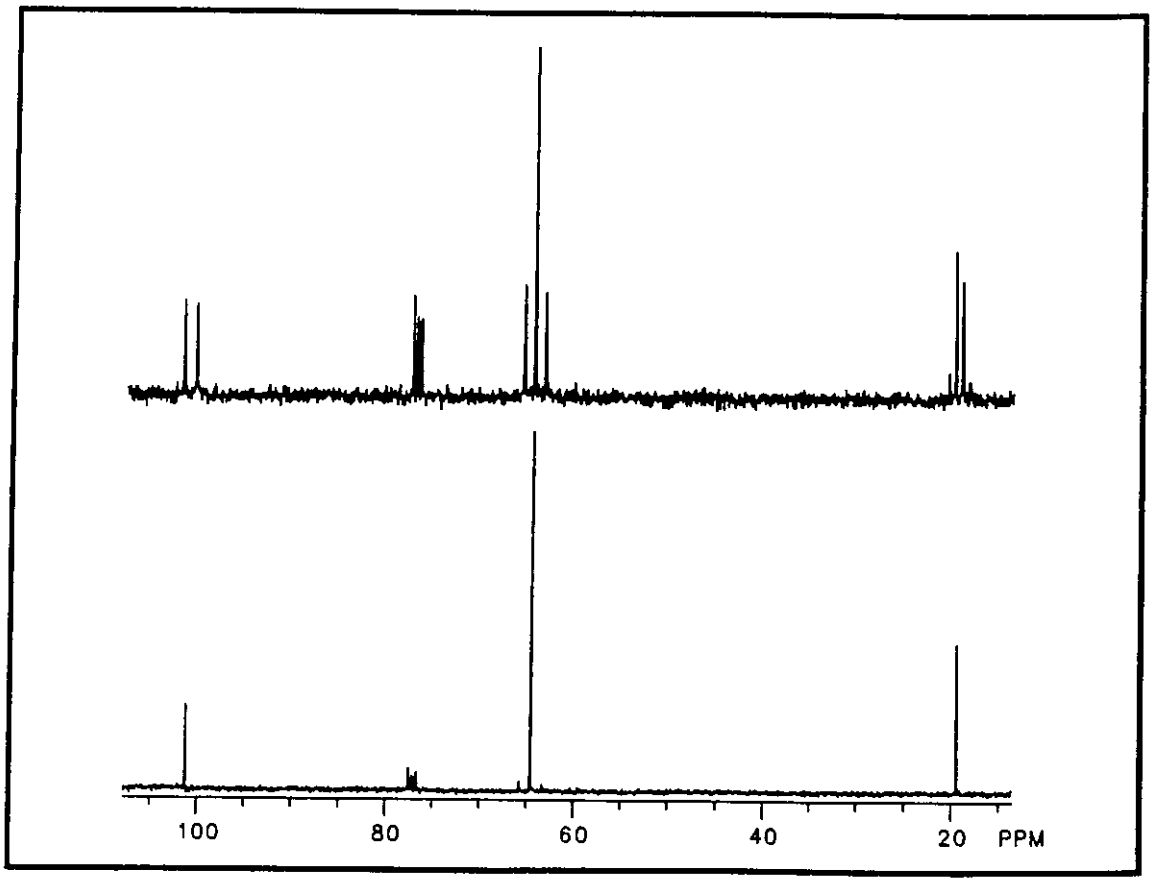
Problem 77

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na



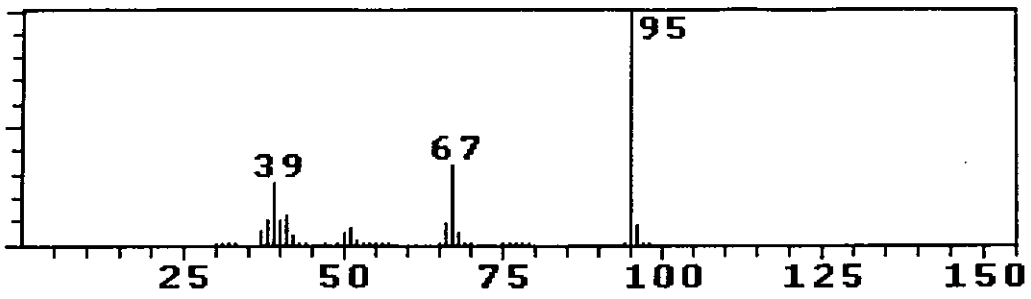


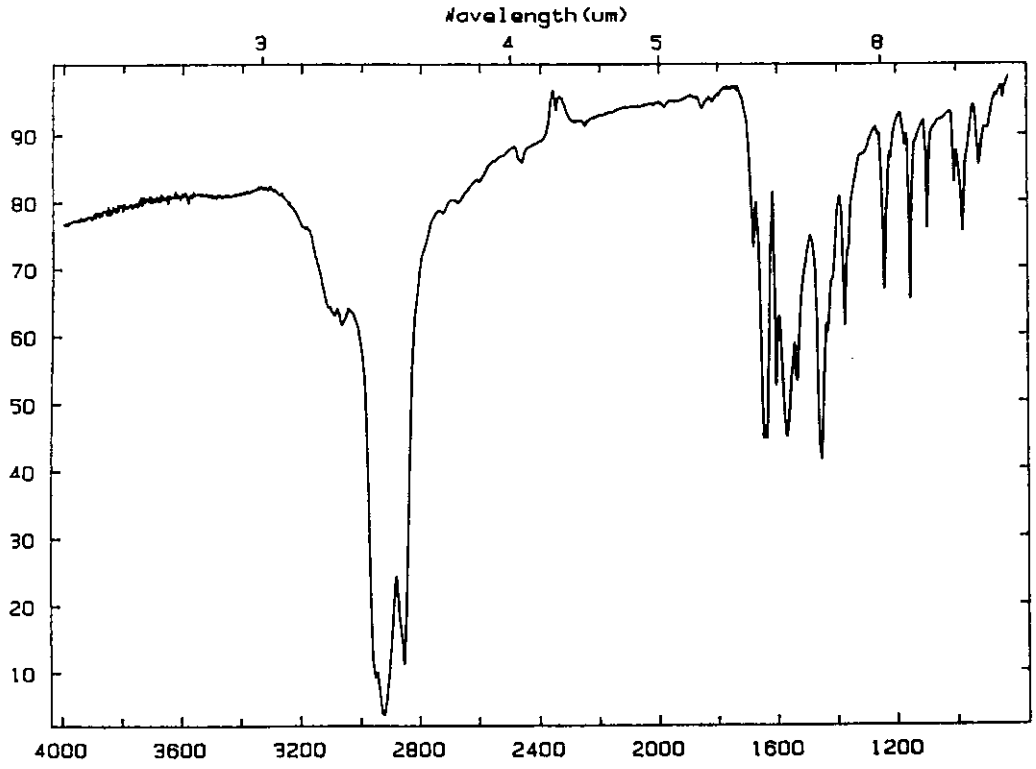

5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
PPM

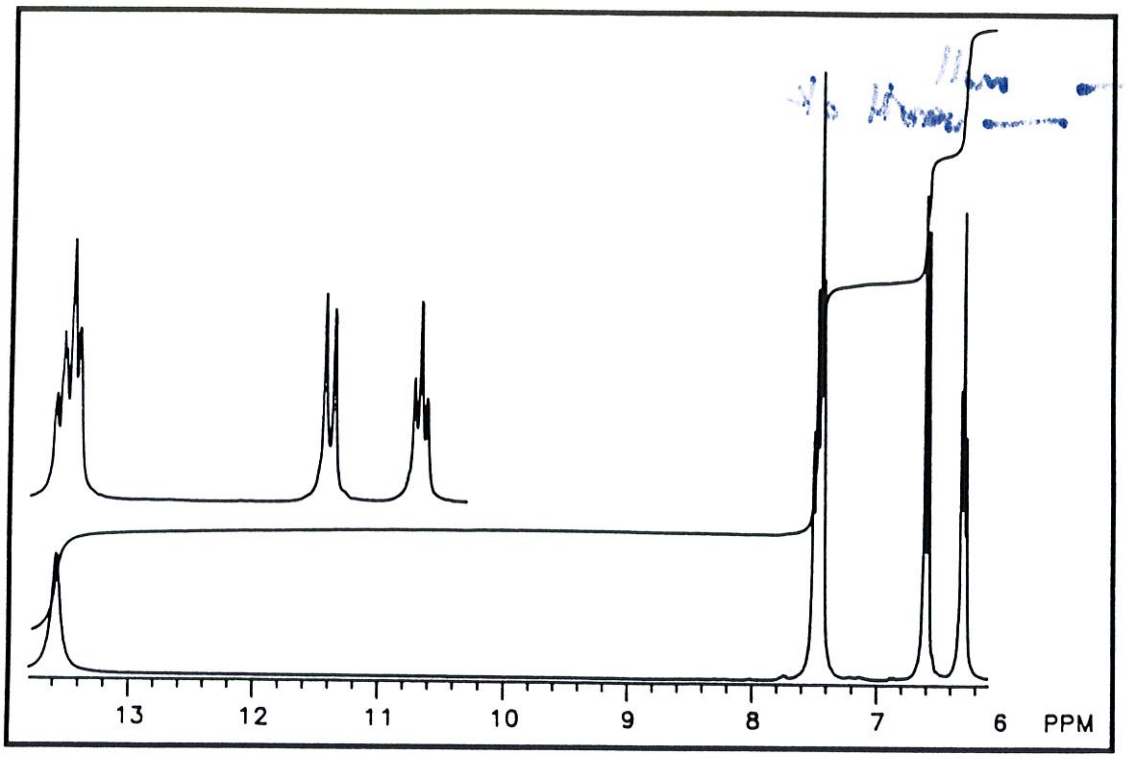

100
80
60
40
20
PPM

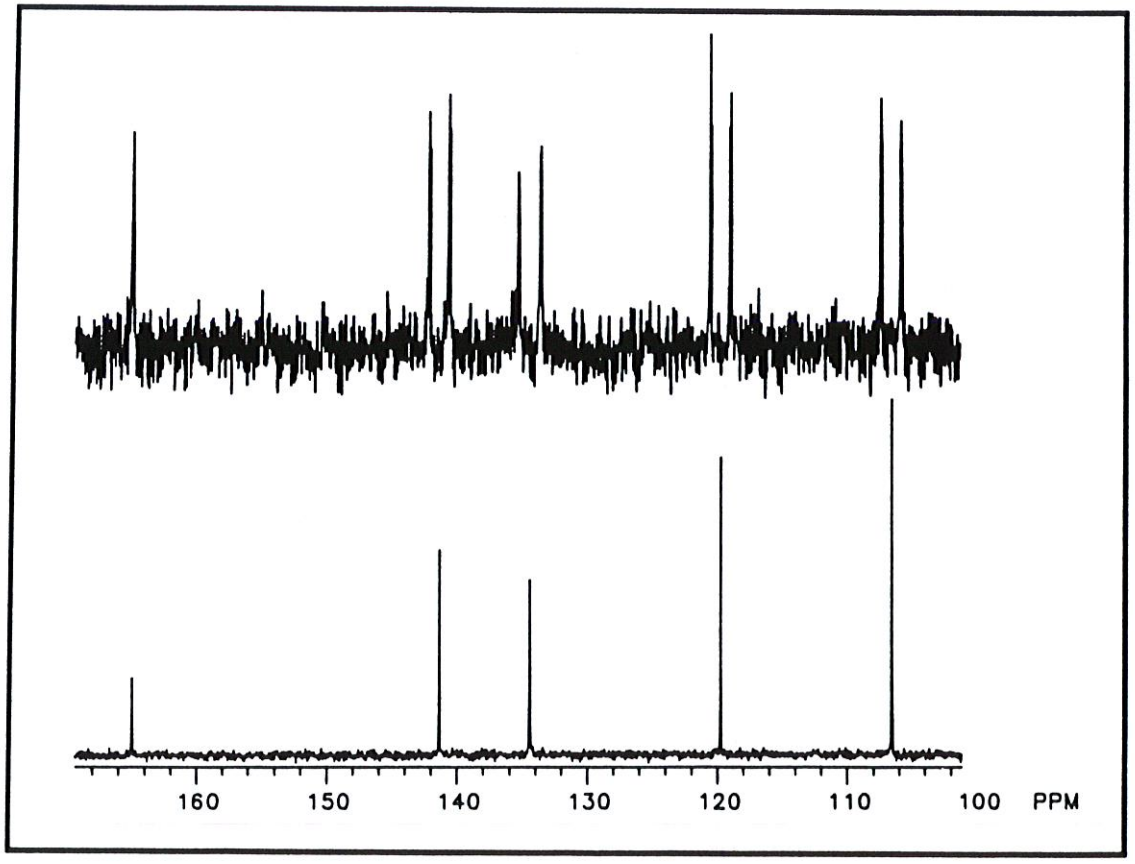
Problem 78

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na



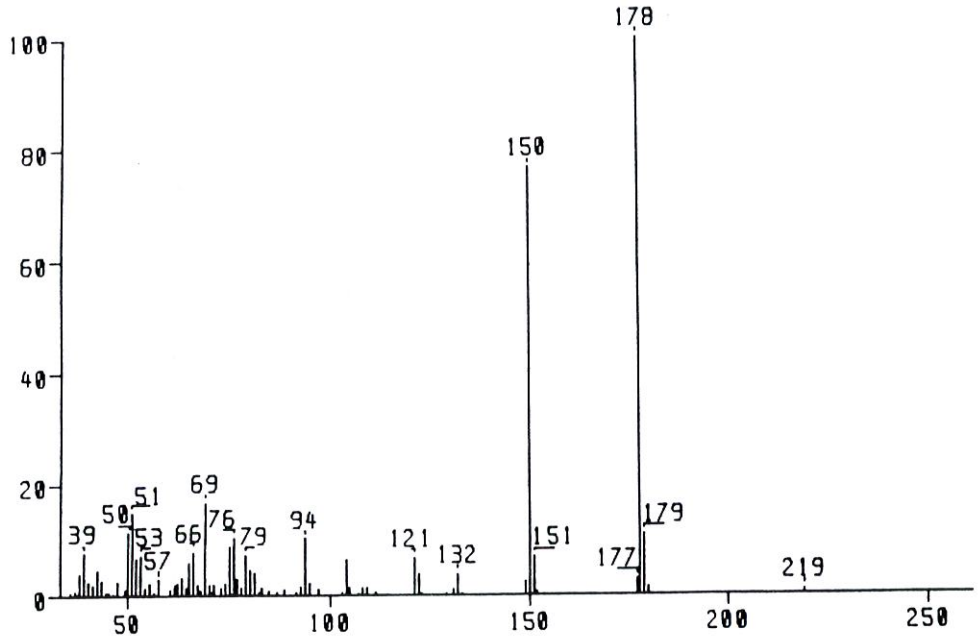


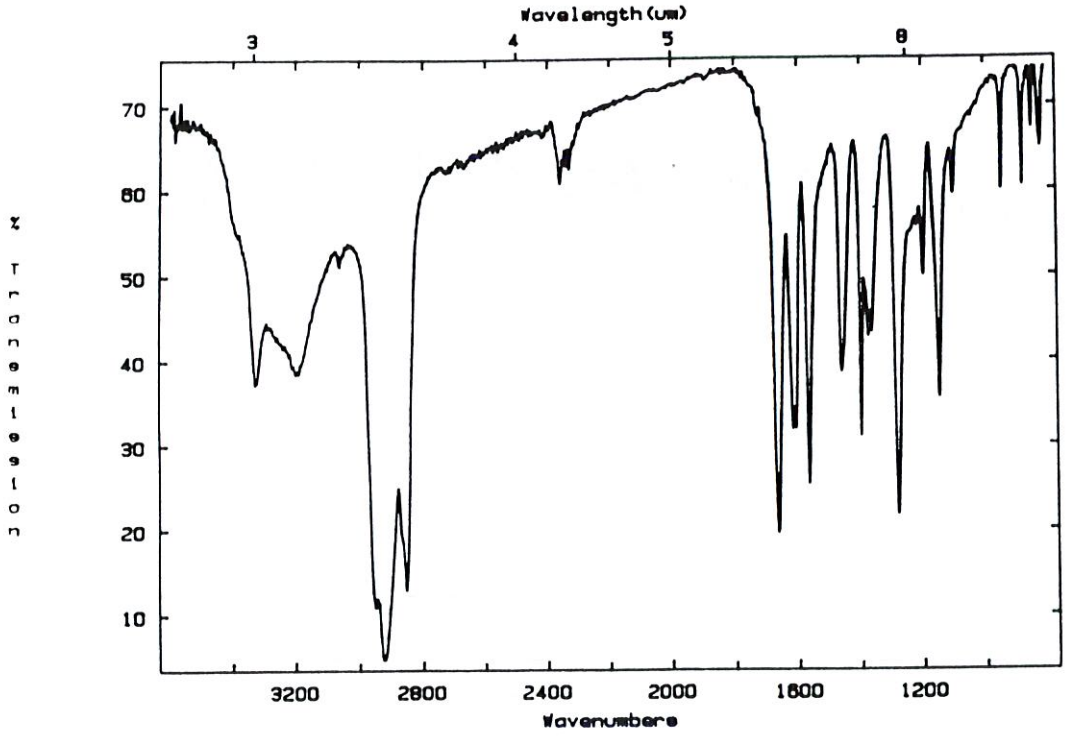

13
12
11
10
9
8
7
6
PPM

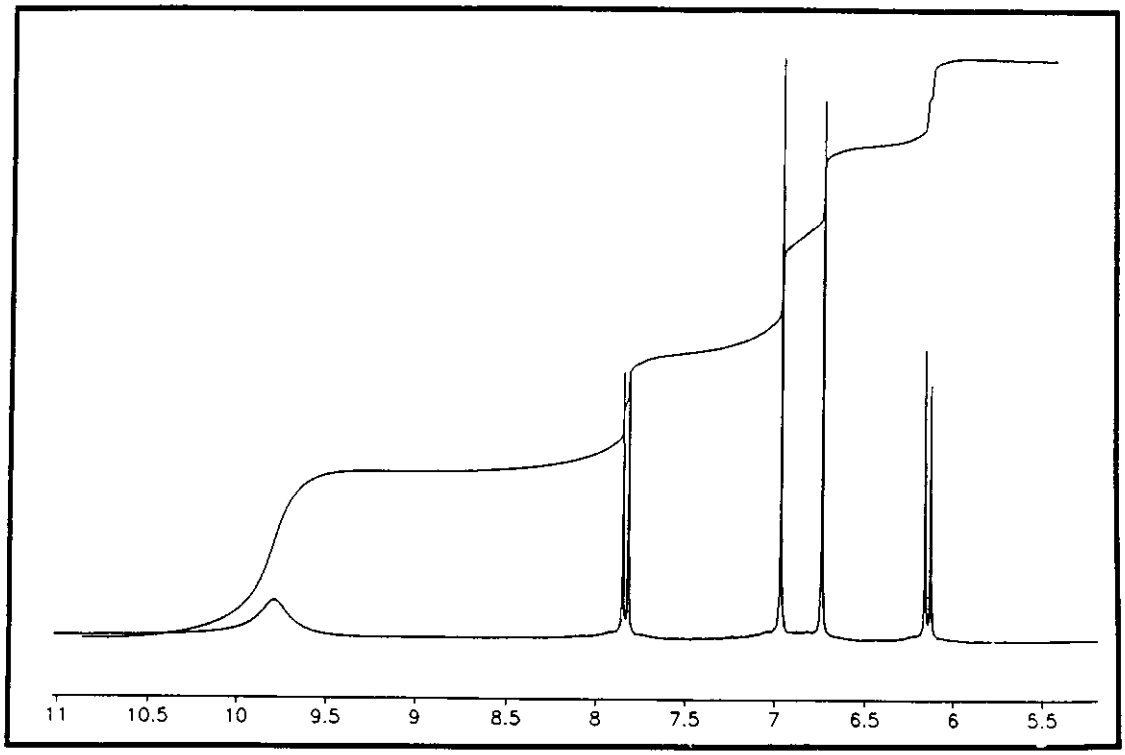

160
150
140
130
120
110
100
PPM

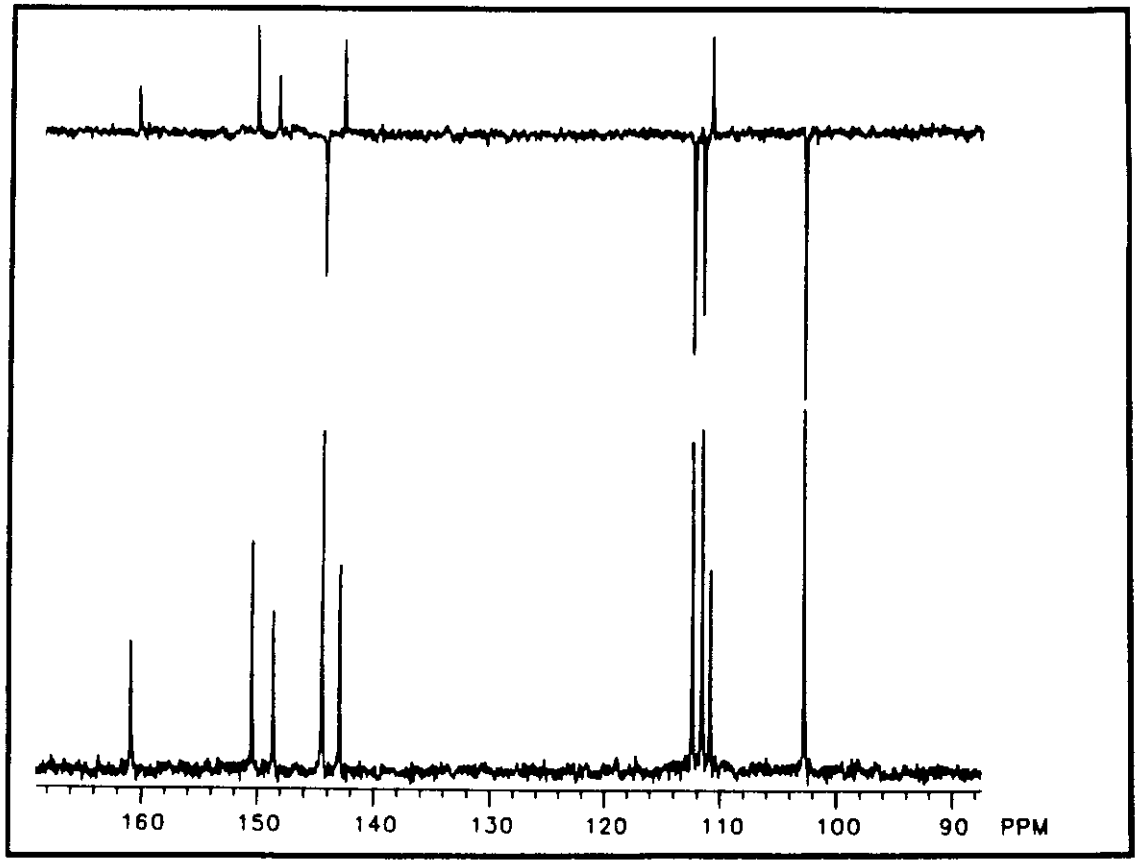
Problem 79

Exact Mass: na
IR: ~~neat~~ mull
^{1}H NMR: ~~DMSO~~ would ok
^{13}C NMR: DMSO
Analysis: na



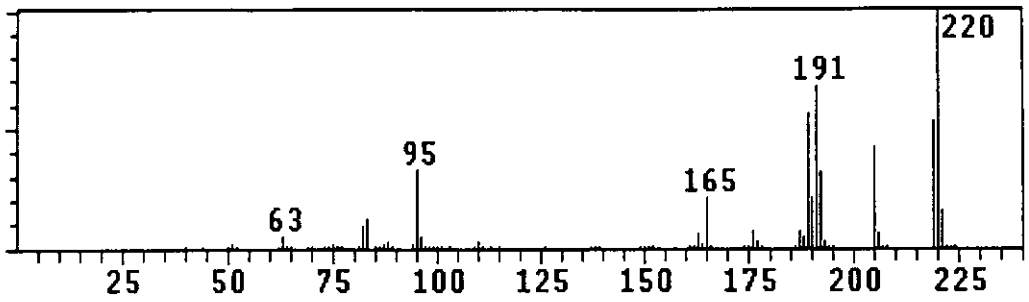


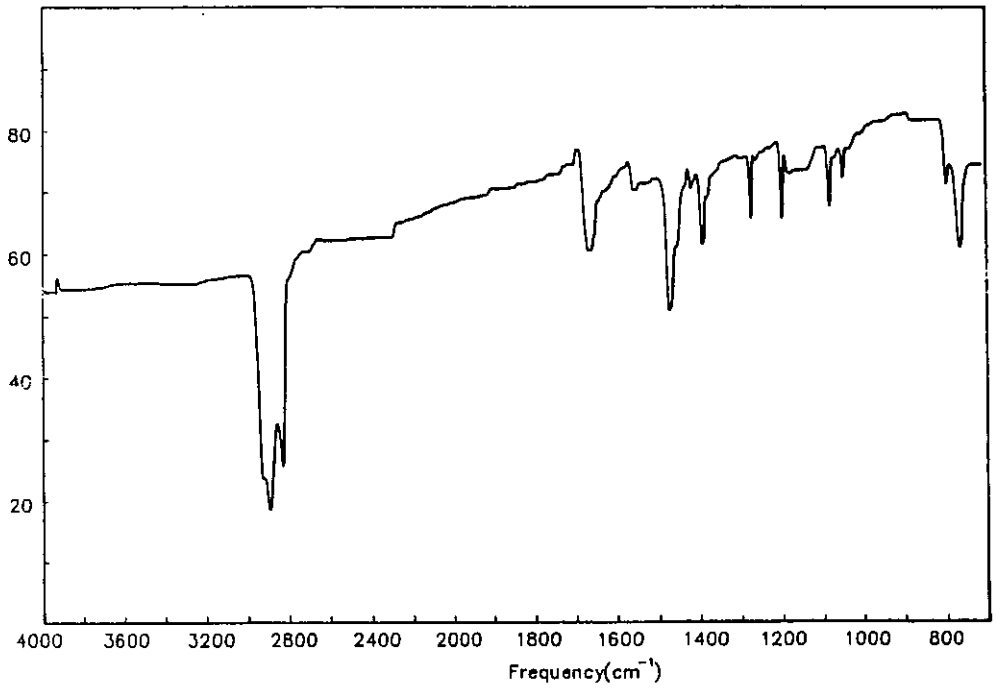

11
10.5
10
9.5
9
8.5
8
7.5
7
6.5
6
5.5

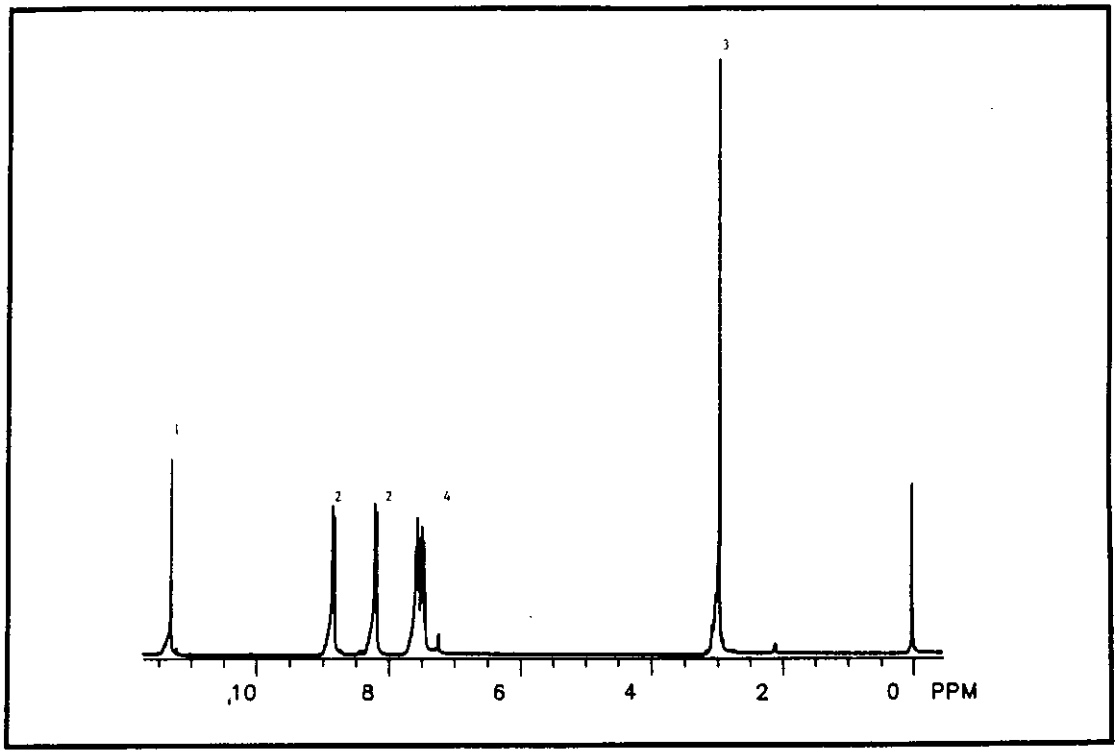

160
150
140
130
120
110
100
90
PPM

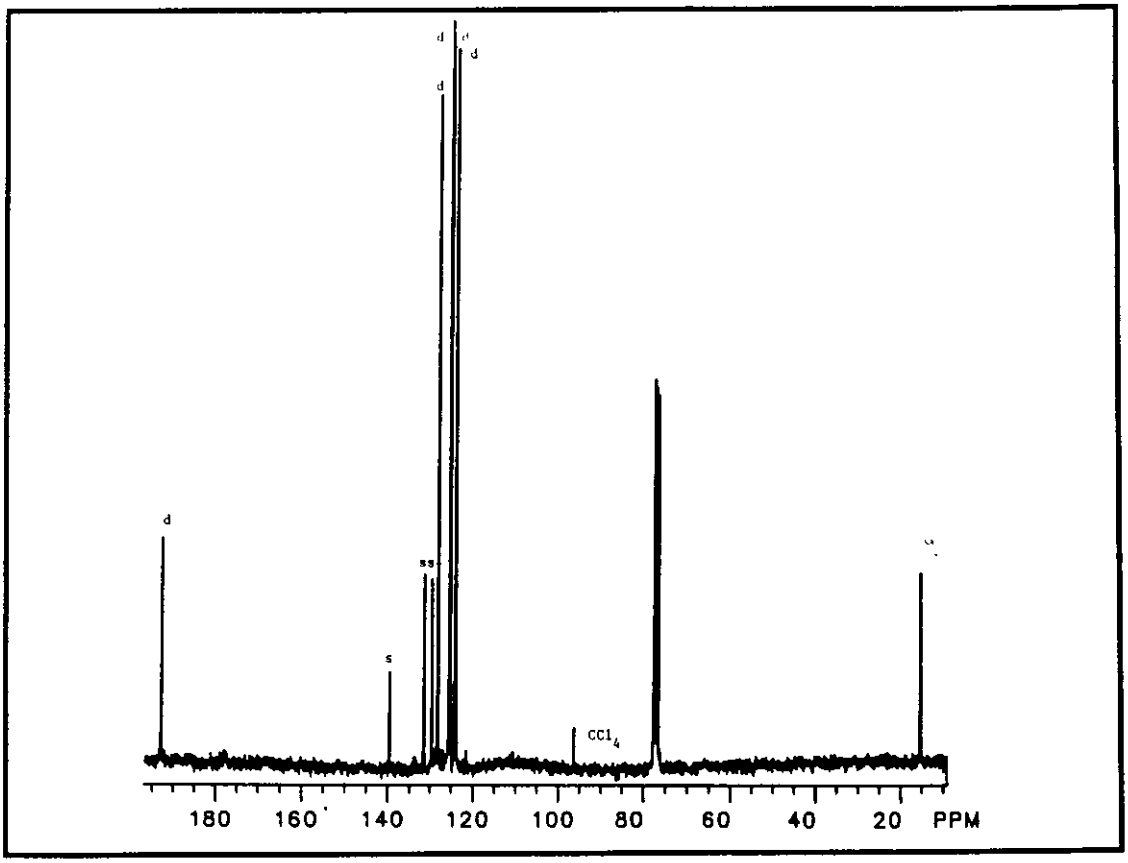
Problem 80

Exact Mass: na
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na



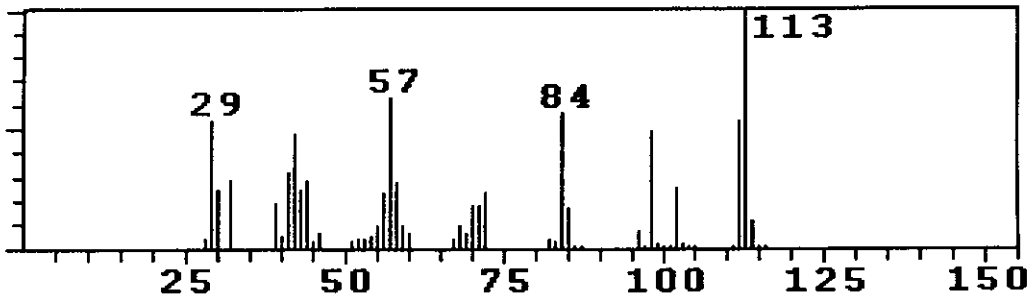


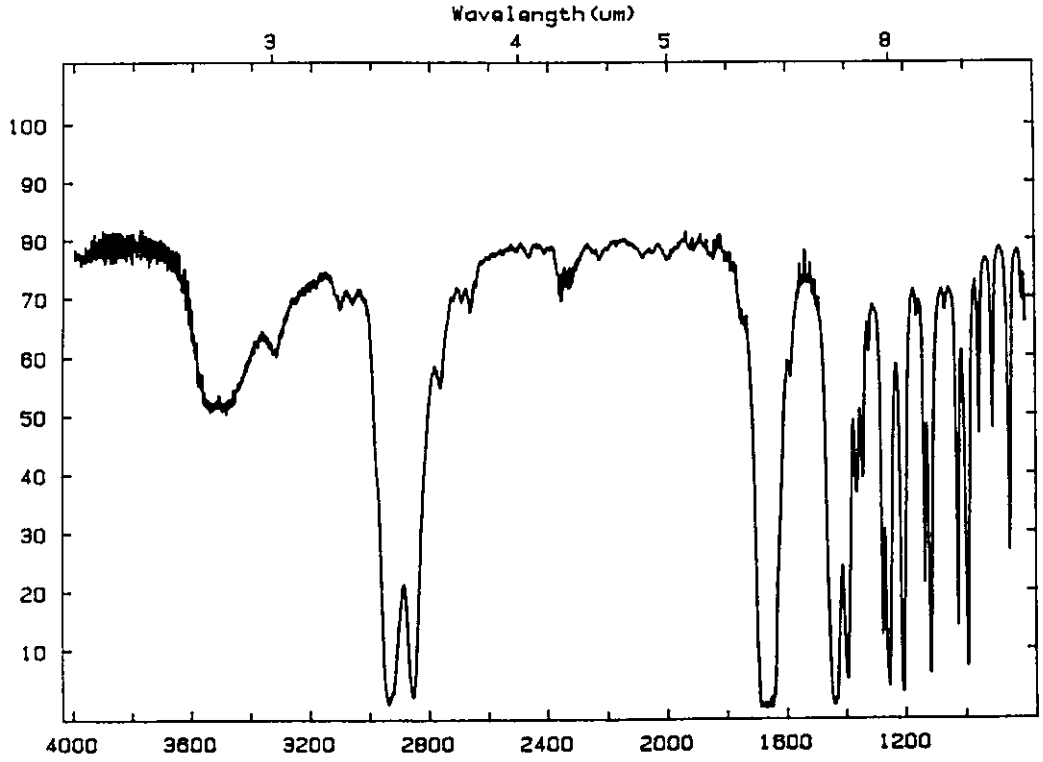

1
2
2
4
3
10
8
6
4
2
0
PPM

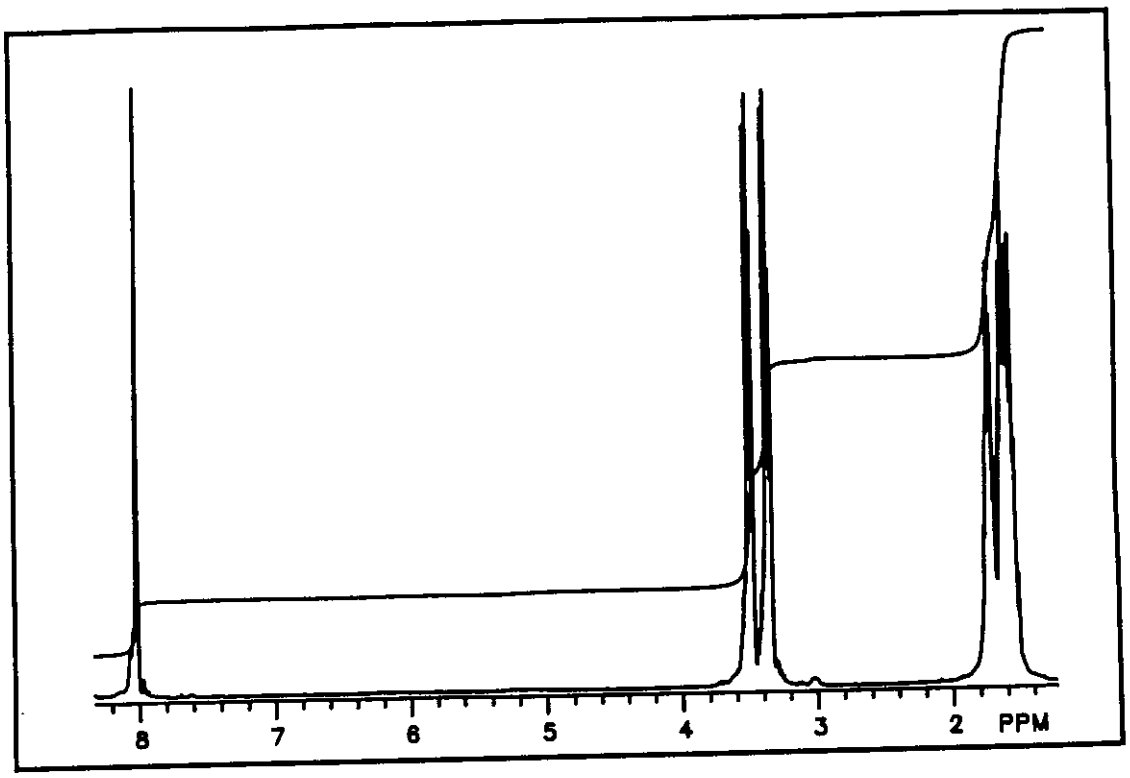

d
d
d
d
d
ss
s
CCl_4
180
160
140
120
100
80
60
40
20
PPM

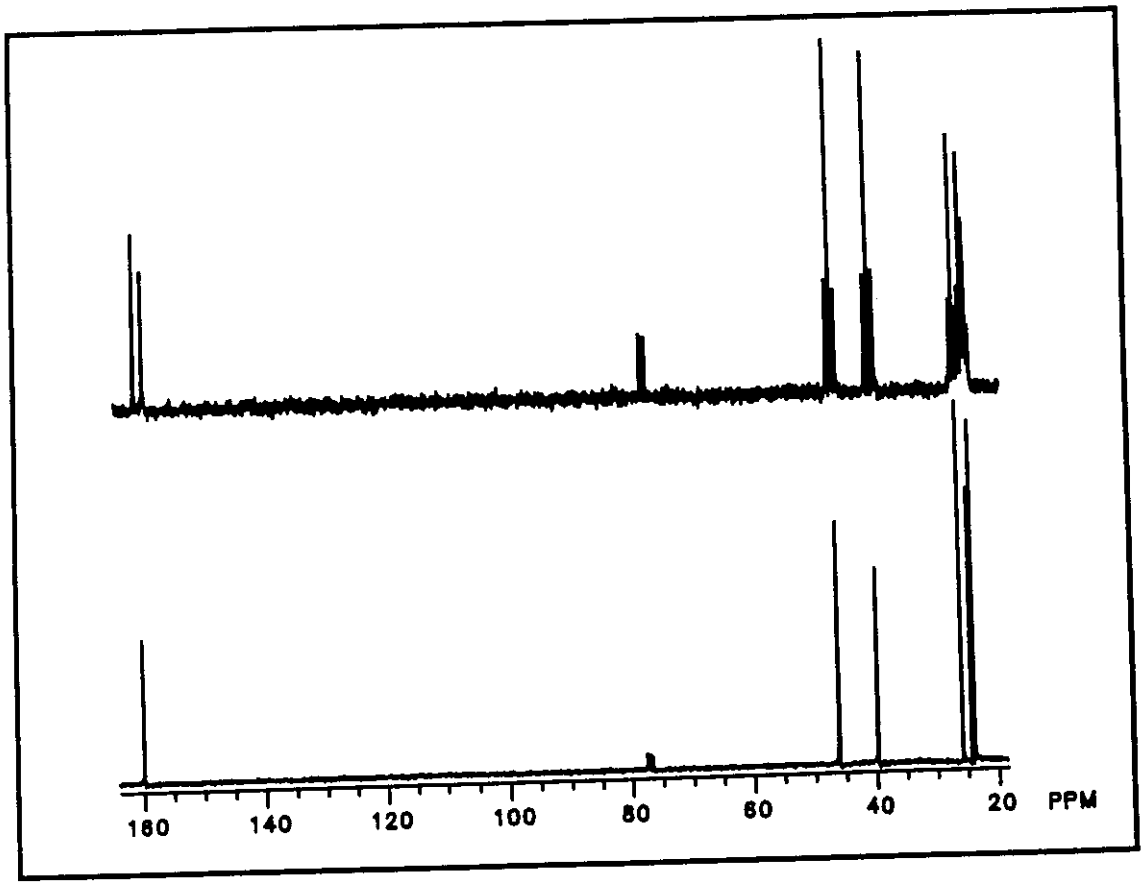
Problem 81

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na



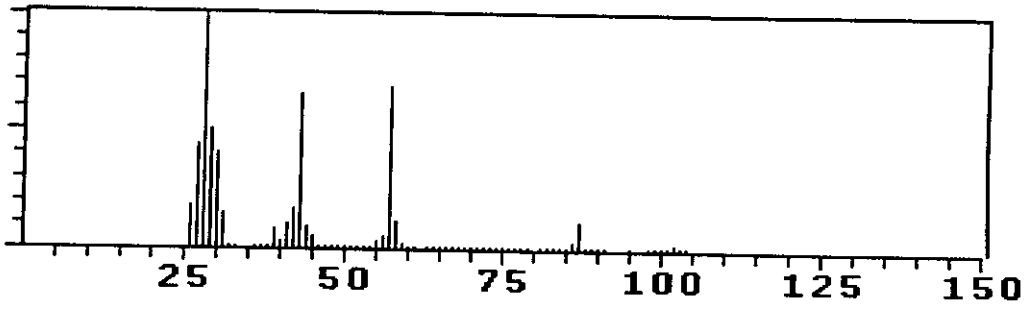


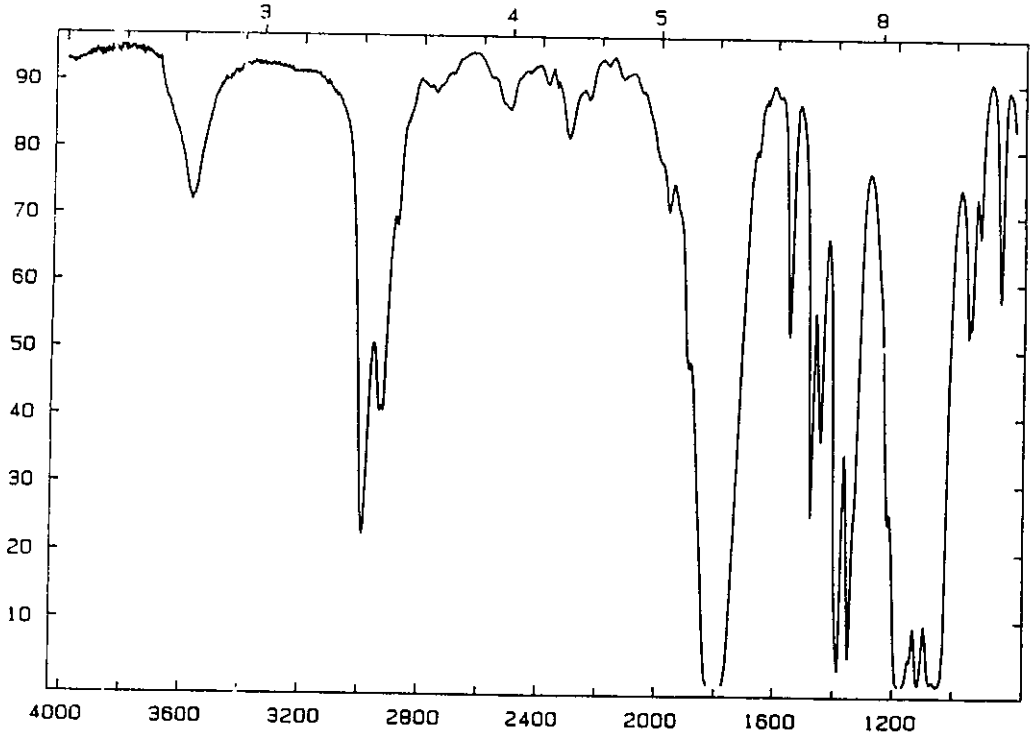

8
7
6
5
4
3
2
PPM

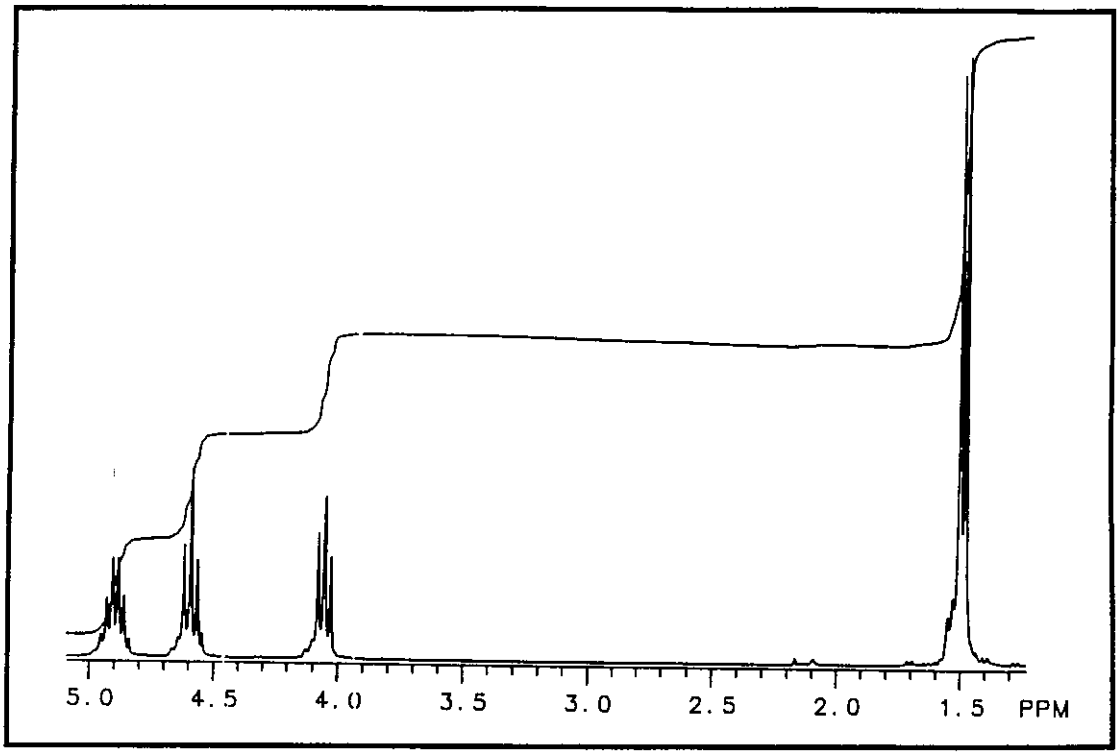

160
140
120
100
80
60
40
20
PPM

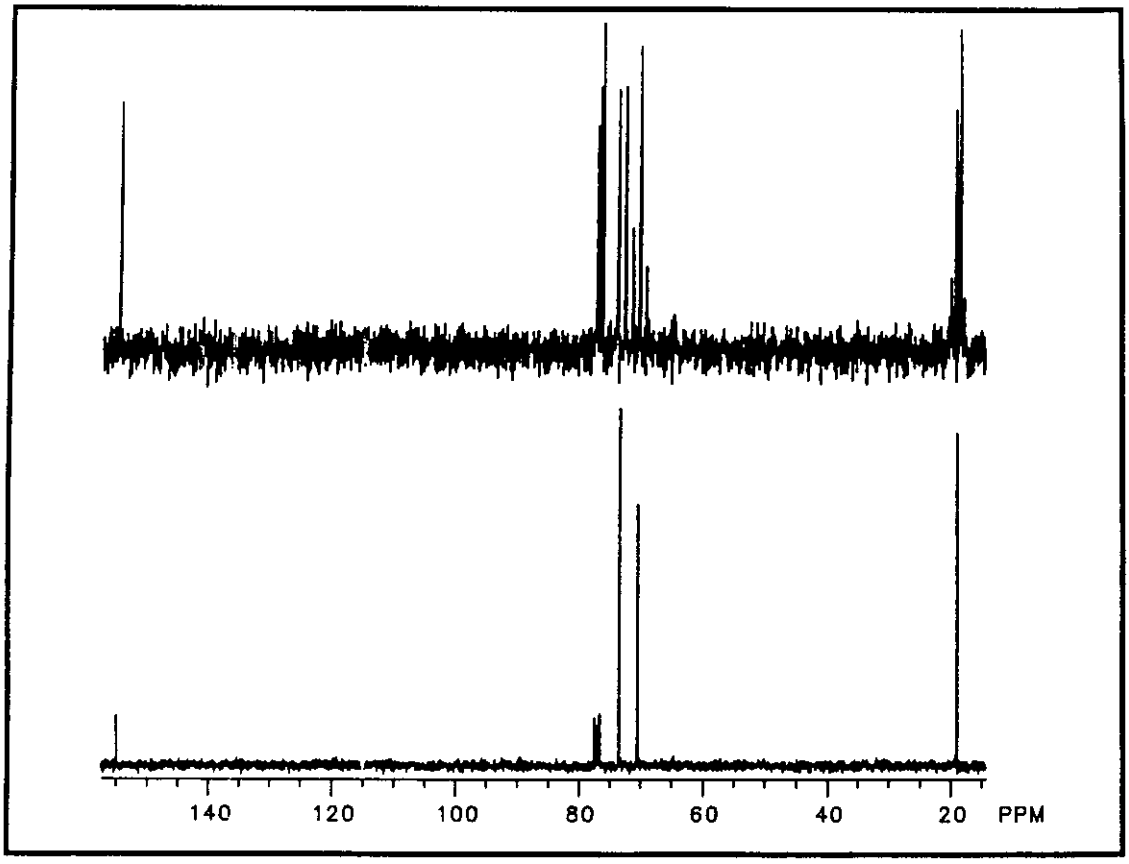
Problem 82

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na



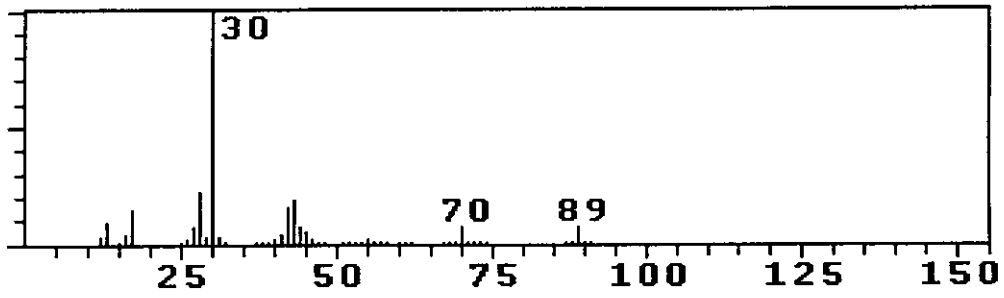


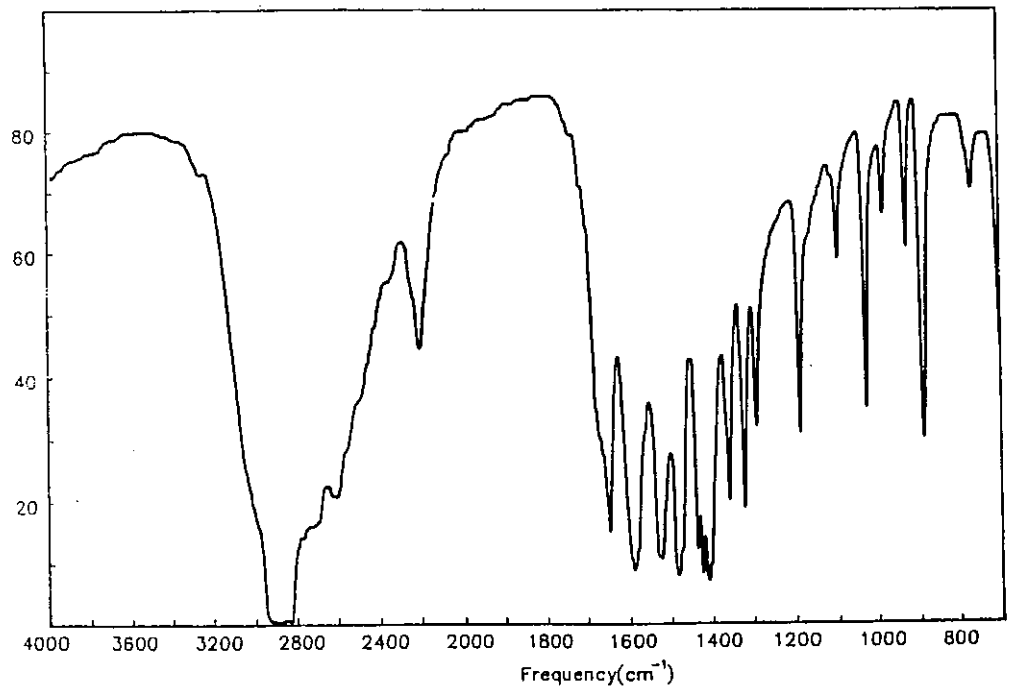

5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
PPM

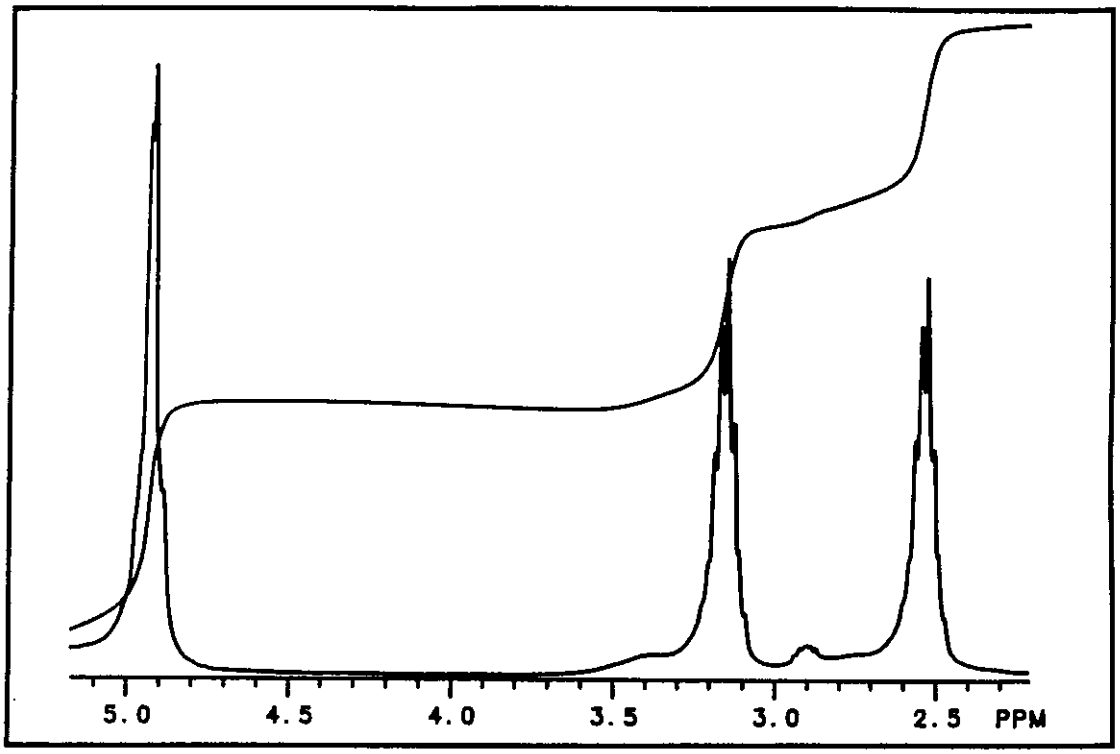

140
120
100
80
60
40
20
PPM

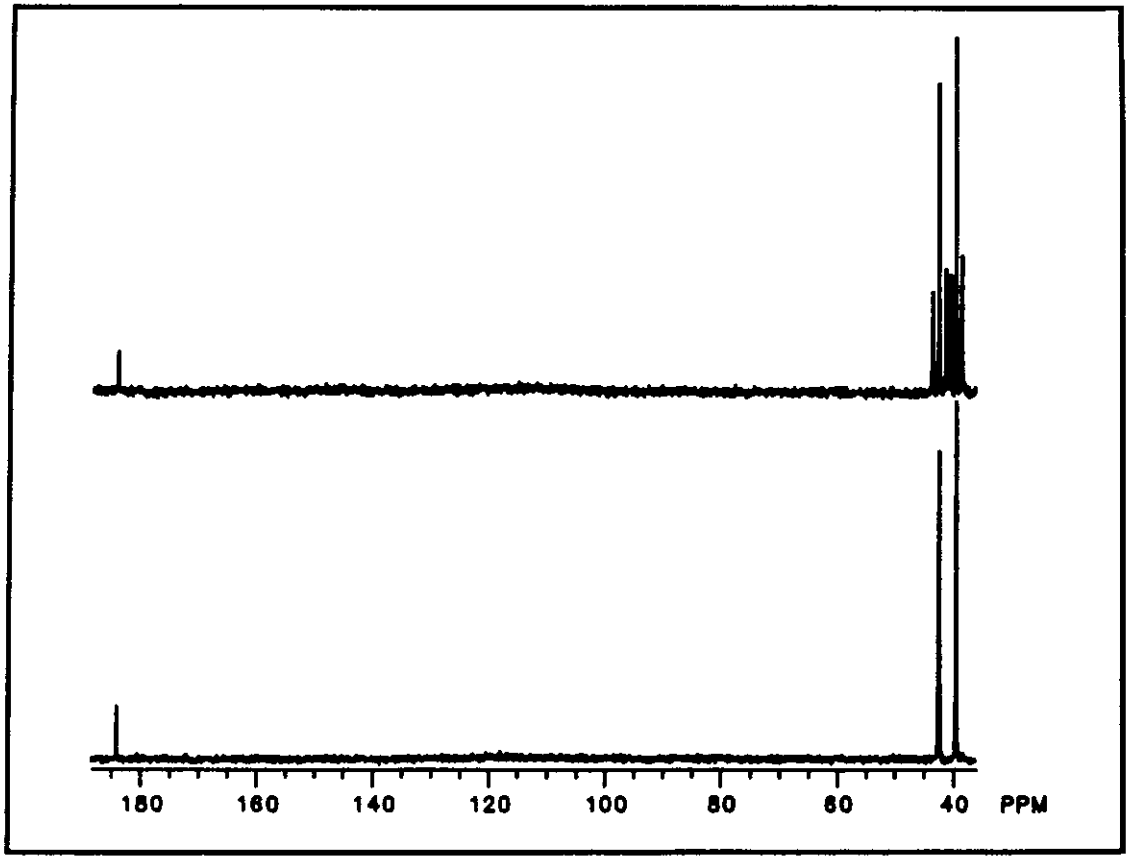
Problem 83

Exact Mass: na
IR: nujol
^{1}H NMR: D_2O
^{13}C NMR: D_2O
Analysis: na



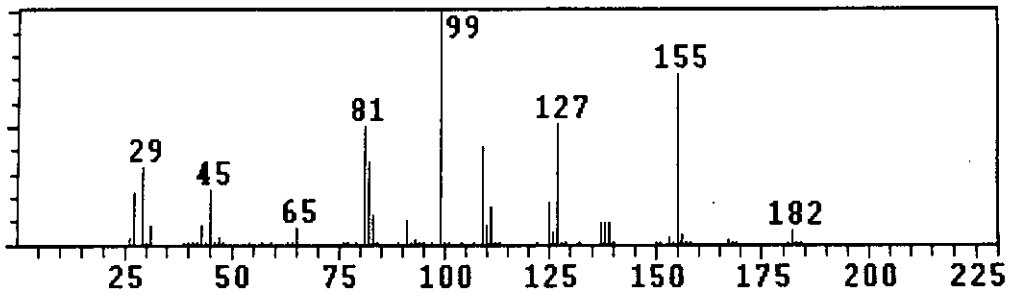


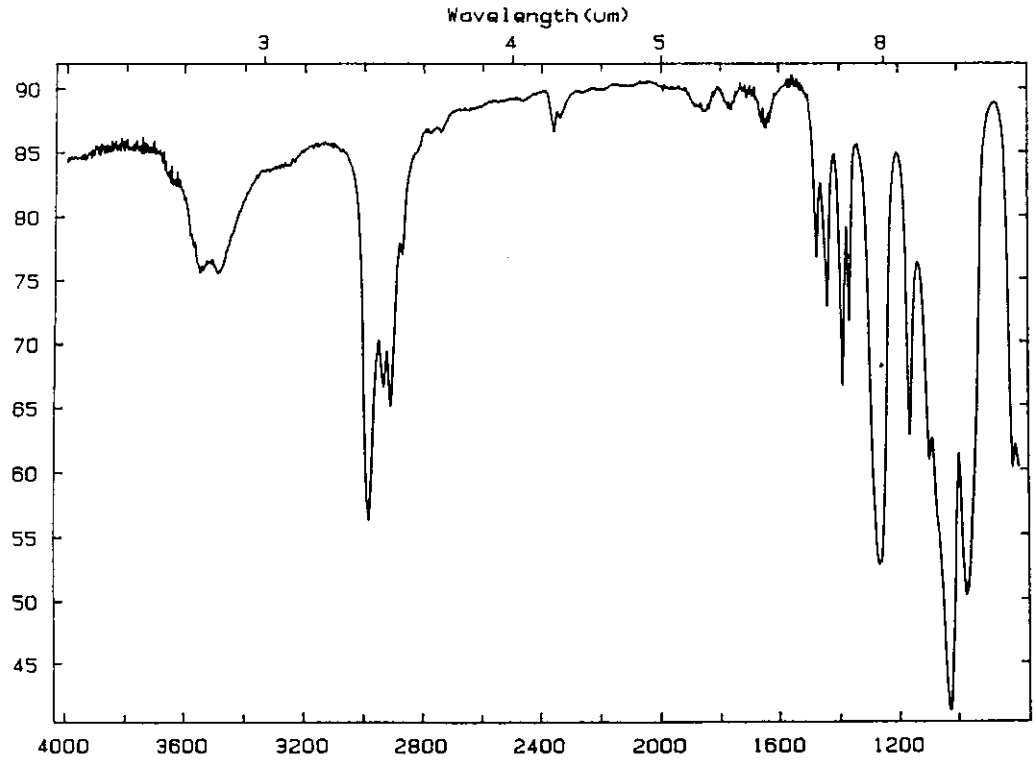

5.0
4.5
4.0
3.5
3.0
2.5
PPM

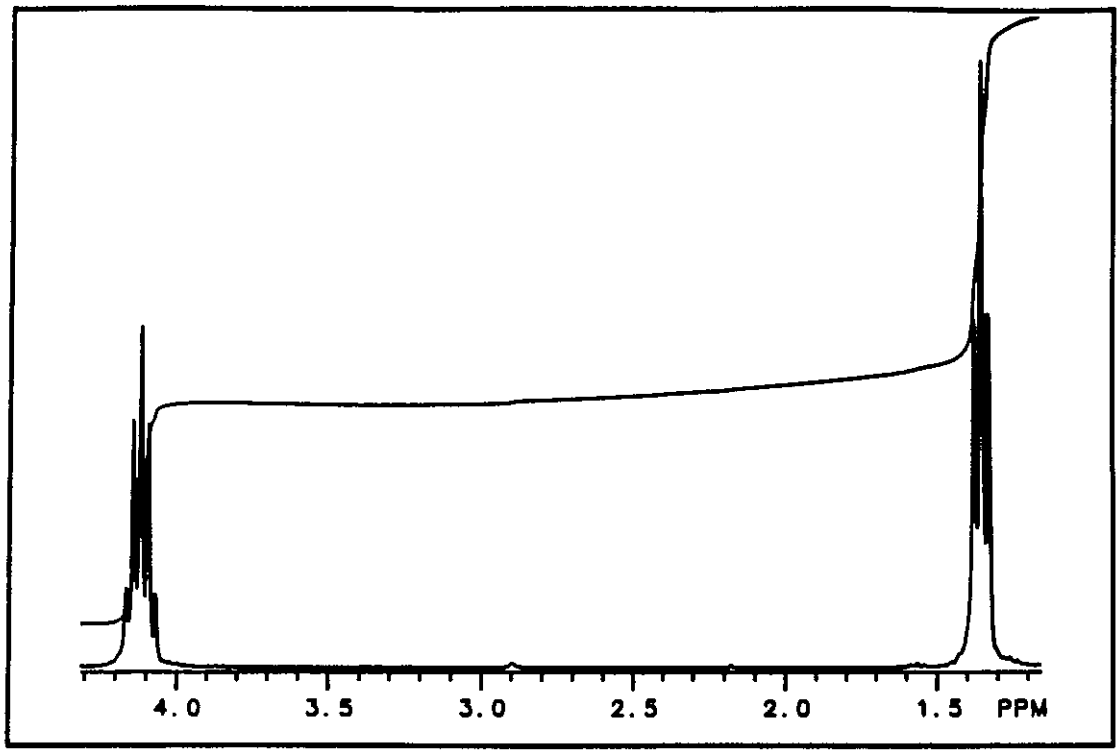

180
160
140
120
100
80
60
40
PPM

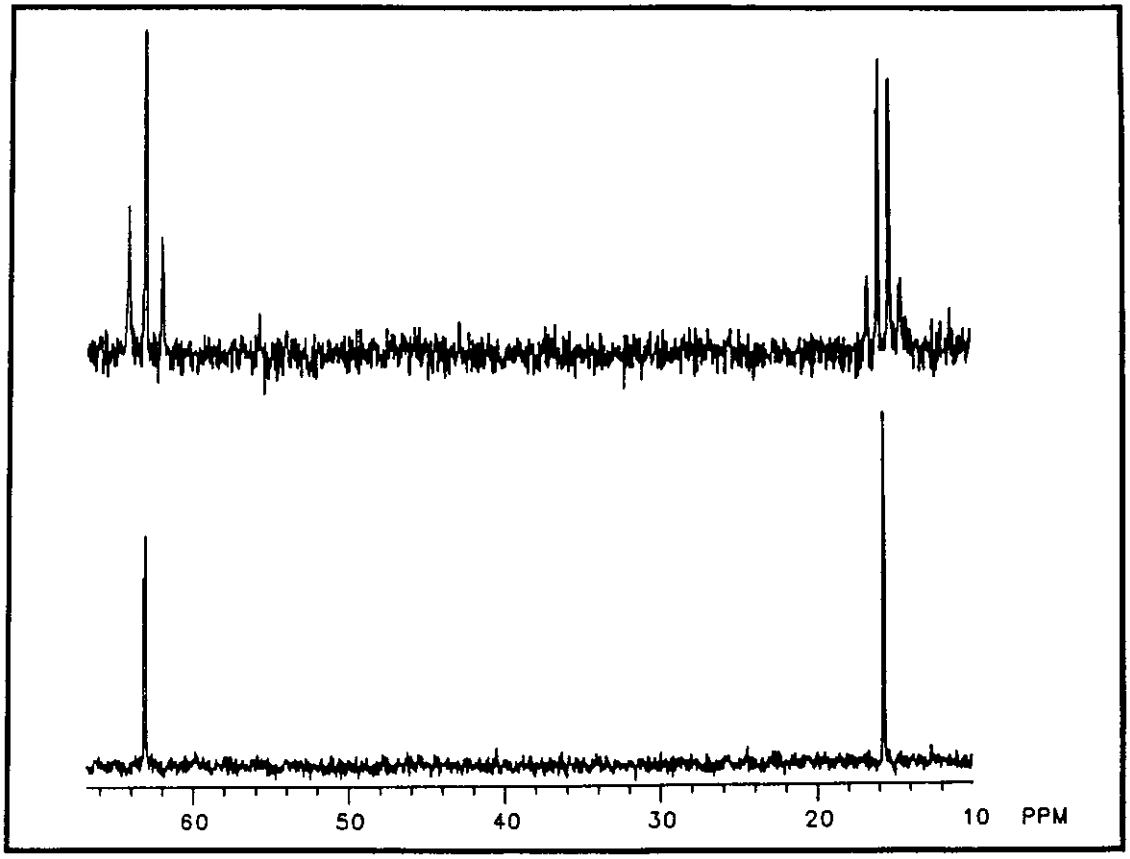
Problem 84

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 39.6% C; 8.3% H; 17.0% P





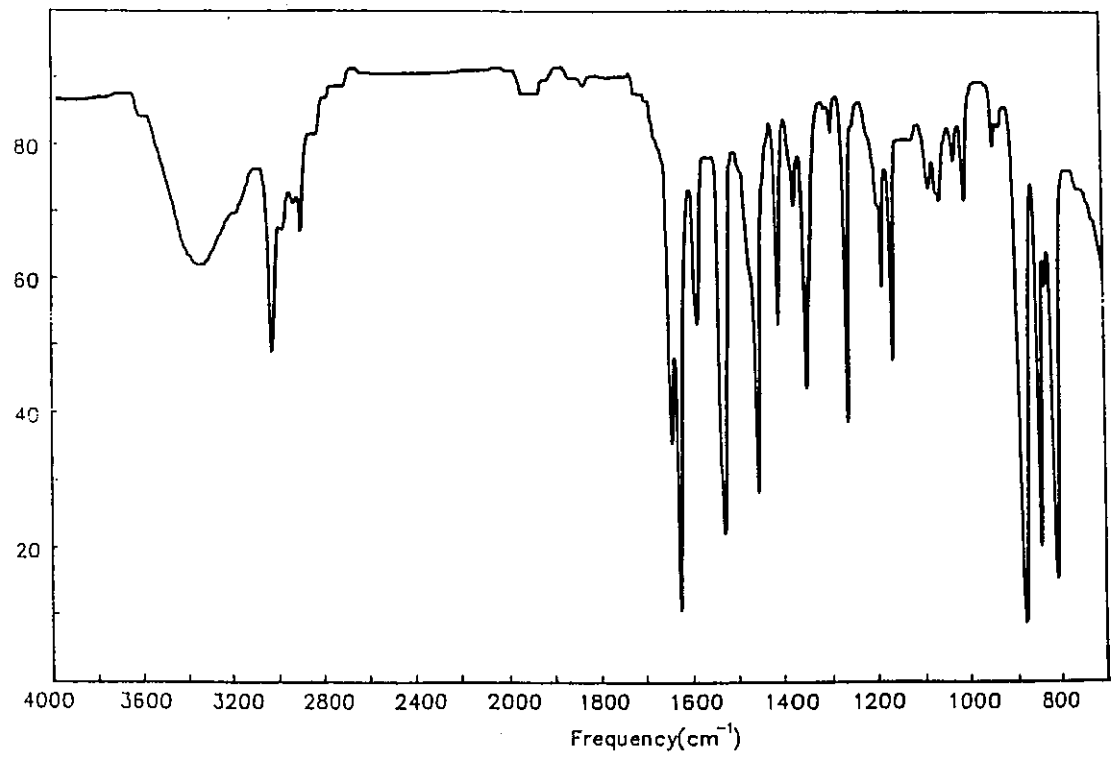

4.0
3.5
3.0
2.5
2.0
1.5
PPM

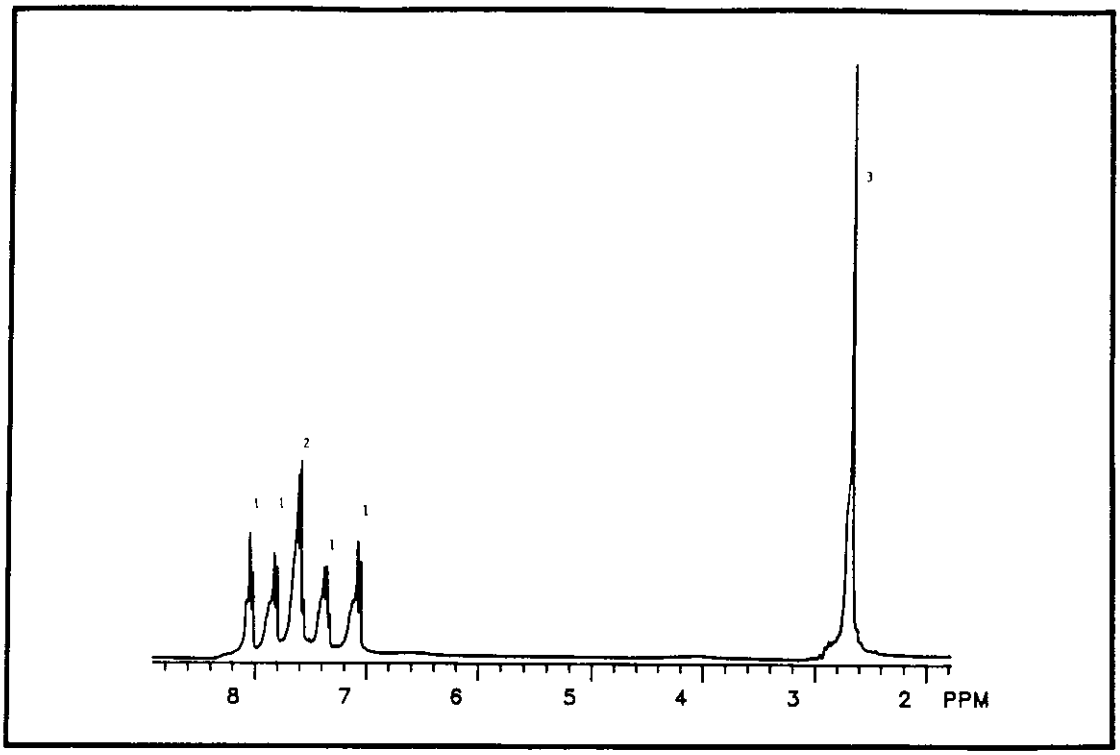

60
50
40
30
20
10
PPM

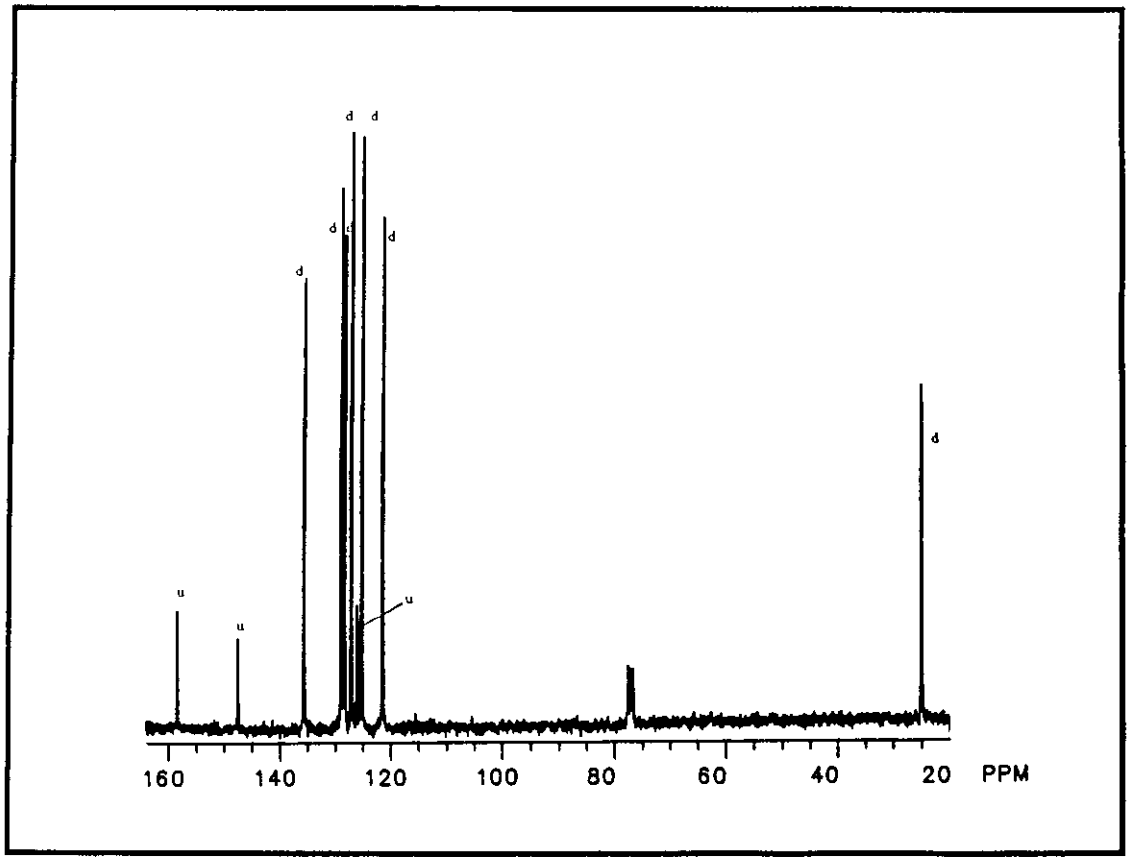
Problem 85

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na

Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A
16, 0.70	41, 0.22	64, 0.88	88, 0.72	114, 1.36	140, 2.47
17, 0.60	42, 0.24	65, 1.06	89, 3.37	115,13.01	141, 1.20
18, 2.77	44, 3.61	66, 0.24	90, 1.99	116, 5.96	142, 9.76
26, 0.18	50, 3.64	71, 0.36	91, 0.52	117, 3.31	143,61.81
27, 0.52	51, 4.94	72, 0.34	98, 0.15	118, 0.34	144, 7.77
28,100.0	52, 1.41	74, 1.61	99, 0.27	121, 0.40	145, 0.44
29, 0.90	53, 0.34	75, 4.64	100, 0.30	126, 0.10	
32,22.76	57, 0.28	76, 4.00	101, 5.18	127, 0.64	
36, 0.72	58, 0.32	77, 4.88	102, 2.56	128,13.01	
37, 0.16	59, 0.34	78, 0.70	103, 0.80	129, 1.43	
38, 0.50	61, 0.24	79, 0.20	104, 0.44	130, 0.16	
39, 3.37	62, 1.12	86, 0.22	106, 1.16	132, 0.10	
40, 2.05	63, 3.31	87, 0.54	113, 1.00	137, 0.14	




1
1
2
1
1
3
8
7
6
5
4
3
2
PPM

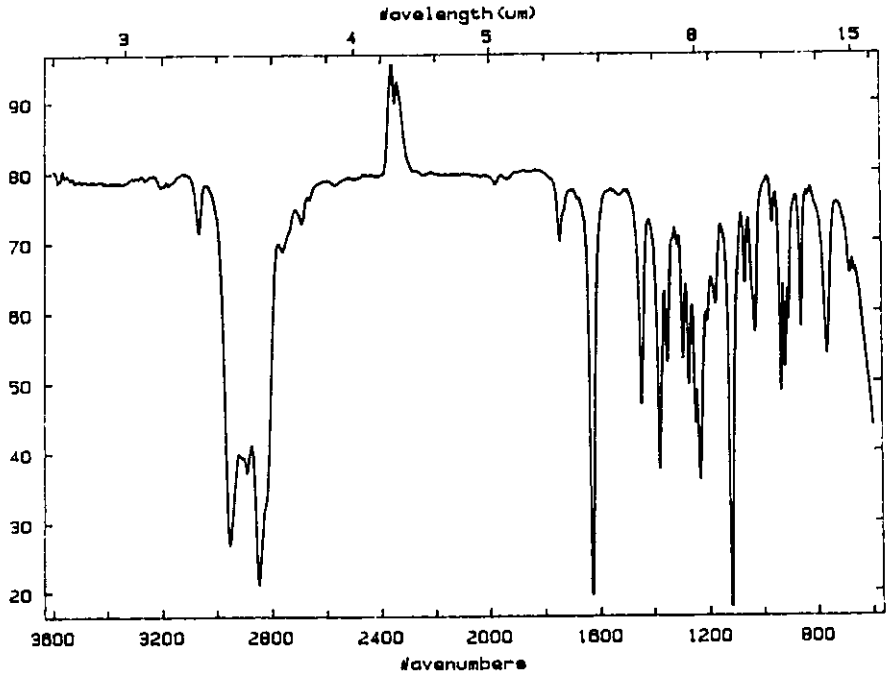

d
d
d
d
d
d
u
u
u
d
160
140
120
100
80
60
40
20
PPM

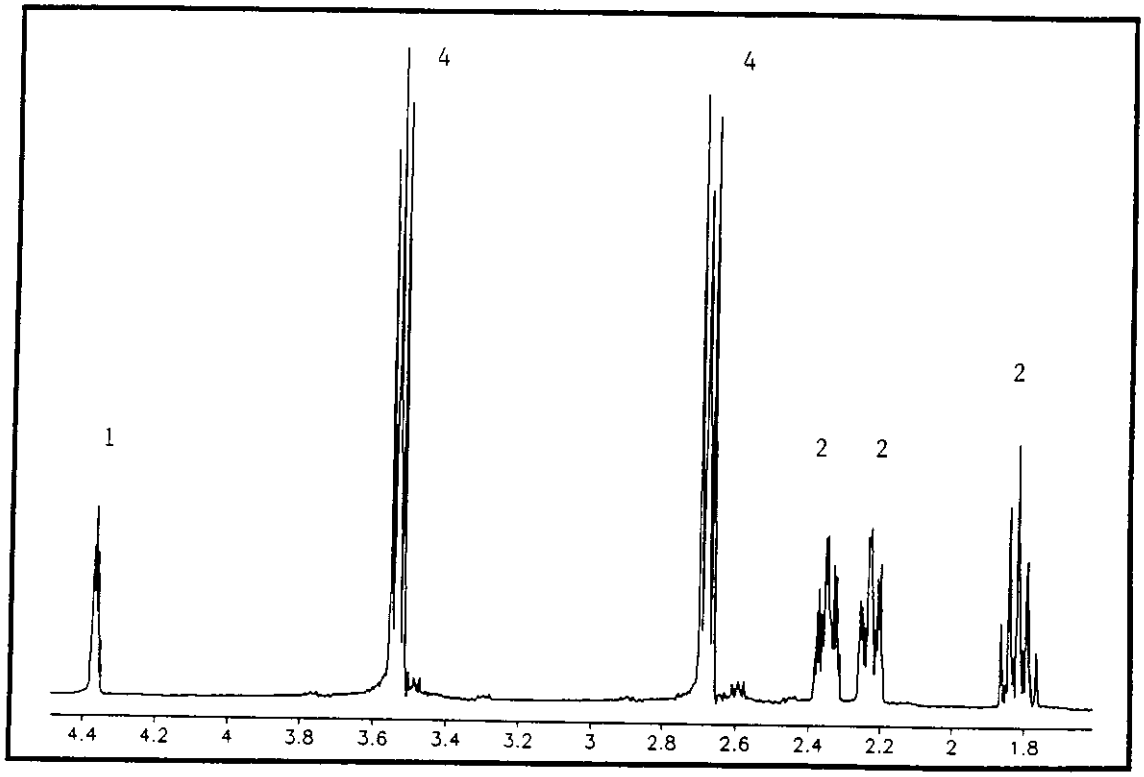
Problem 86

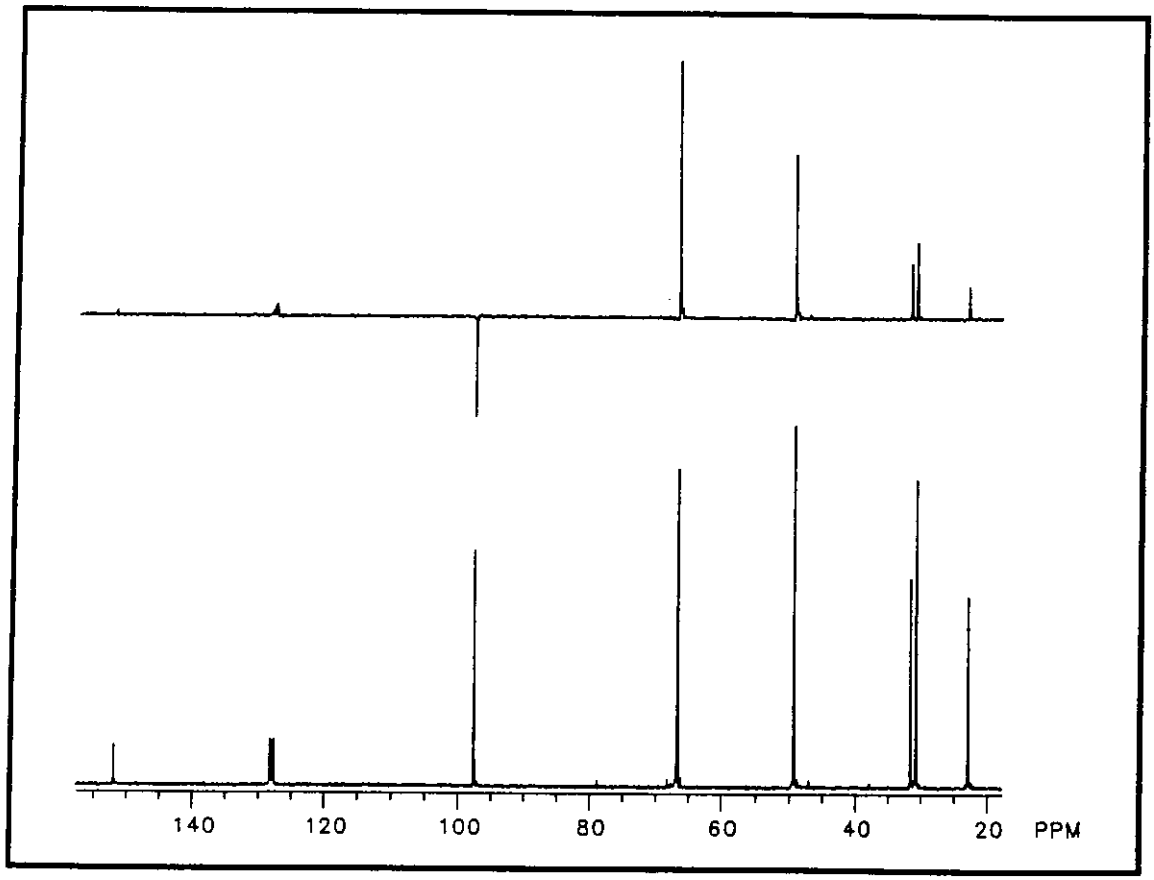
Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
30	2.74	51	2.30	64	0.86	79	3.73	95	24.08	122	10.68
31	2.65	52	2.98	65	8.62	80	5.44	96	7.72	123	2.45
37	0.44	53	5.28	66	5.68	81	3.65	97	1.23	124	5.98
38	1.68	54	12.46	67	51.09	82	2.90	98	0.26	125	0.83
39	14.69	55	8.62	68	6.21	83	0.59	106	1.23	136	0.34
40	4.23	56	3.85	69	2.07	84	0.34	107	1.00	138	11.67
41	18.44	57	1.64	70	0.54	85	0.23	108	15.60	139	1.10
42	7.19	58	1.06	71	0.38	86	1.66	109	2.90	150	0.63
43	3.19	59	0.24	72	0.49	91	1.14	110	1.71	152	100.00
44	1.57	61	0.19	76	0.18	92	1.57	111	0.30	153	58.70
45	1.67	62	0.60	77	1.92	93	4.93	112	0.75	154	5.68
50	0.87	63	1.55	78	1.12	94	22.28	120	0.82	155	0.37

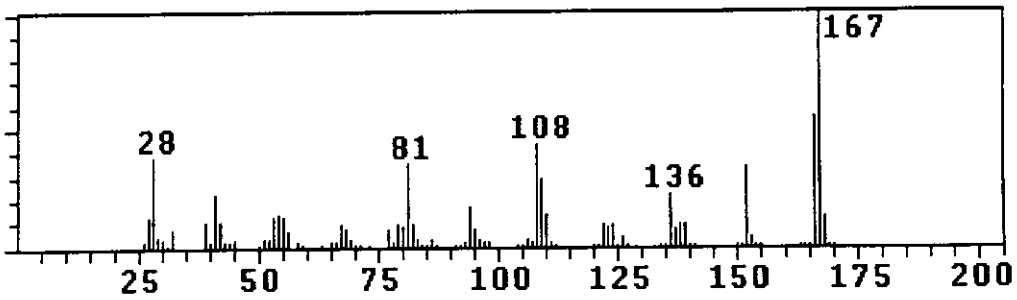


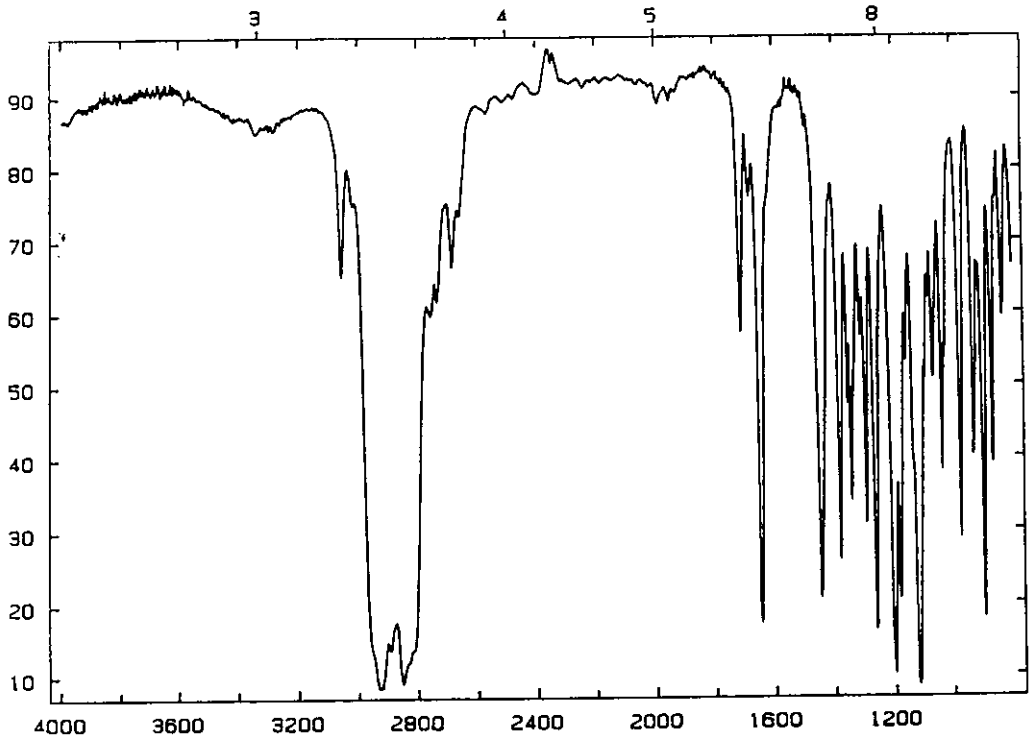

4
4
1
2
2
2
4.4
4.2
4
3.8
3.6
3.4
3.2
3
2.8
2.6
2.4
2.2
2
1.8

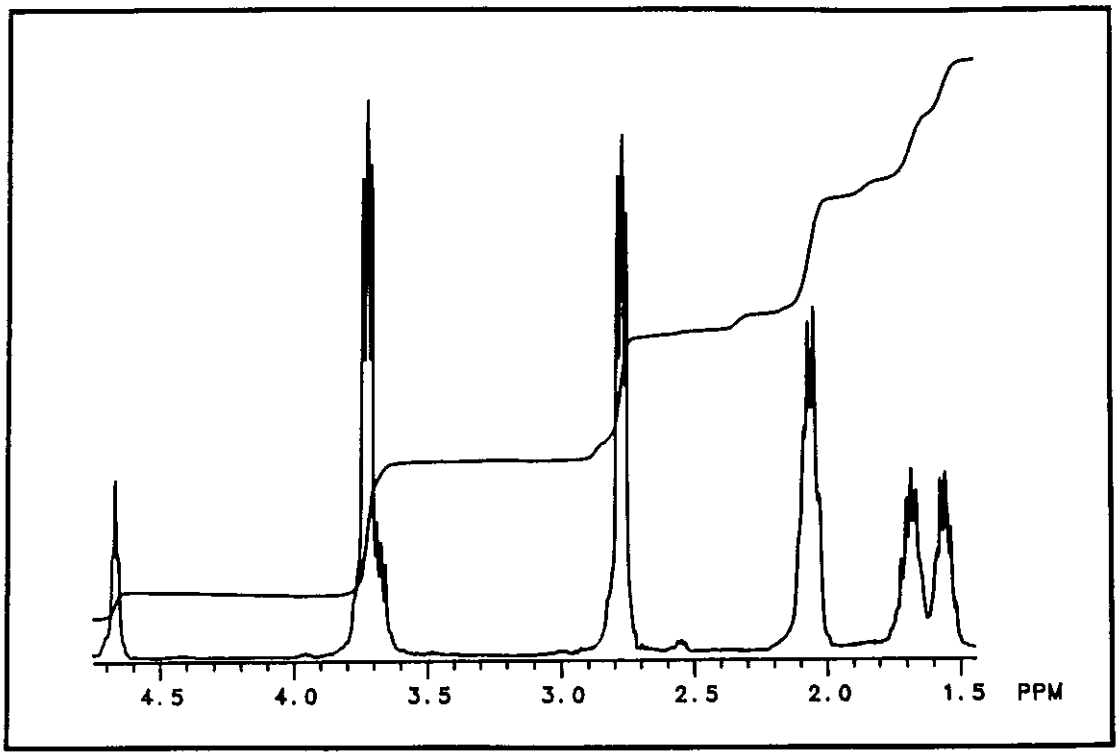

140
120
100
80
60
40
20
PPM

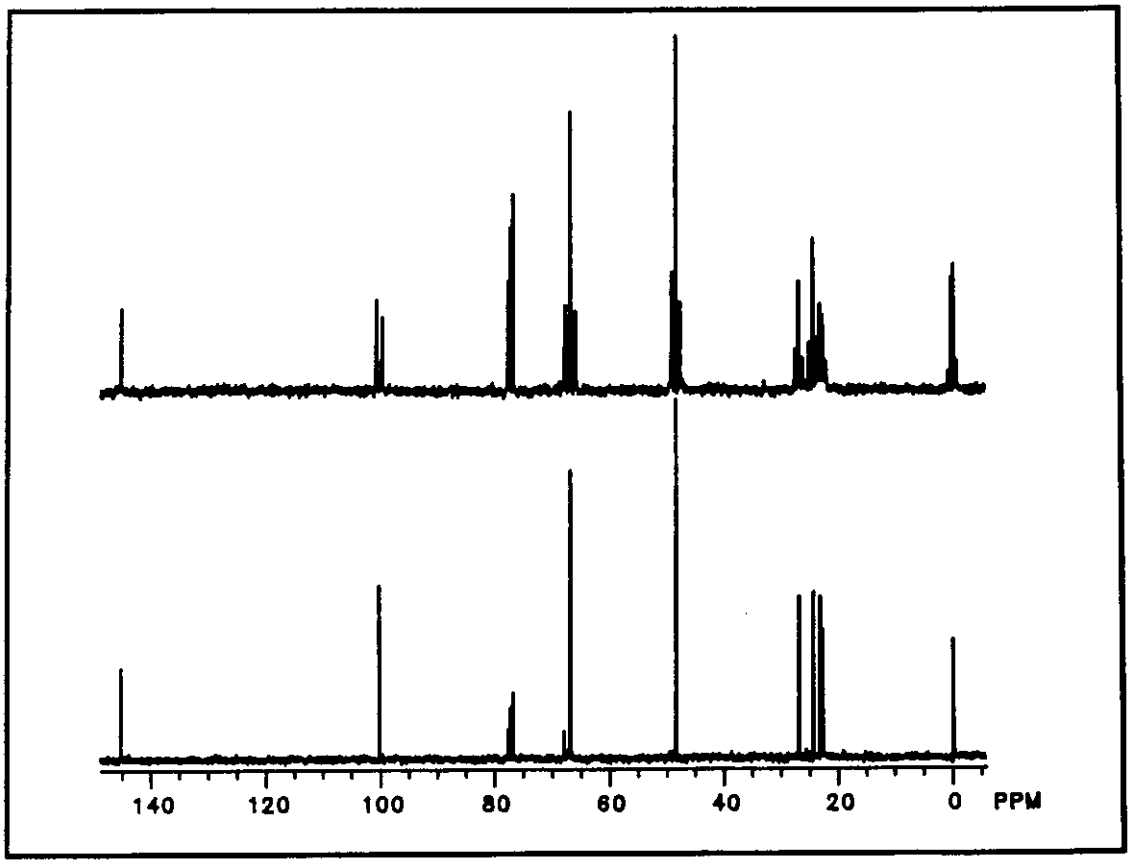
Problem 87

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na



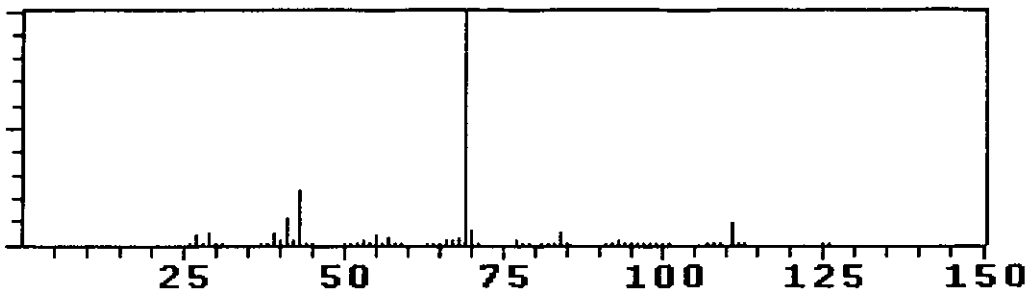


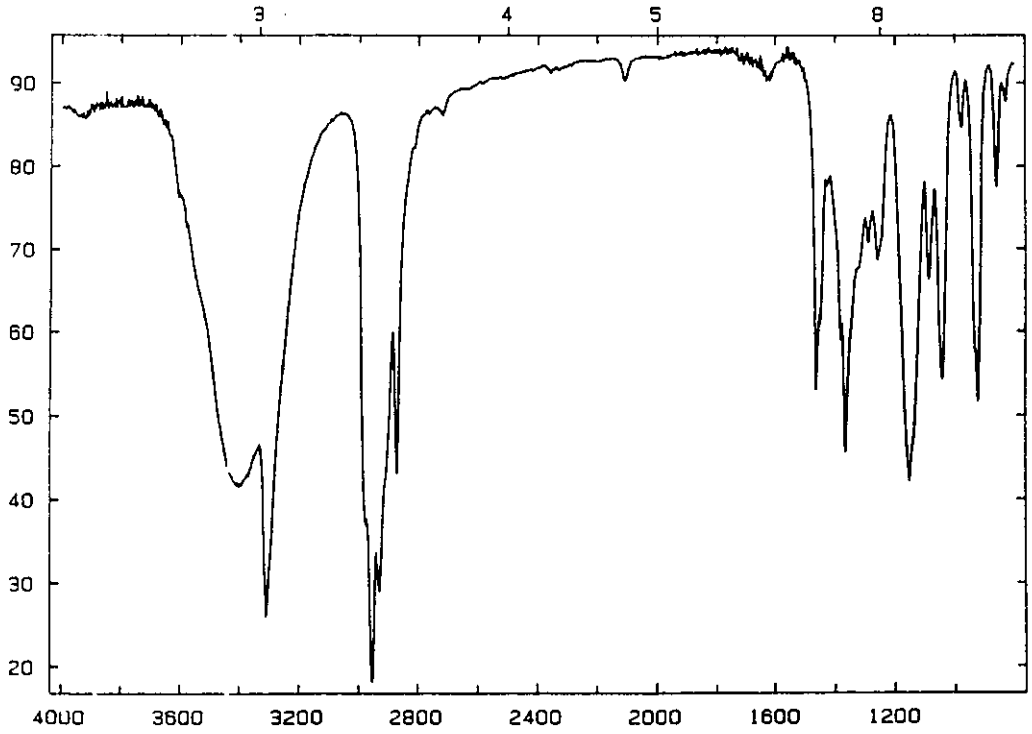

4.5
4.0
3.5
3.0
2.5
2.0
1.5
PPM

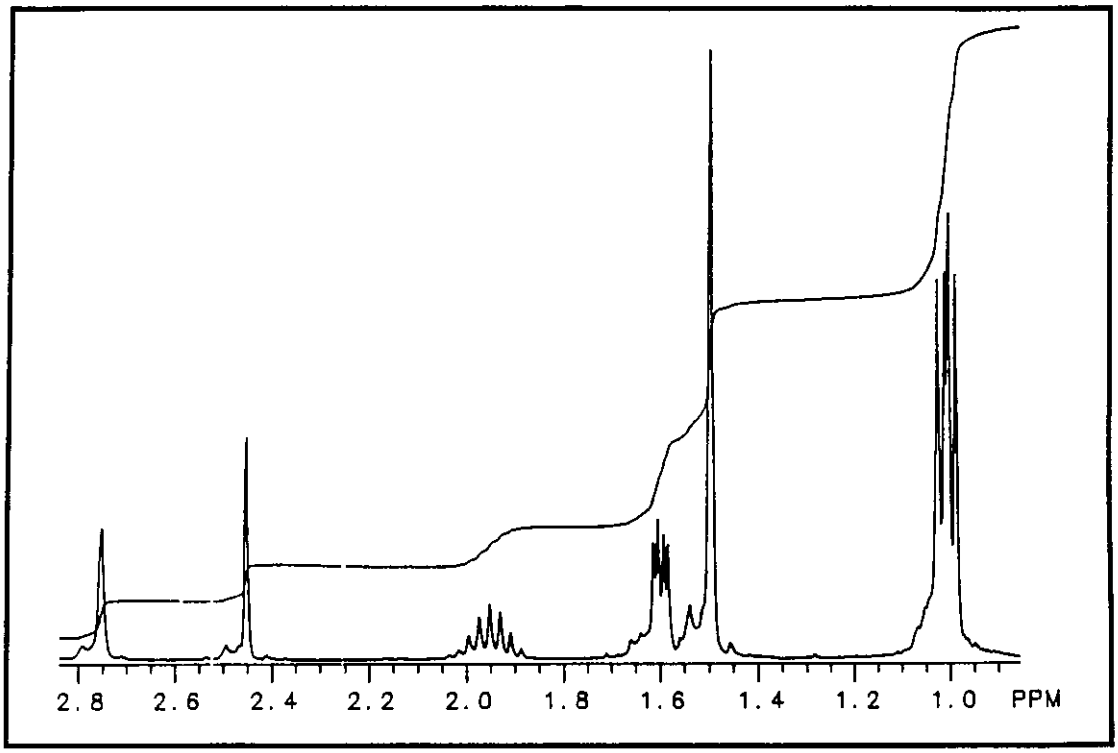

140
120
100
80
60
40
20
0
PPM

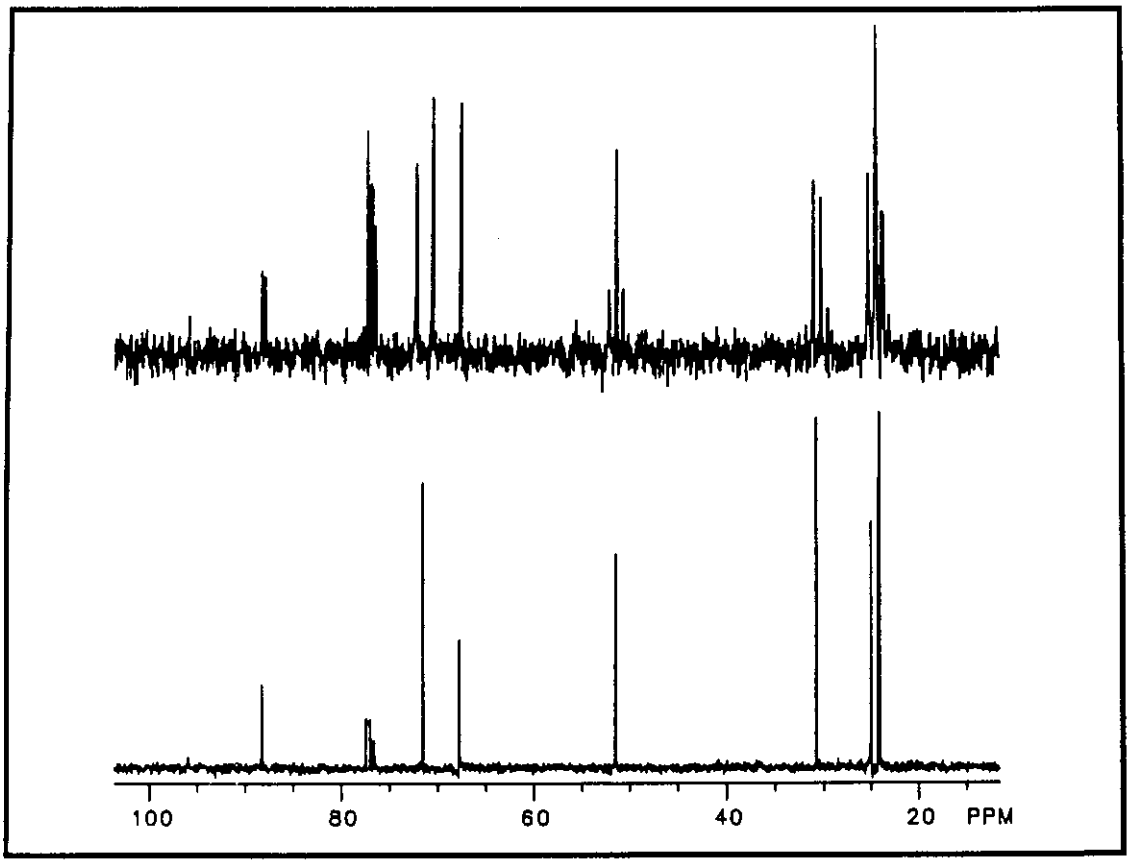
Problem 88

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 76.1% C; 11.2% H



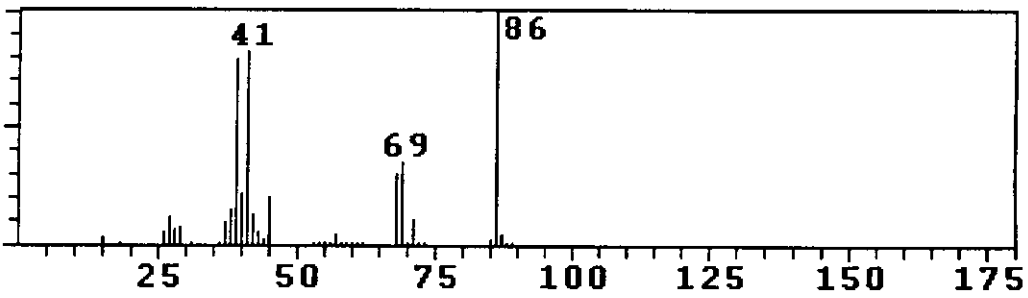


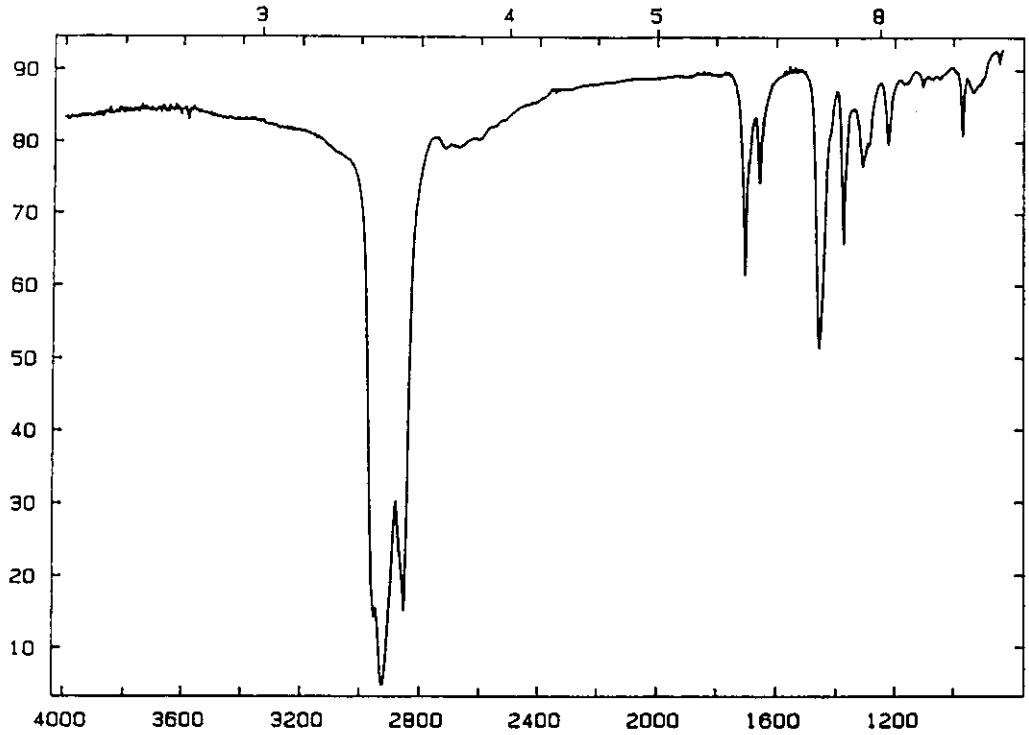

2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
PPM

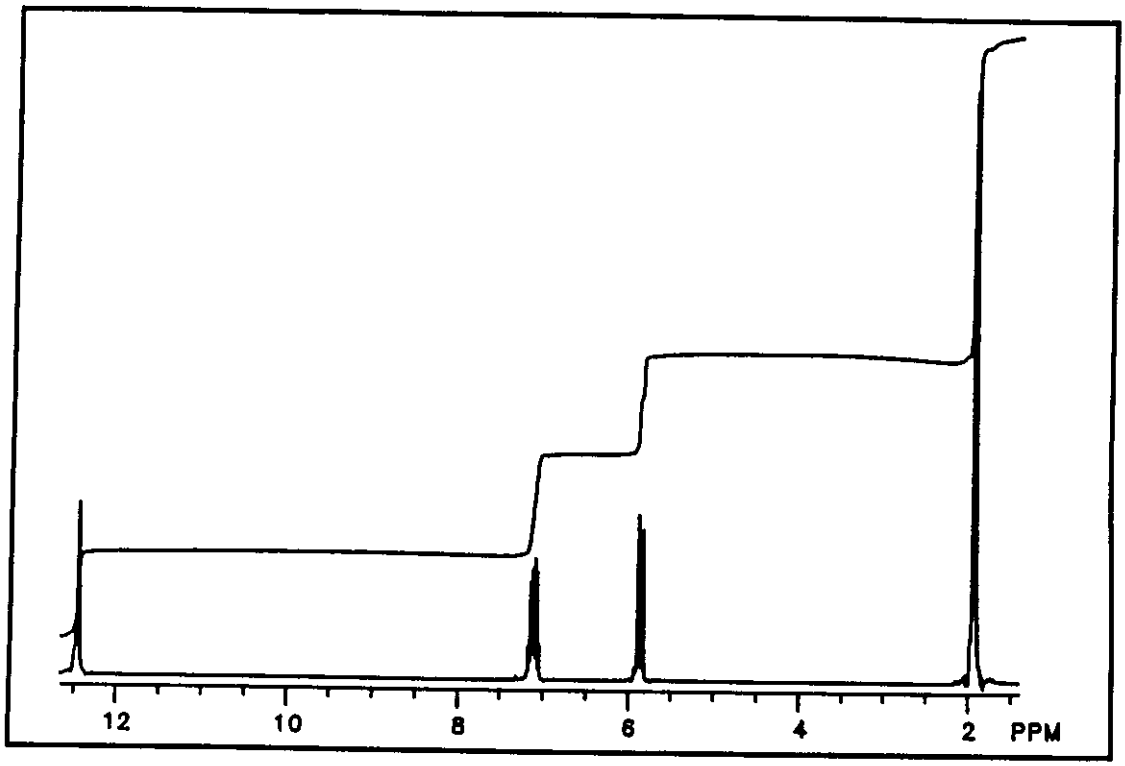

100
80
60
40
20
PPM

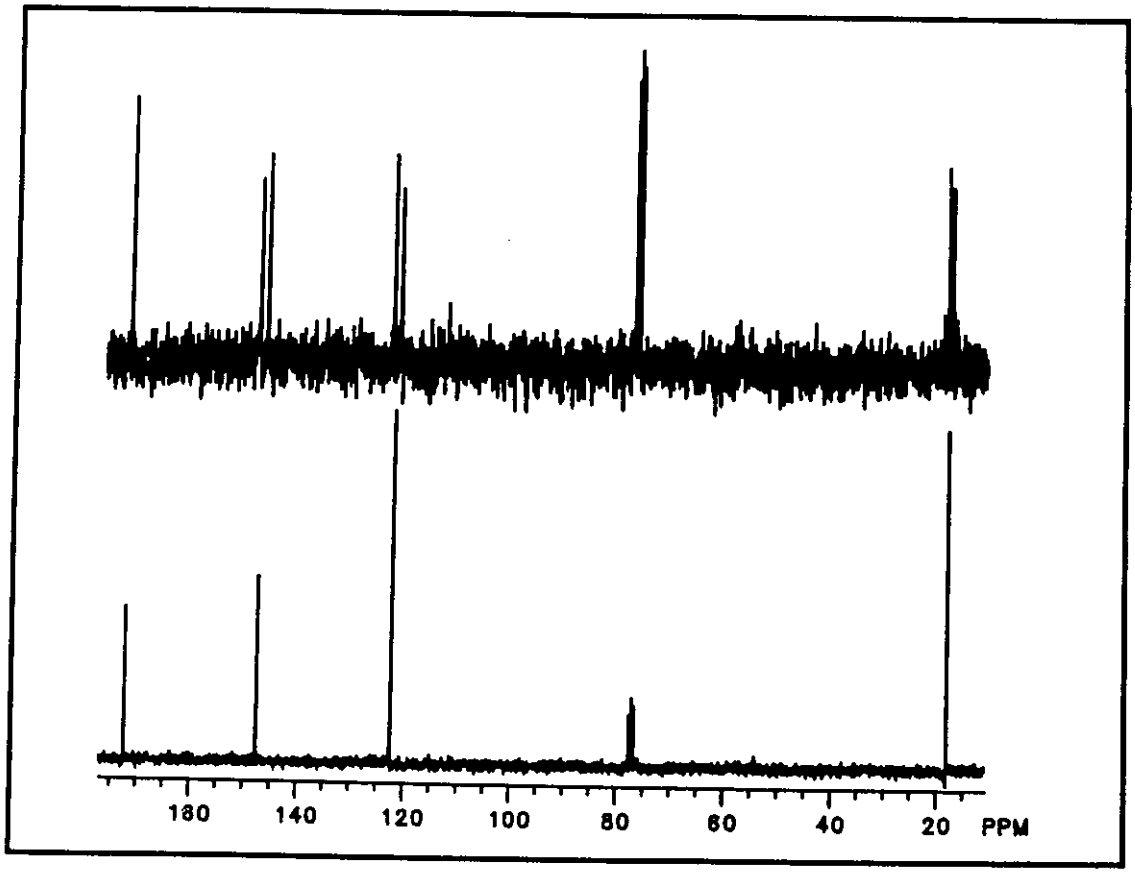
Problem 89

Exact Mass: na
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 55.8% C; 7.0% H



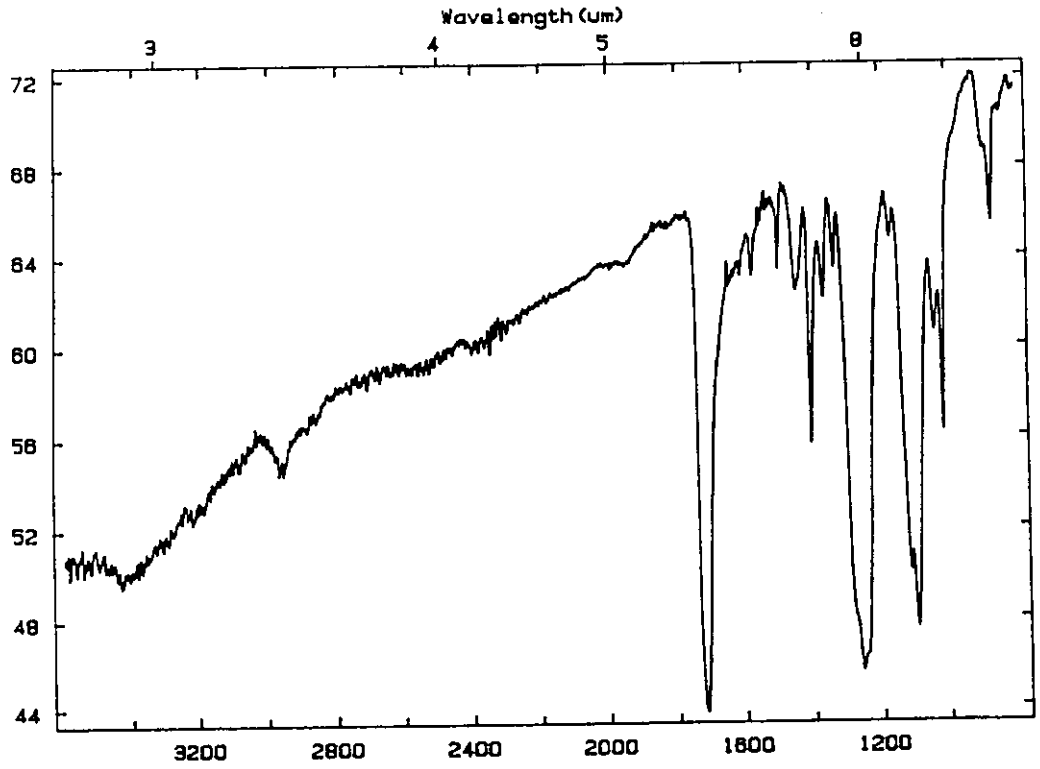


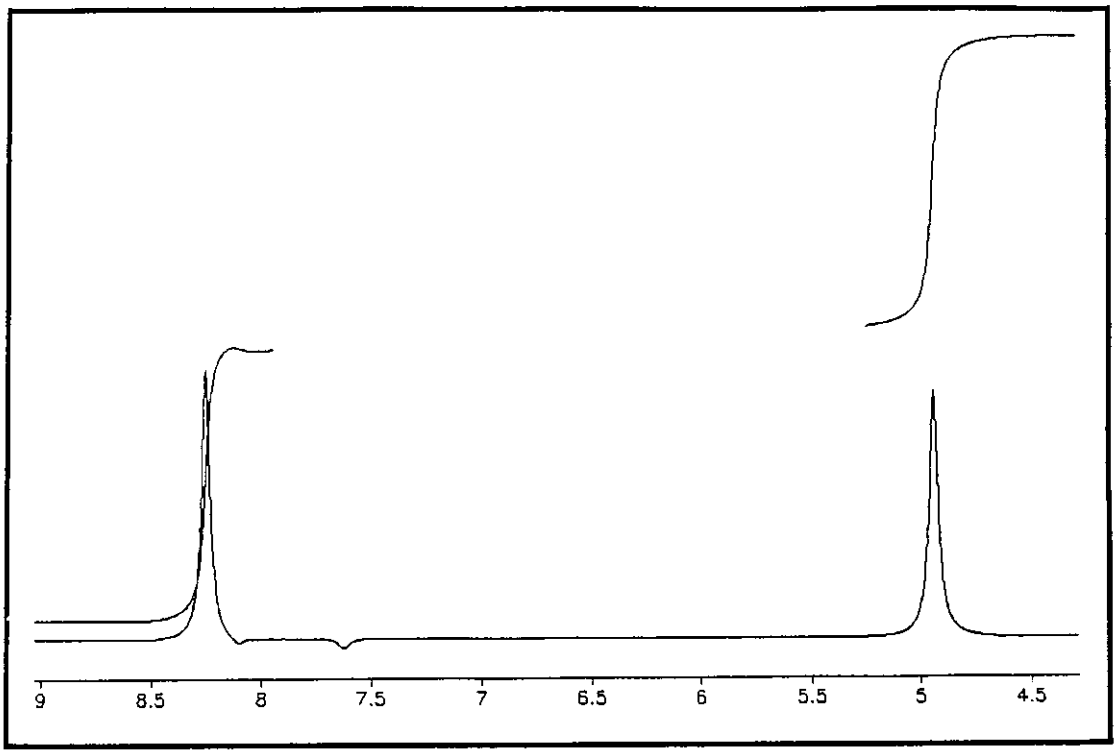

12
10
8
6
4
2
PPM

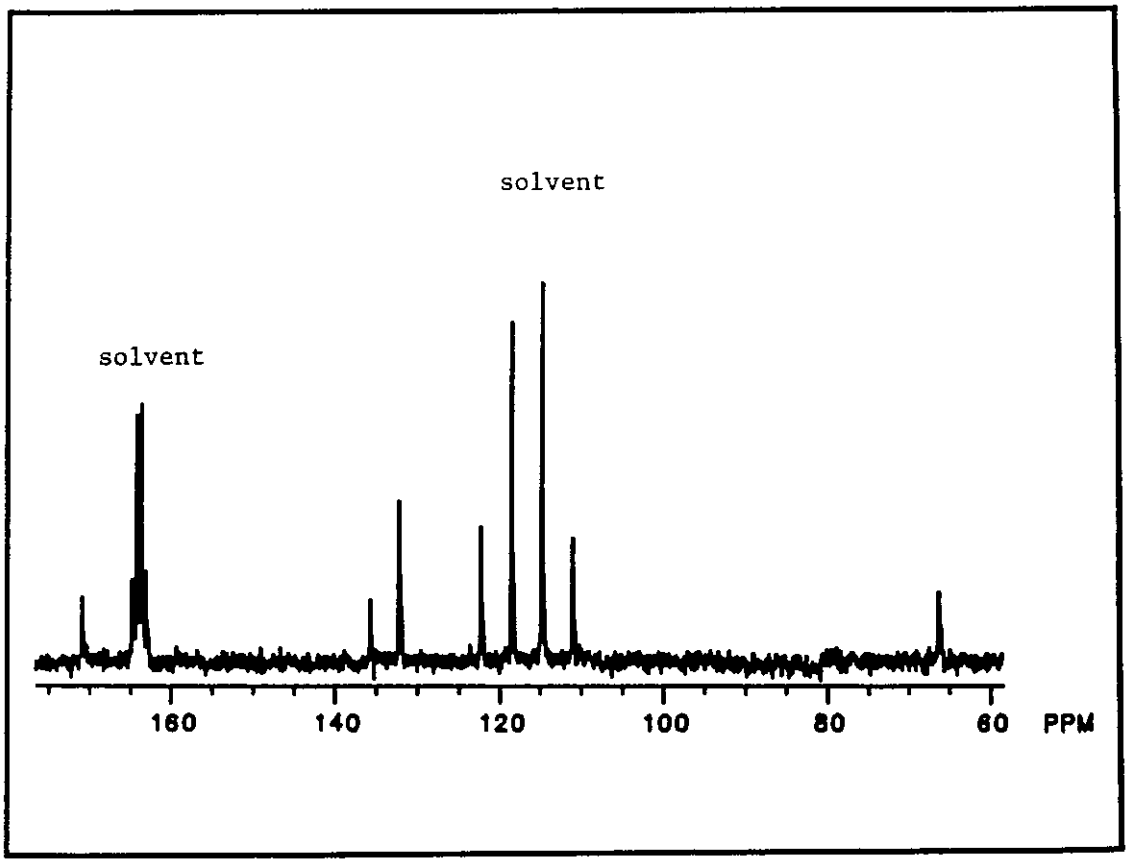

180
140
120
100
80
60
40
20
PPM

Problem 90

Exact Mass: na
IR: neat
^{1}H NMR: CF_3CO_2D
^{13}C NMR: CF_3CO_2D
Analysis: 62.5% C; 1.04% H
Other: Polymeric



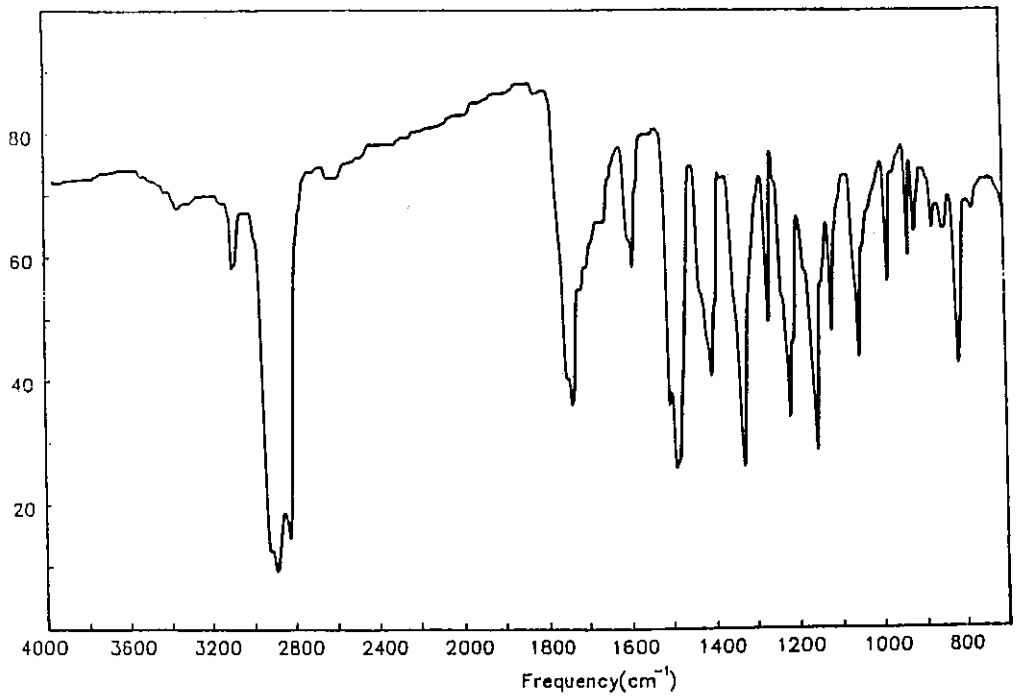

9
8.5
8
7.5
7
6.5
6
5.5
5
4.5

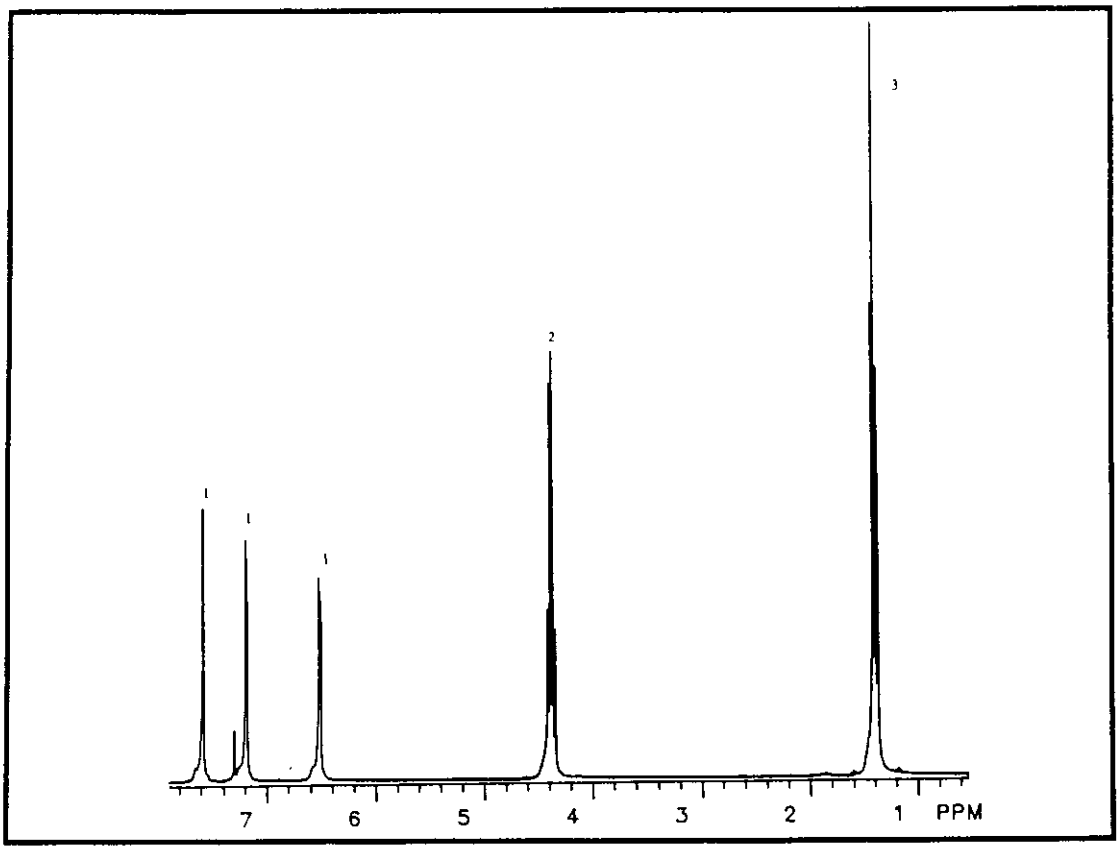

solvent
solvent
160
140
120
100
80
60
PPM

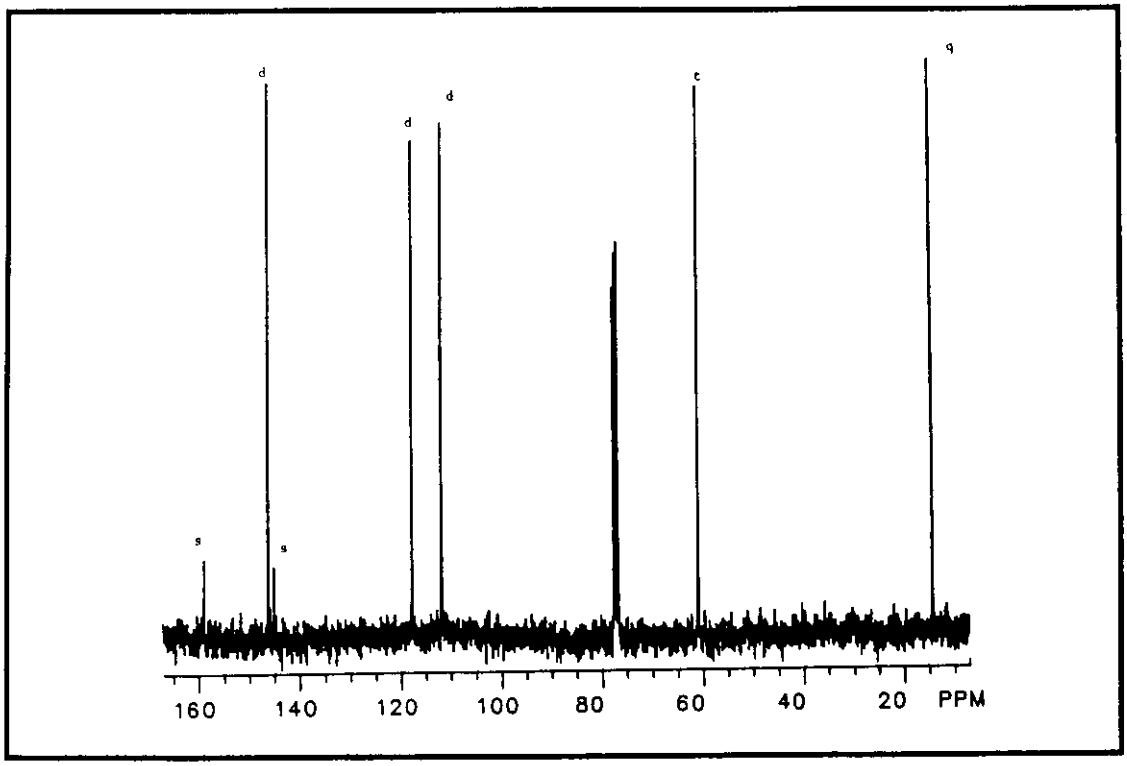
Problem 91

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 60.0% C; 5.8% H

Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A
27,11.95	43, 1.04	55, 1.33	70, 0.09	90, 0.22	107, 0.07
29,15.05	44, 0.24	56, 0.45	71, 0.07	91, 0.04	111, 0.13
30, 0.52	45, 6.85	57, 0.02	75, 0.06	92, 0.07	112,36.04
31, 0.18	46, 0.12	58, 0.12	79, 0.10	93, 0.12	113, 1.84
36, 0.19	47, 0.19	59, 0.11	81, 0.21	94, 0.30	114, 0.27
37, 3.93	49, 0.11	63, 0.03	82, 0.06	95,100.0	125, 0.43
38,10.79	50, 0.31	65, 0.25	83, 0.21	96,17.02	133, 0.03
39,34.76	51, 0.90	66, 1.42	84, 3.00	97, 1.95	140,13.35
40, 3.21	52, 0.11	67, 2.60	85, 0.13	98, 0.14	141, 1.06
41, 1.91	53, 1.71	68, 9.22	86, 0.06	101, 0.04	142, 0.11
42, 1.44	54, 0.20	69, 0.49	89, 0.20	103, 0.01	




3
2
1
1
1
7
6
5
4
3
2
1
PPM

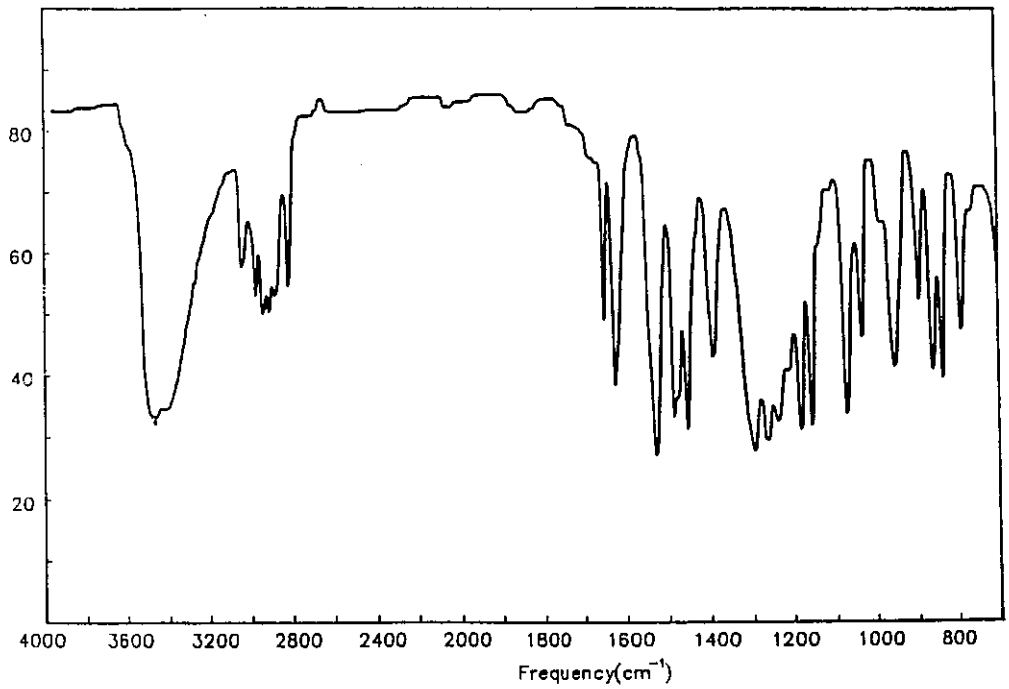

d
d
d
s
s
160
140
120
100
80
60
40
20
PPM

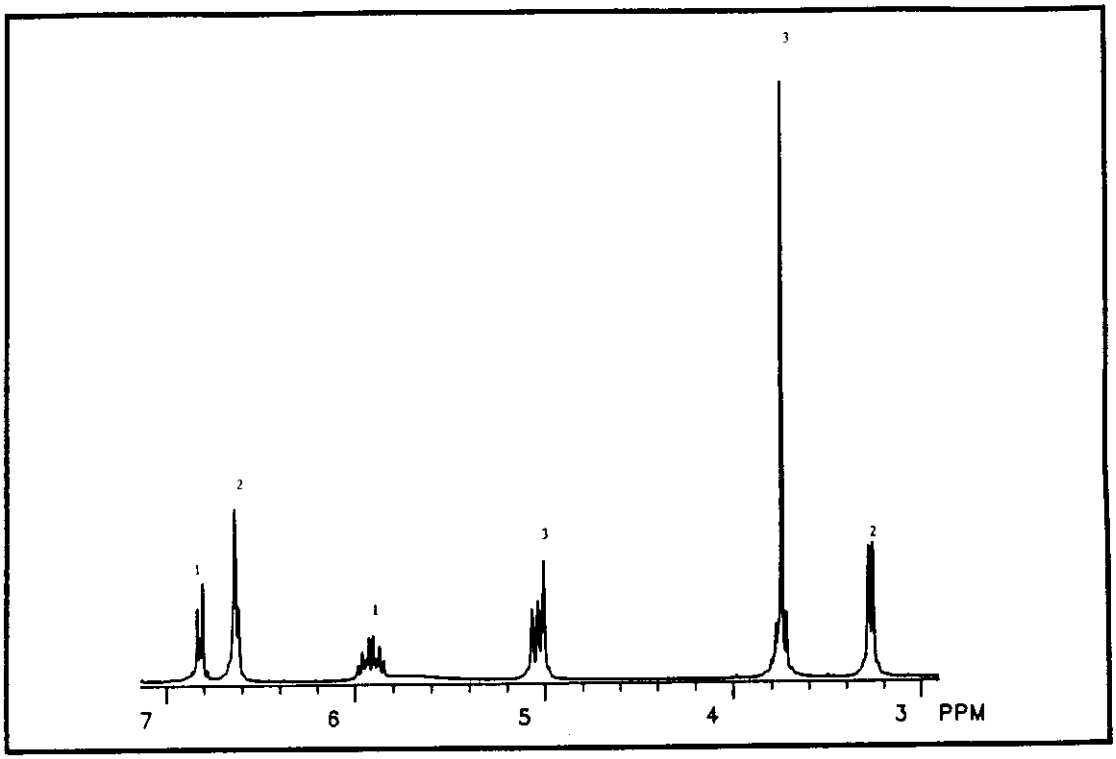
Problem 92

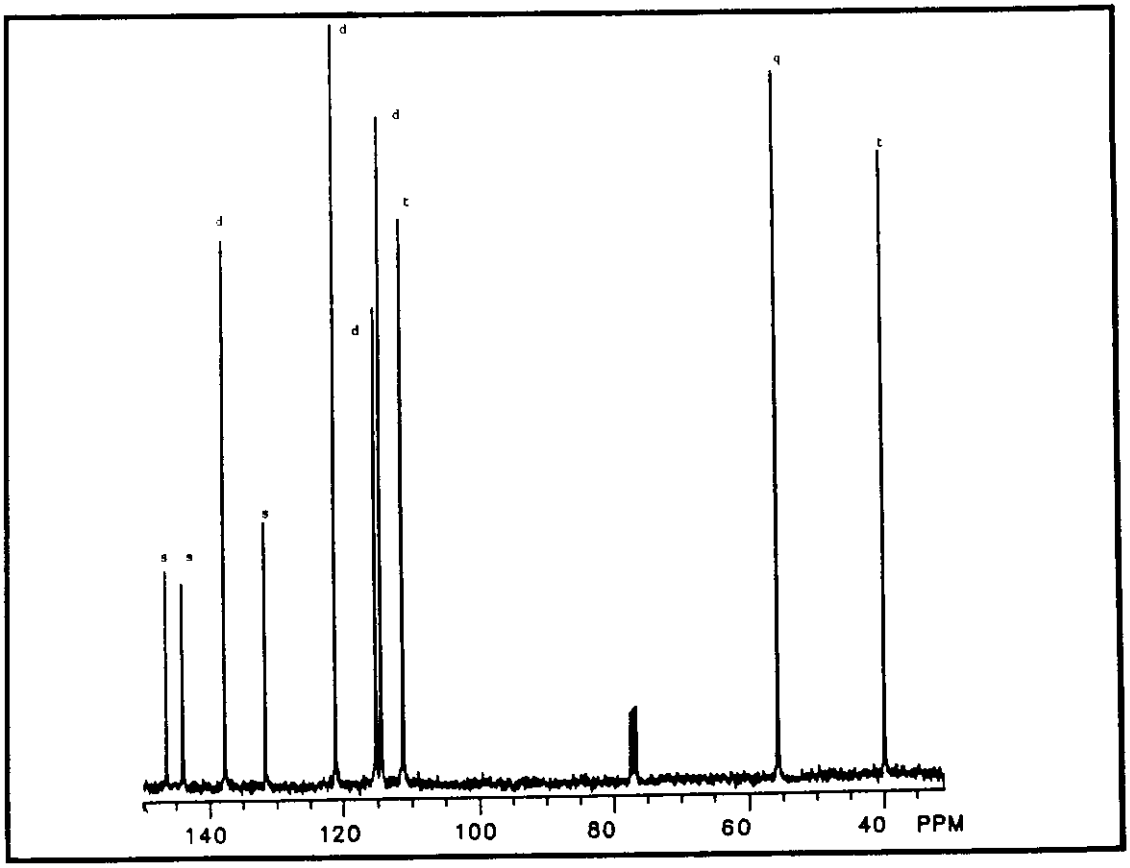
Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 73.2% C; 7.4% H

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
30	0.23	53	6.55	74	2.40	91	32.82	115	3.28	133	20.47
31	0.69	54	0.88	75	2.28	92	4.29	116	0.89	134	2.49
37	0.39	55	11.96	76	1.96	93	7.32	117	0.90	135	2.05
38	1.95	56	0.32	77	34.27	94	11.40	118	1.30	137	19.84
39	9.42	61	0.95	78	10.25	95	1.70	119	2.83	138	1.80
40	1.63	62	3.24	79	8.53	101	0.90	120	1.77	147	5.50
41	2.68	63	7.08	80	1.09	102	4.16	121	23.01	148	1.30
42	0.48	64	2.09	81	3.10	103	38.84	122	9.90	149	39.46
43	1.58	65	11.62	82	0.22	104	26.00	123	1.22	150	4.37
45	0.10	66	6.95	85	0.21	105	11.76	128	0.42	151	0.36
49	0.29	67	1.66	86	0.49	106	1.74	129	2.36	163	4.13
50	5.30	68	0.62	87	0.63	107	4.57	130	0.49	164	100.00
51	11.33	69	0.64	89	3.64	108	1.00	131	28.50	165	11.03
52	4.81	73	0.36	90	1.53	109	1.60	132	9.02	166	1.01

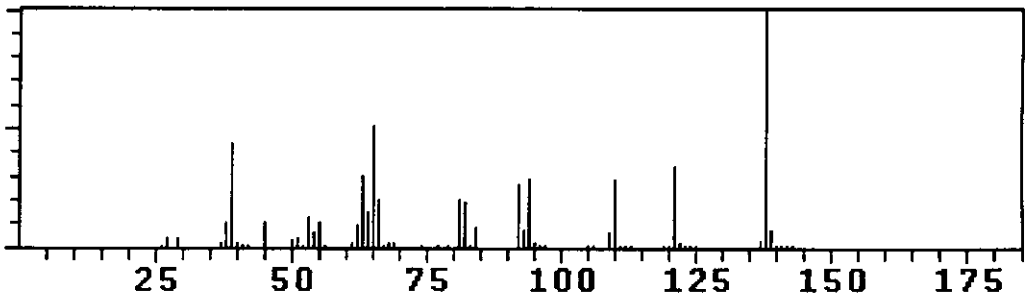


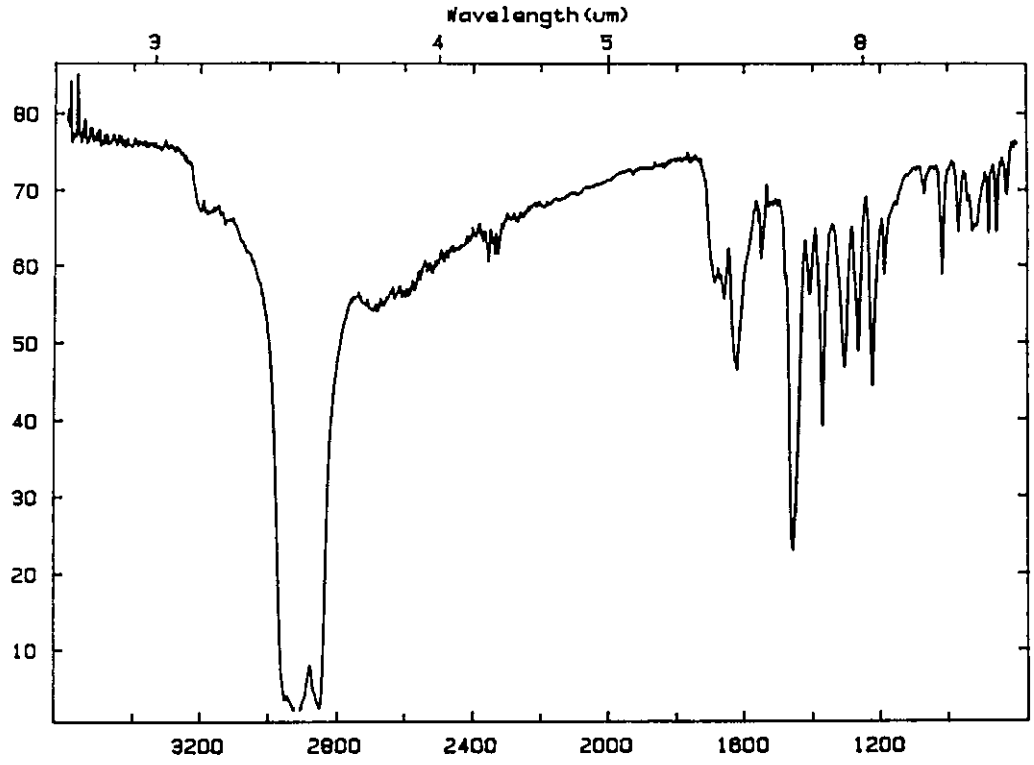

3
2
1
3
1
2
7
6
5
4
3
PPM

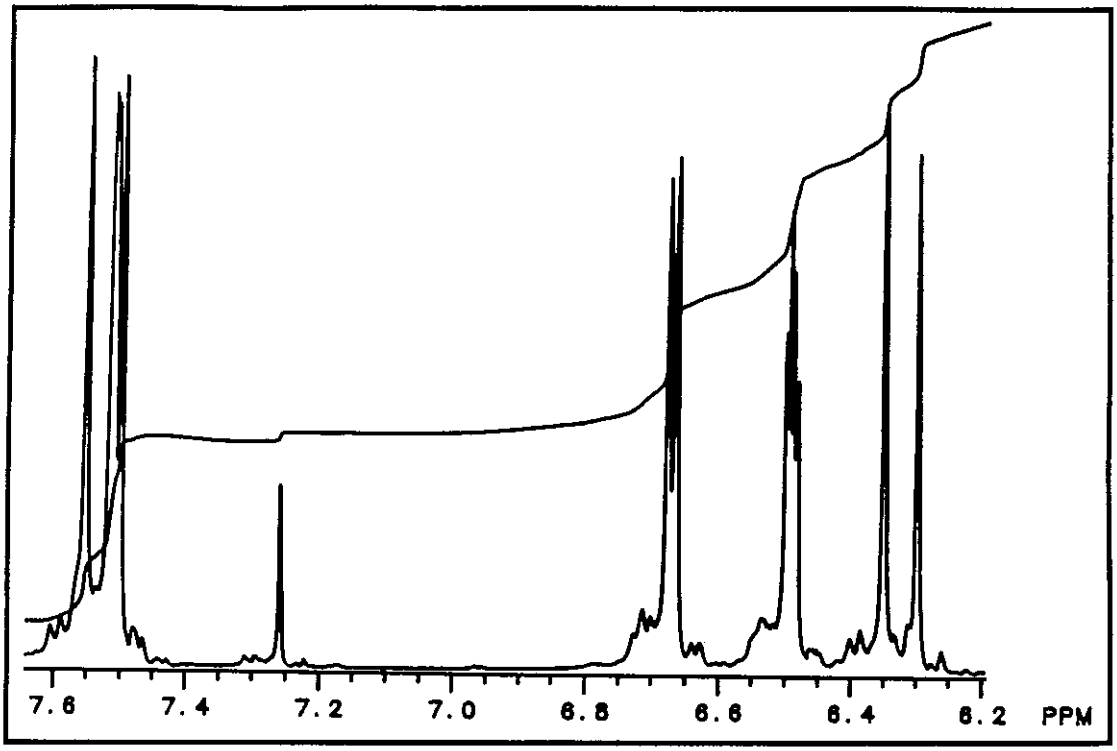

d
q
d
t
d
t
d
s
s
s
140
120
100
80
60
40
PPM

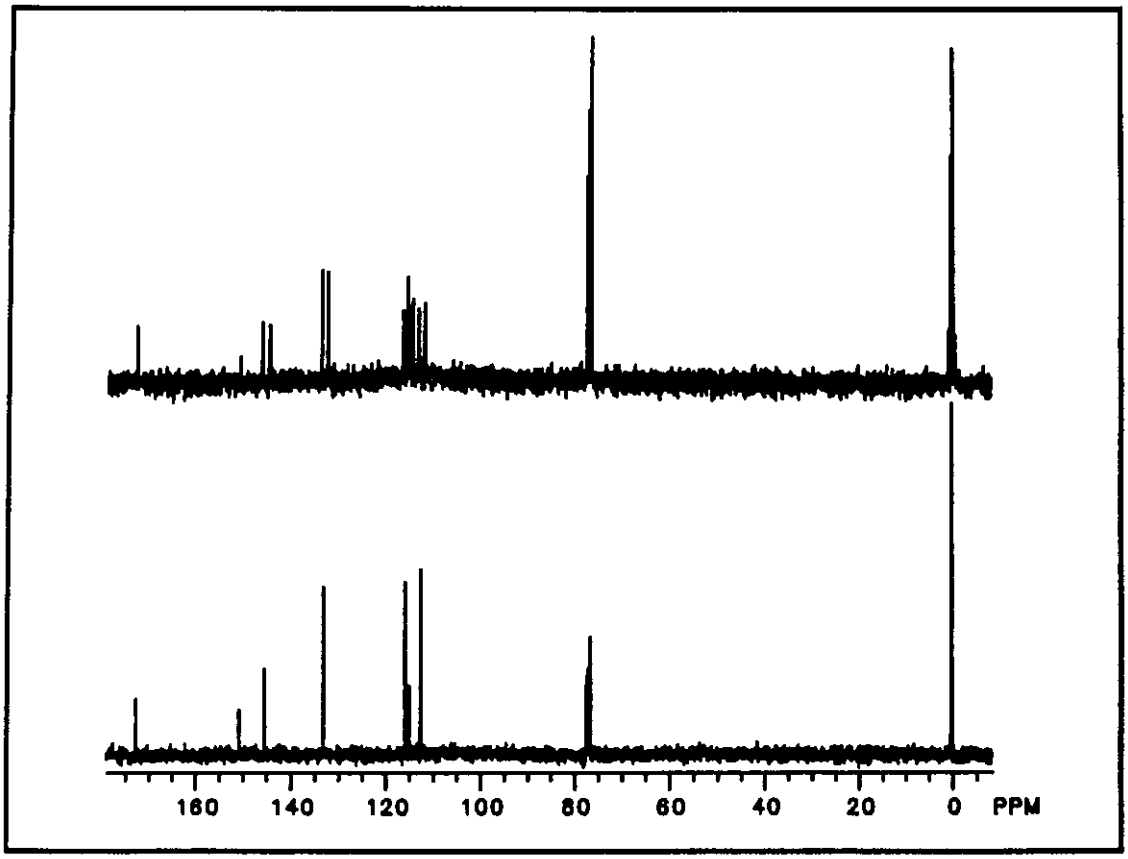
Problem 93

Exact Mass: na
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 60.9% C; 4.4% H



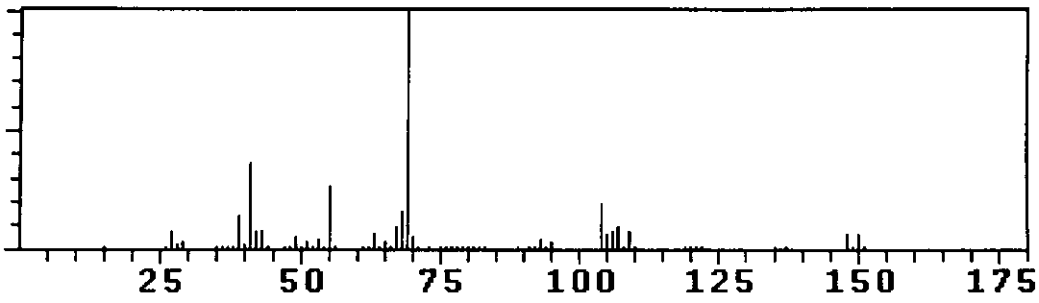


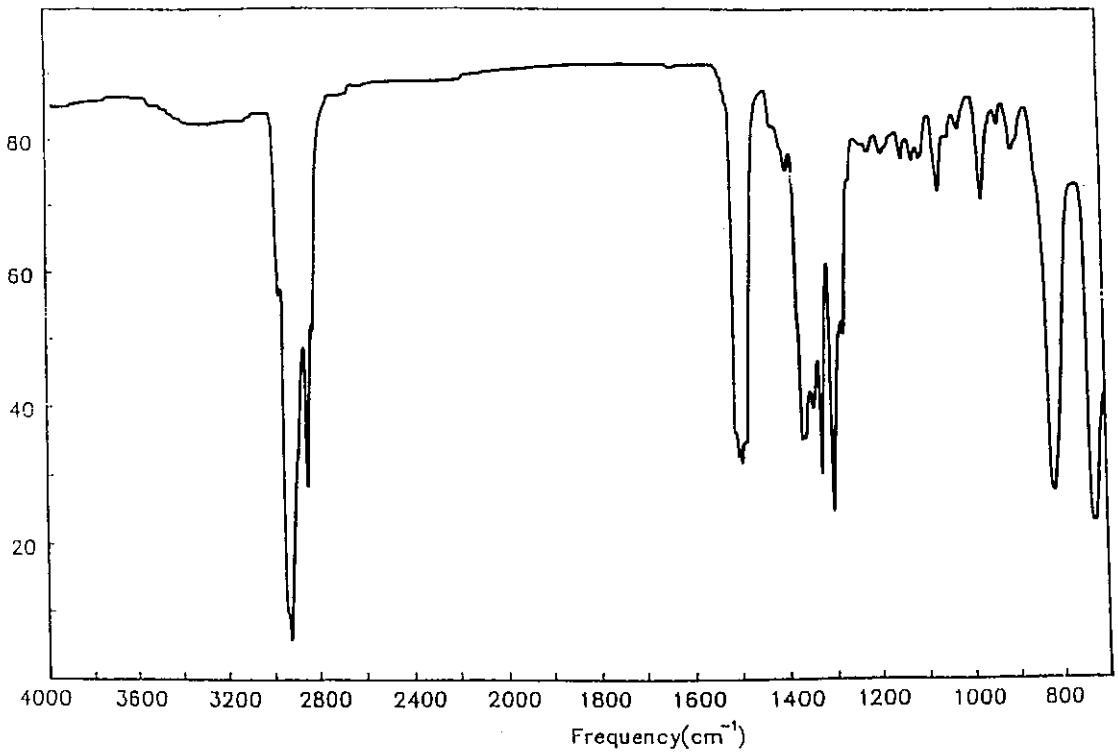

7.6
7.4
7.2
7.0
6.8
6.6
6.4
6.2
PPM

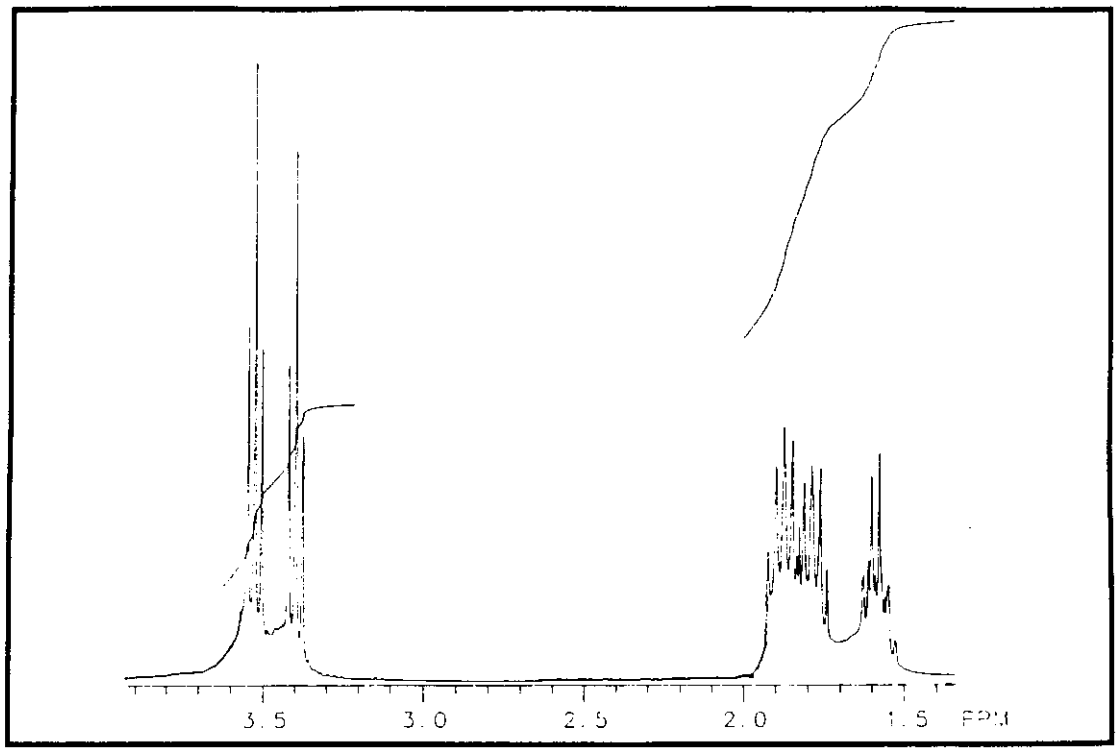

160
140
120
100
80
60
40
20
0
PPM

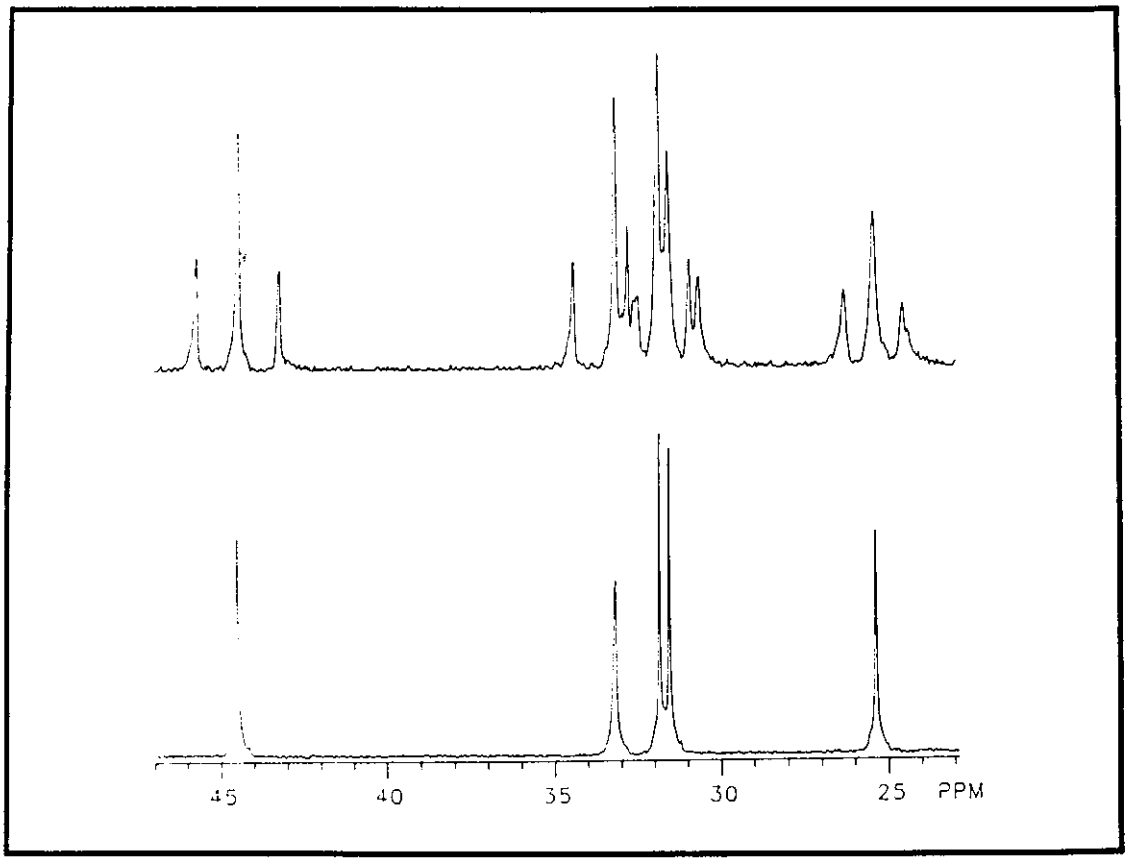
Problem 94

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 32.4% C; 5.4% H



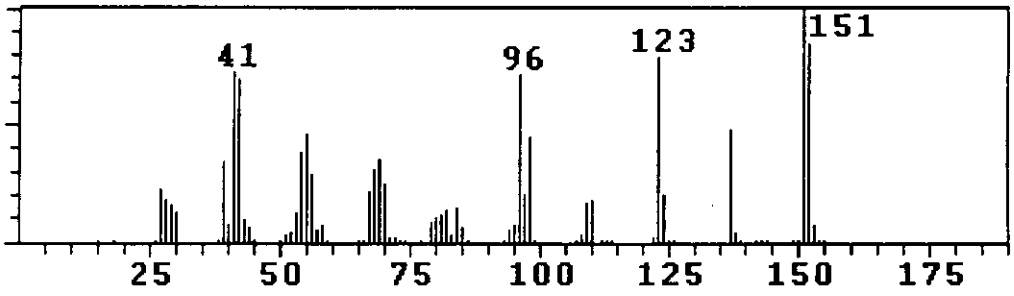


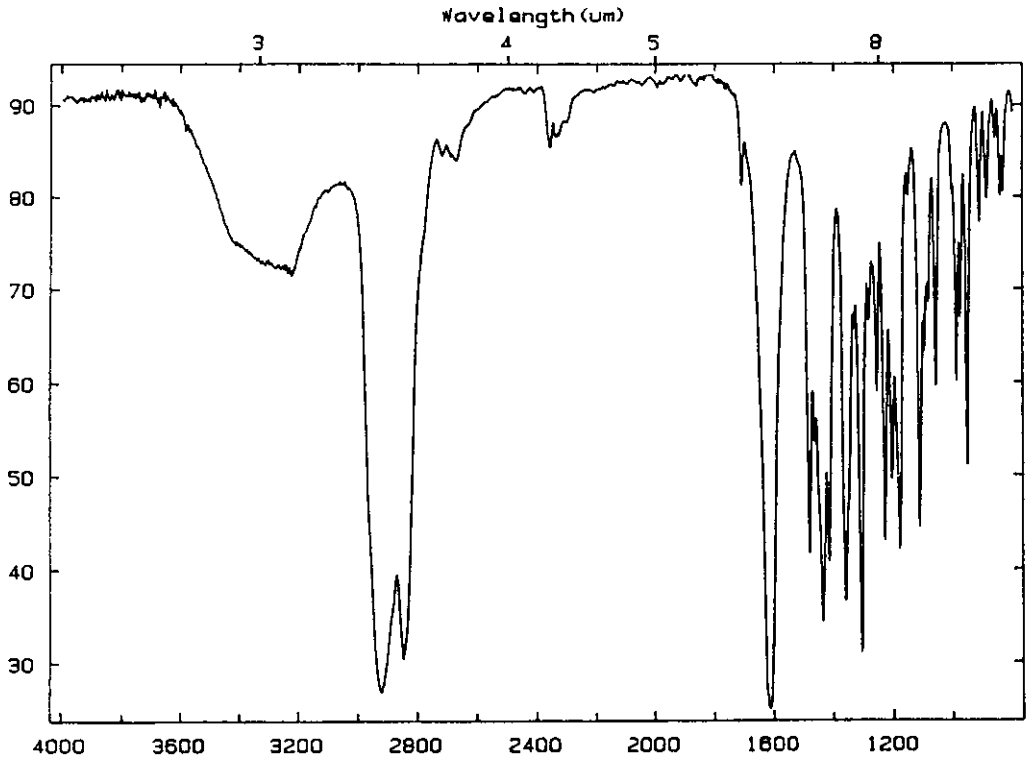

3.5
3.0
2.5
2.0
1.5
PPM

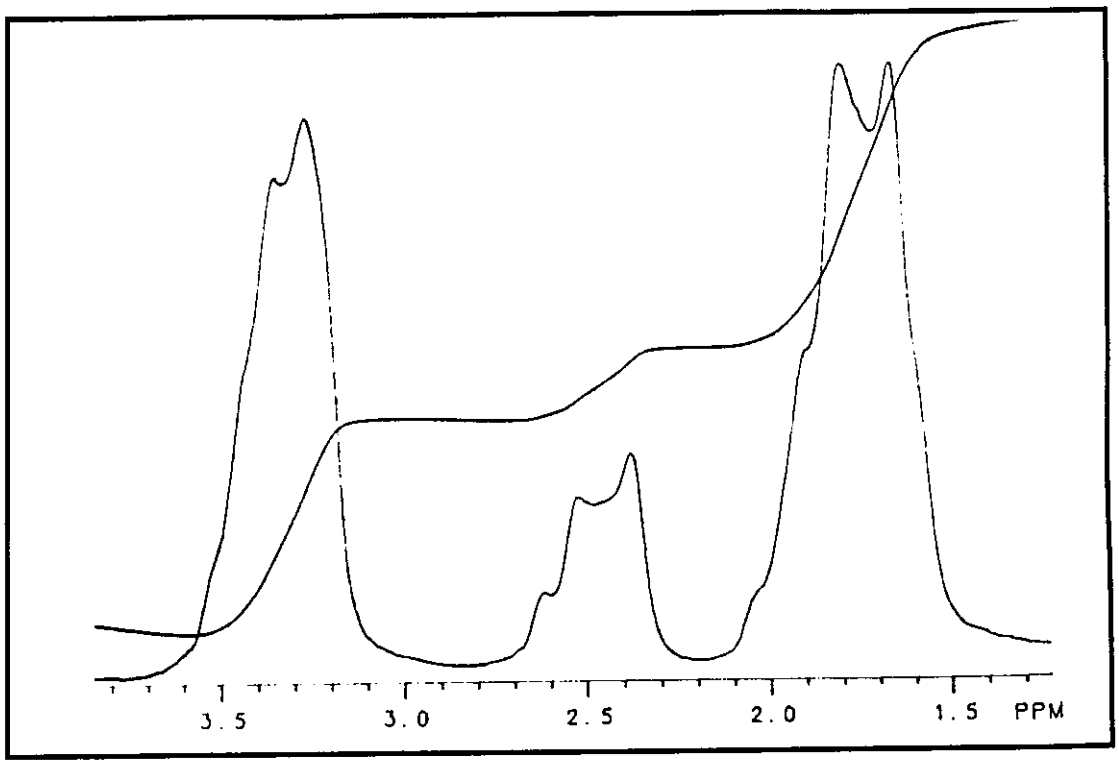

45
40
35
30
25
PPM

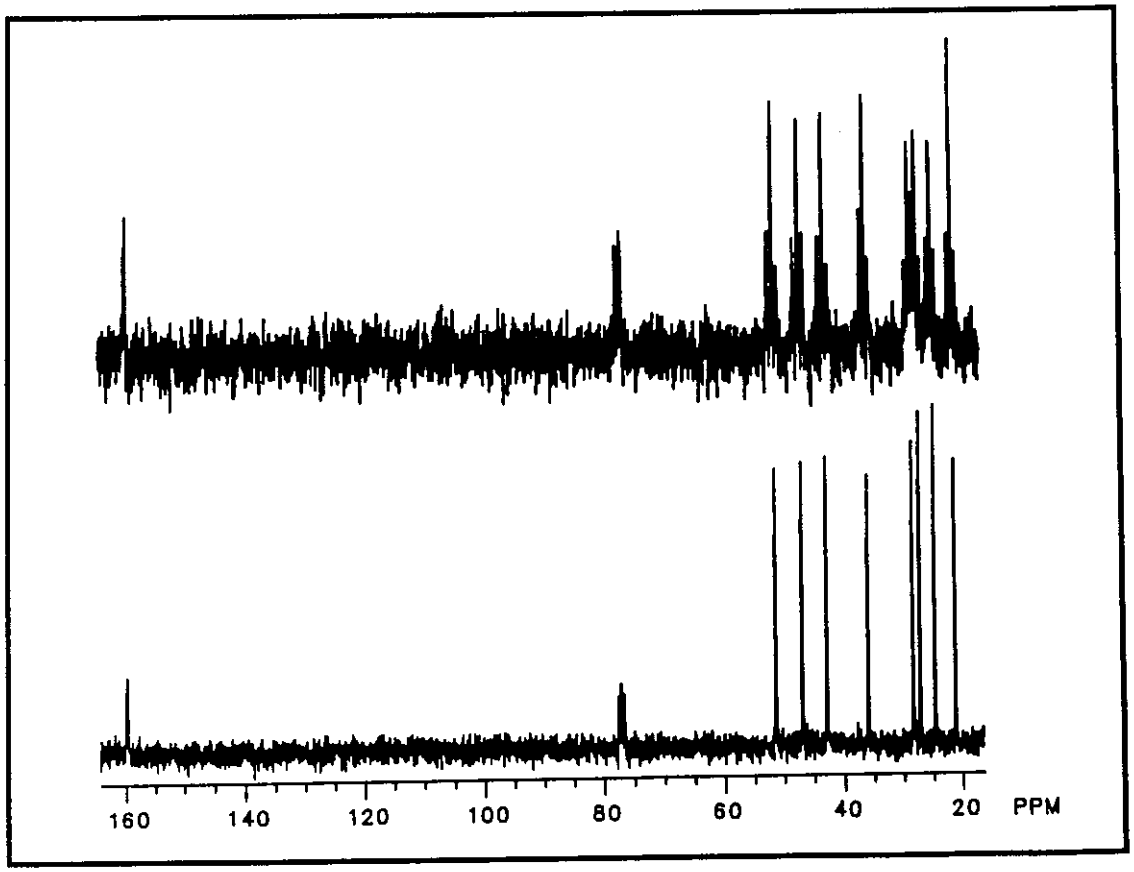
Problem 95

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 71.0% C; 10.6% H; 18.4% N



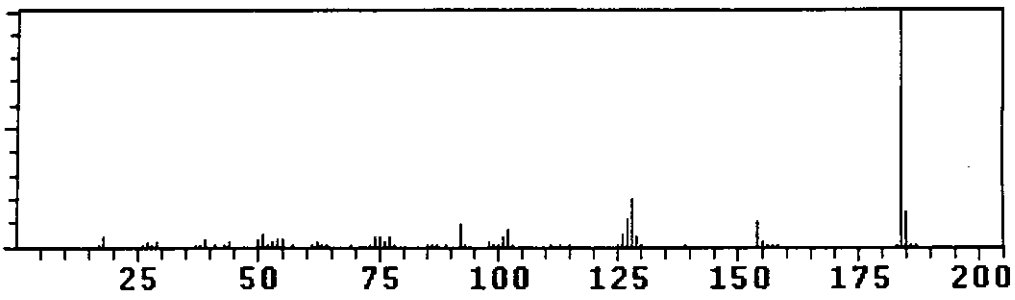


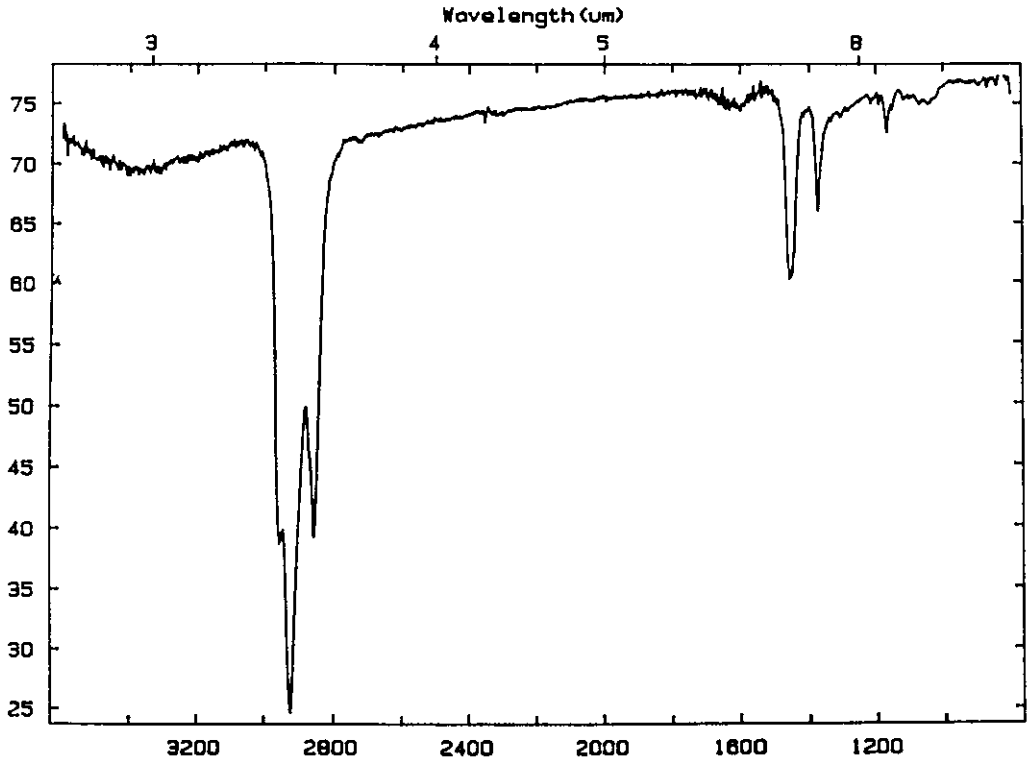

3.5
3.0
2.5
2.0
1.5
PPM

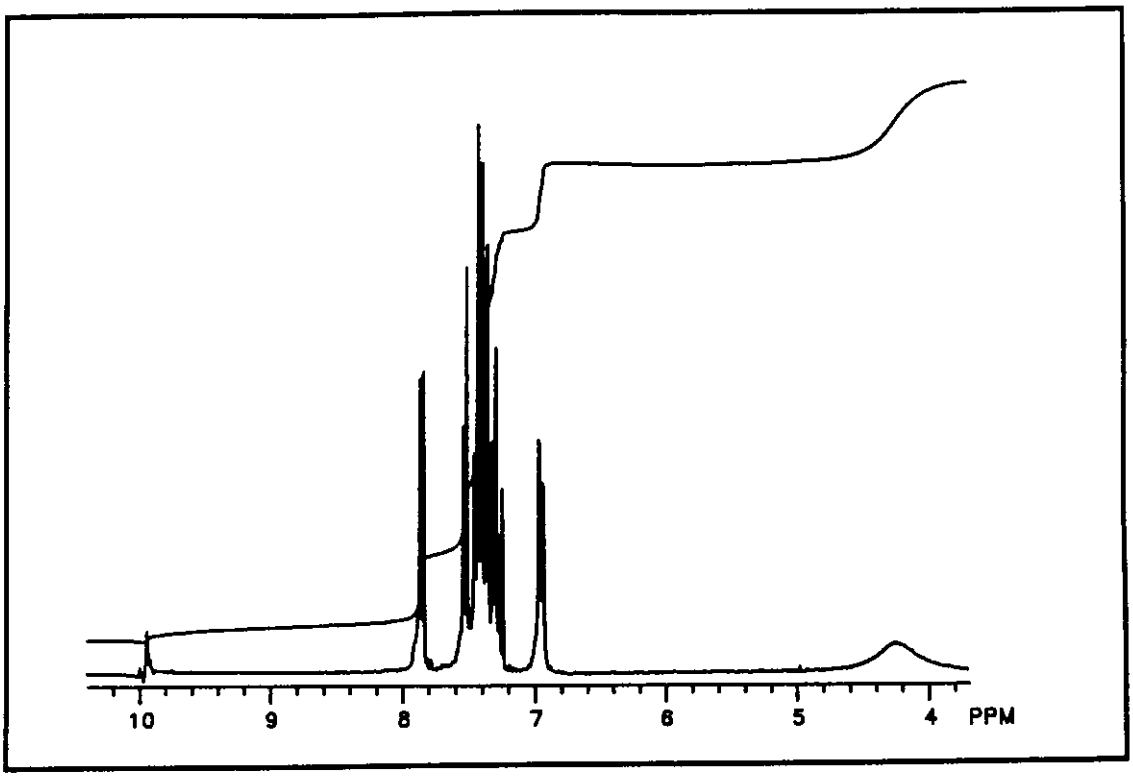

160
140
120
100
80
60
40
20
PPM

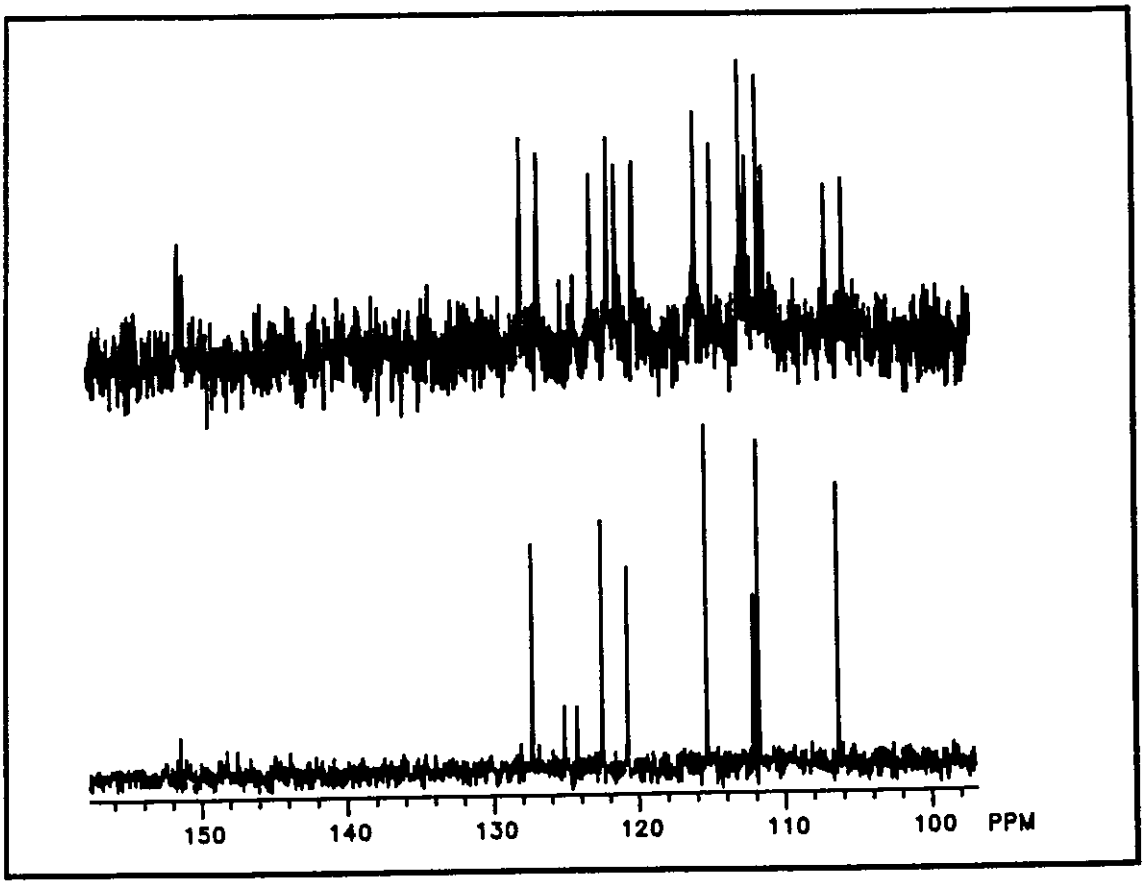
Problem 96

Exact Mass: na
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 78.3% C; 4.4% H



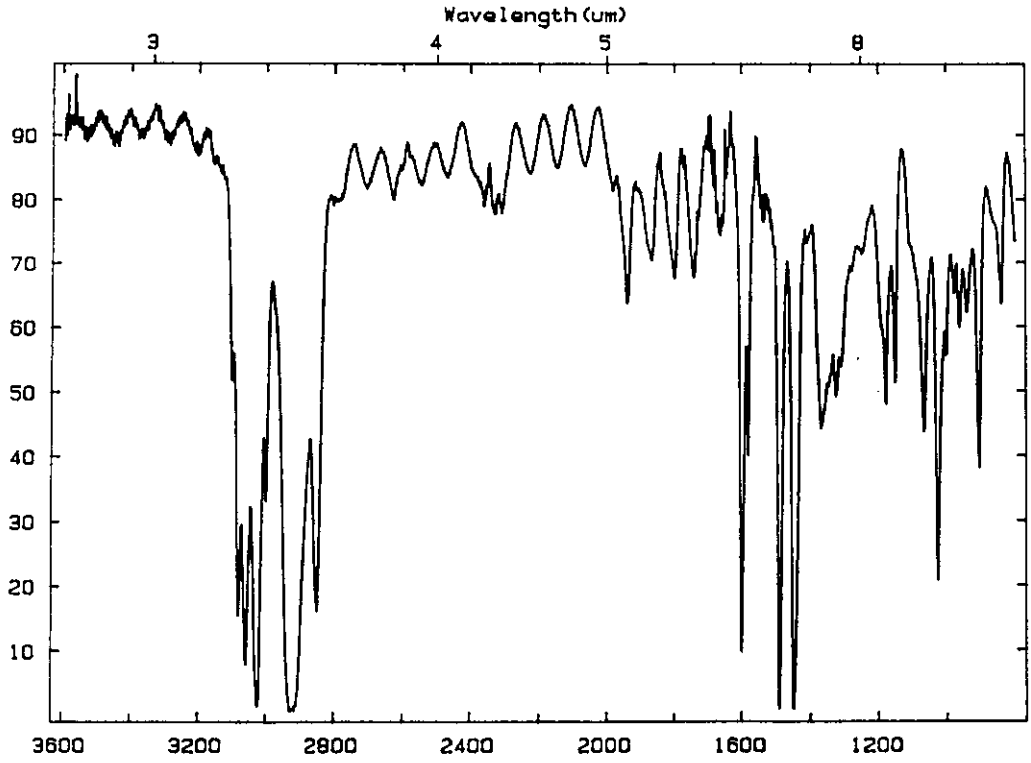


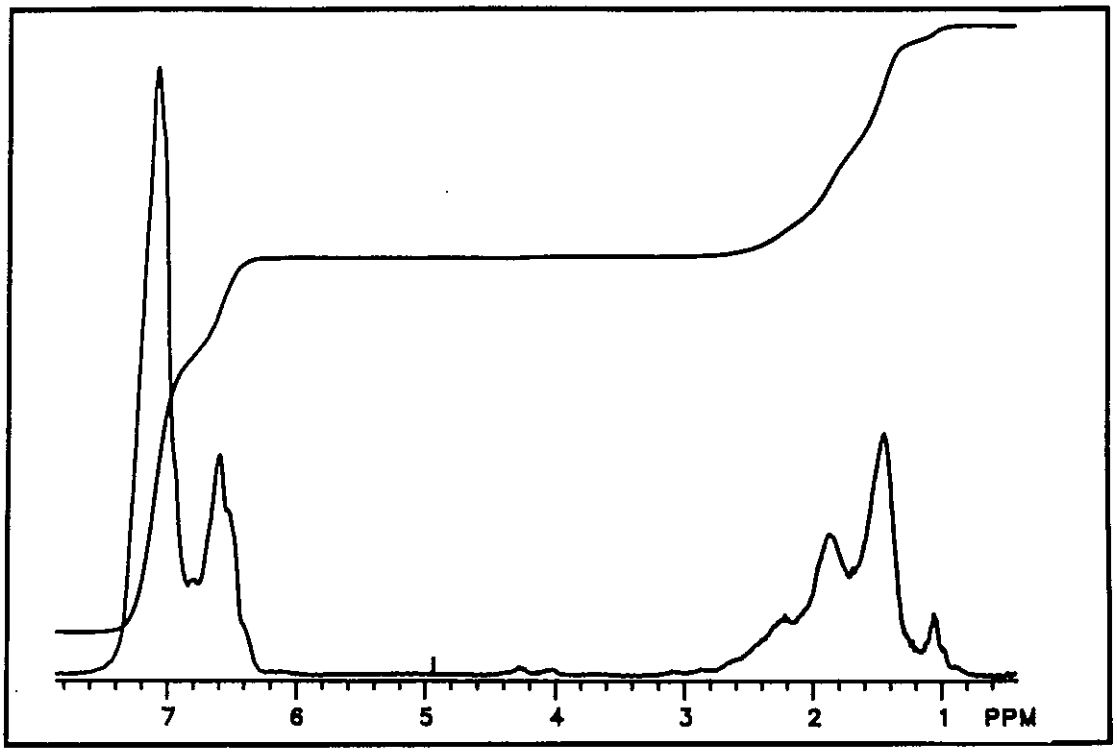

10
9
8
7
6
5
4
PPM

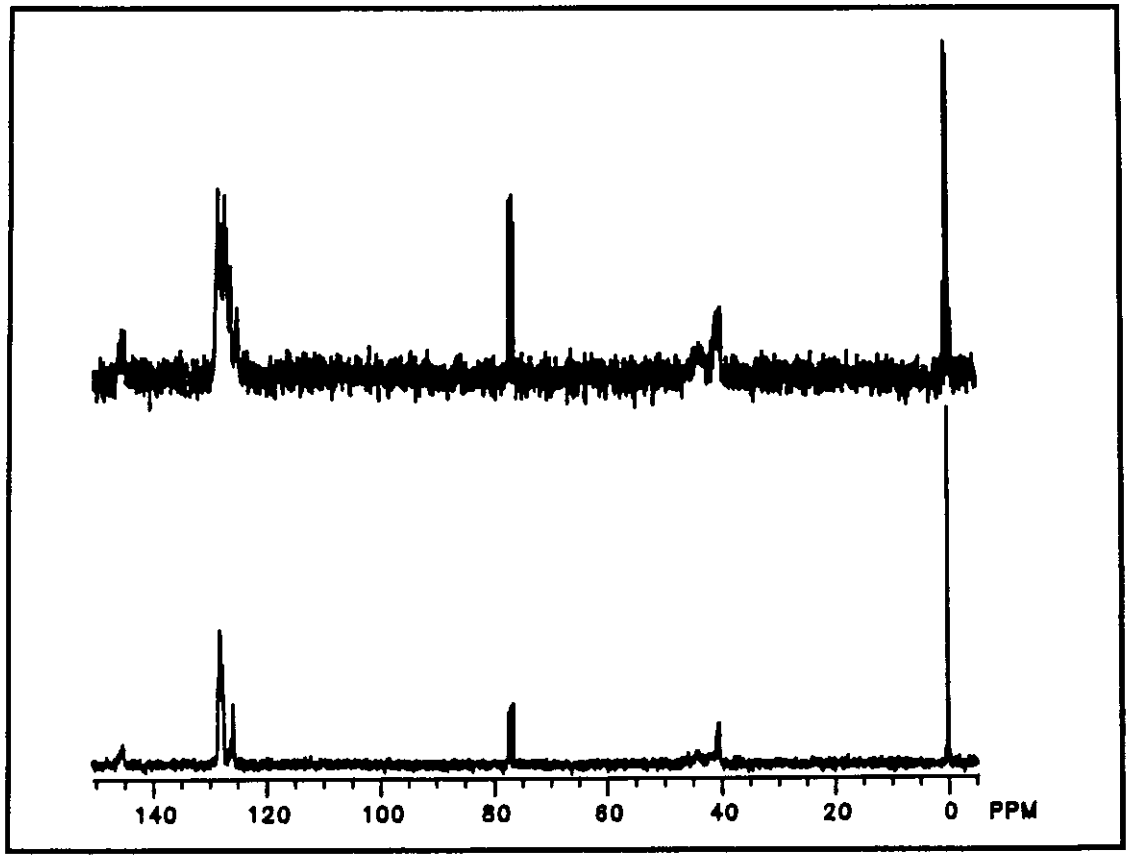

150
140
130
120
110
100
PPM

Problem 97

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 92.3% C; 7.8% H
Other: Polymeric (Mass Spectra not included)

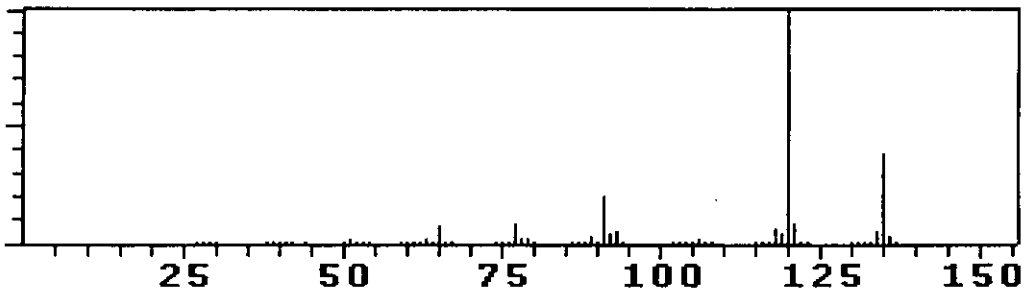


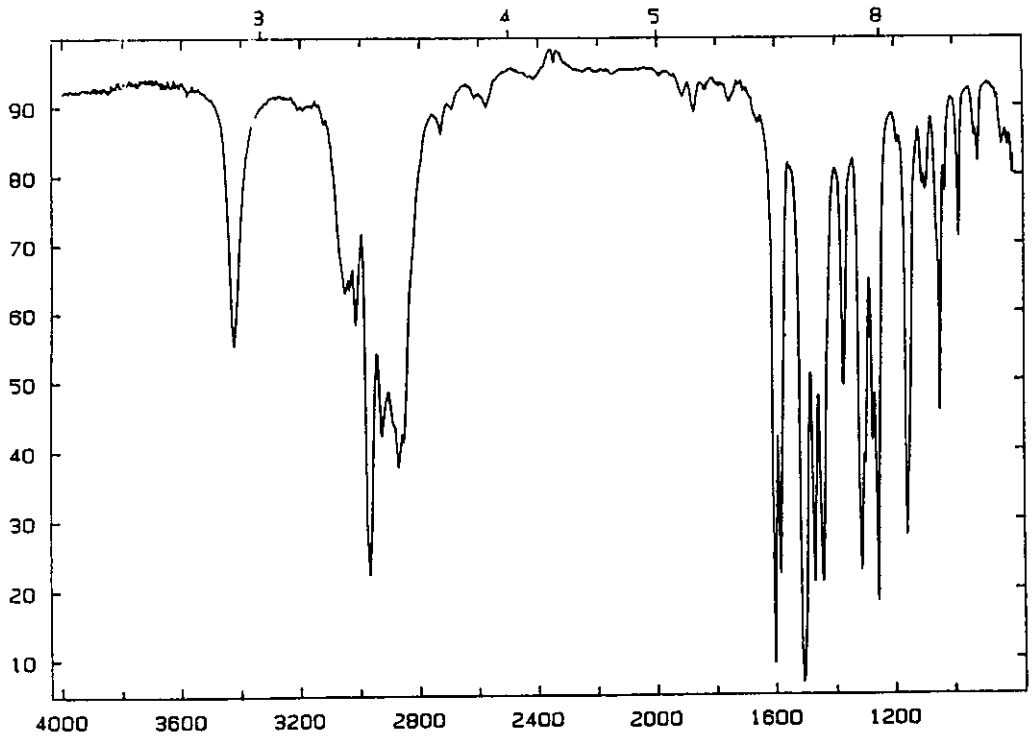

7
6
5
4
3
2
1
PPM

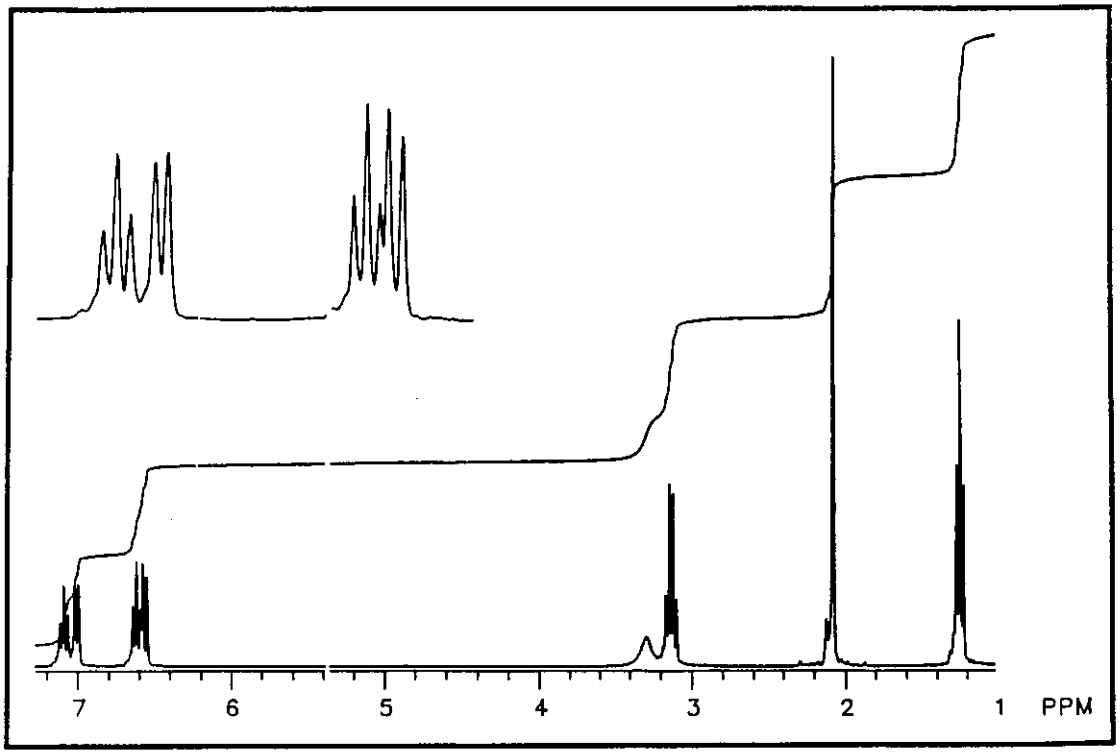

140
120
100
80
60
40
20
0
PPM

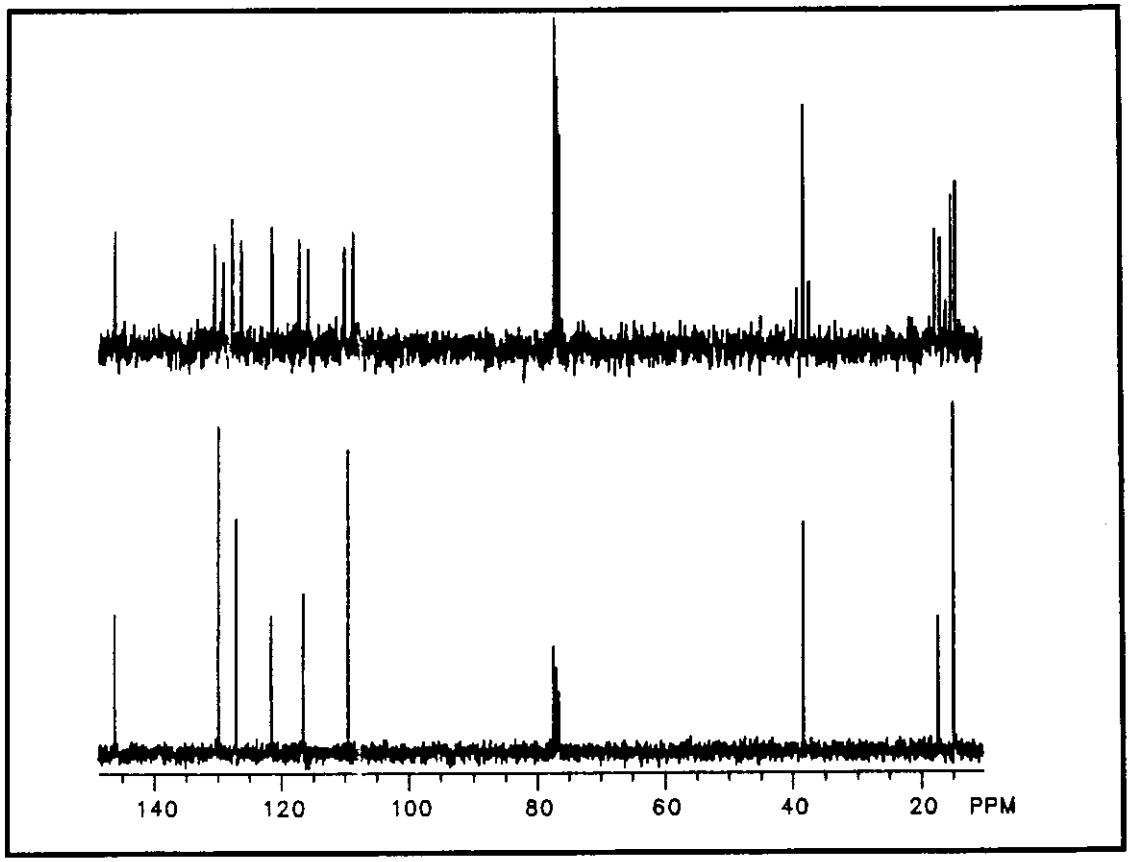
Problem 98

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 80.0% C; 9.7% H; 10.4% N






7
6
5
4
3
2
1
PPM

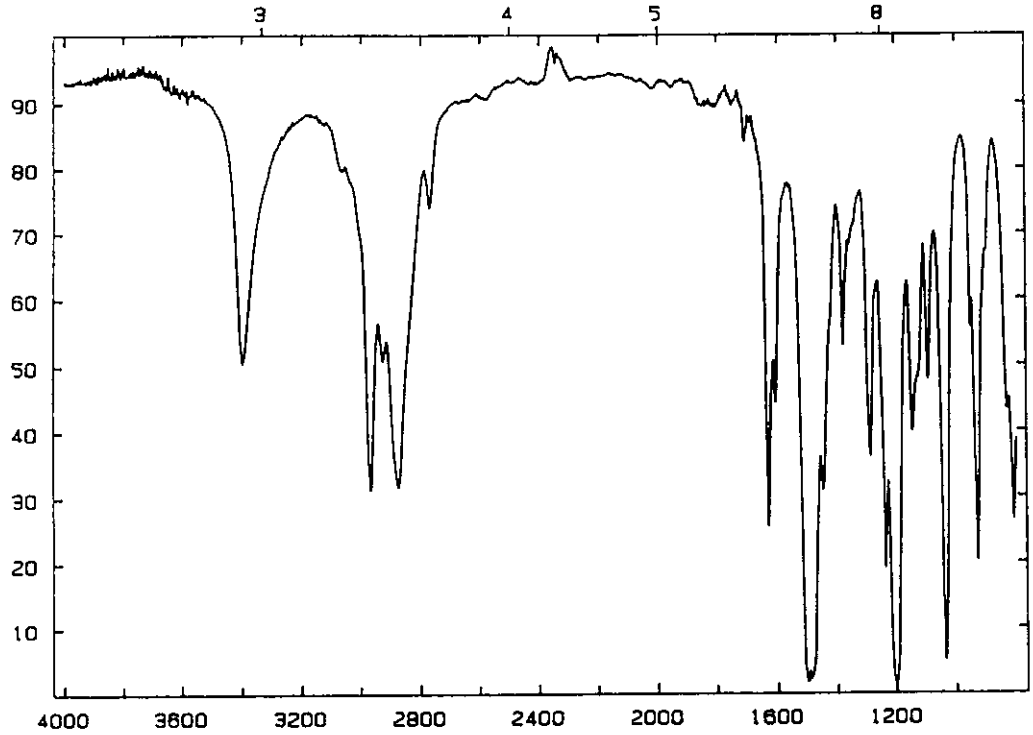

140
120
100
80
60
40
20
PPM

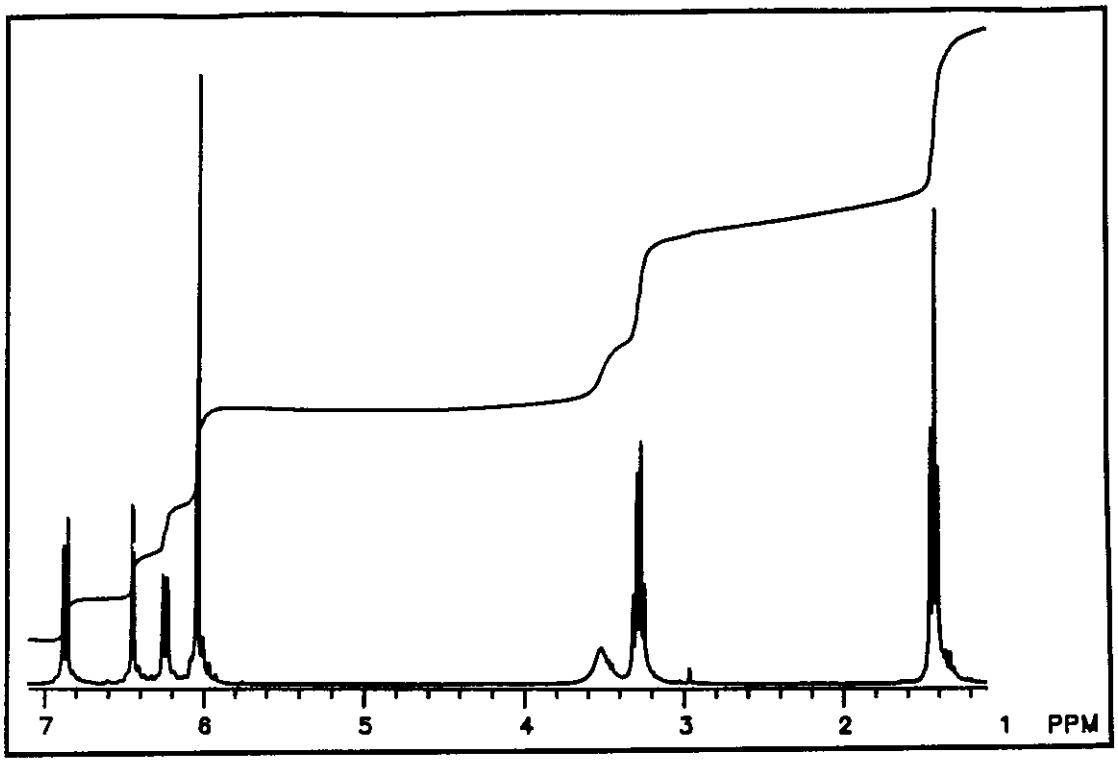
Problem 99

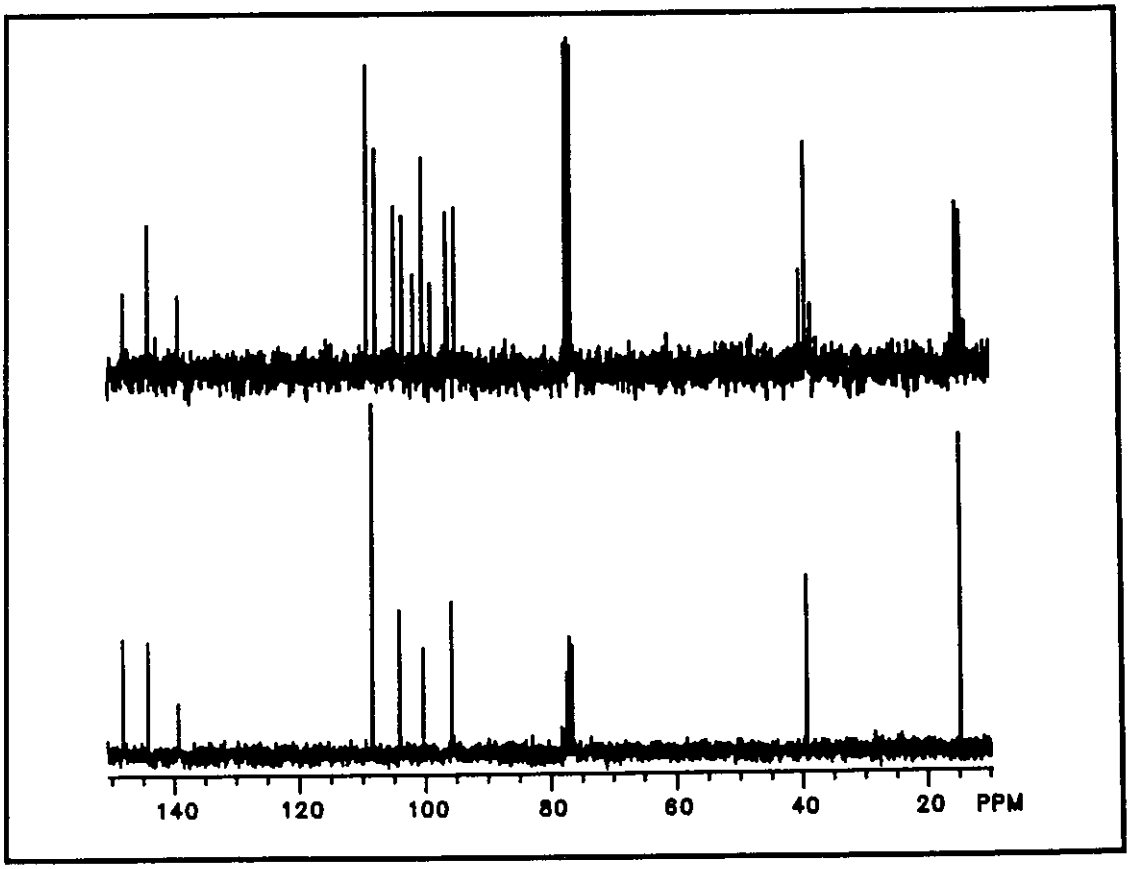
Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
33	40.90	50	7.59	66	2.75	90	0.65	117	0.19	151	10.82
37	2.08	51	19.01	67	2.10	91	2.18	118	0.36	152	0.97
38	4.26	52	17.44	68	3.55	92	10.65	120	10.14	162	0.31
39	8.72	53	11.21	69	0.41	93	6.44	121	5.00	165	62.76
40	3.30	54	3.56	75	11.21	94	1.74	122	7.33	166	7.21
41	3.87	55	1.43	76	1.96	95	1.15	123	0.75	167	0.62
42	3.13	56	0.28	77	5.71	104	1.52	132	0.39	168	0.04
43	0.63	60	0.29	78	20.24	106	10.91	133	0.27		
44	0.89	61	2.21	79	8.69	107	3.17	134	2.10		
45	0.29	62	6.25	80	11.06	108	1.80	136	7.61		
47	0.30	63	11.03	81	2.20	109	0.97	137	1.06		
48	0.13	64	3.53	82	1.04	110	0.08	148	2.45		
49	1.19	65	14.04	89	0.26	116	0.28	150	100.00		

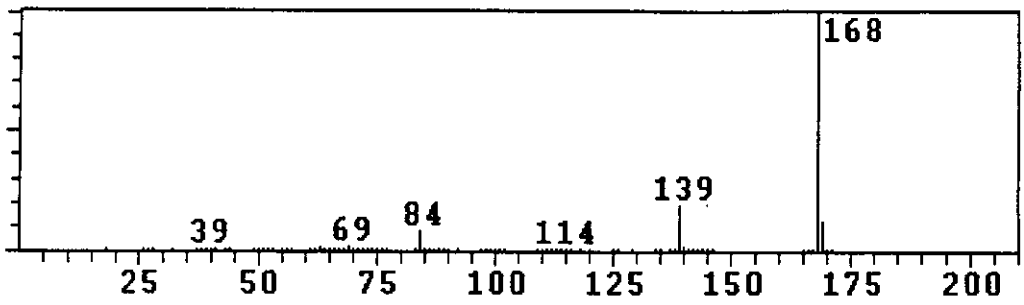


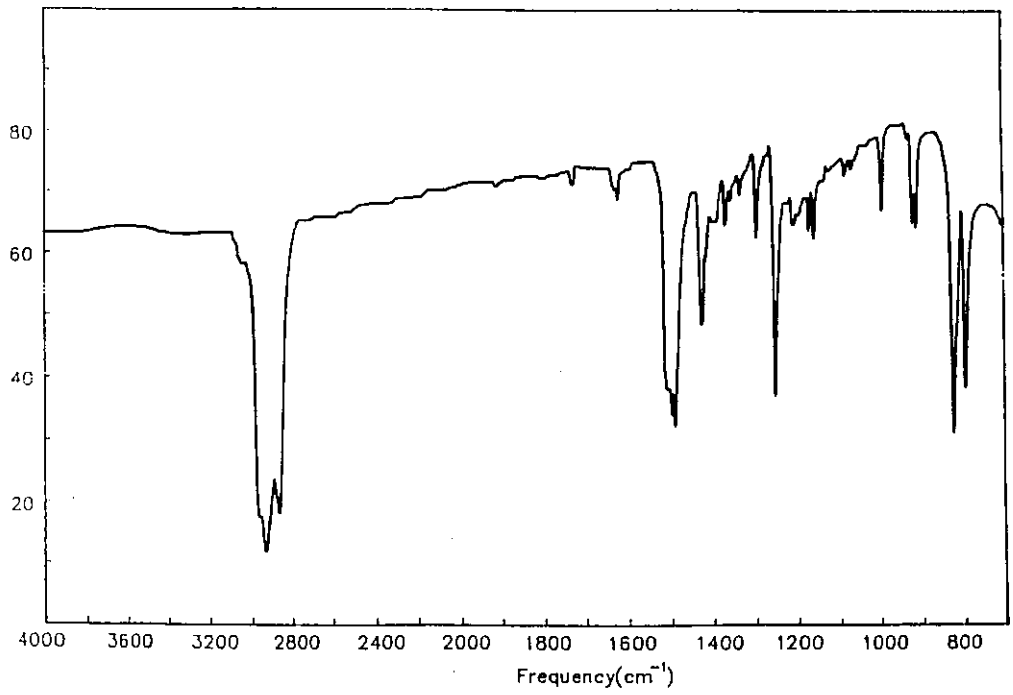

7
6
5
4
3
2
1
PPM

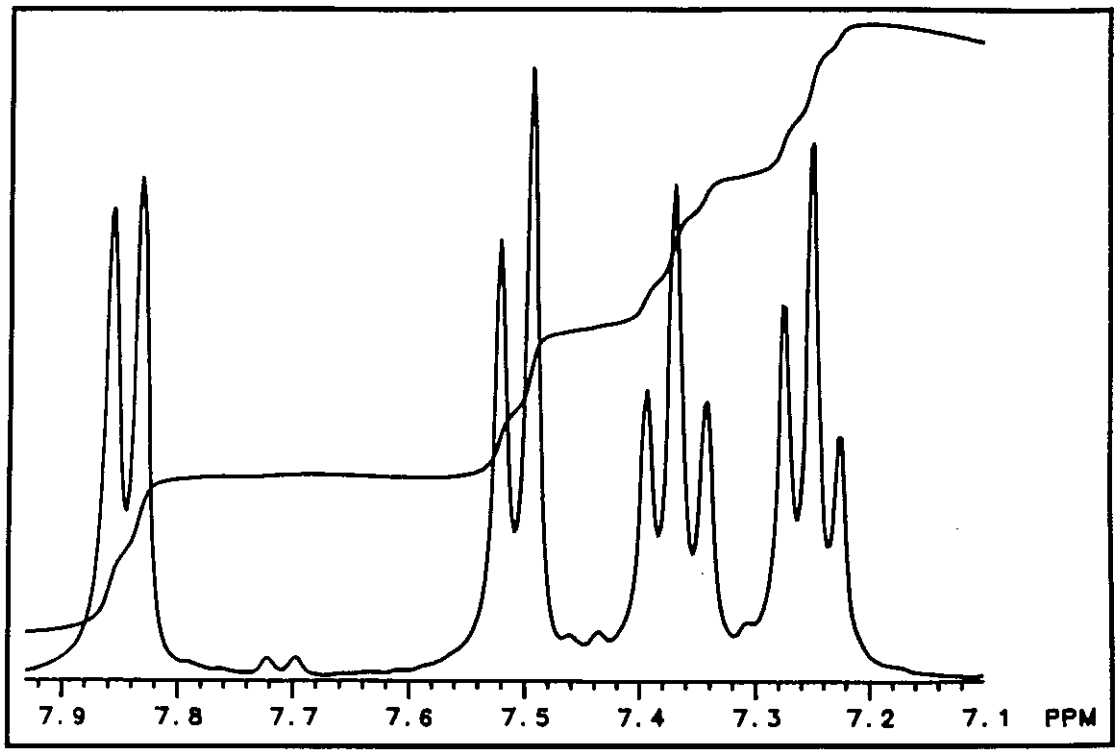

140
120
100
80
60
40
20
PPM

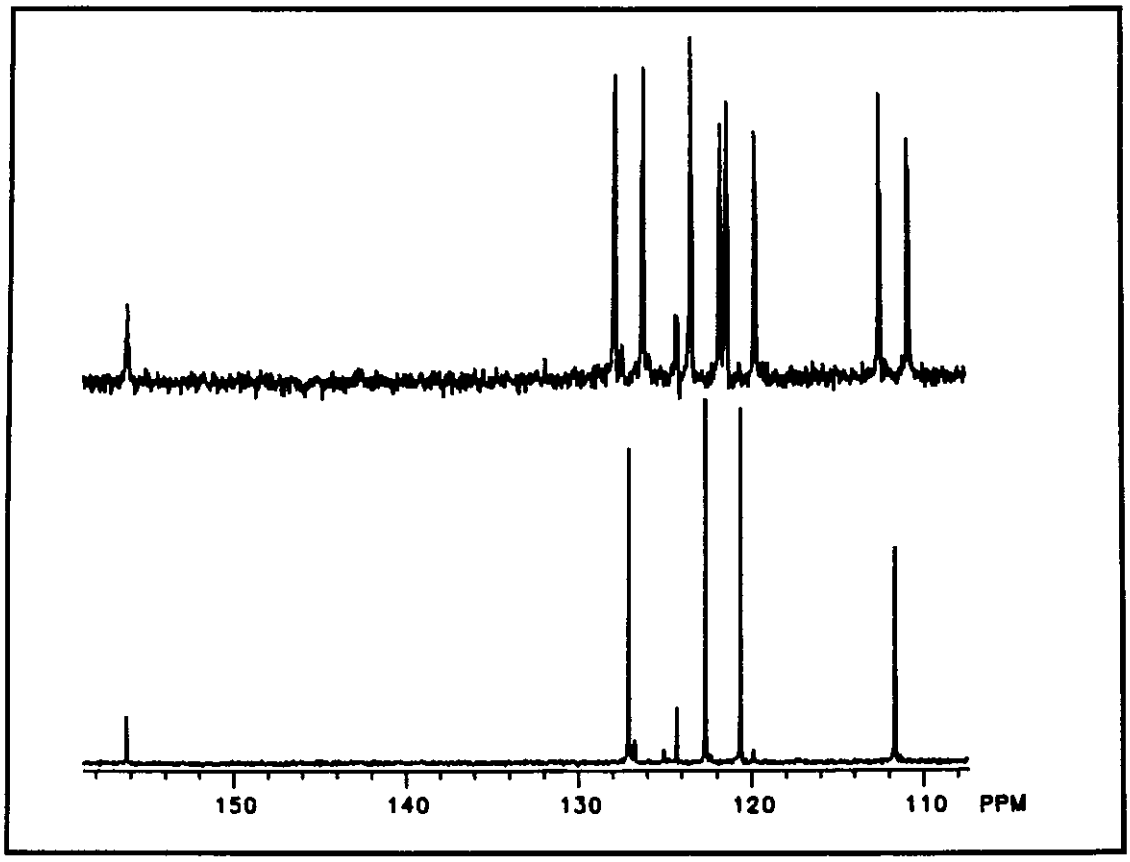
Problem 100

Exact Mass: na
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 86.7% C; 4.8% H



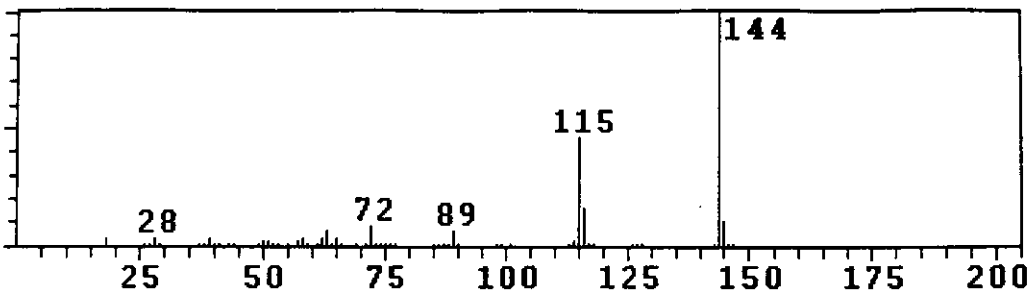


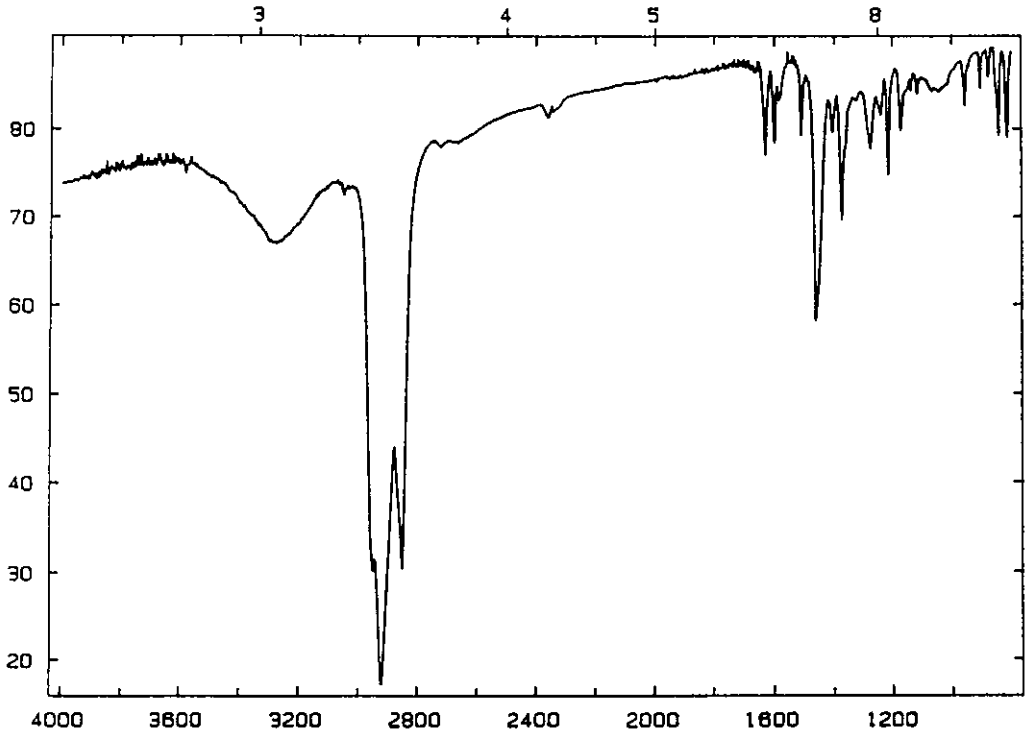

7.9
7.8
7.7
7.6
7.5
7.4
7.3
7.2
7.1
PPM

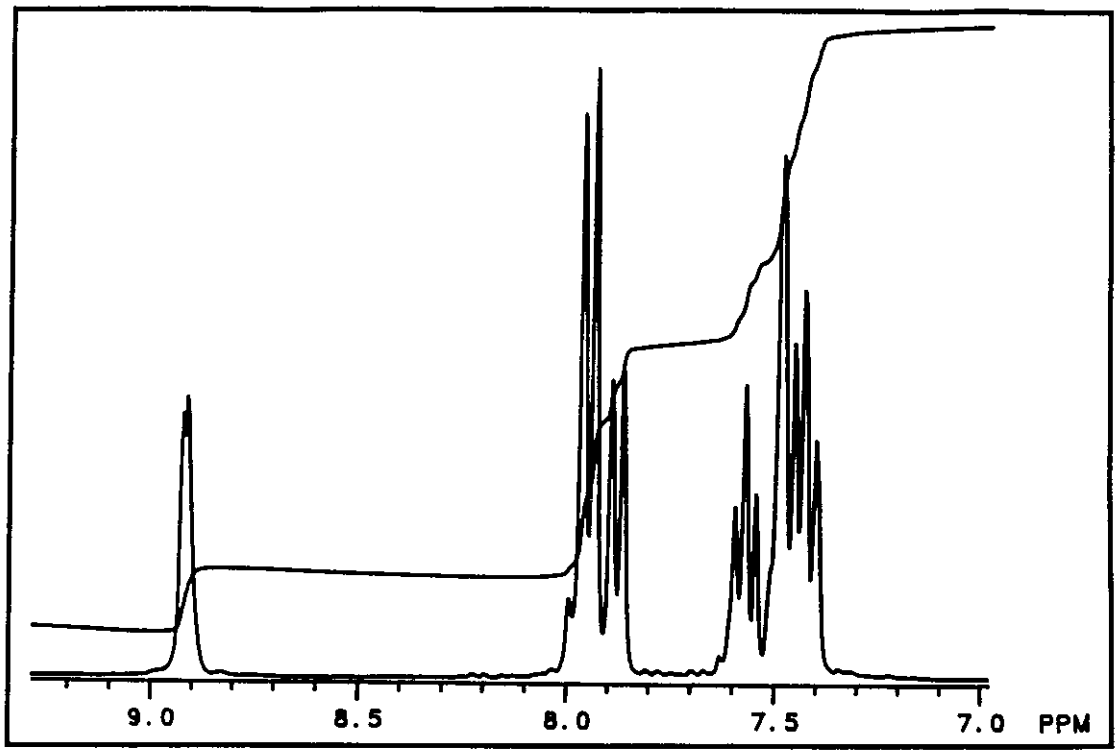

150
140
130
120
110
PPM

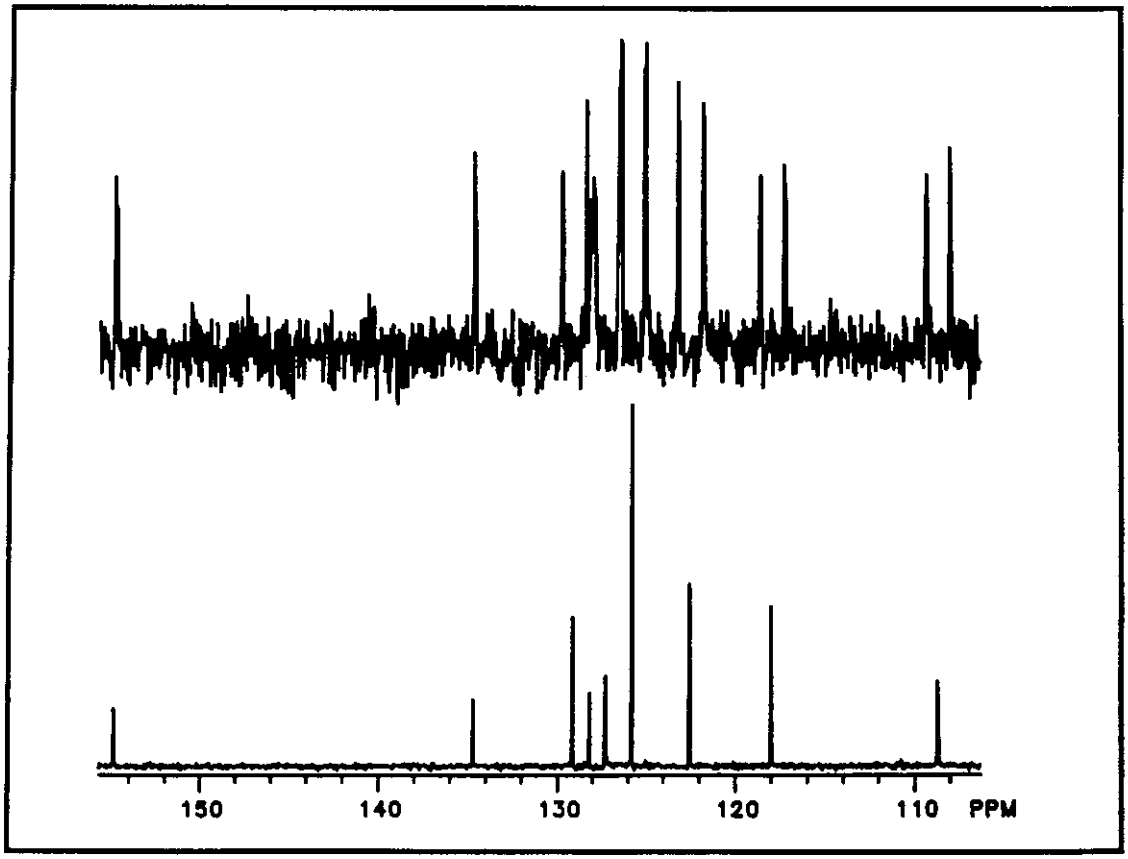
Problem 101

Exact Mass: na
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 83.3% C; 5.6% H



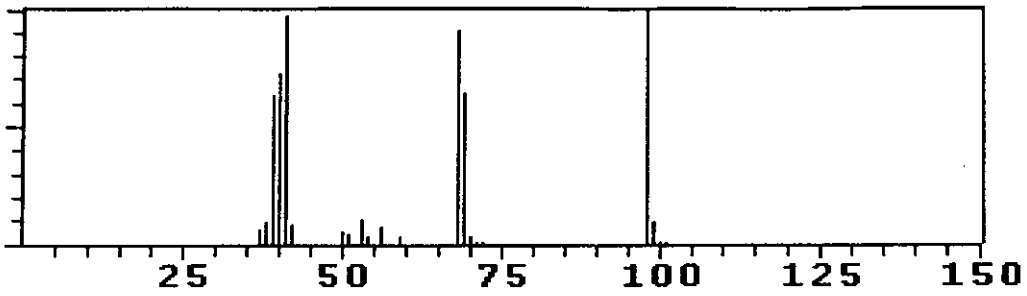


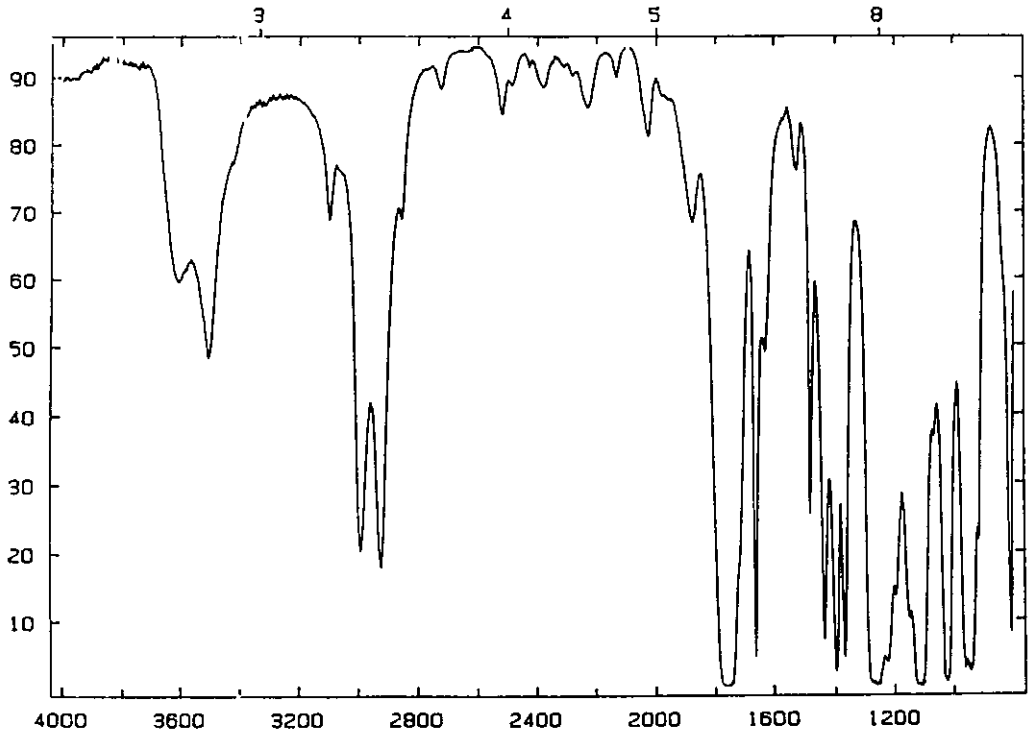

9.0
8.5
8.0
7.5
7.0
PPM

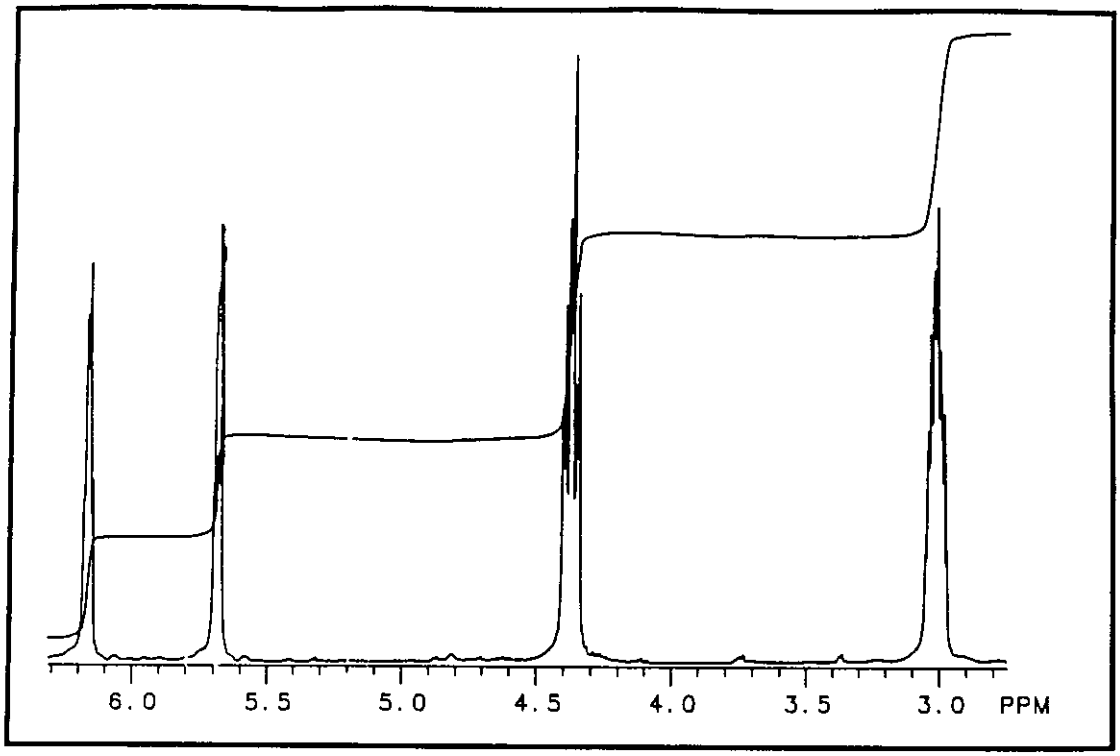

150
140
130
120
110
PPM

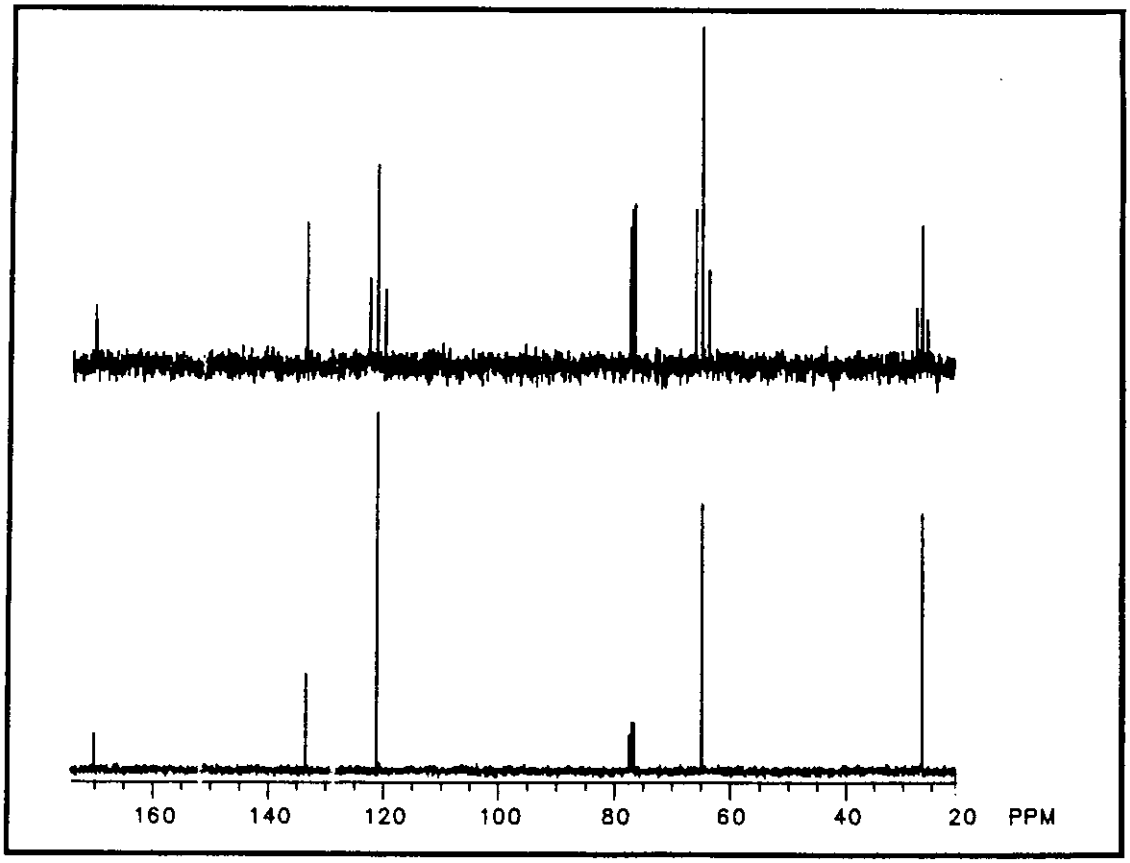
Problem 102

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 61.2% C; 6.2% H






6.0
5.5
5.0
4.5
4.0
3.5
3.0
PPM

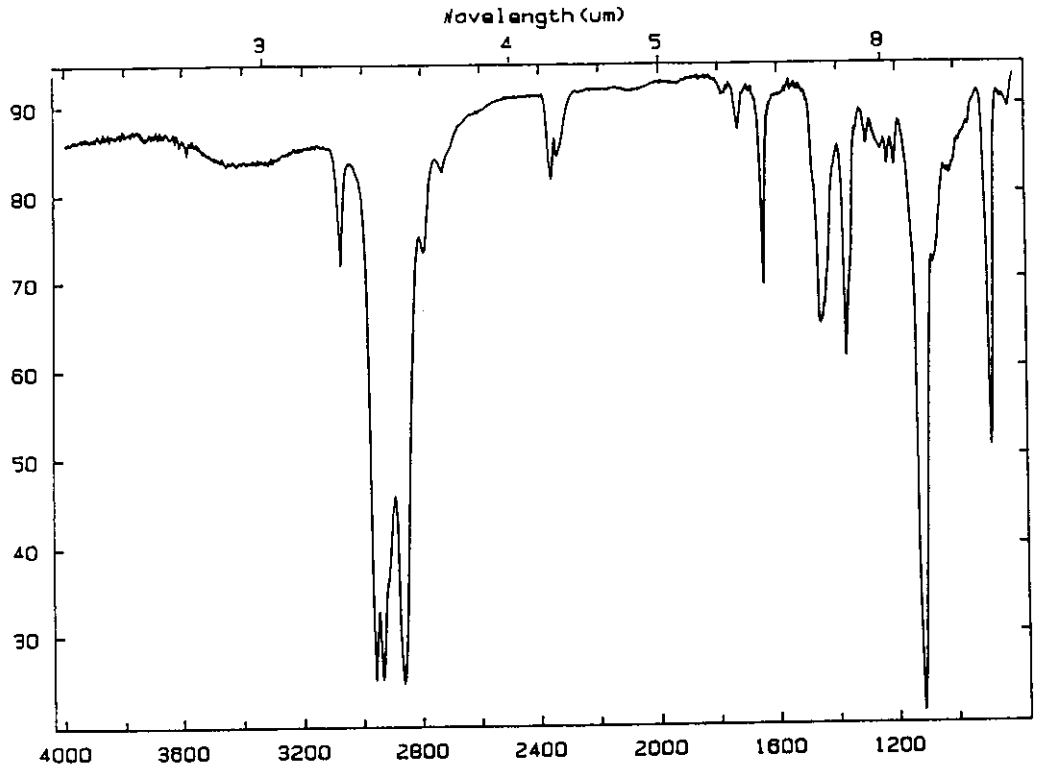

160
140
120
100
80
60
40
20
PPM

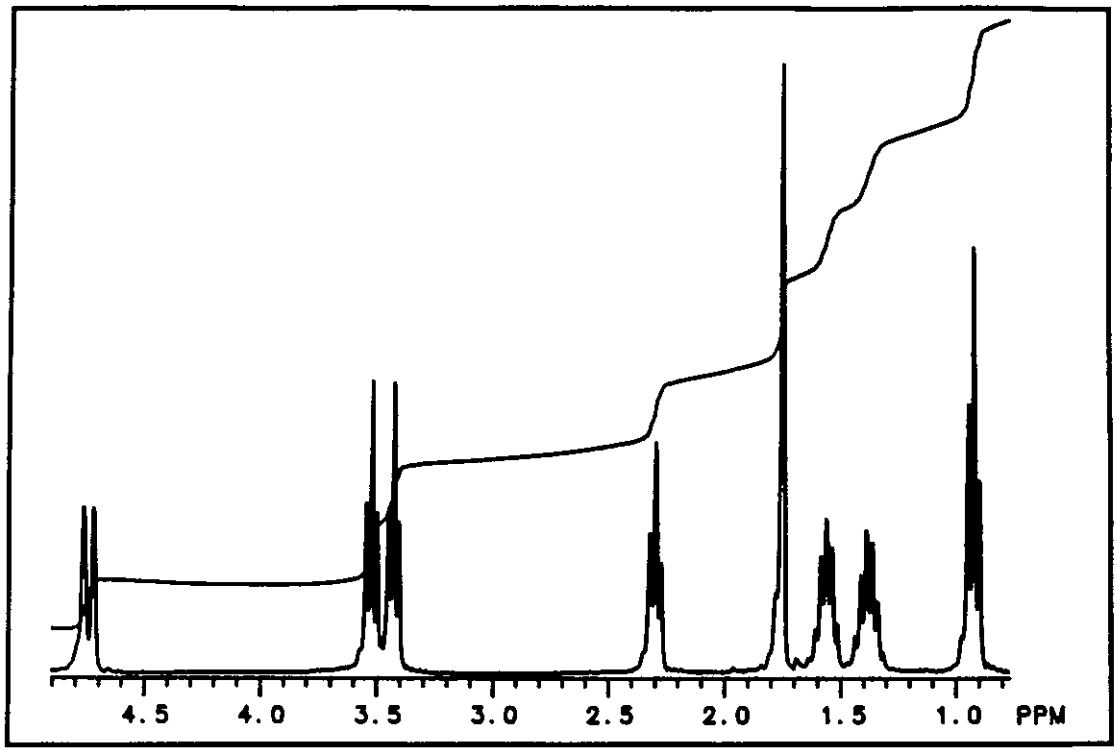
Problem 103

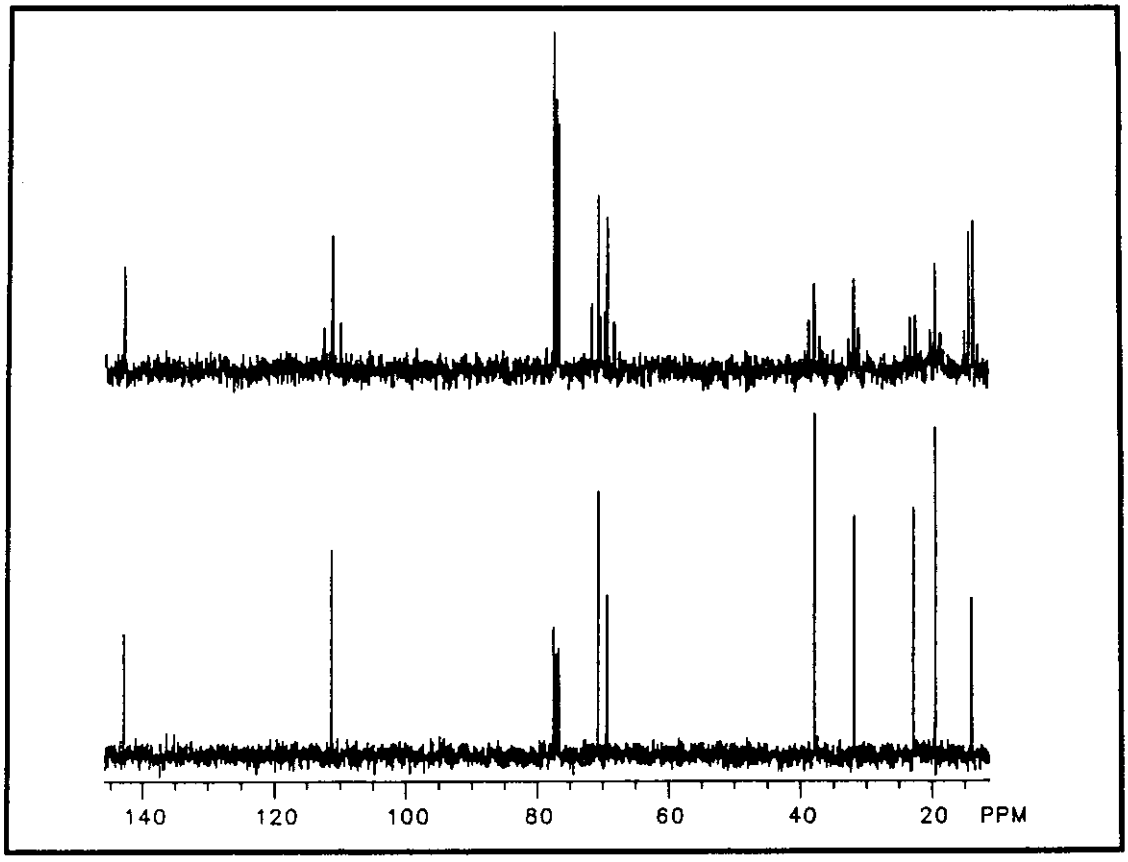
Exact Mass: 142.136
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 76.0% C; 12.8% H

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
30	2.62	45	15.51	58	4.44	71	13.44	86	25.13	105	0.20
31	49.18	46	0.37	59	1.36	72	0.76	87	1.68	106	0.33
32	0.89	47	0.17	60	2.00	73	0.30	88	0.13	107	2.03
33	0.30	48	0.23	61	0.79	75	0.12	89	0.15	108	0.43
36	0.45	49	2.04	62	0.93	77	0.29	90	1.42	109	1.93
37	5.72	50	10.42	63	1.09	78	0.10	91	0.73	110	0.17
38	11.93	51	11.05	64	0.24	79	0.95	92	0.36	119	0.12
39	79.01	52	3.93	65	2.21	80	0.40	93	1.12	136	3.70
40	23.80	53	30.53	66	1.89	81	1.10	94	0.13	137	0.27
41	100.00	54	4.85	67	44.49	82	0.63	95	1.02	138	3.60
42	10.79	55	31.29	68	57.40	83	0.68	98	0.10	139	0.17
43	23.16	56	84.31	69	6.15	84	0.56	99	0.09	142	0.11
44	6.79	57	30.70	70	1.16	85	0.89	100	0.17		




4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
PPM

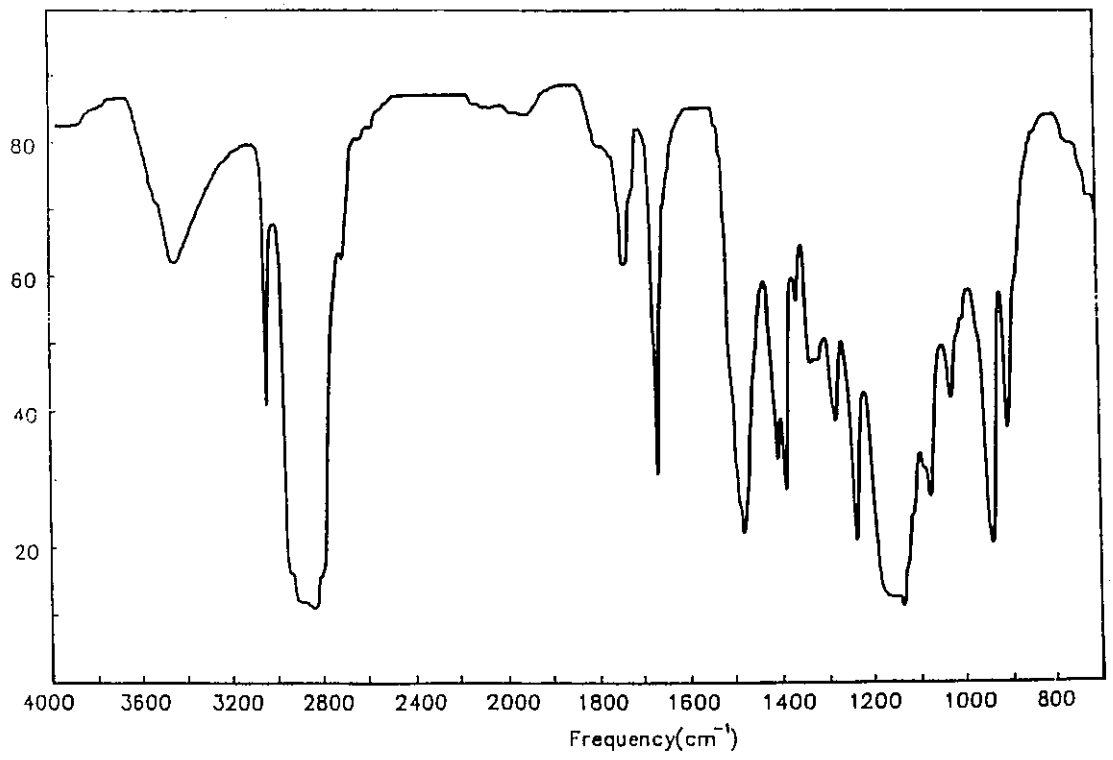

140
120
100
80
60
40
20
PPM

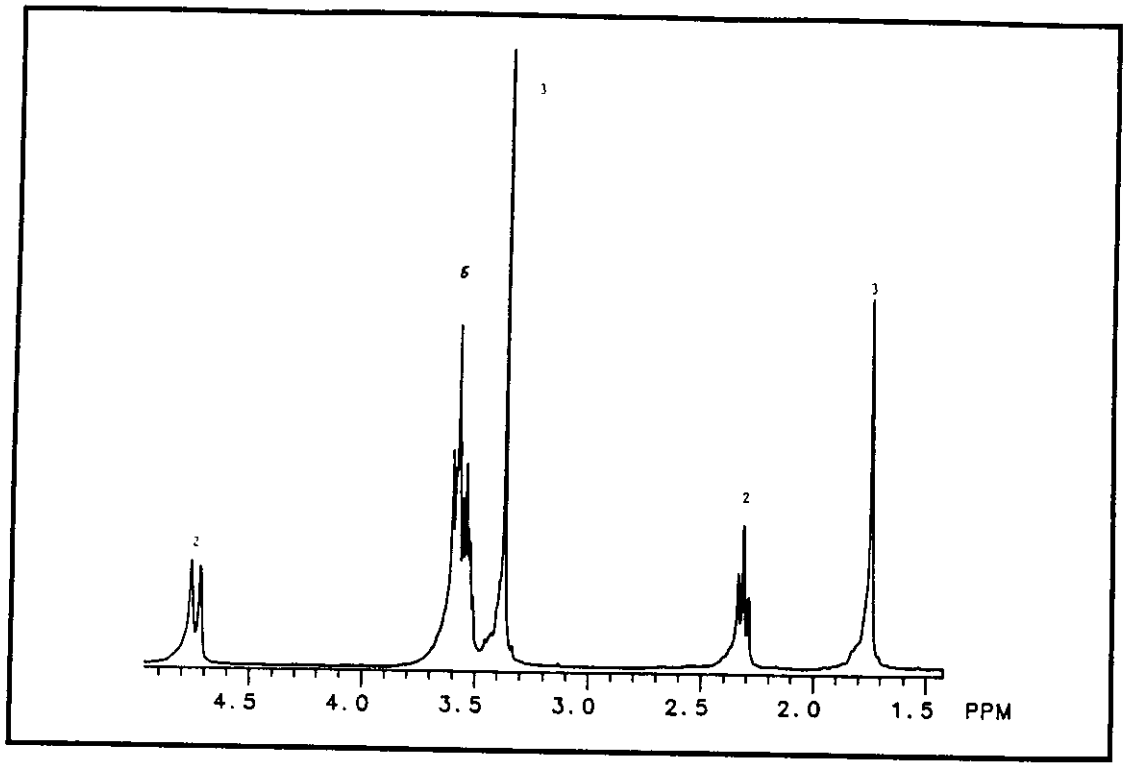
Problem 104

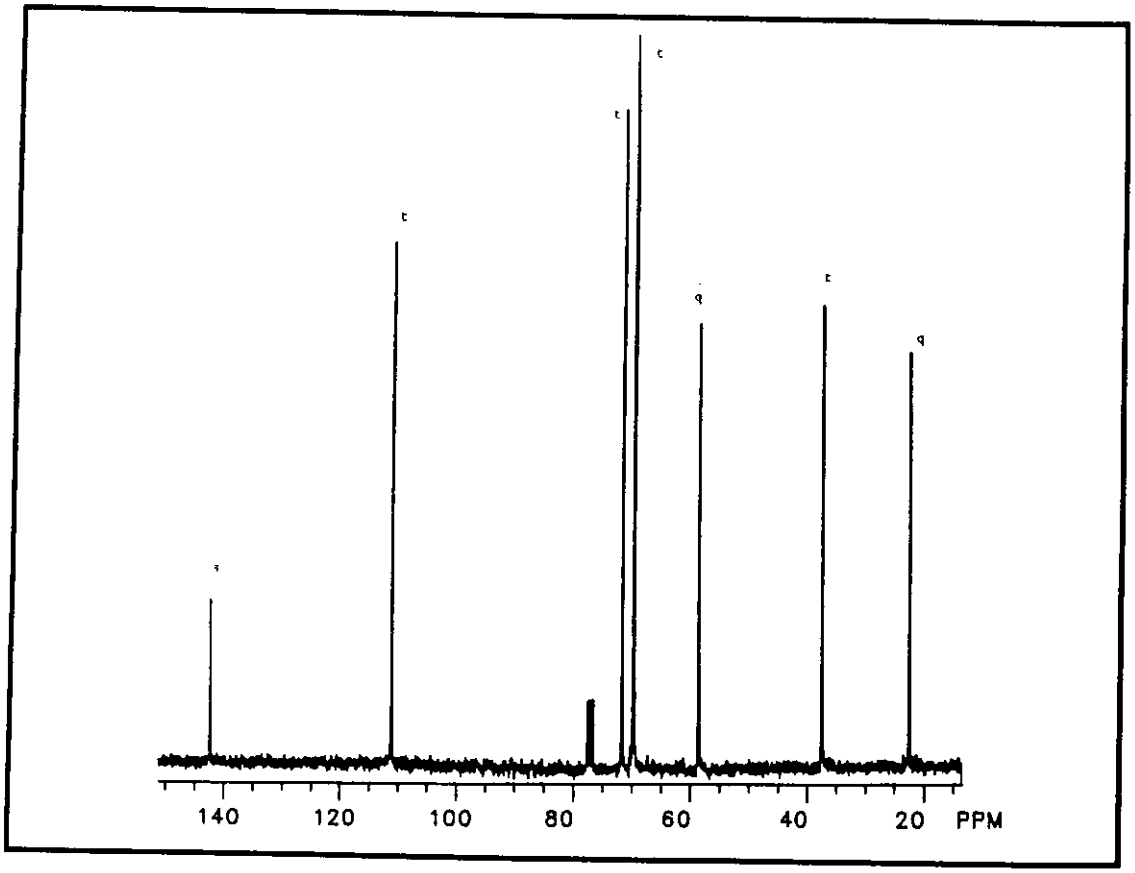
Exact Mass: 194.115
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 66.6% C; 11.2% H

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
30	1.71	43	12.93	56	0.97	69	18.11	84	0.38	126	0.23
31	23.79	44	3.94	57	1.26	70	8.67	85	0.90	127	0.02
32	0.43	45	23.56	58	4.35	71	1.14	89	26.29	129	0.77
33	0.85	46	0.57	59	100.00	74	3.23	90	1.17	144	0.37
37	0.38	50	0.86	60	3.82	75	5.60	94	1.01	145	0.03
38	1.35	51	1.61	61	0.34	76	0.25	99	6.19		
39	18.86	52	0.79	65	0.72	77	1.02	100	0.43		
40	4.66	53	6.11	66	0.45	81	1.56	111	0.25		
41	40.09	54	2.15	67	8.58	82	0.97	112	0.33		
42	3.86	55	4.28	68	23.78	83	1.07	113	0.84		




3
6
3
2
2
4.5
4.0
3.5
3.0
2.5
2.0
1.5
PPM

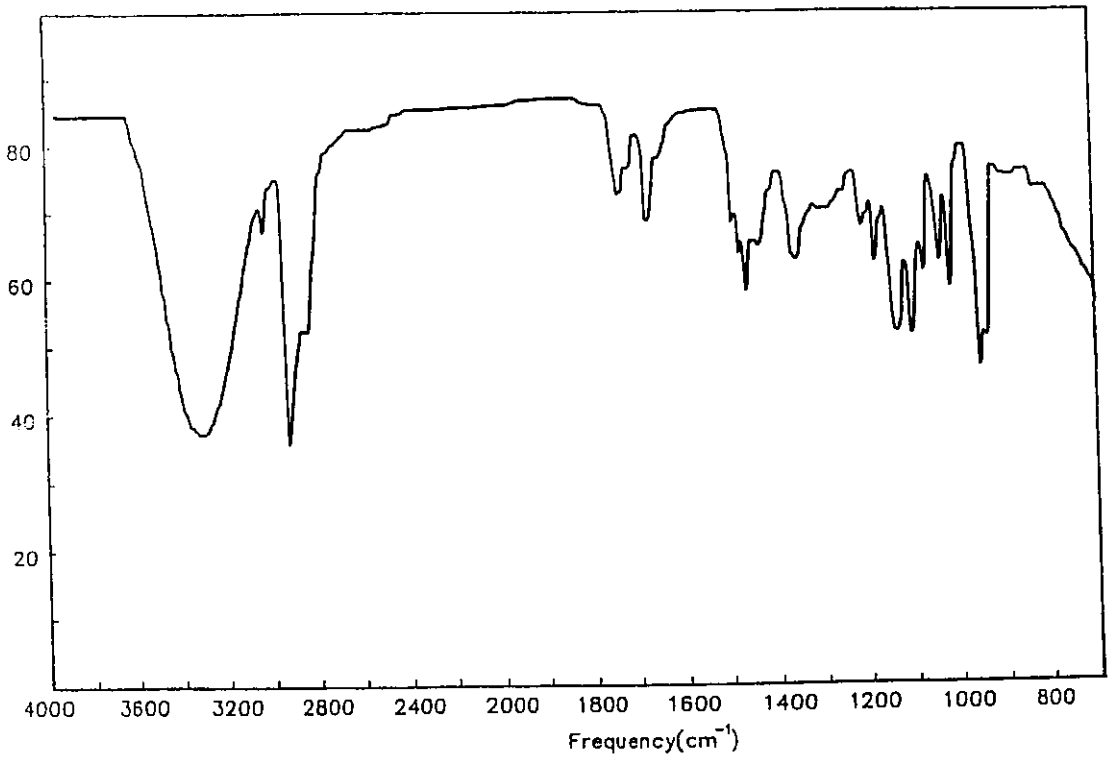

c
t
t
q
t
q
140
120
100
80
60
40
20
PPM

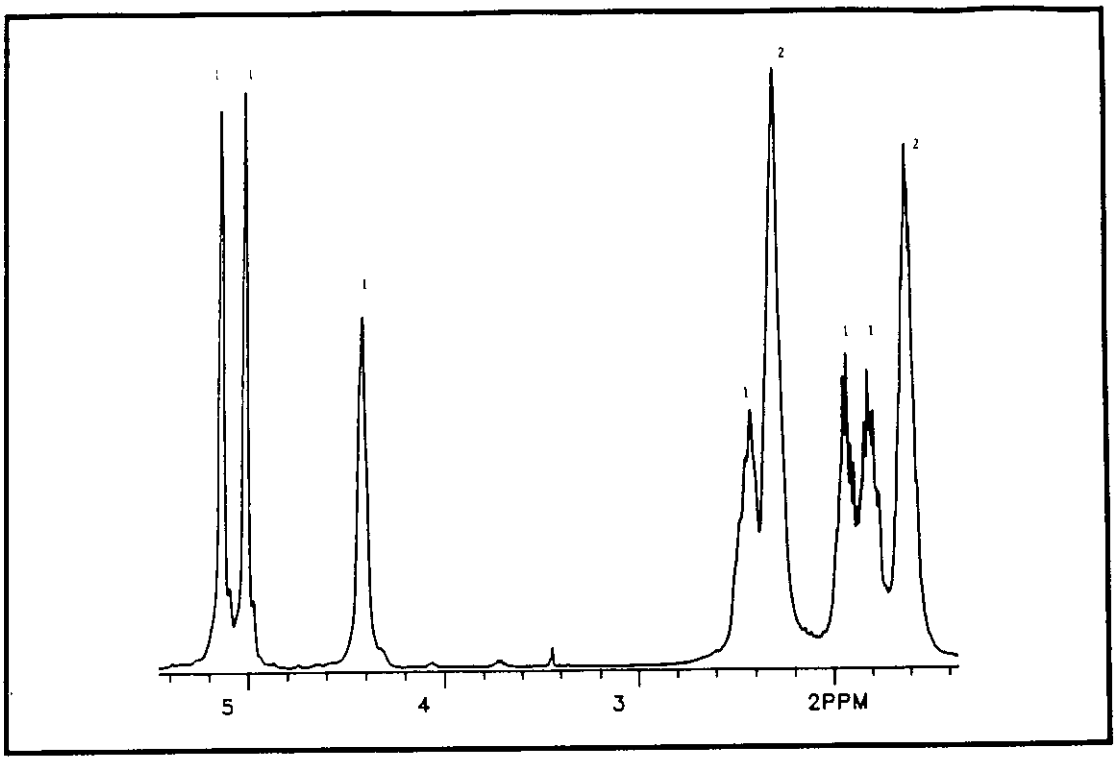
Problem 105

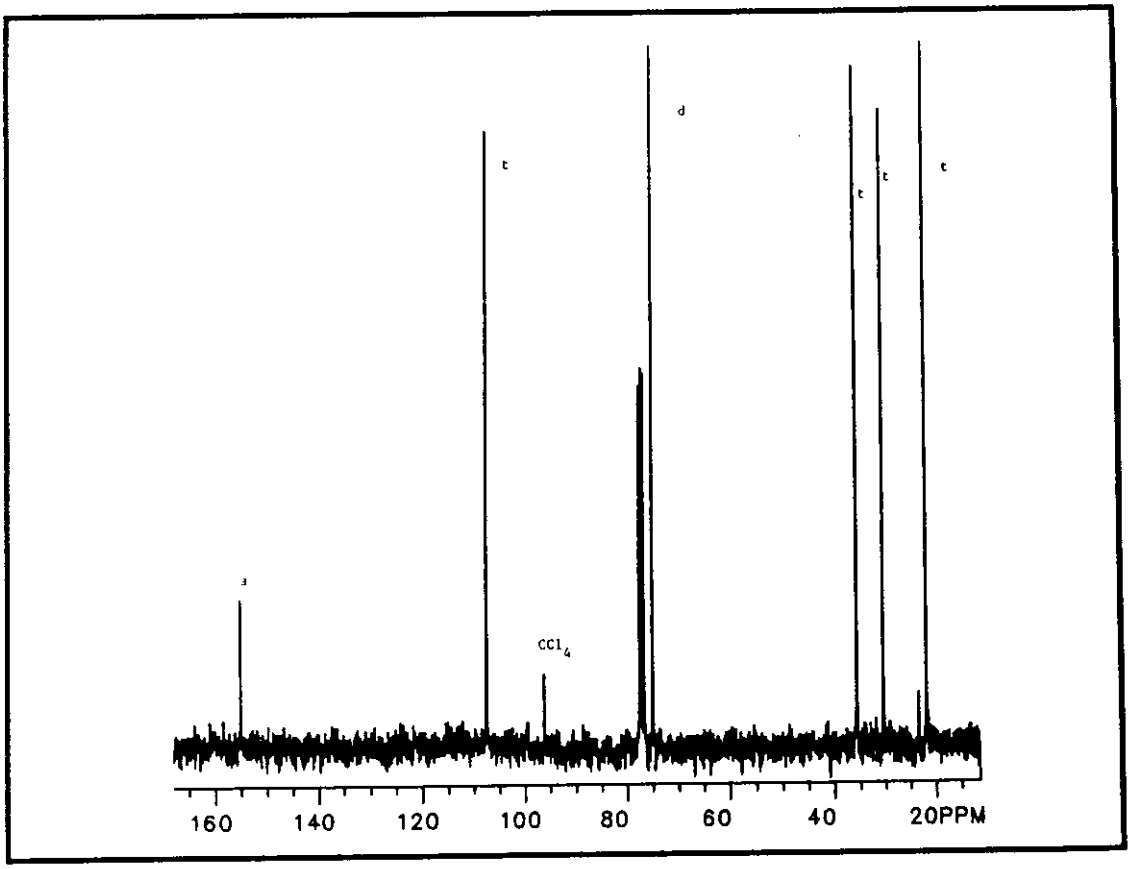
Exact Mass: 98.070
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 73.4% C; 10.3% H

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
30	1.83	43	29.45	54	7.36	63	2.33	72	0.55	83	65.76
31	9.75	44	5.60	55	51.03	64	0.42	73	0.29	84	3.69
32	0.67	45	1.23	56	9.92	65	4.12	74	0.69	85	0.26
37	3.50	47	0.79	57	21.25	66	2.46	75	0.26	95	1.14
38	8.21	49	1.14	58	2.09	67	13.28	77	8.43	97	49.39
39	54.88	50	7.86	59	0.20	68	2.62	78	1.71	98	25.61
40	12.60	51	10.86	60	0.16	69	26.25	79	18.12	99	1.76
41	49.51	52	5.78	61	0.84	70	100.00	80	5.28	100	0.19
42	28.38	53	14.17	62	1.44	71	5.71	81	3.71		



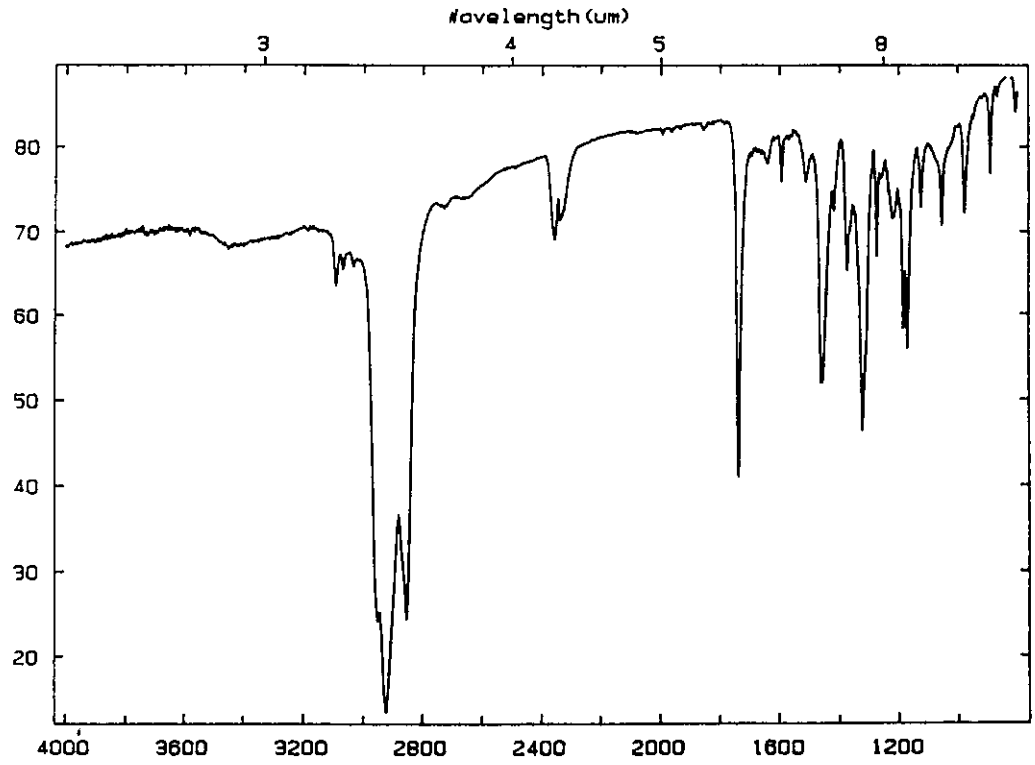

1
1
1
2
1
1
1
2
5
4
3
2PPM

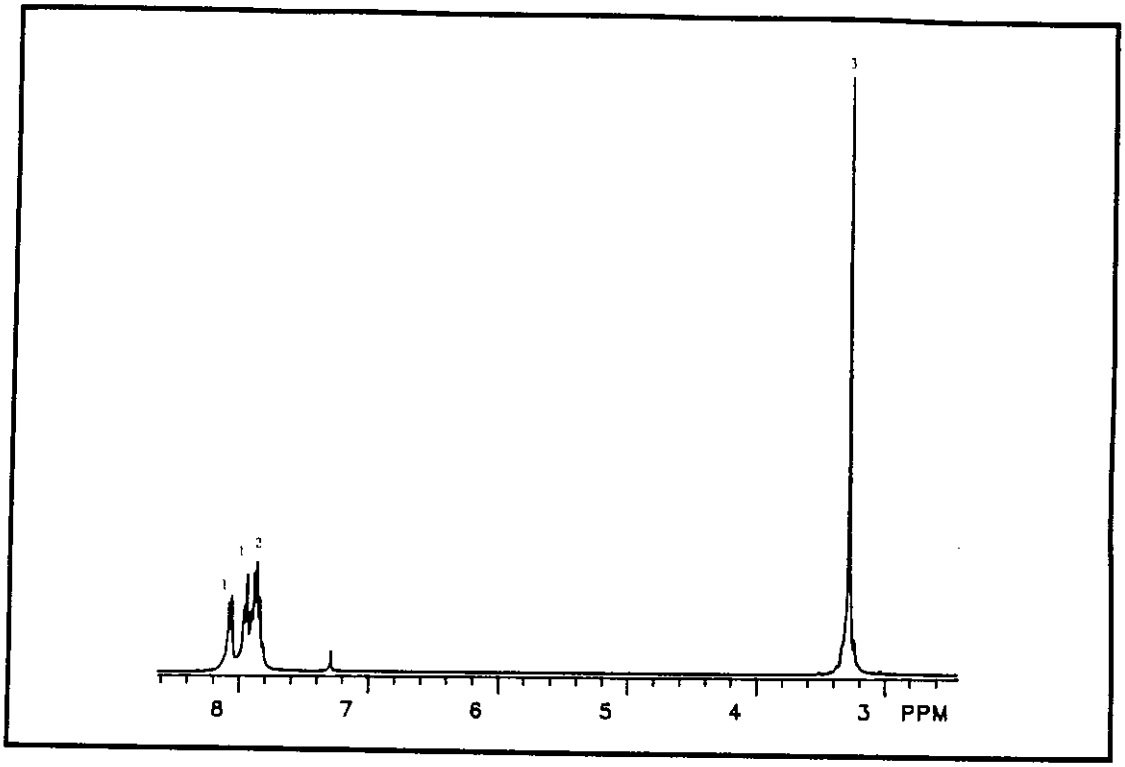

t
d
t
t
t
t
CCl_4
160
140
120
100
80
60
40
20PPM

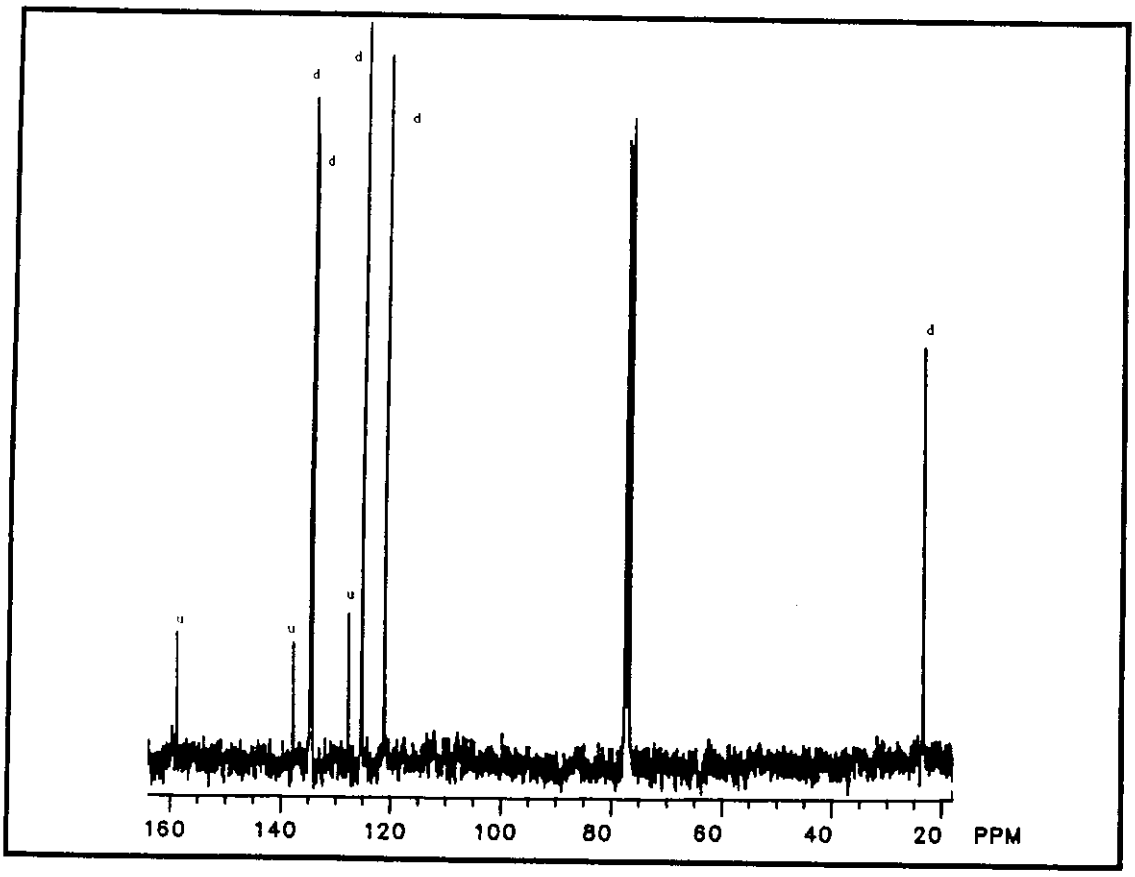
Problem 106

Exact Mass: na
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 48.7% C; 3.6% H; 7.1% N; 16.2% S

Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A
48, 1.00	64, 4.00	77,18.02	103, 2.00	131, 2.00	196,10.01
49, 1.00	69, 3.00	78, 8.01	104,65.08	132,42.04	197,100.0
50,43.04	70, 2.00	84, 5.00	105,45.04	133,53.07	198,12.01
51, 7.01	73, 2.00	90, 3.00	106,10.01	134, 5.00	199, 6.01
52, 1.00	74,20.02	91,11.01	117,10.01	140, 2.00	
62, 1.00	75,20.02	95, 2.00	120, 6.01	152, 2.00	
63, 5.00	76,42.04	96, 3.00	121, 4.00	169,11.01	




3
1
1
2
8
7
6
5
4
3
PPM

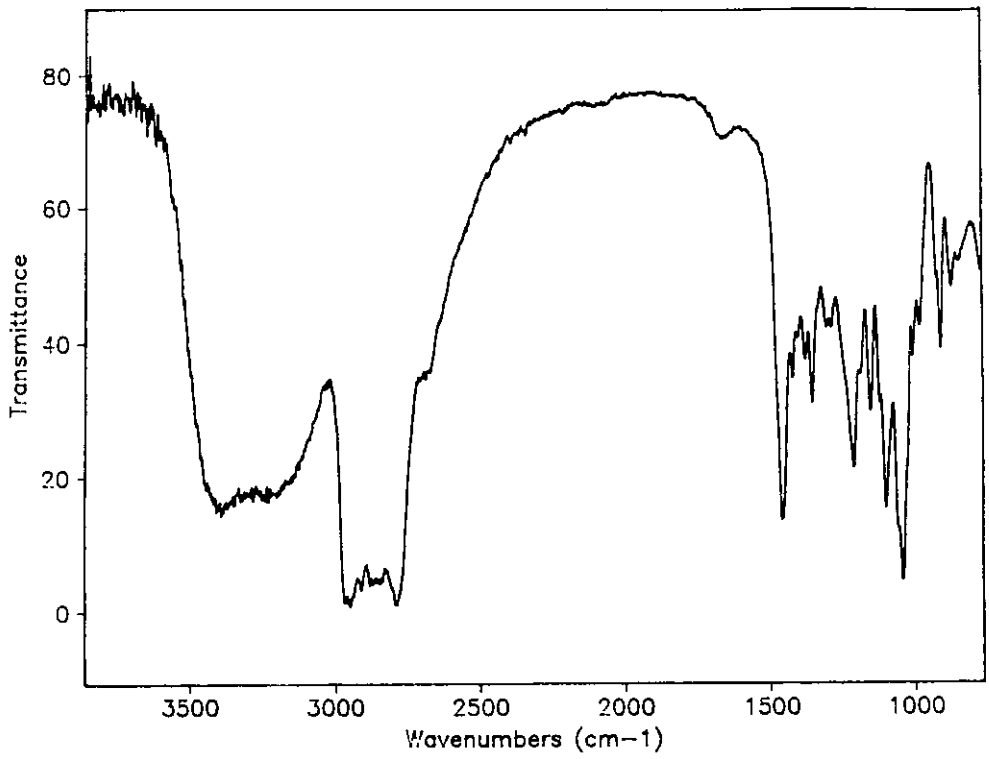

d
d
d
d
d
d
u
u
u
160
140
120
100
80
60
40
20
PPM

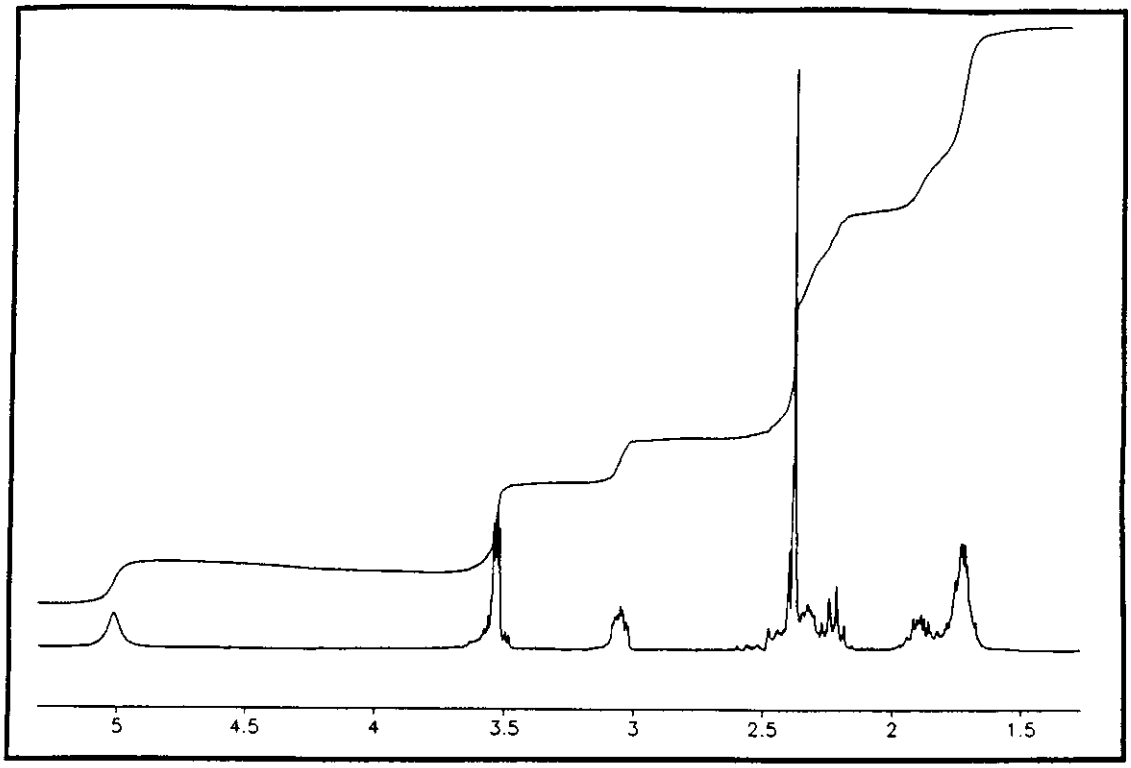
Problem 107

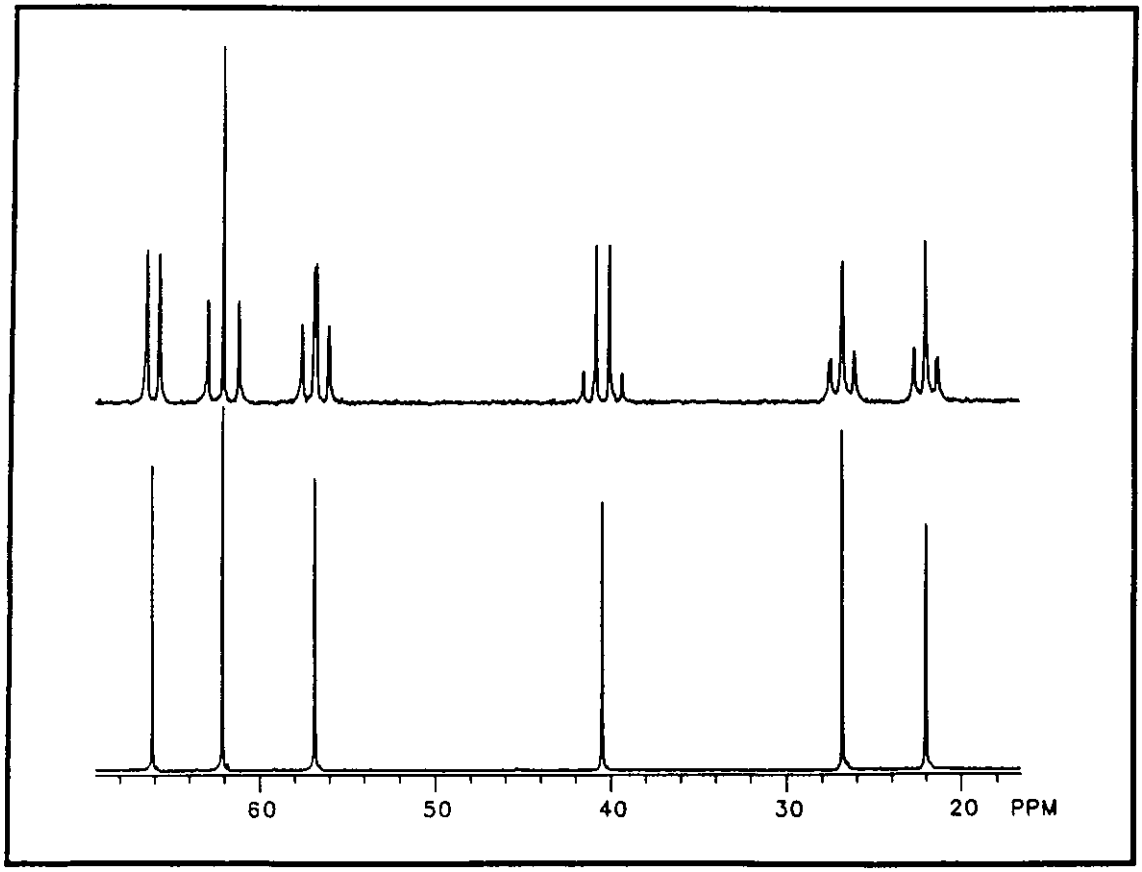
Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na

Mass Spectral data

m/z		m/z		m/z		m/z		m/z		m/z	
30.0	2.84	45.0	0.34	59.0	0.11	73.0	0.12	87.0	0.43	116.1	0.59
31.0	6.20	46.3	0.02	60.0	0.03	74.0	0.30	88.0	0.02	117.0	0.04
32.0	0.25	46.9	0.02	61.0	0.03	75.0	0.03	92.0	0.02		
33.0	0.02	47.8	0.01	62.0	0.05	76.0	0.02	93.1	0.05		
36.0	0.01	49.0	0.10	63.0	0.09	77.0	0.04	94.0	0.44		
37.0	0.24	50.0	0.58	64.0	0.10	78.0	0.12	95.0	0.07		
38.1	0.64	51.0	0.85	65.0	0.52	79.1	0.06	96.0	0.72		
38.6	4.92	52.0	0.85	66.1	0.30	80.1	1.49	97.0	0.24		
39.0	4.39	53.1	1.78	67.1	3.26	81.1	0.12	98.0	0.30		
40.1	2.38	54.1	3.97	68.1	2.34	82.0	20.91	99.0	0.04		
41.1	12.61	55.1	6.78	69.0	2.15	83.1	0.33	100.0	0.02		
42.1	66.75	56.0	3.13	70.0	8.20	84.0	100.00	112.1	0.11		
43.0	5.45	57.0	7.86	71.0	0.56	85.0	9.18	114.1	1.41		
44.0	8.10	58.0	2.16	72.0	1.54	86.0	1.56	115.1	1.08		




5
4.5
4
3.5
3
2.5
2
1.5

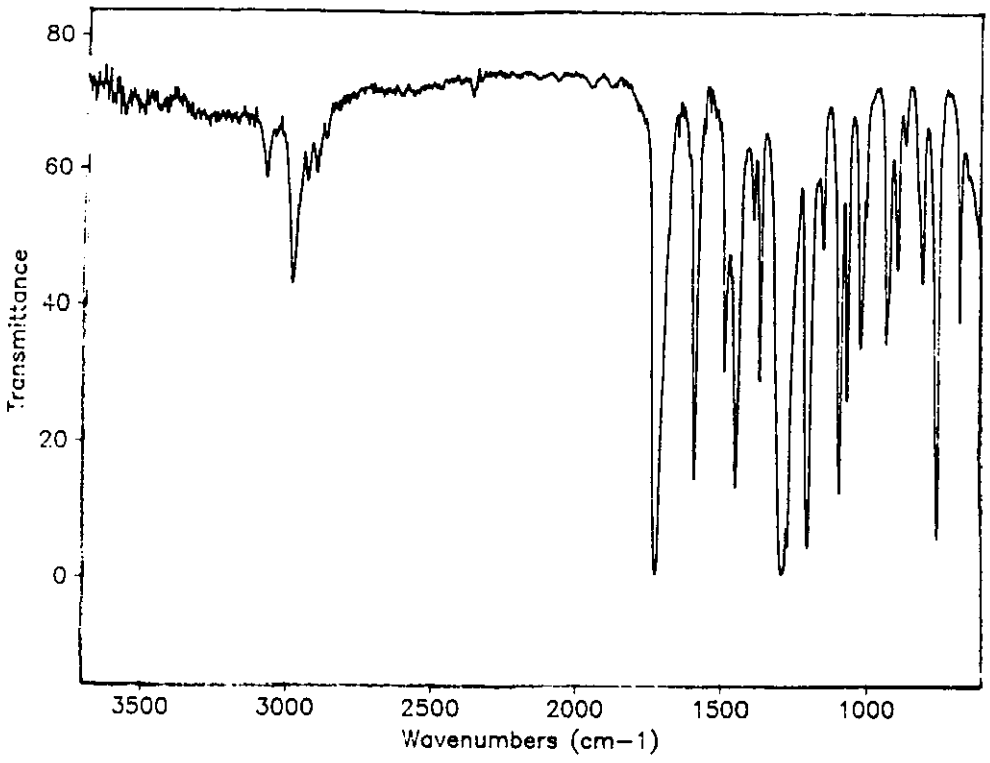

60
50
40
30
20
PPM

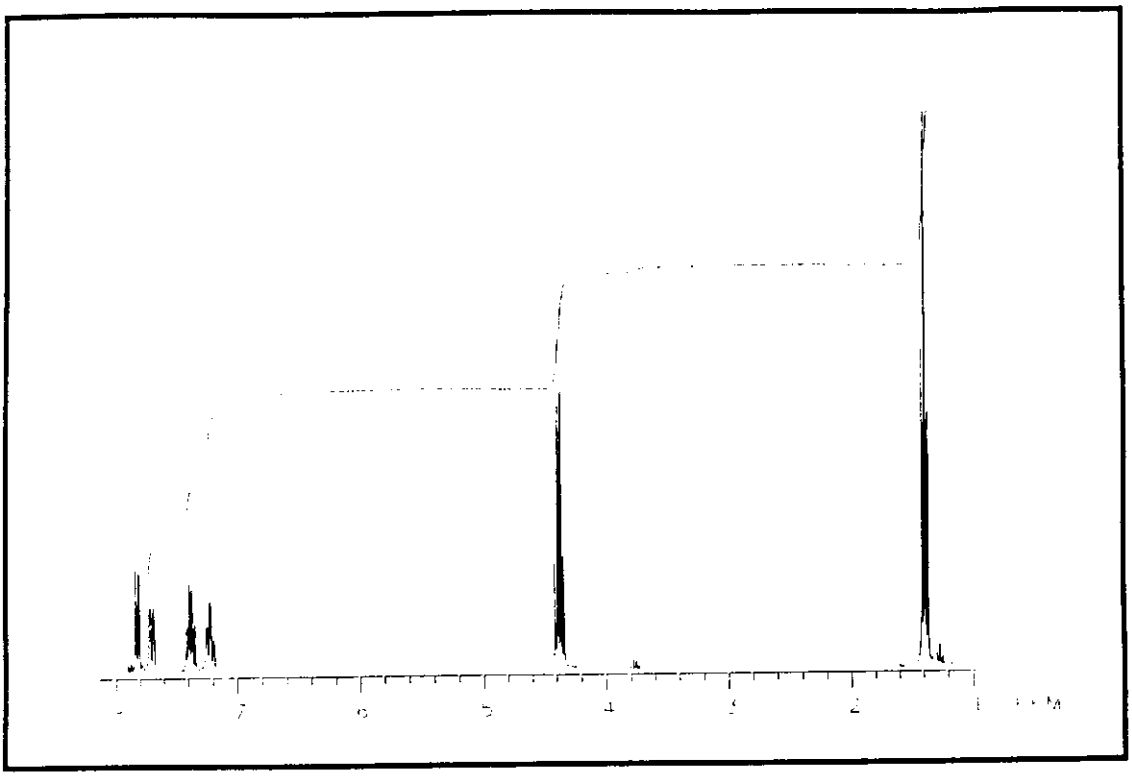
Problem 108

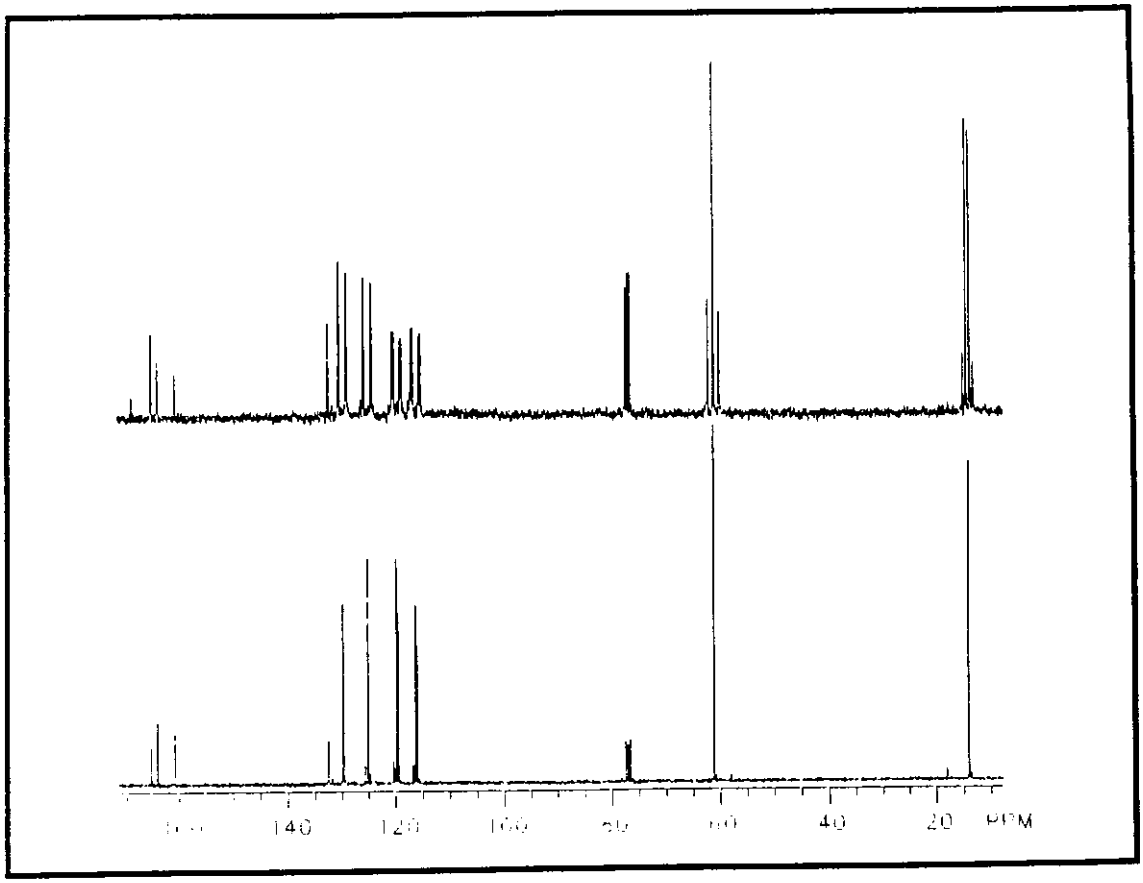
Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
30	1.01	46	0.19	62	0.88	78	0.04	105	0.12	149	0.30
31	0.80	48	0.20	63	1.12	80	0.06	107	0.05	150	2.63
32	0.12	49	0.60	64	0.17	81	0.22	109	0.66	151	0.56
33	0.07	50	5.74	65	0.17	82	0.12	110	0.11	153	2.63
36	0.04	51	3.15	66	0.04	83	0.87	111	0.16	154	0.23
37	0.59	52	0.17	68	2.98	84	0.19	112	0.28	168	14.70
38	0.83	53	0.32	69	4.96	92	0.54	113	0.02	169	1.53
39	1.07	55	0.06	70	0.97	93	1.05	119	0.05	170	0.15
40	0.06	56	0.32	71	0.08	94	4.29	123	100.00		
41	0.10	57	1.44	73	0.61	95	49.99	124	11.46		
42	0.34	58	0.08	74	4.22	96	5.81	125	0.92		
43	1.15	59	0.03	75	21.65	97	0.66	140	41.36		
44	0.32	60	0.05	76	2.21	103	0.18	141	3.48		
45	6.42	61	0.58	77	0.44	104	0.11	142	0.30		

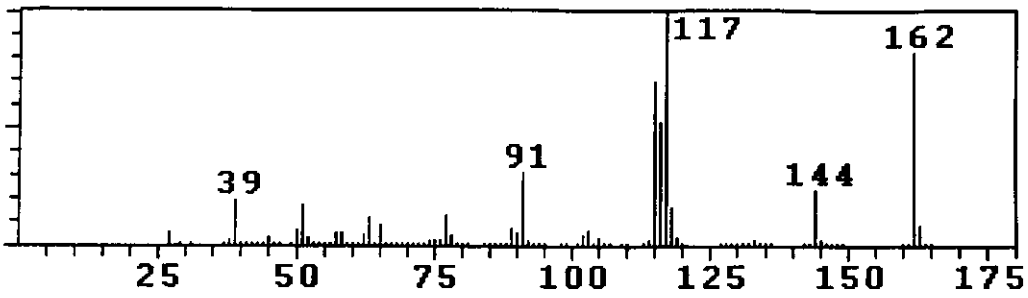


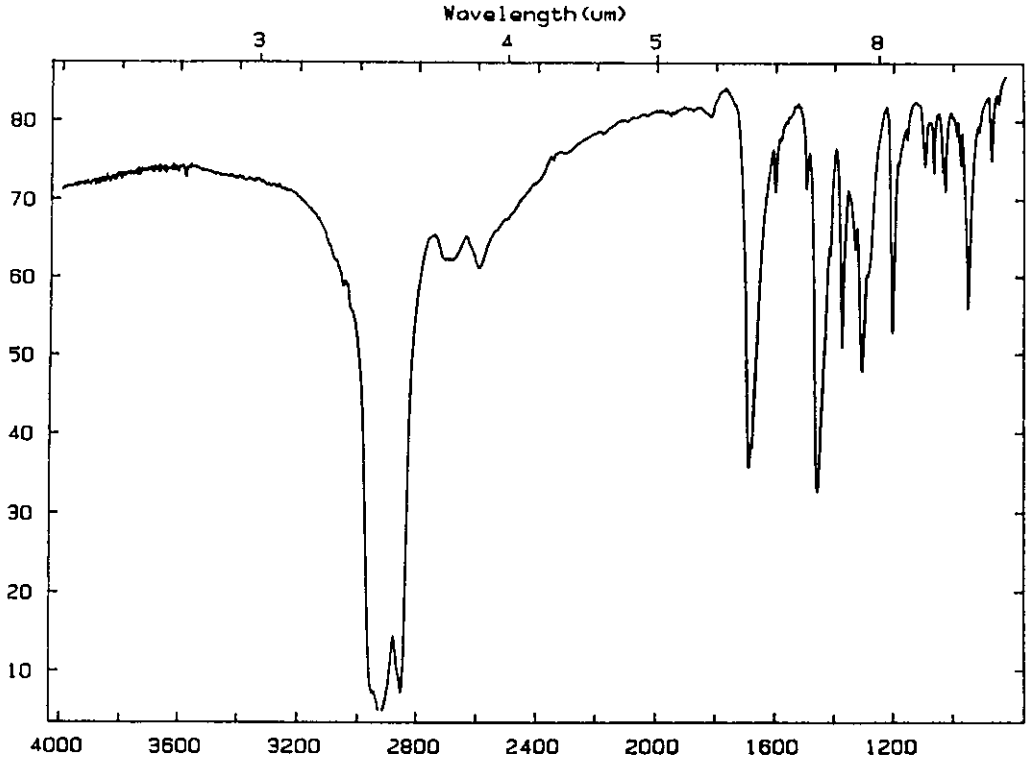


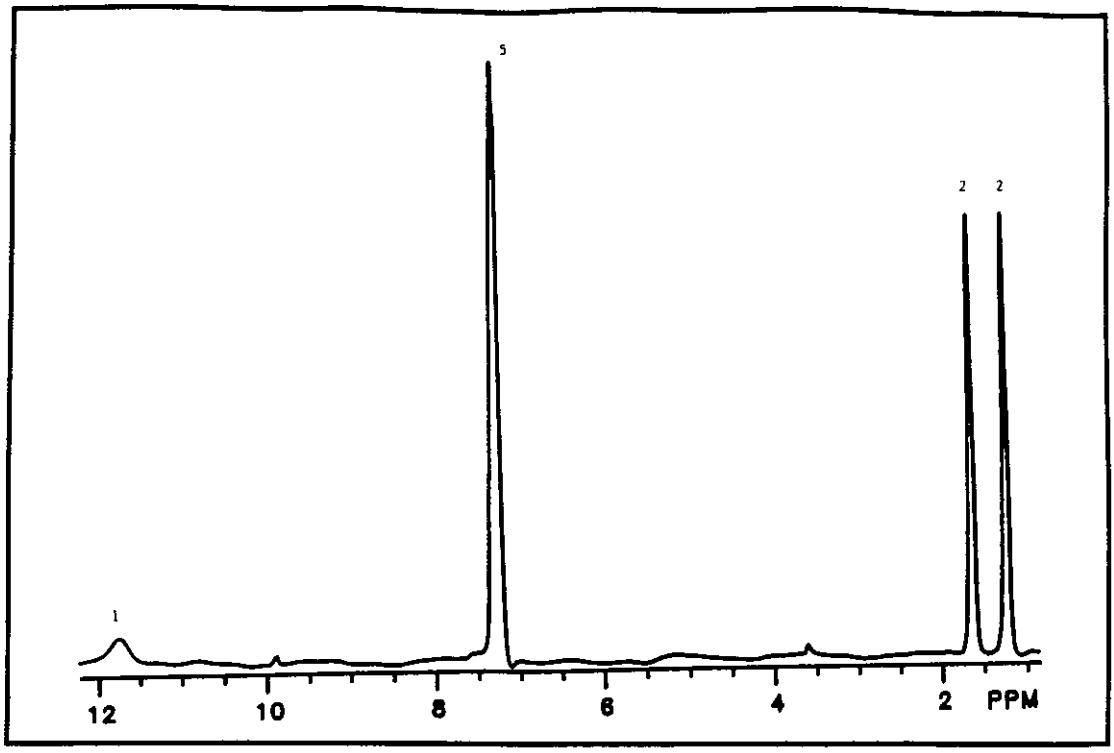

140
120
100
80
60
40
20
PPM

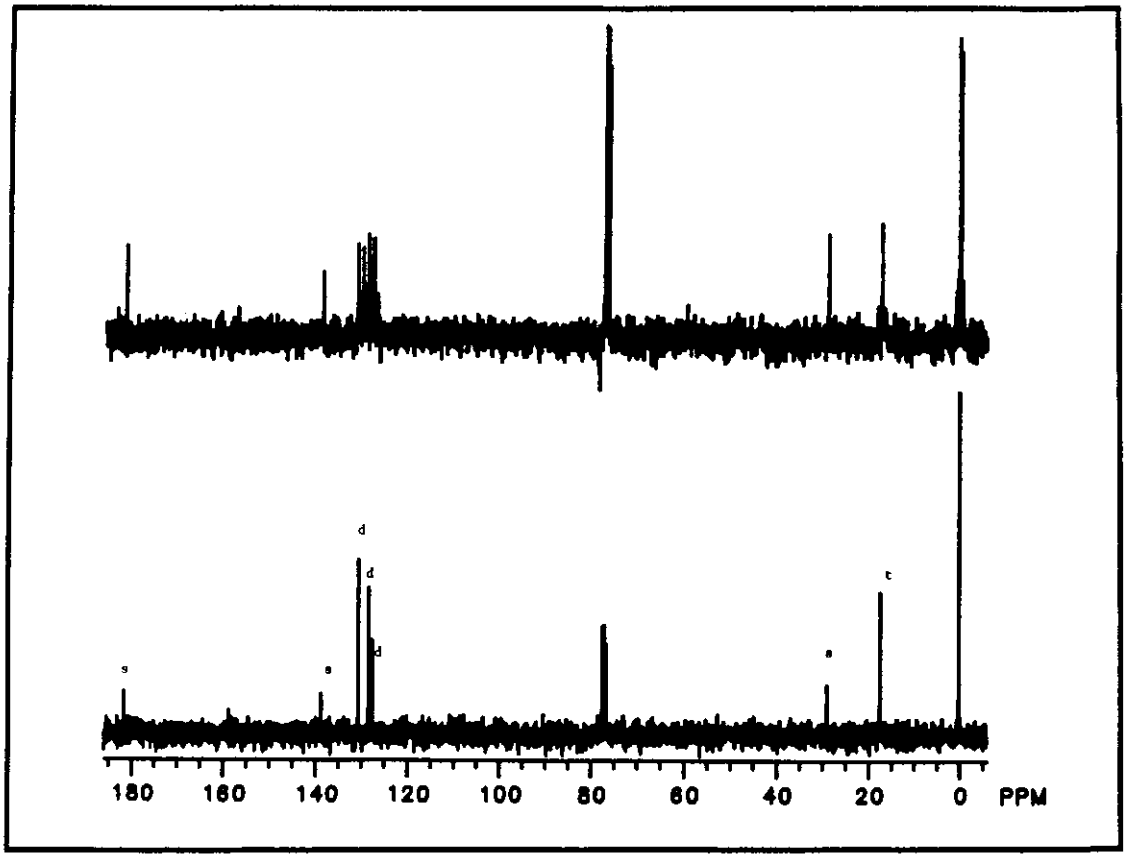
Problem 109

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 74.1% C; 6.21% H



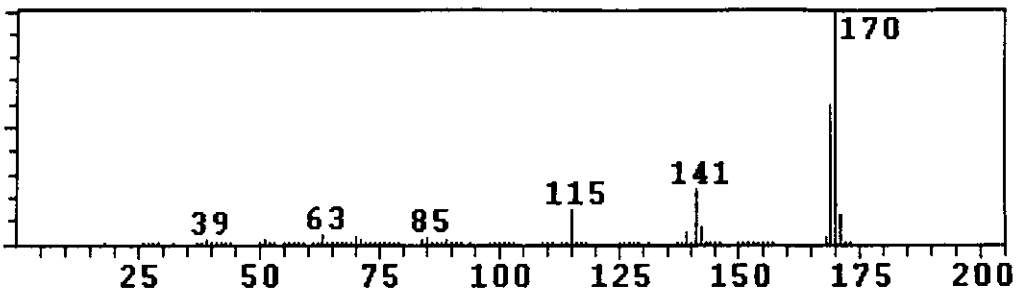


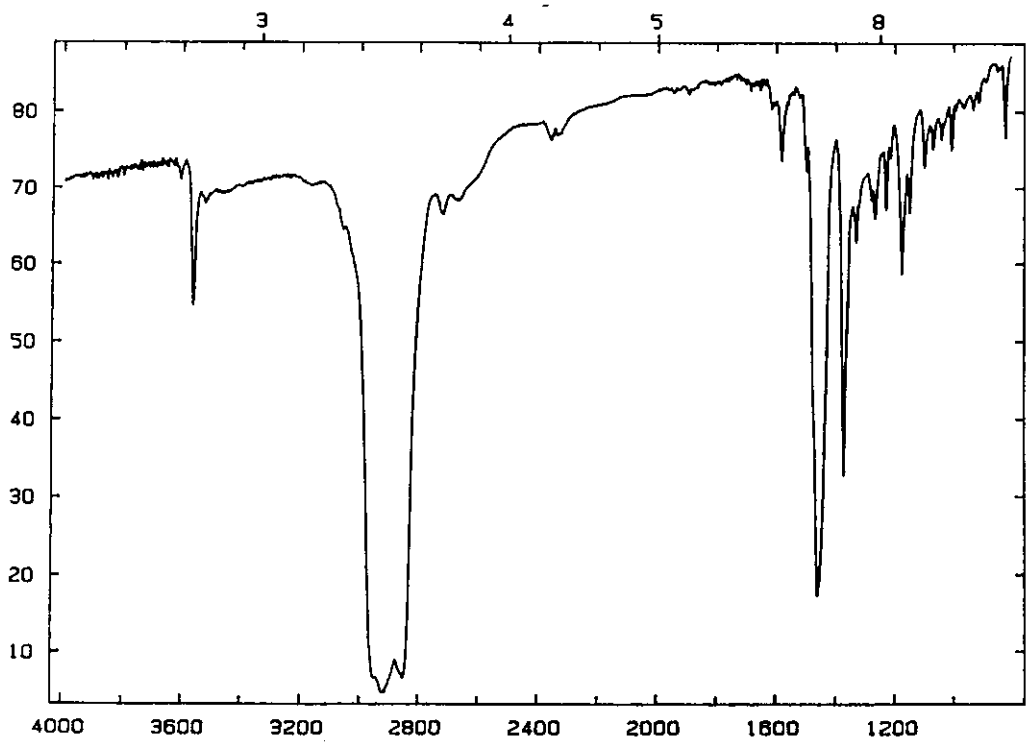

5
2
2
1
12
10
8
6
4
2
PPM

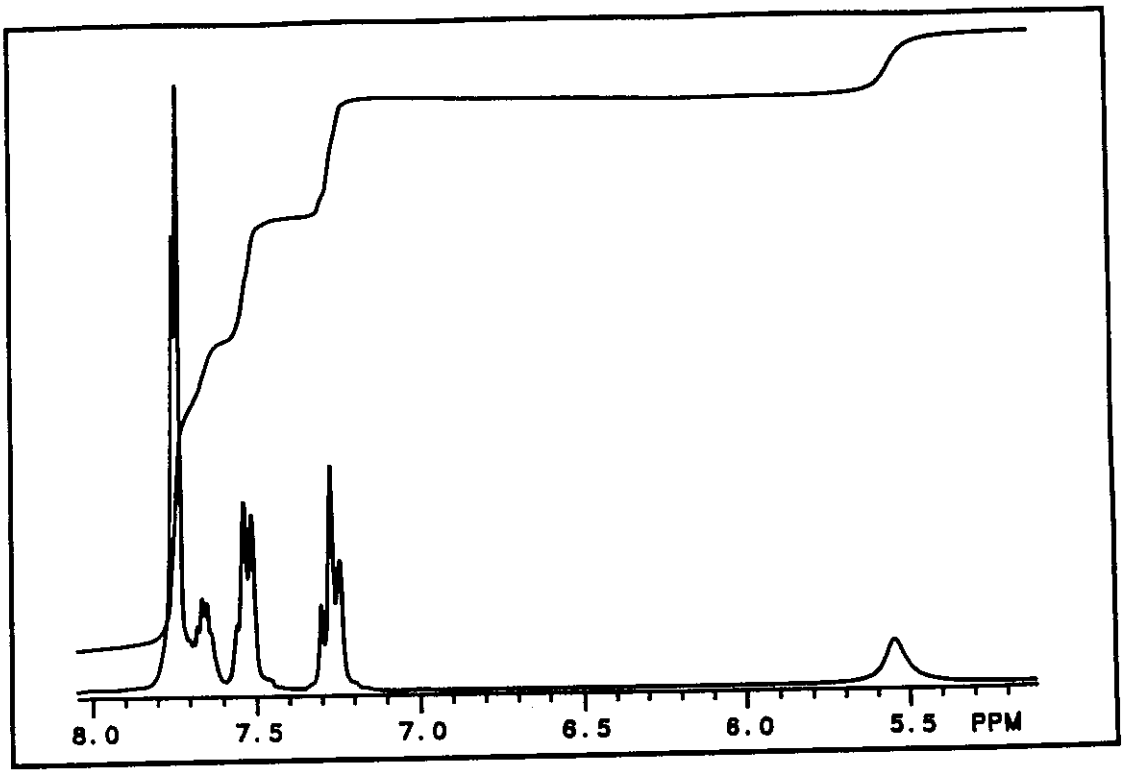

d
d
d
s
a
a
t
180
160
140
120
100
80
60
40
20
0
PPM

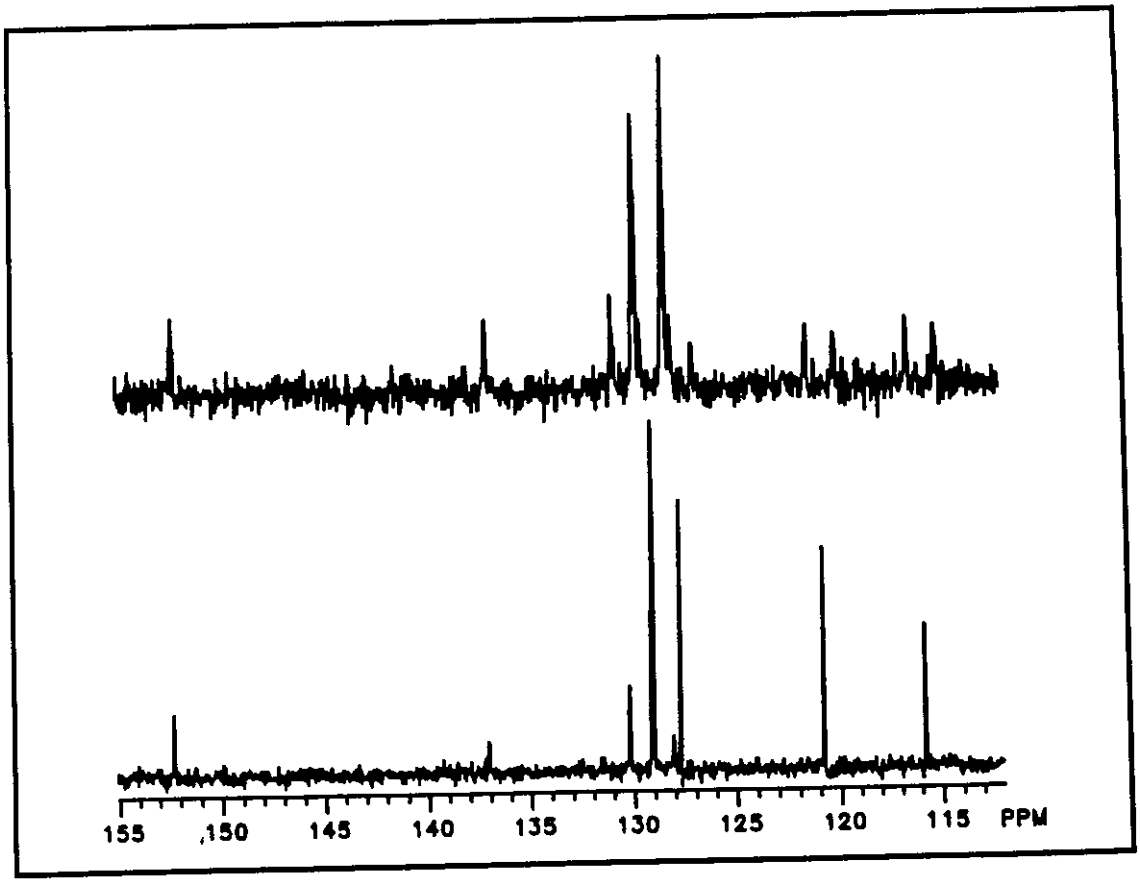
Problem 110

Exact Mass: na
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 84.7% C; 5.9% H






8.0
7.5
7.0
6.5
6.0
5.5
PPM

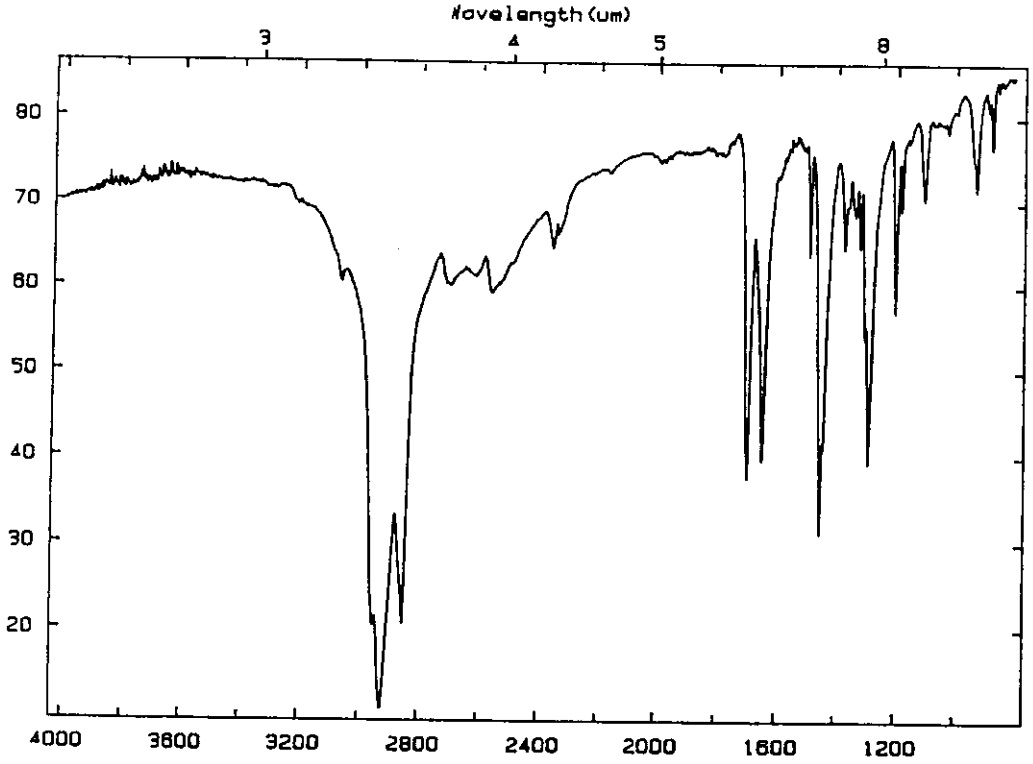

155
150
145
140
135
130
125
120
115
PPM

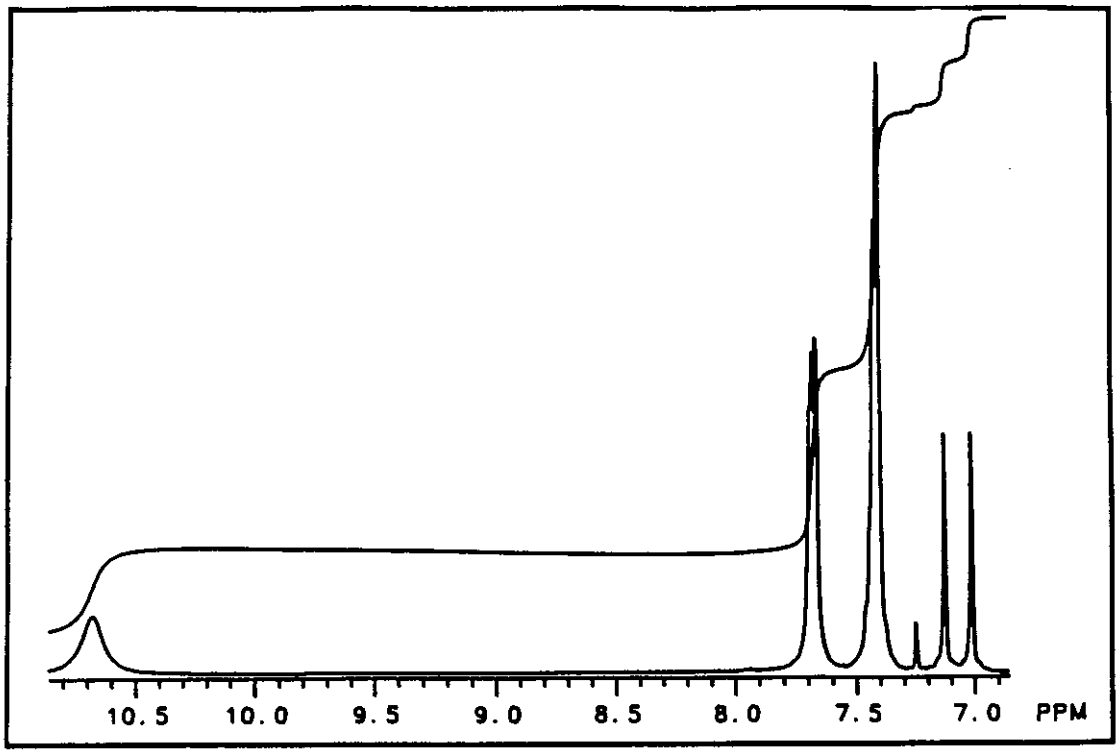
Problem 111

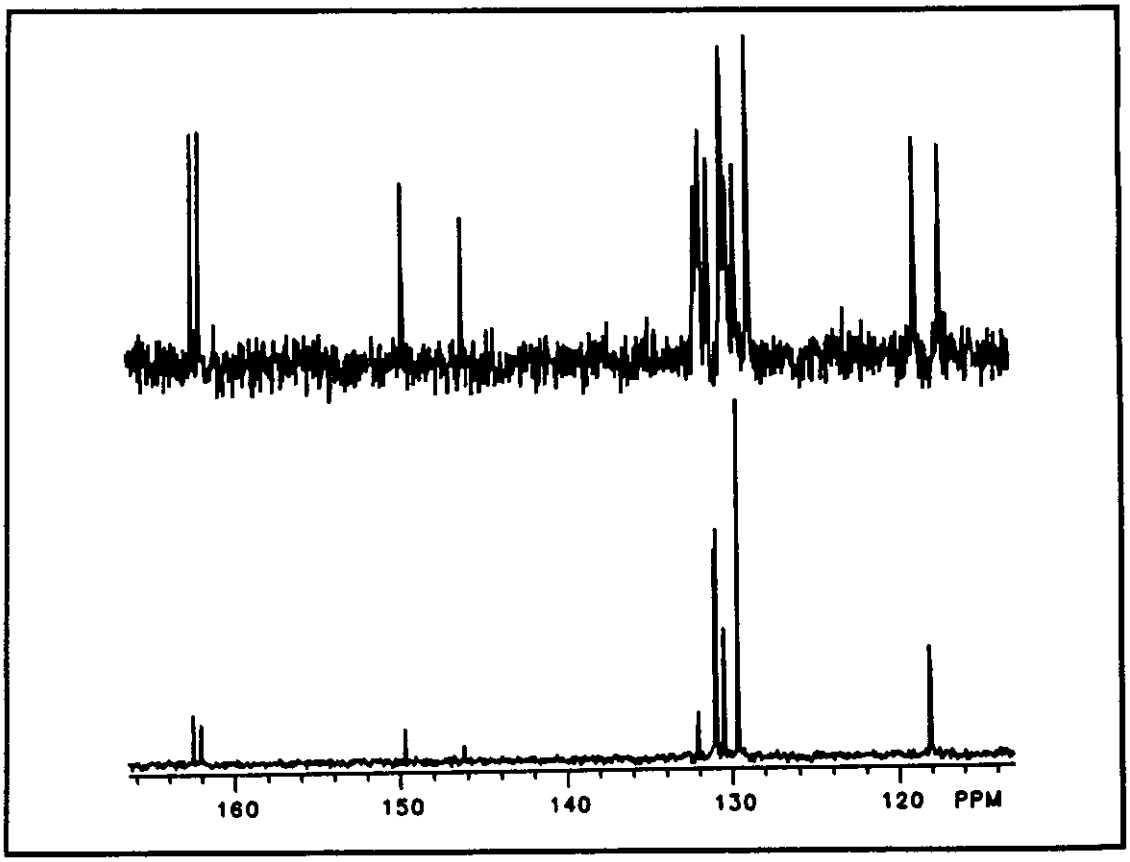
Exact Mass: na
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 65.1% C; 4.3% H; 11.4% F

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
32	1.02	63	2.48	79	0.53	96	1.56	119	1.35	148	1.32
39	1.38	65	0.46	81	0.75	101	17.02	120	11.84	149	1.94
45	2.71	69	1.53	83	1.90	102	5.09	121	5.12	162	9.72
50	3.07	70	0.50	89	2.81	109	5.59	129	12.20	165	61.13
51	5.35	74	3.66	90	2.66	115	10.22	130	0.56	166	100.00
60	0.89	75	7.83	91	4.45	116	4.78	144	1.24	167	9.79
61	0.41	76	1.89	94	2.68	117	9.17	146	25.98		
62	1.25	77	2.48	95	1.89	118	15.78	147	1.82		

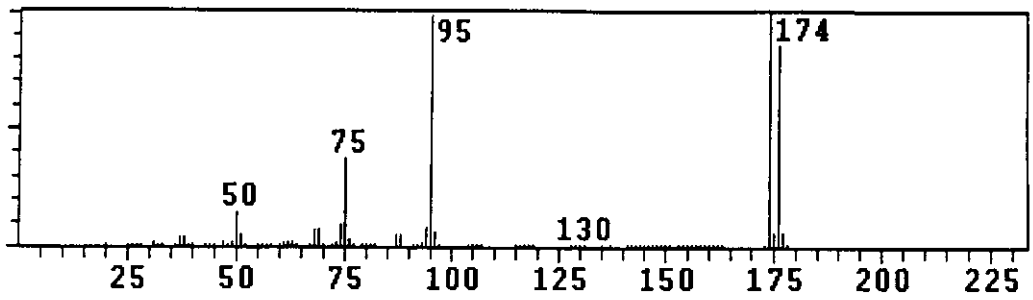


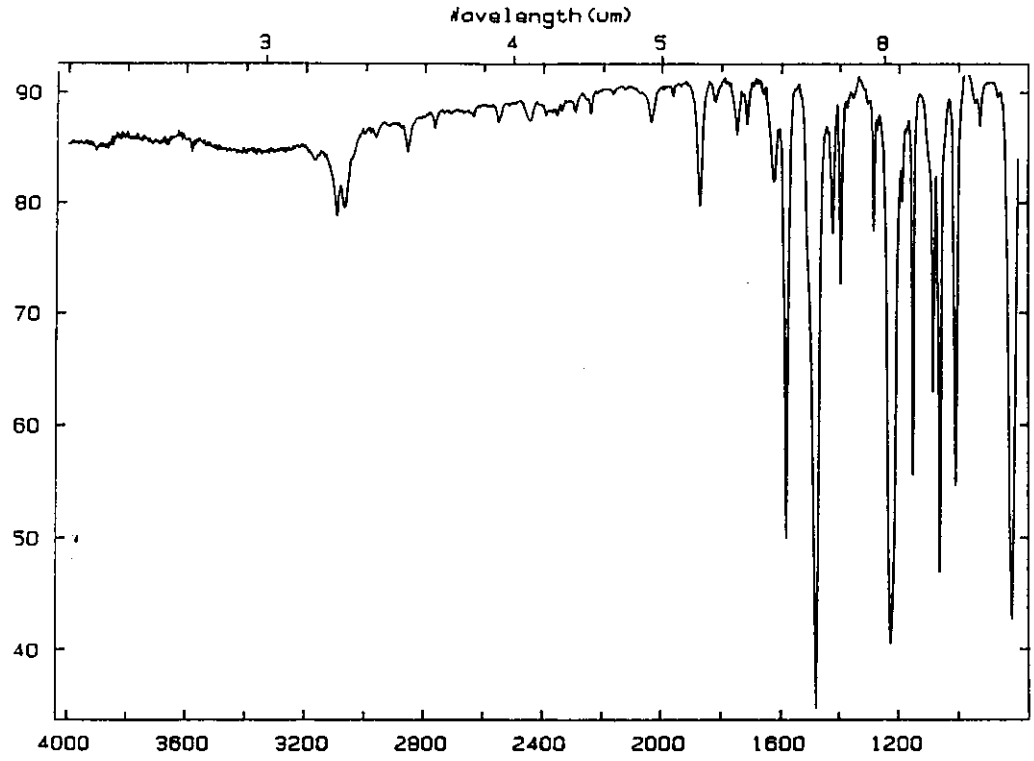

10.5
10.0
9.5
9.0
8.5
8.0
7.5
7.0
PPM

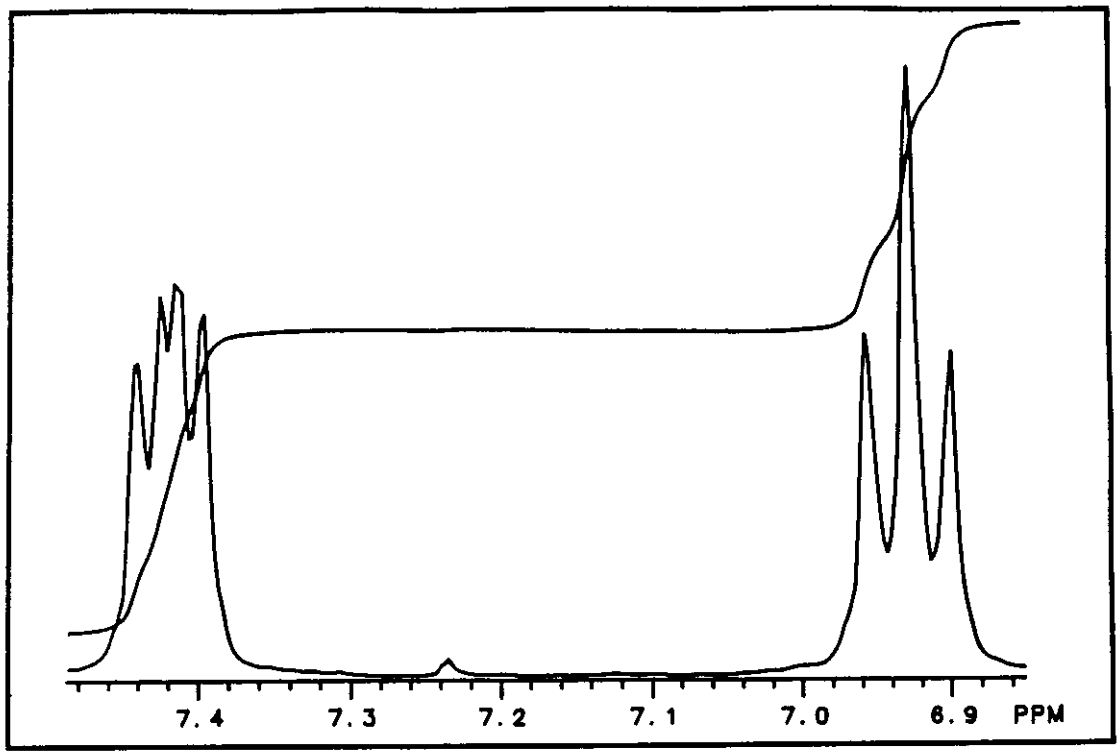

160
150
140
130
120
PPM

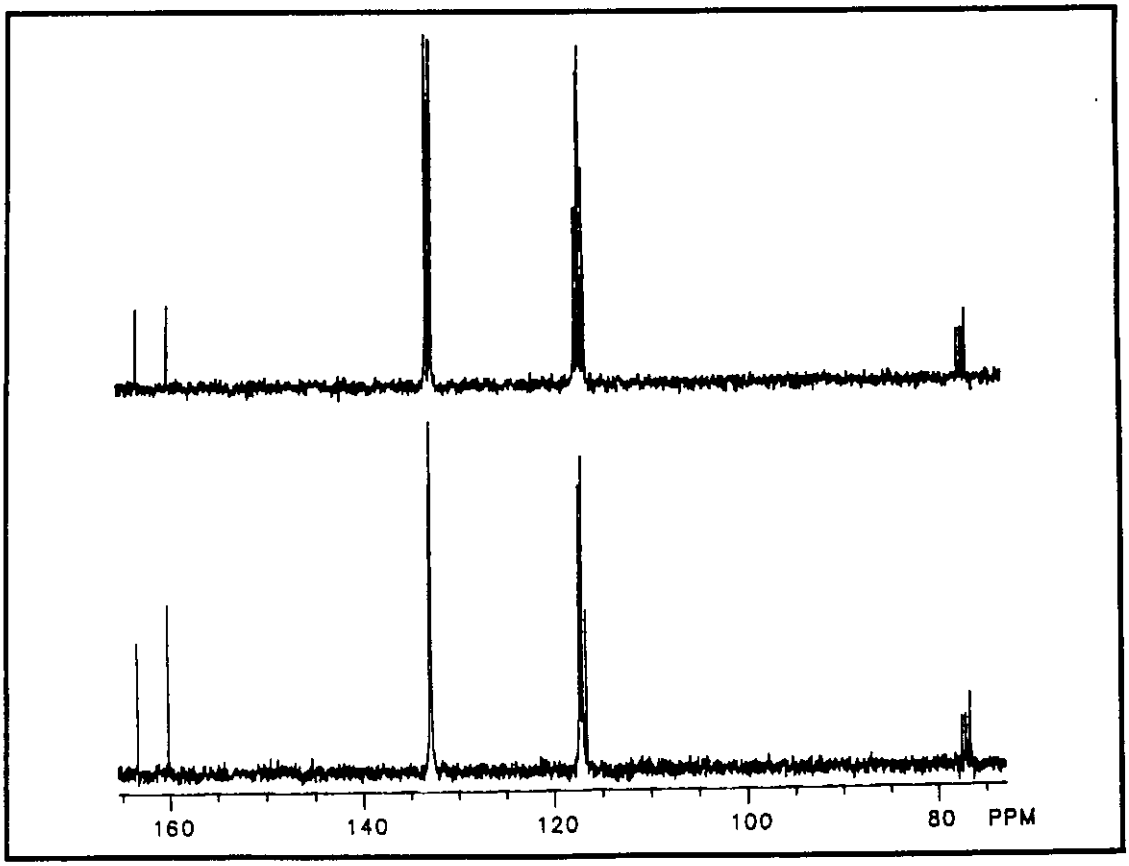
Problem 112

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 41.2% C; 2.3% H; 10.9% F






7.4
7.3
7.2
7.1
7.0
6.9
PPM

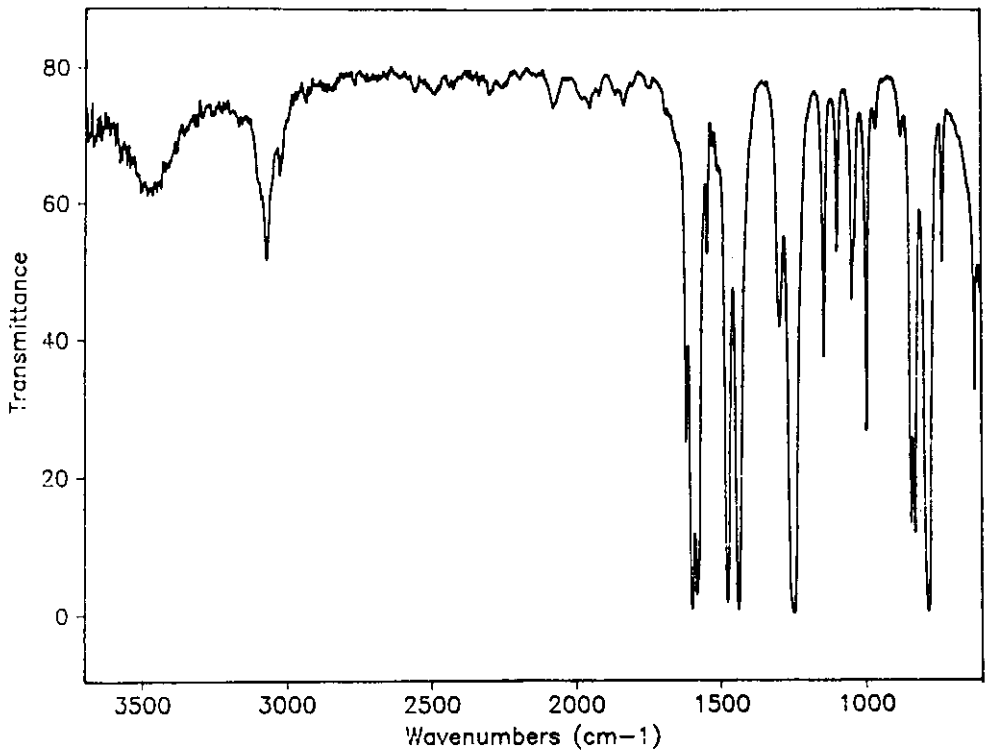

160
140
120
100
80
PPM

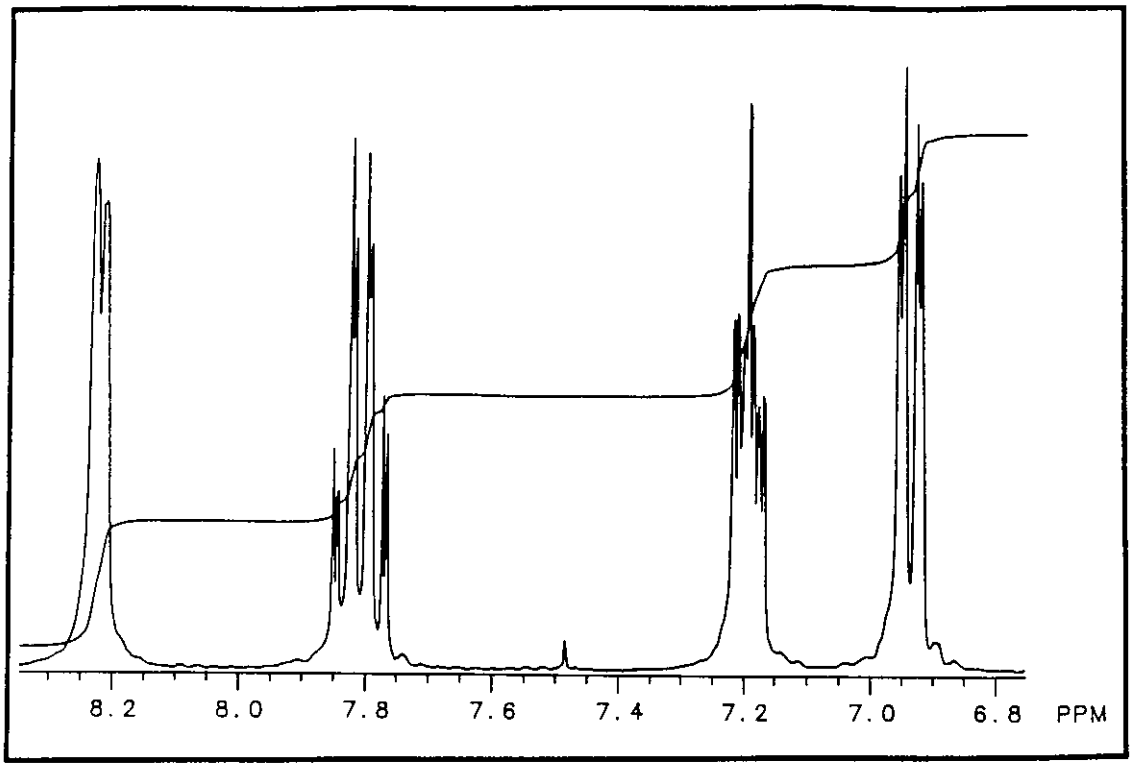
Problem 113

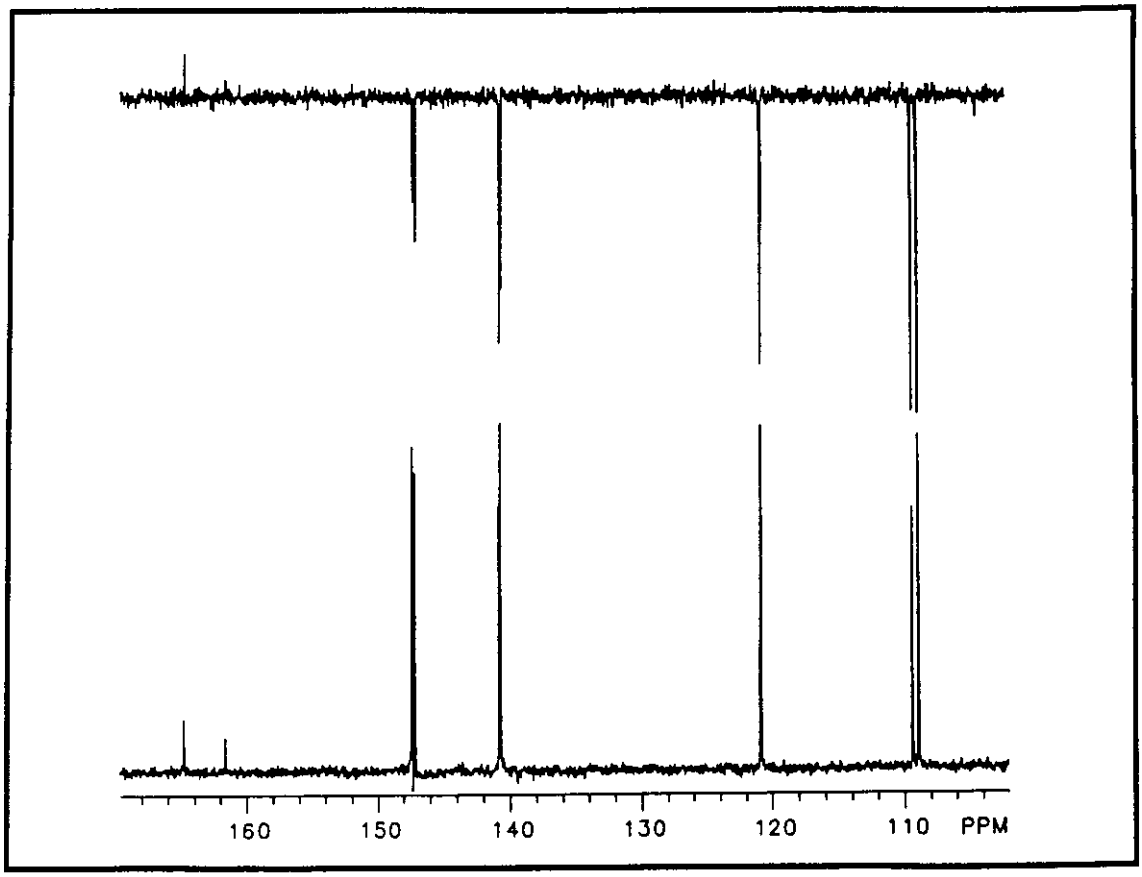
Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 61.9% C; 4.2% H; 19.5% F

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
31	11.09	40	1.05	49	5.41	58	0.78	68	5.84	78	3.17
32	0.55	41	0.12	50	19.28	59	0.08	69	11.87	79	0.20
33	0.60	42	0.03	51	17.87	60	0.08	70	68.62	82	0.28
34	0.03	43	0.21	52	9.00	61	0.11	71	8.28	93	0.22
35	0.11	44	5.18	53	0.78	62	0.41	72	0.28	94	0.30
36	1.23	45	1.45	54	0.05	63	0.62	74	0.48	96	9.38
37	6.40	46	3.99	55	0.28	64	1.11	75	2.57	97	100.00
38	7.47	47	0.21	56	1.84	65	0.31	76	7.49	98	7.41
39	14.39	48	1.77	57	14.08	66	0.08	77	8.35	99	0.22

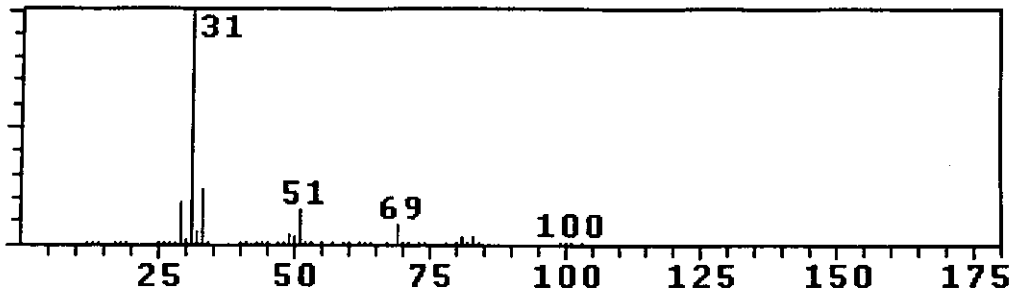


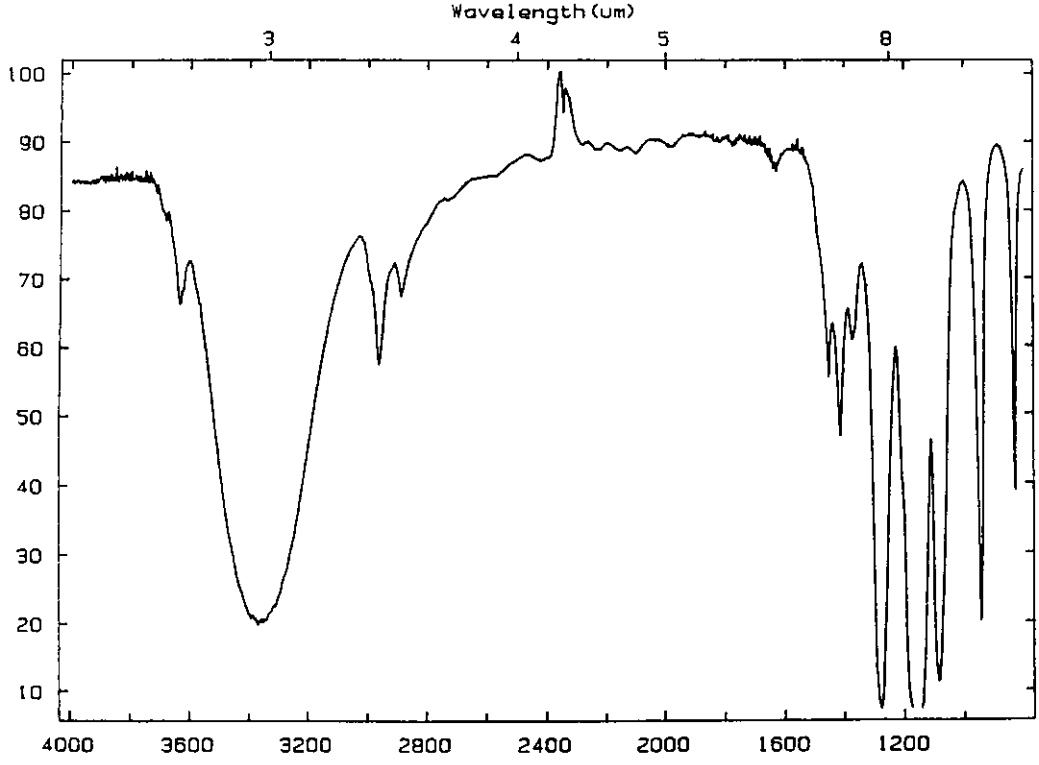

8.2
8.0
7.8
7.6
7.4
7.2
7.0
6.8
PPM

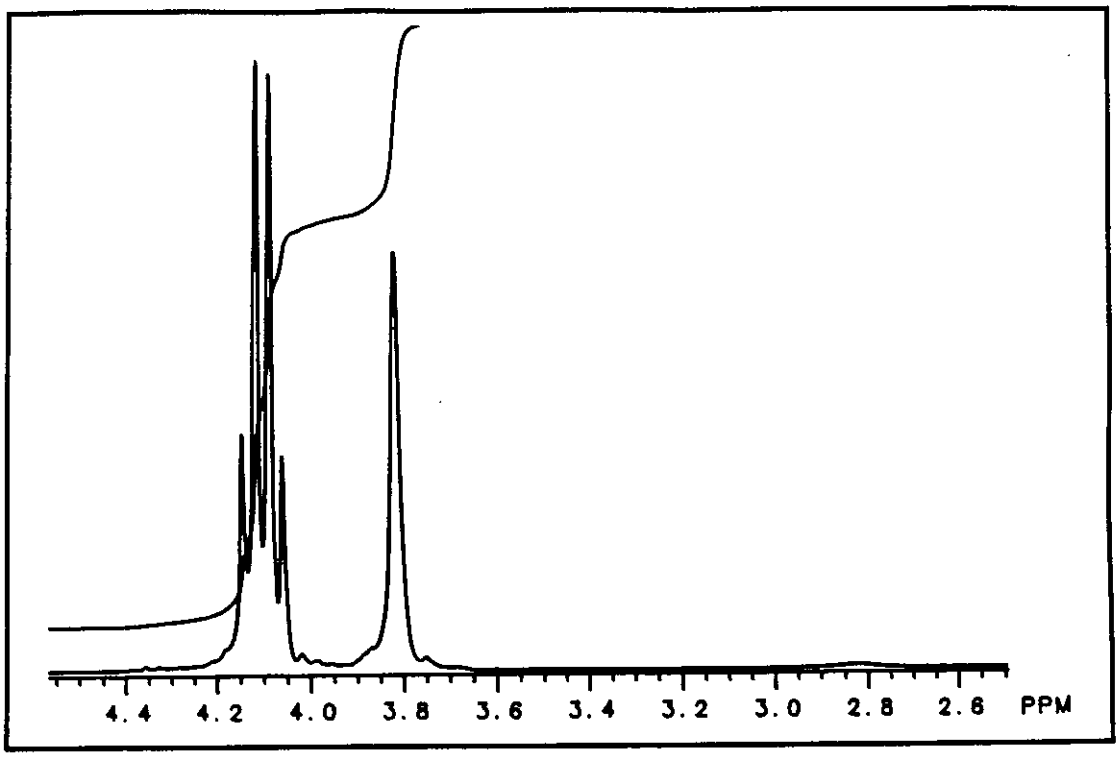

160
150
140
130
120
110
PPM

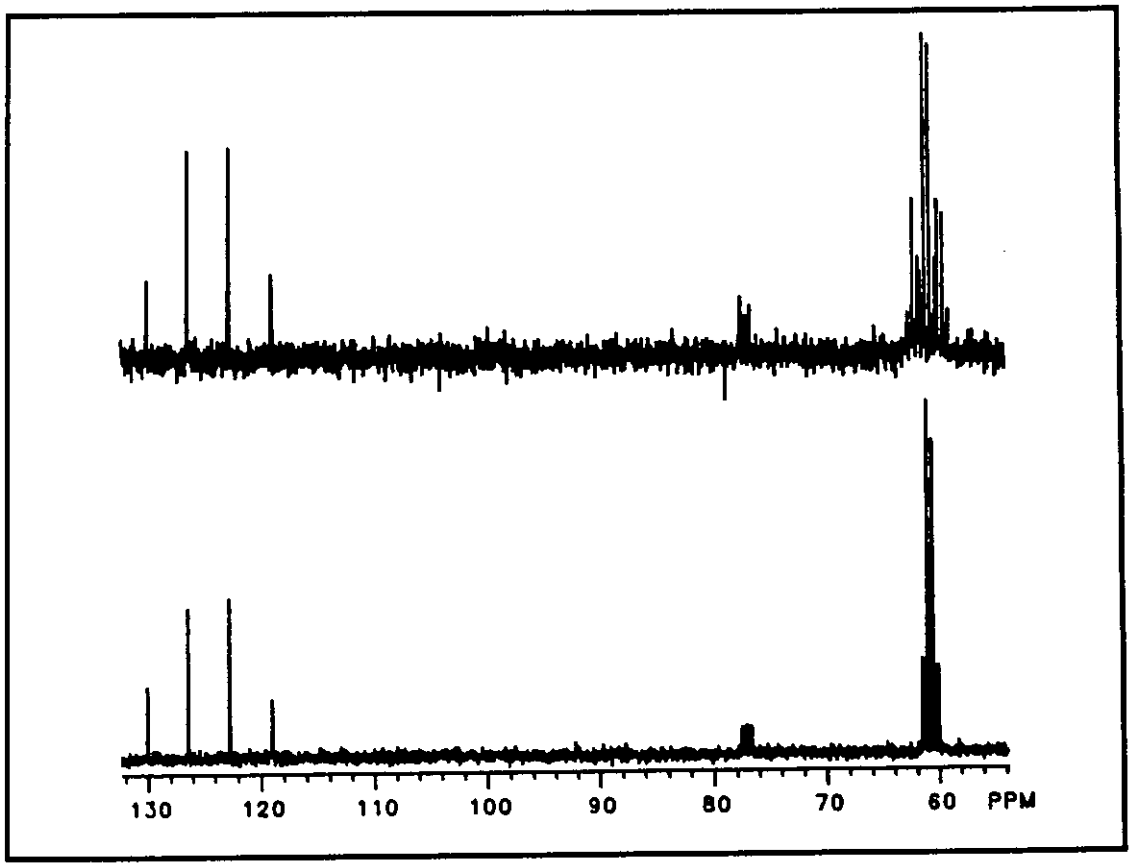
Problem 114

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 24.0% C; 3.0% H; 57.0% F






4.4
4.2
4.0
3.8
3.6
3.4
3.2
3.0
2.8
2.6
PPM

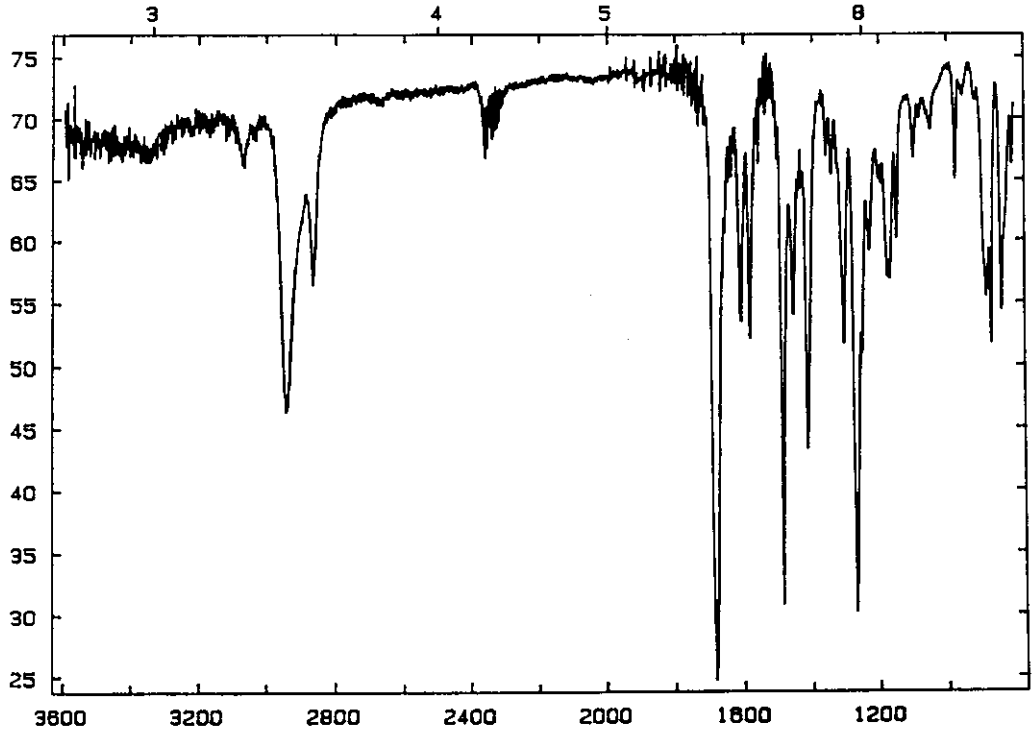

130
120
110
100
90
80
70
60
PPM

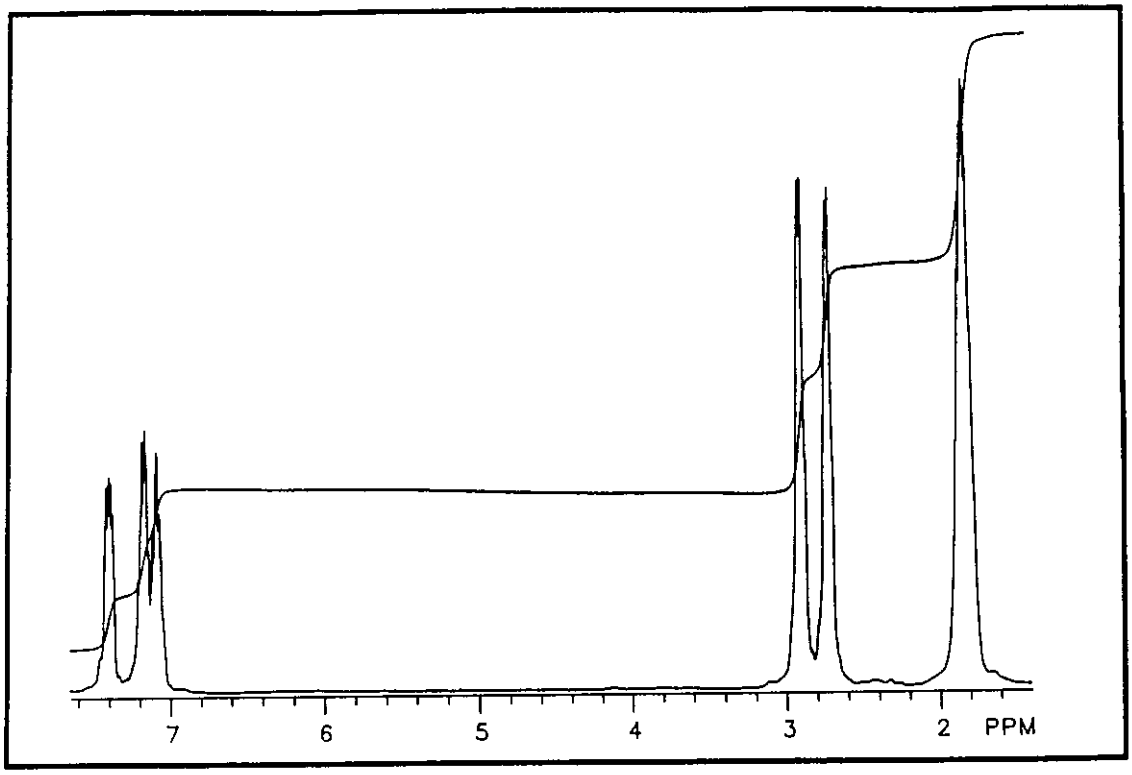
Problem 115

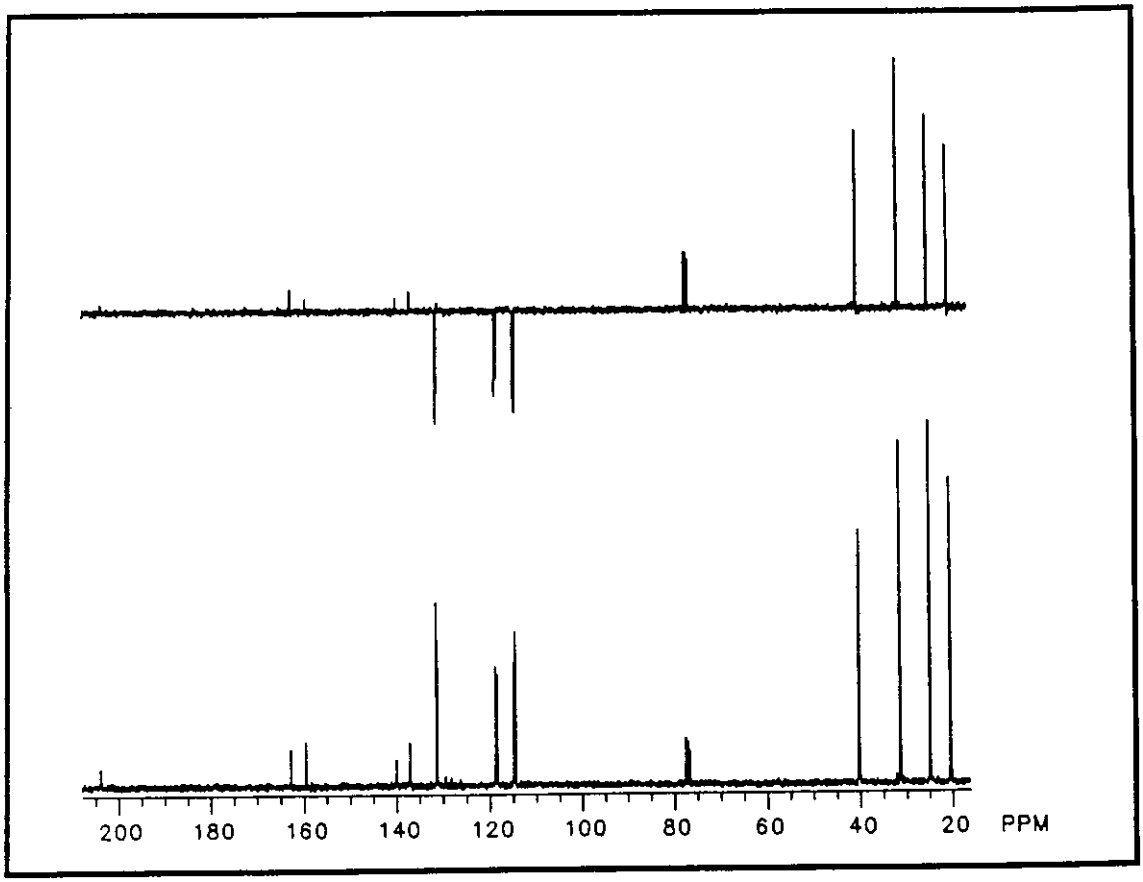
Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 74.1% C; 6.2% H; 10.7% F

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
31	1.39	60	0.89	80	0.90	97	1.40	120	5.94	138	1.22
38	1.61	61	1.44	81	6.75	98	1.04	121	20.57	140	1.14
39	9.18	62	4.53	82	2.24	99	1.56	122	100.00	145	1.99
40	1.05	63	7.58	83	7.98	100	1.04	123	16.41	146	4.95
41	3.45	64	1.01	85	0.72	101	18.04	124	1.01	147	5.70
42	2.71	65	0.79	86	1.33	102	3.59	125	0.88	149	41.42
43	0.87	67	0.65	87	2.01	103	1.96	127	2.05	150	17.36
50	5.56	68	2.14	88	1.04	104	1.89	128	1.58	151	1.73
51	6.92	69	2.10	89	2.95	105	1.40	129	1.36	159	4.40
52	1.16	70	2.46	90	0.65	107	25.85	131	2.79	160	16.25
53	1.70	73	1.22	91	1.19	108	30.61	132	1.13	161	2.60
54	0.66	74	5.42	92	0.83	109	46.29	133	11.48	163	10.33
55	3.44	75	11.52	93	1.54	110	3.83	134	5.18	164	1.14
56	1.12	76	1.88	94	6.50	115	4.48	135	14.80	177	2.33
57	8.03	77	2.79	95	8.56	116	0.83	136	11.82	178	71.46
59	0.83	78	1.02	96	14.67	119	0.75	137	14.00		




7
6
5
4
3
2
PPM

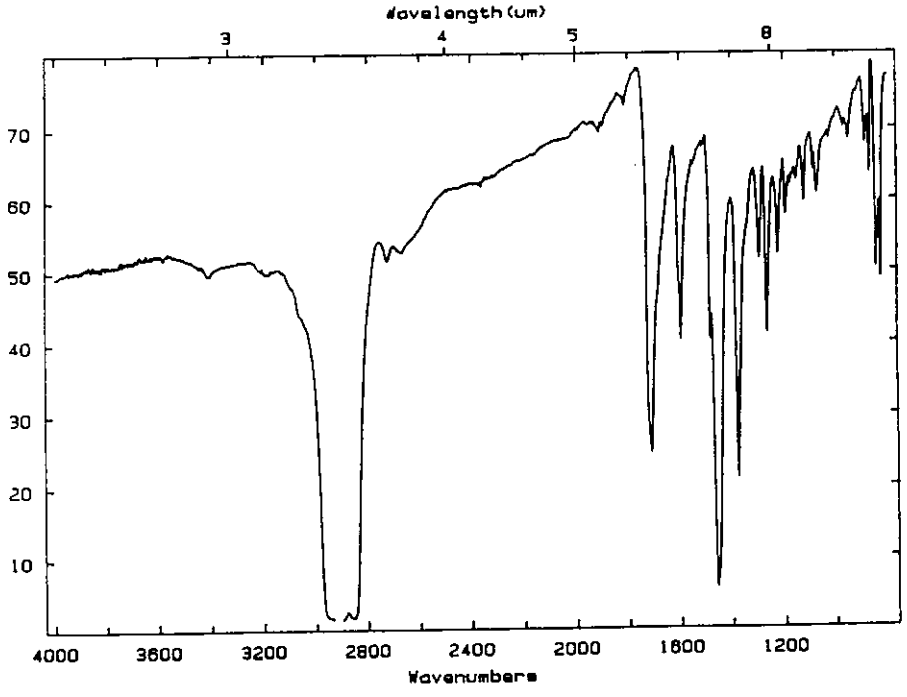

200
180
160
140
120
100
80
60
40
20
PPM

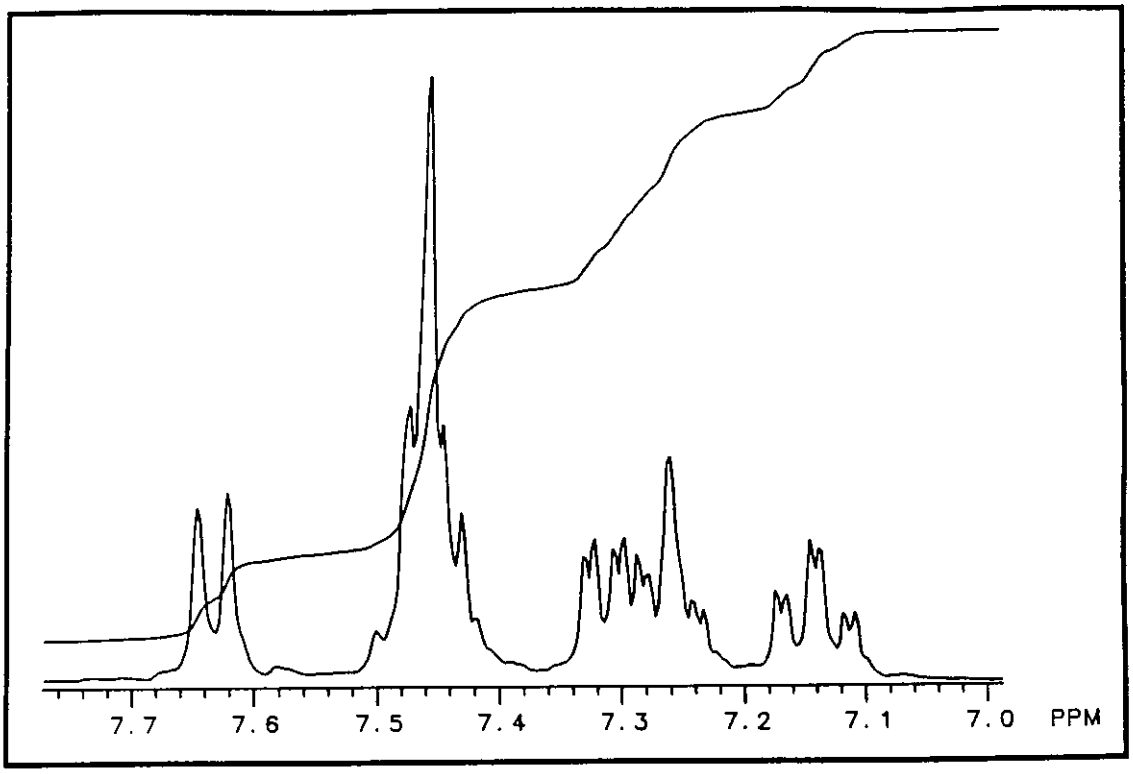
Problem 116

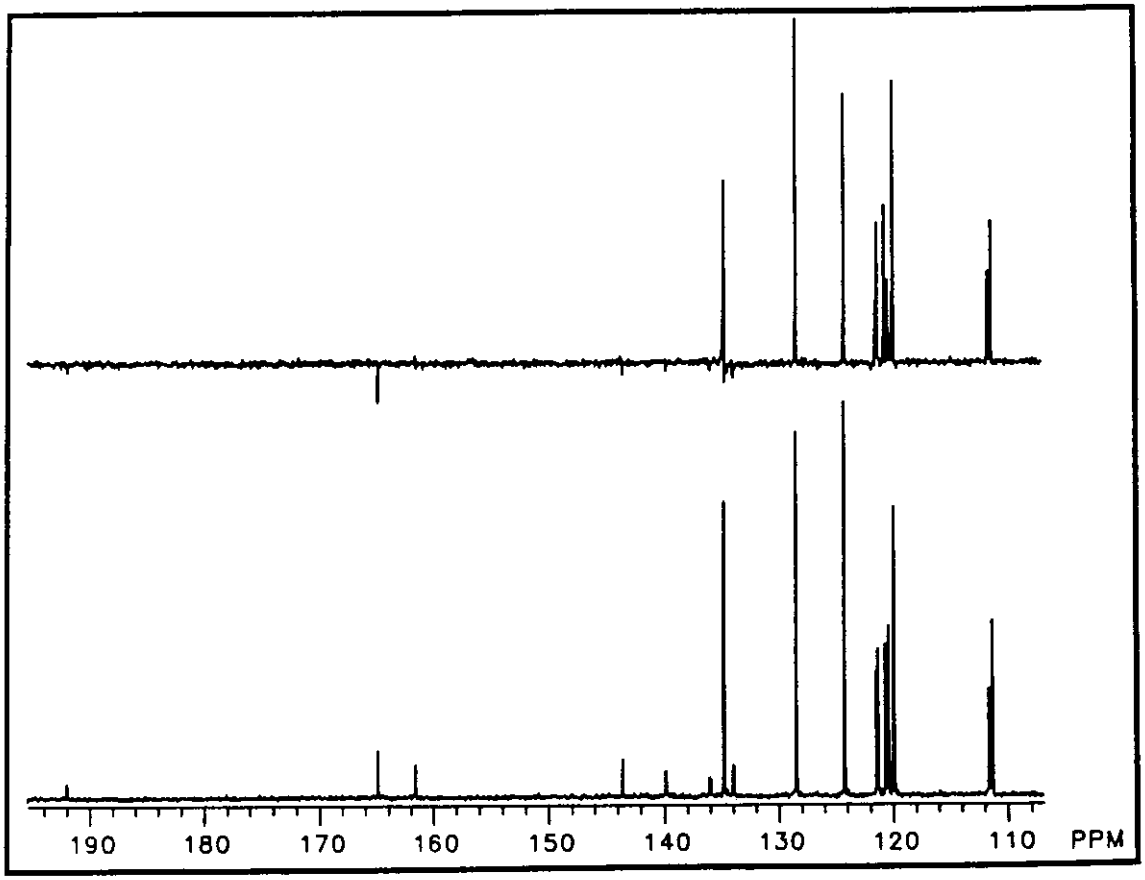
Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 82.9% C; 2.9% H; 7.7% F

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
31	0.32	68	0.37	91	0.18	111	1.11	131	0.75	150	4.65
33	0.19	69	0.28	92	0.70	112	0.13	132	0.15	151	1.26
37	0.16	70	0.28	93	0.99	113	0.22	133	0.16	152	0.13
38	0.39	71	0.17	94	1.66	115	0.28	134	0.17	162	0.15
39	0.67	72	1.39	95	0.47	116	0.49	135	0.17	167	0.98
43	0.27	73	0.56	96	0.26	117	0.92	137	0.19	168	9.89
44	0.11	74	3.15	97	0.27	118	0.94	139	0.55	169	16.60
49	0.15	75	2.21	98	2.43	119	0.30	140	0.31	170	40.69
50	1.20	76	0.50	99	2.75	120	1.63	141	0.25	171	5.41
51	0.55	77	0.28	100	0.55	121	0.37	142	0.39	172	0.35
53	0.16	80	0.24	103	0.10	122	1.14	143	1.34	198	100.00
56	0.26	81	1.03	104	0.27	123	2.20	144	6.14	199	14.46
57	0.93	84	0.91	105	1.07	124	0.53	145	0.74	200	1.24
58	0.12	85	6.37	106	0.20	125	0.25	146	0.29		
61	0.75	86	1.67	107	0.27	126	0.34	147	0.25		
62	1.13	87	1.29	109	0.52	129	0.35	148	0.13		
63	1.04	88	0.17	110	1.01	130	0.09	149	2.92		



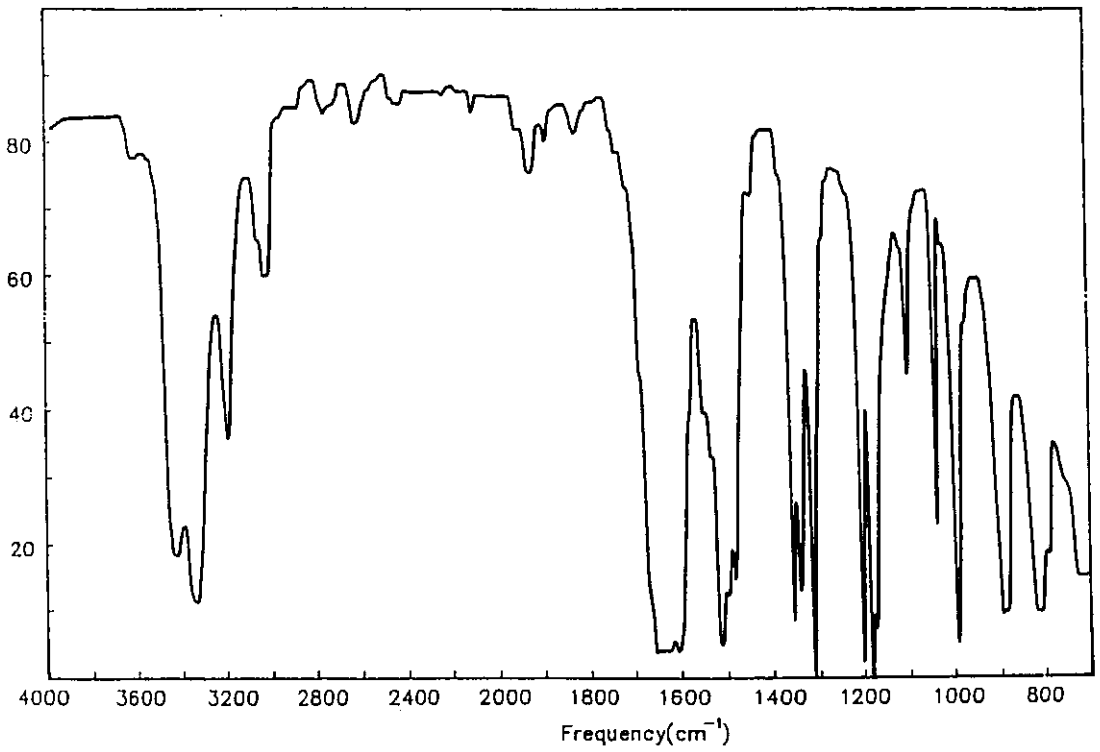

7.7
7.6
7.5
7.4
7.3
7.2
7.1
7.0
PPM

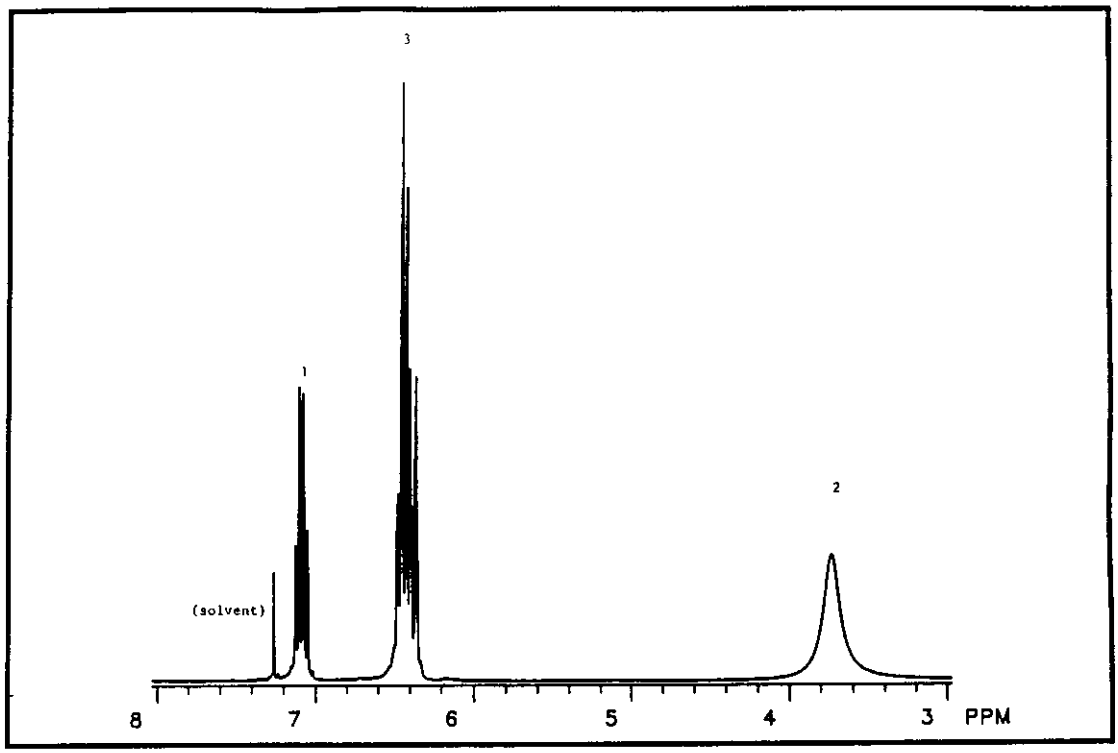

190
180
170
160
150
140
130
120
110
PPM

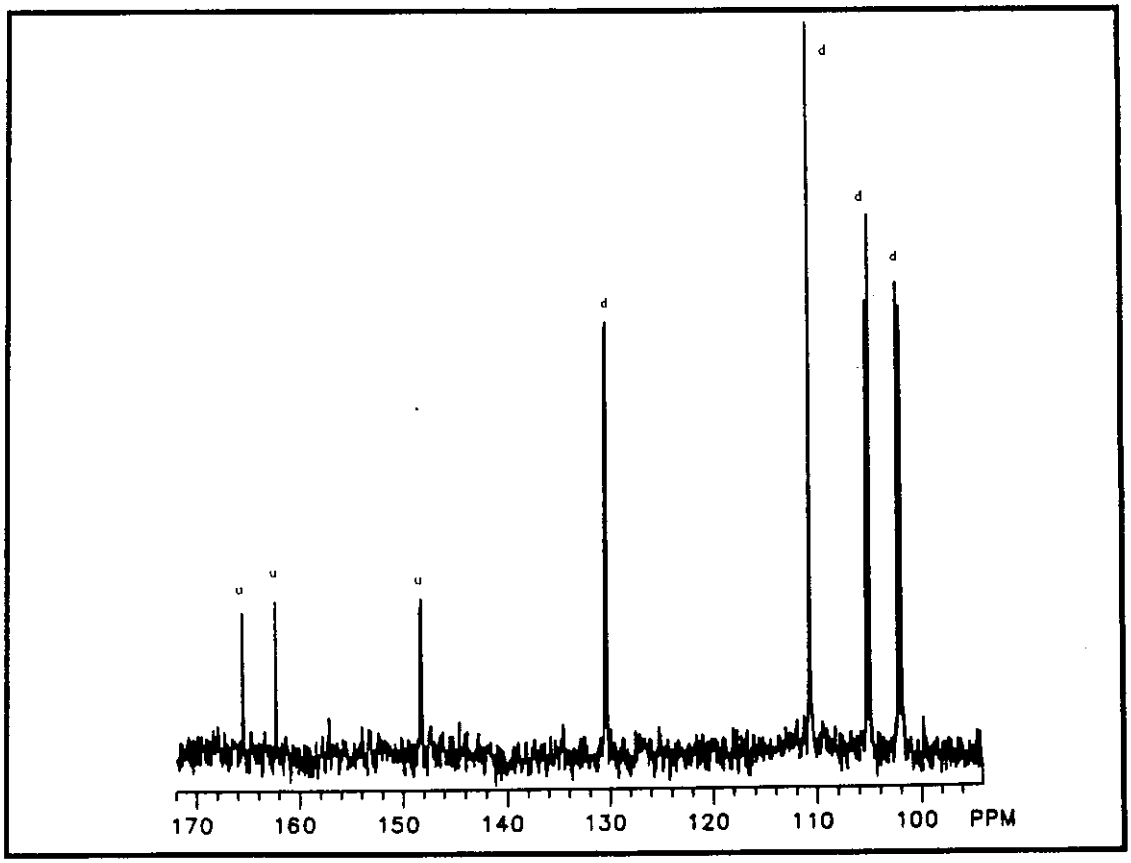
Problem 117

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 64.9% C; 5.4% H; 17.0% F; 12.6% N

Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A
13, 0.20	33, 1.40	48, 0.60	63, 8.01	78, 0.60	95, 1.70
14, 0.60	35, 0.30	49, 1.00	64,11.21	79, 0.20	96, 0.70
15, 1.90	36, 1.70	50, 3.60	65, 4.60	80, 1.10	97, 0.10
16, 0.40	37, 3.30	51, 3.20	66, 0.80	81, 4.40	98, 0.30
17, 3.60	38, 5.00	52, 7.21	67, 0.90	82, 5.91	107, 0.10
18,14.41	39, 6.51	53, 1.60	68, 1.60	83,30.73	108, 0.60
19, 0.10	40, 2.60	54, 1.90	69, 1.40	84,40.74	109, 2.80
20, 0.60	41, 6.91	54, 2.10	70, 1.10	85, 4.40	110, 8.91
24, 0.10	42, 0.90	55, 1.80	71, 0.50	86, 0.40	111,100.0
25, 0.40	42, 0.30	55, 8.91	72, 1.40	87, 1.30	112, 7.01
26, 2.20	43, 1.30	56, 4.30	72, 1.10	88, 0.40	113, 0.10
27, 3.90	44, 1.00	57,15.81	73, 0.60	89, 0.90	18, 0.00
28,15.11	44, 1.40	58, 2.40	73, 0.40	90, 1.60	
29, 2.50	45, 2.80	59, 1.90	74, 1.30	91, 4.90	
30, 0.60	45, 2.70	60, 0.80	75, 2.70	92, 0.90	
31, 9.51	46, 0.60	61, 3.10	76, 0.70	93, 0.40	
32, 2.80	47, 0.10	62, 3.80	77, 0.20	94, 1.70	



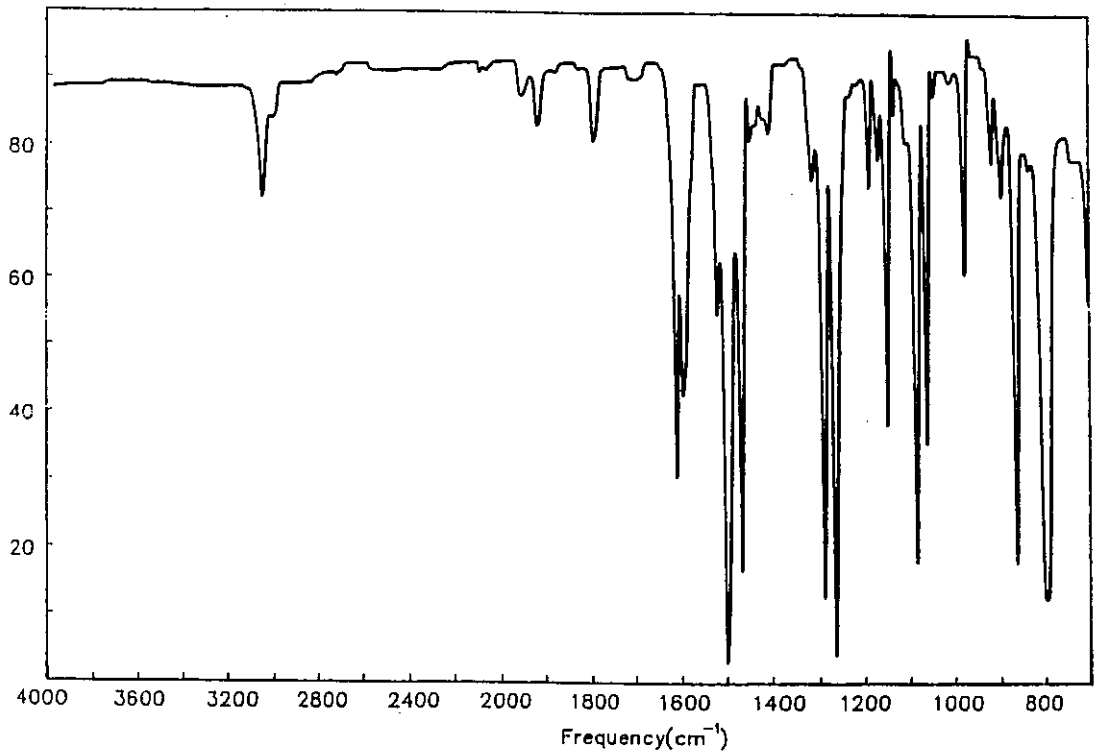

3
1
2
(solvent)
8
7
6
5
4
3
PPM

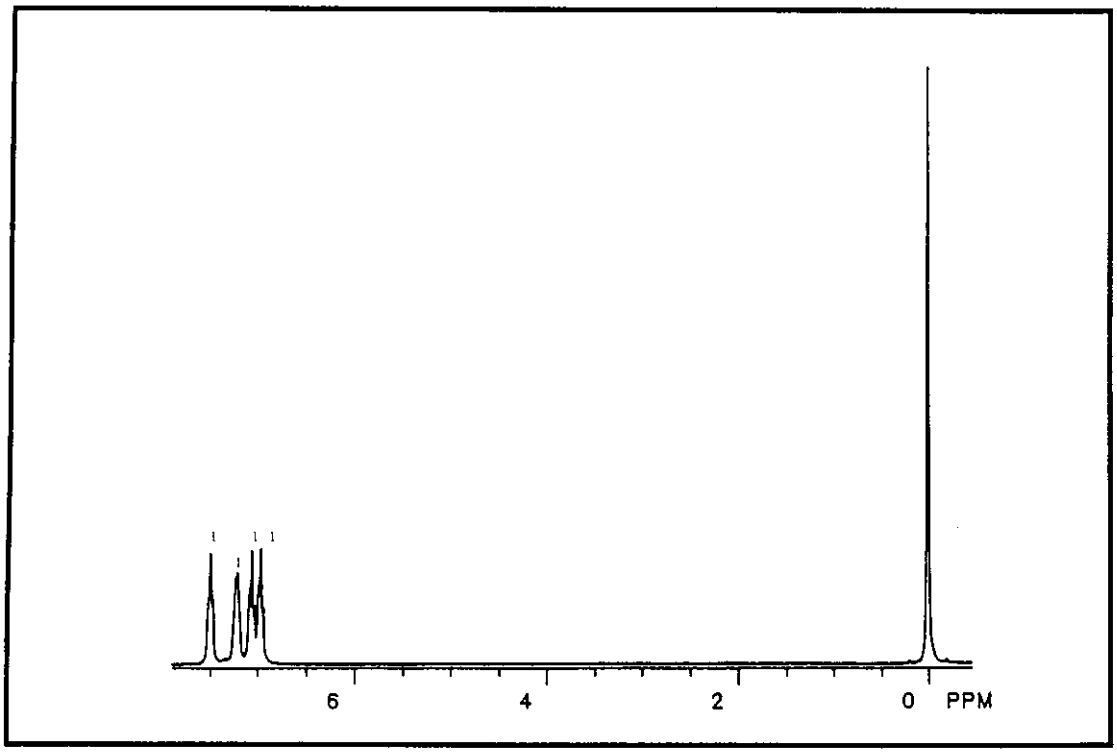

d
d
d
d
u
u
u
170
160
150
140
130
120
110
100
PPM

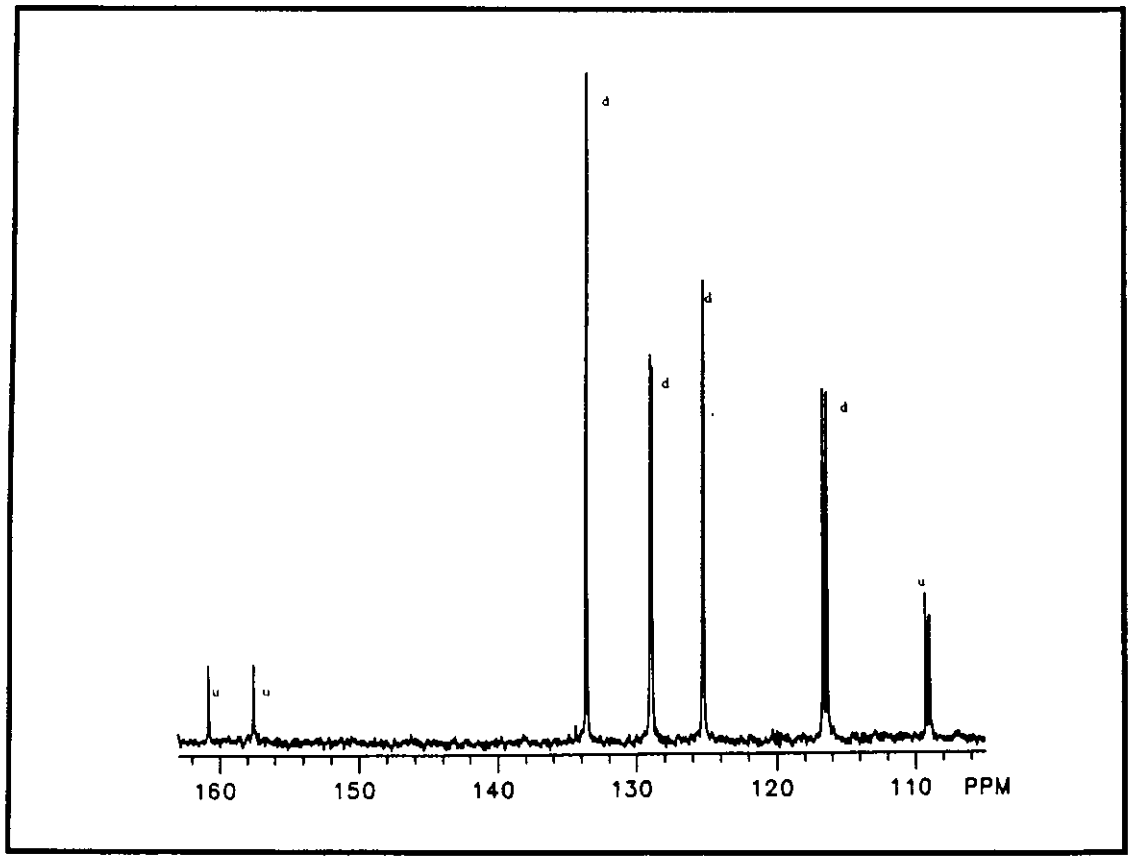
Problem 118

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 41.2% C; 2.3% H; 10.9% F

Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A	Mass R/A
20, 0.23	47, 2.14	63, 1.91	81, 1.79	106, 0.23	156, 0.14
25, 0.27	47, 0.32	64, 0.21	82, 0.53	117, 0.38	157, 0.16
26, 0.59	48, 0.32	68, 7.62	87, 6.83	118, 0.14	173, 0.81
27, 0.39	49, 2.11	69, 7.02	87, 0.57	119, 0.34	174,100.0
28, 0.05	50,10.65	70, 0.69	88, 6.63	120, 0.09	175, 7.32
31, 2.28	51, 4.21	72, 0.11	88, 0.50	127, 0.16	176,97.45
36, 0.35	52, 0.67	73, 1.80	92, 1.61	128, 0.58	177, 6.51
37, 2.83	56, 0.79	74, 7.61	93, 2.88	129, 0.20	178, 0.20
37, 0.11	57, 1.20	75,30.76	94, 8.76	130, 0.58	
38, 2.51	58, 0.05	76, 2.71	95,87.53	141, 0.50	
39, 1.79	60, 0.44	77, 0.11	96, 6.03	143, 0.50	
44, 0.16	61, 2.25	79, 1.80	97, 0.25	154, 0.16	
45, 0.64	62, 2.32	80, 0.58	104, 0.24	155, 0.18	




6
4
2
0
PPM

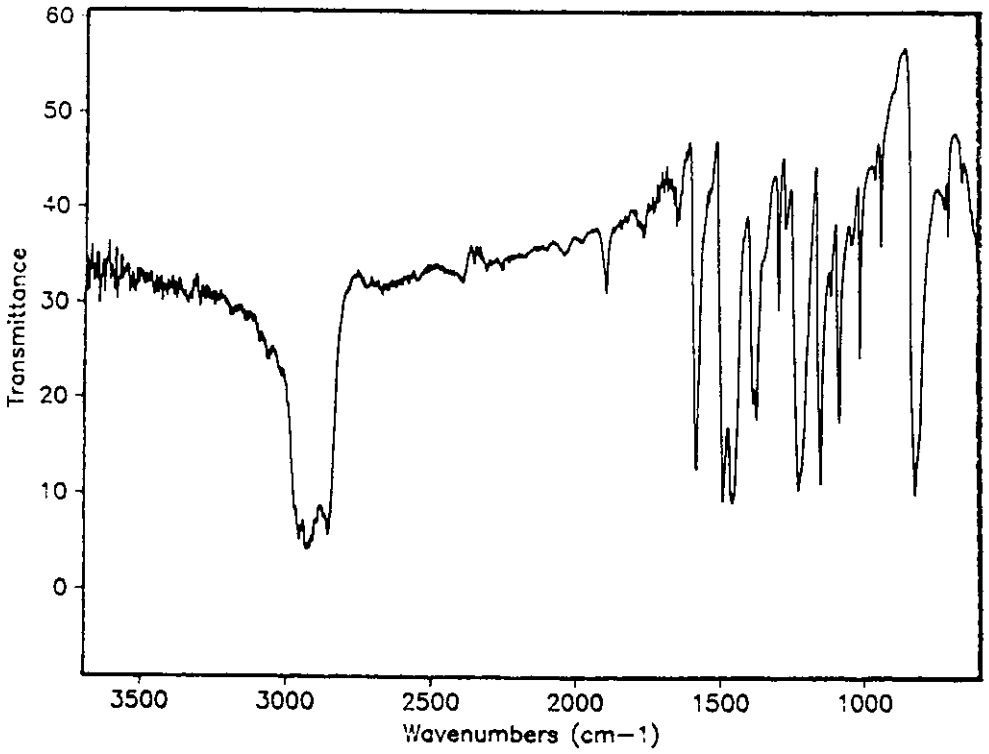

160
150
140
130
120
110
PPM

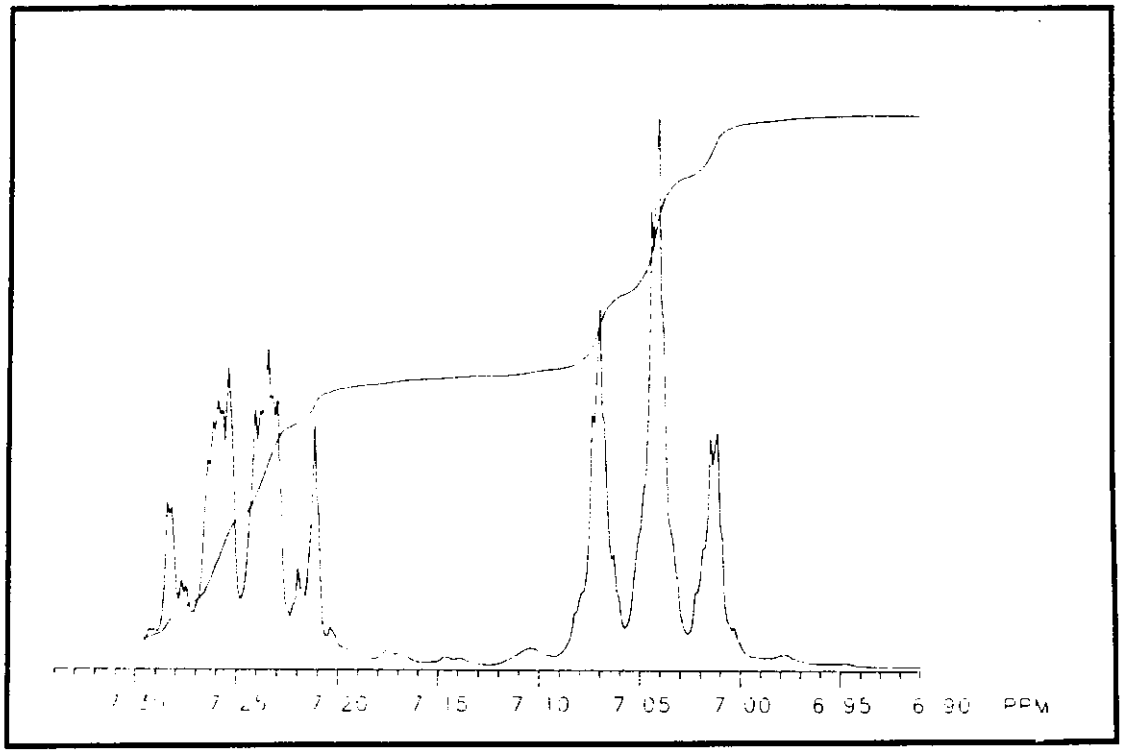
Problem 119

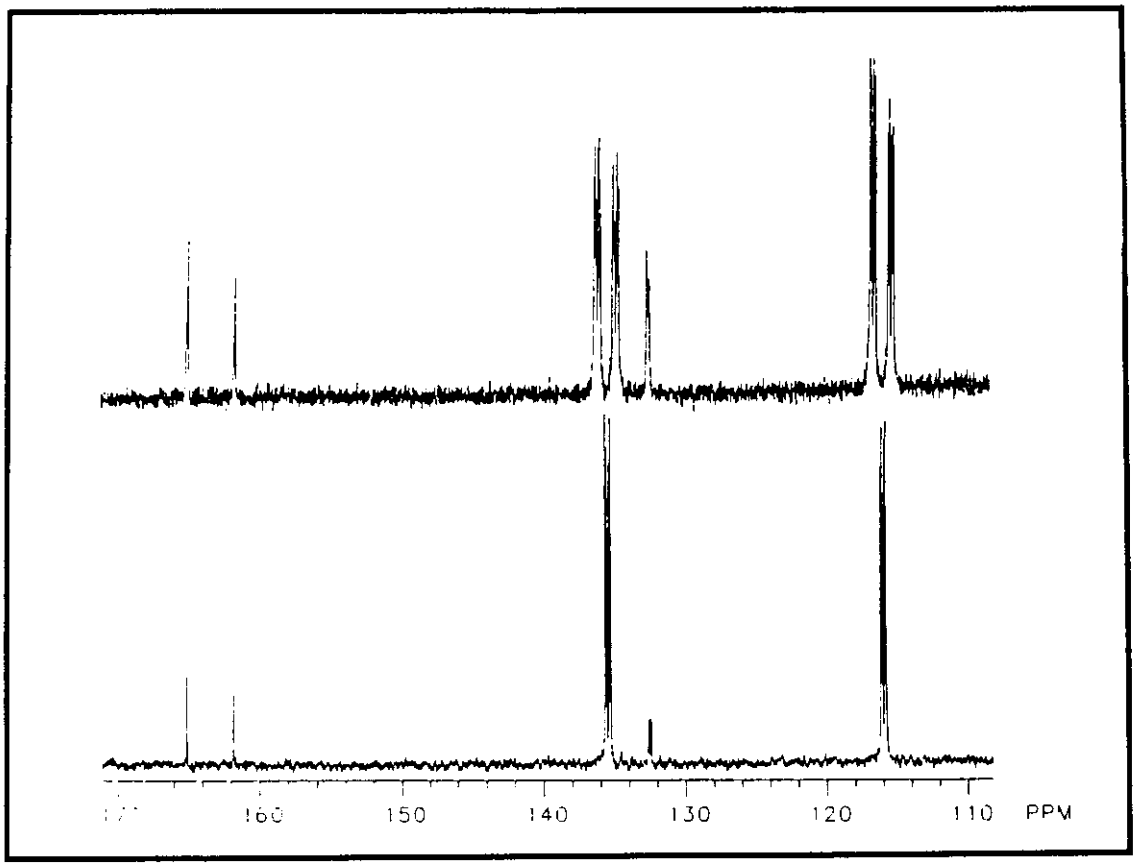
Exact Mass: na
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: na

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
44	1.72	76	2.00	101	3.07	149	1.35	171	2.17	202	2.62
50	2.73	80	1.78	107	2.56	150	7.45	175	2.98	219	75.46
51	2.22	81	1.86	123	1.20	151	6.47	181	1.94	220	10.97
57	3.01	83	2.05	125	25.62	152	3.56	188	5.14	221	20.99
63	1.05	94	1.36	126	65.99	157	1.47	189	1.91	222	2.72
68	1.25	95	3.41	127	5.10	158	2.59	190	5.09	315	2.07
69	3.82	96	1.36	133	1.58	168	2.00	193	1.46	316	100.00
74	2.45	99	3.89	144	1.52	169	4.52	199	3.97	317	19.68
75	14.45	100	2.75	145	2.12	170	13.63	201	20.31	318	1.77

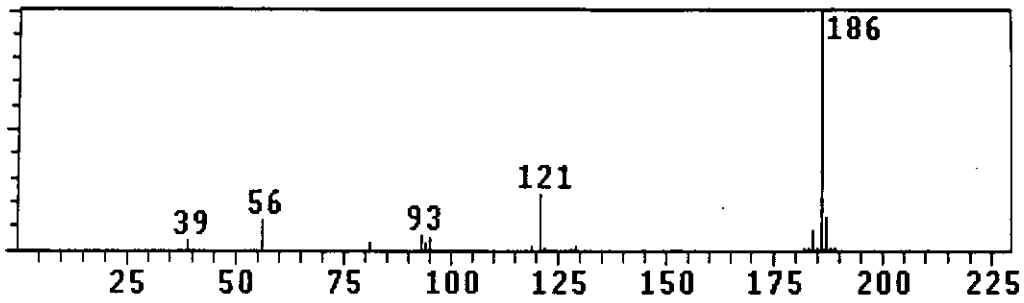


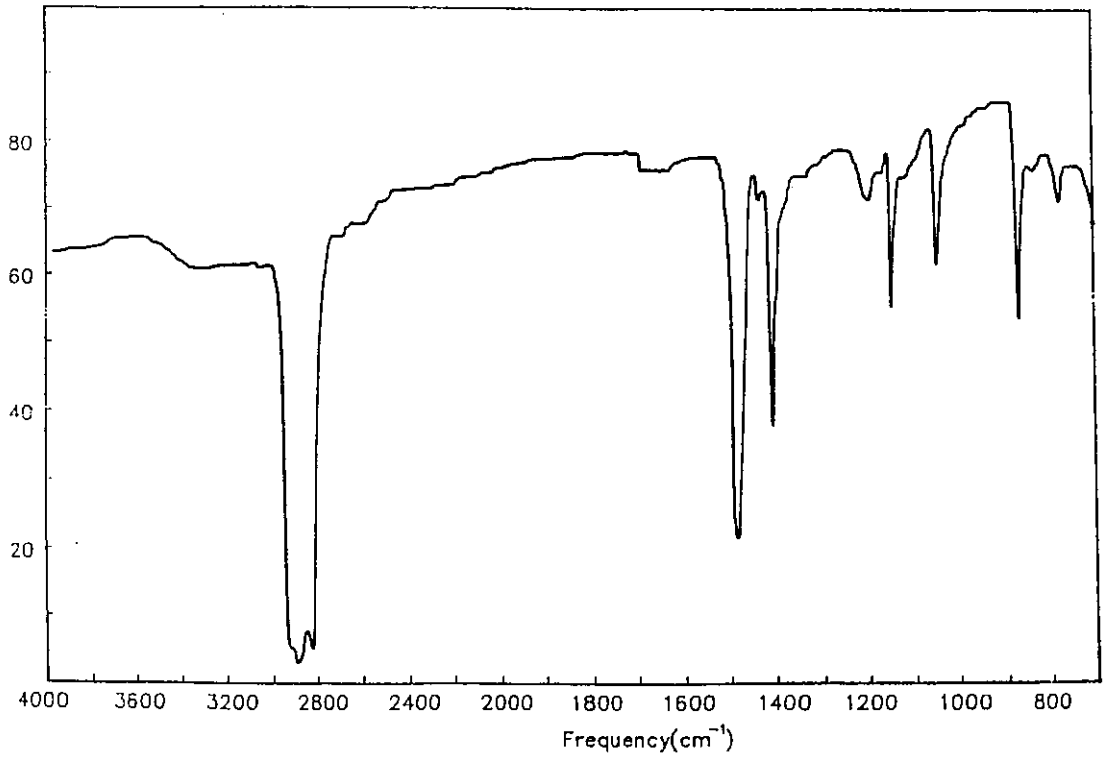

7 25
7 20
7 15
7 10
7 05
7 00
6 95
6 90
PPM

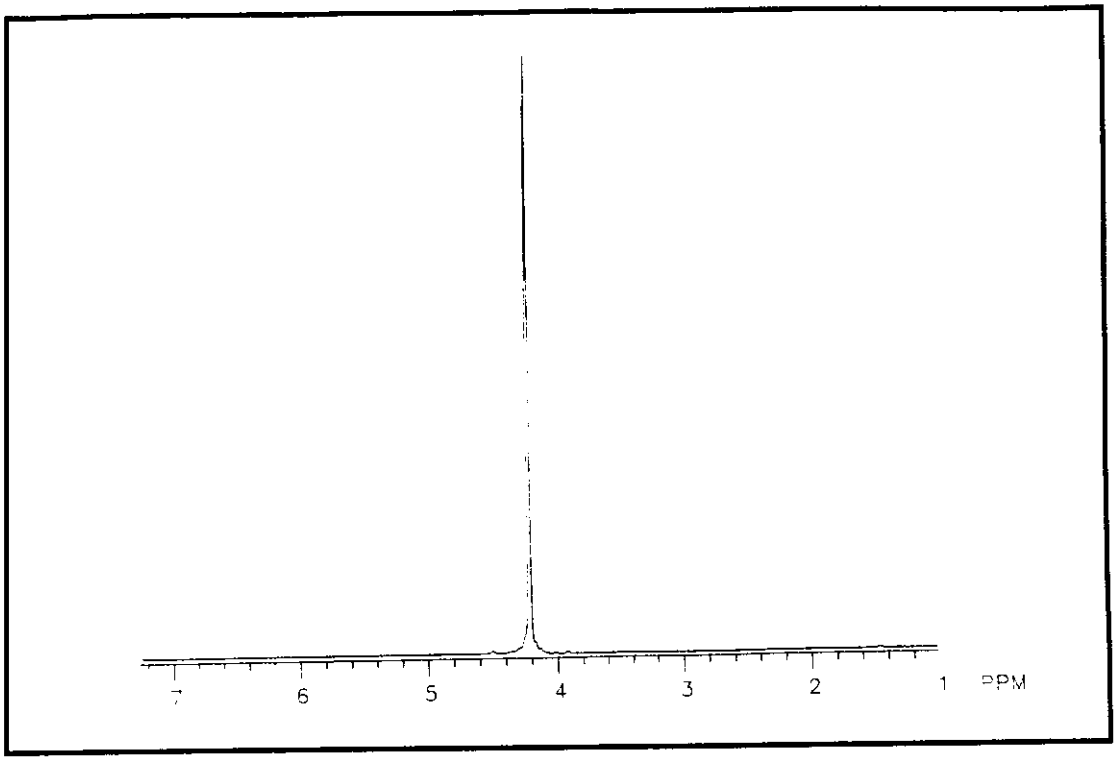

160
150
140
130
120
110
PPM

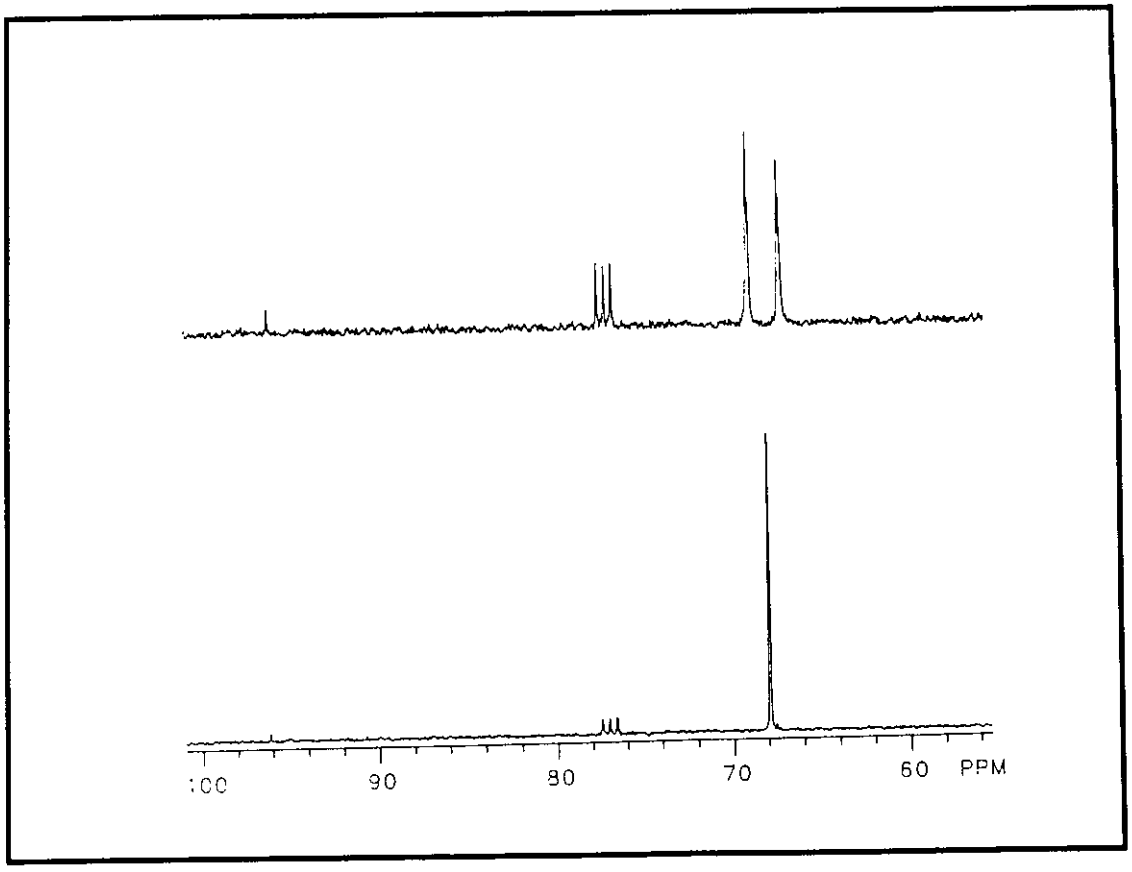
Problem 120

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 64.6% C; 5.4% H; 30.0% Fe






7
6
5
4
3
2
1
PPM

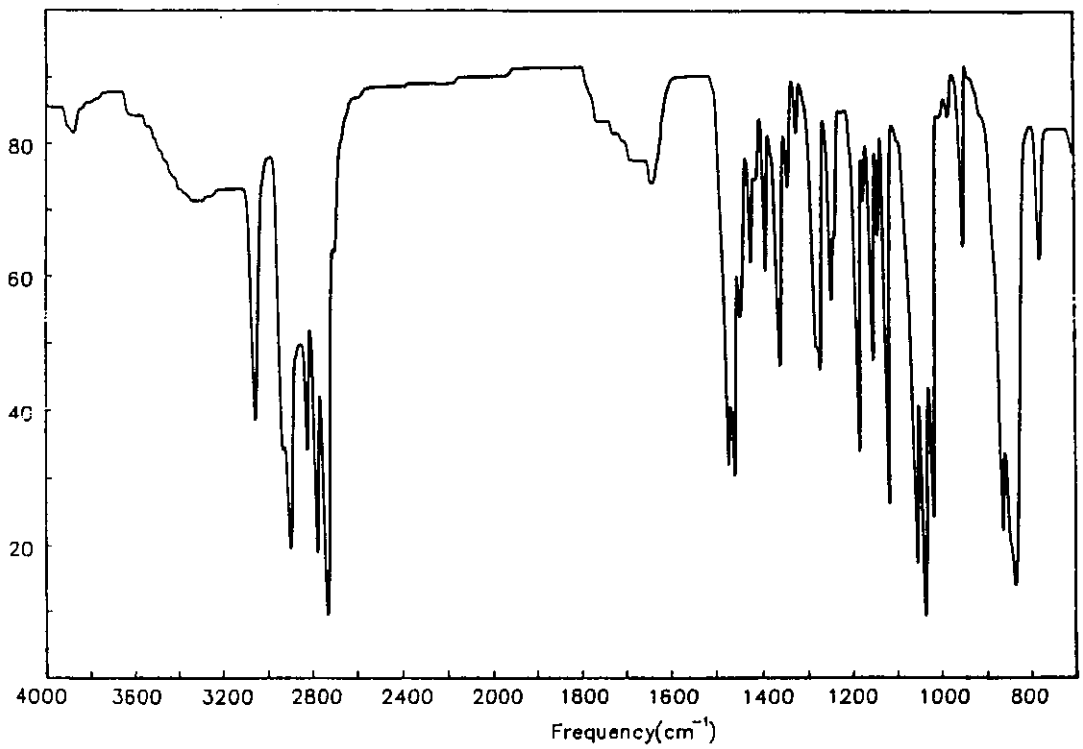

100
90
80
70
60
PPM

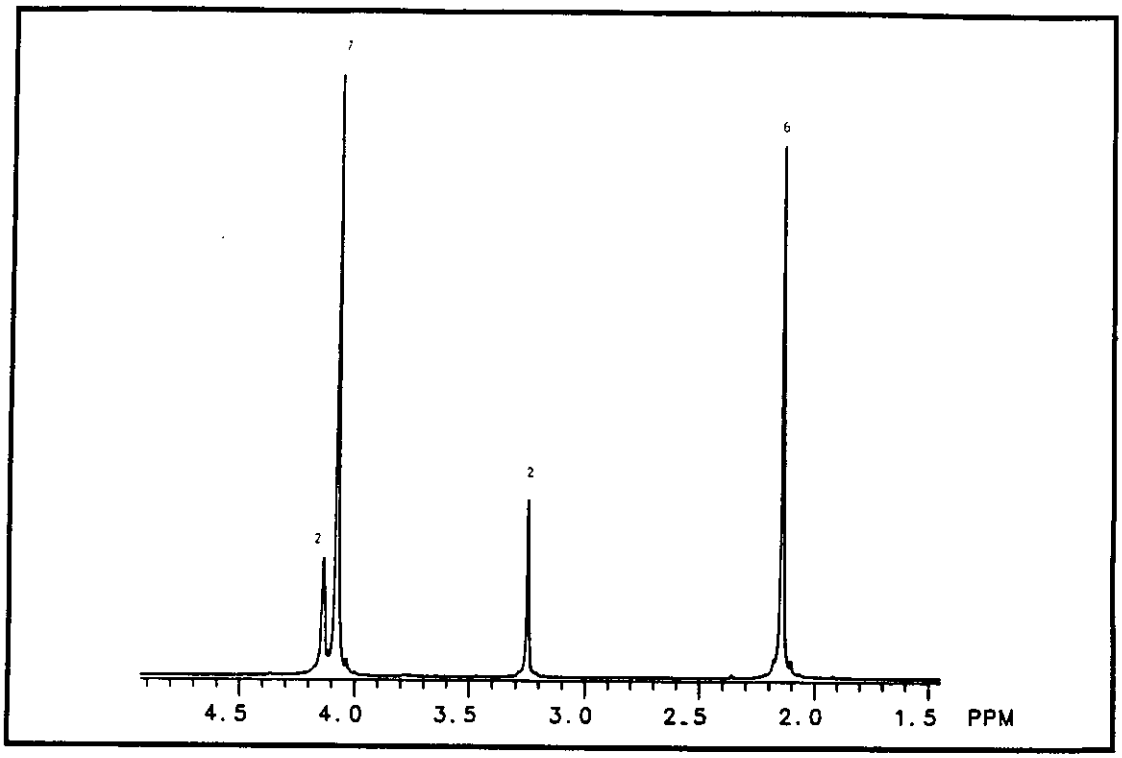
Problem 121

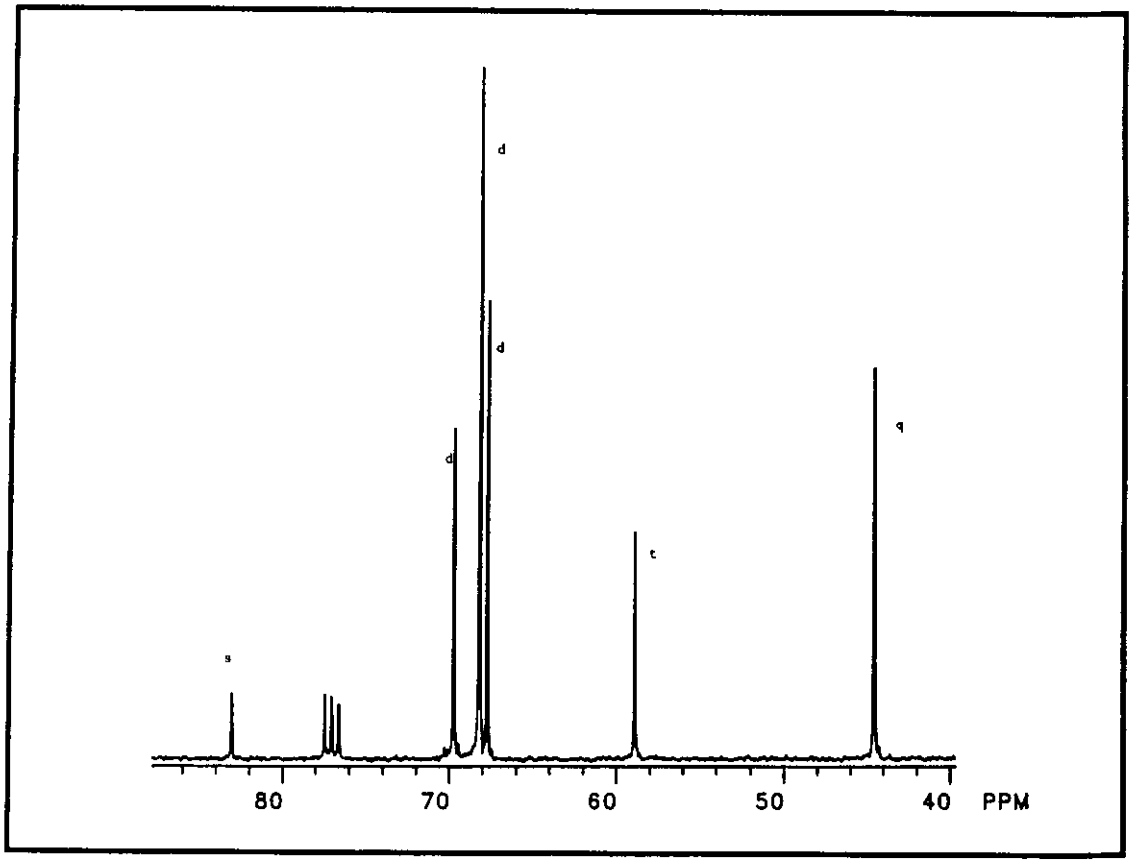
Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 64.5% C; 6.7% H; 23.1% Fe; 5.8% N

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
30	1.72	74	5.44	96	1.04	122	16.22	147	0.46	184	1.81
39	2.90	76	0.68	97	3.97	123	1.34	148	1.83	186	19.20
40	0.36	77	8.76	98	1.24	127	0.97	149	0.98	187	2.80
41	0.59	78	9.26	99	4.90	128	2.68	150	0.43	197	6.62
42	6.77	79	7.59	100	1.38	129	4.67	158	0.28	199	100.00
43	1.37	80	1.74	102	0.58	130	0.62	159	0.67	200	27.16
44	2.23	81	8.97	103	1.14	131	0.32	160	1.32	201	3.21
50	0.36	82	2.39	104	0.82	132	1.40	161	1.01	227	2.30
51	1.08	83	3.58	105	2.19	133	1.74	162	16.45	228	1.45
52	1.04	84	0.60	106	4.04	134	9.80	163	16.07	241	4.58
53	0.48	85	0.28	107	2.32	135	7.27	164	2.85	242	3.44
54	1.92	89	0.75	108	0.79	136	0.77	165	0.95	243	64.76
56	30.27	90	0.35	115	2.04	139	0.40	173	0.48	244	10.77
57	3.52	91	1.31	116	0.45	141	1.10	175	4.92	245	1.09
58	6.55	92	0.84	117	0.41	142	0.43	176	1.08	246	0.05
63	0.62	93	2.28	118	0.97	143	0.30	177	2.90		
65	1.08	94	8.94	119	6.66	145	0.27	178	2.86		
66	0.48	95	9.12	121	88.27	146	0.93	179	0.32		




7
6
2
2
4.5
4.0
3.5
3.0
2.5
2.0
1.5
PPM

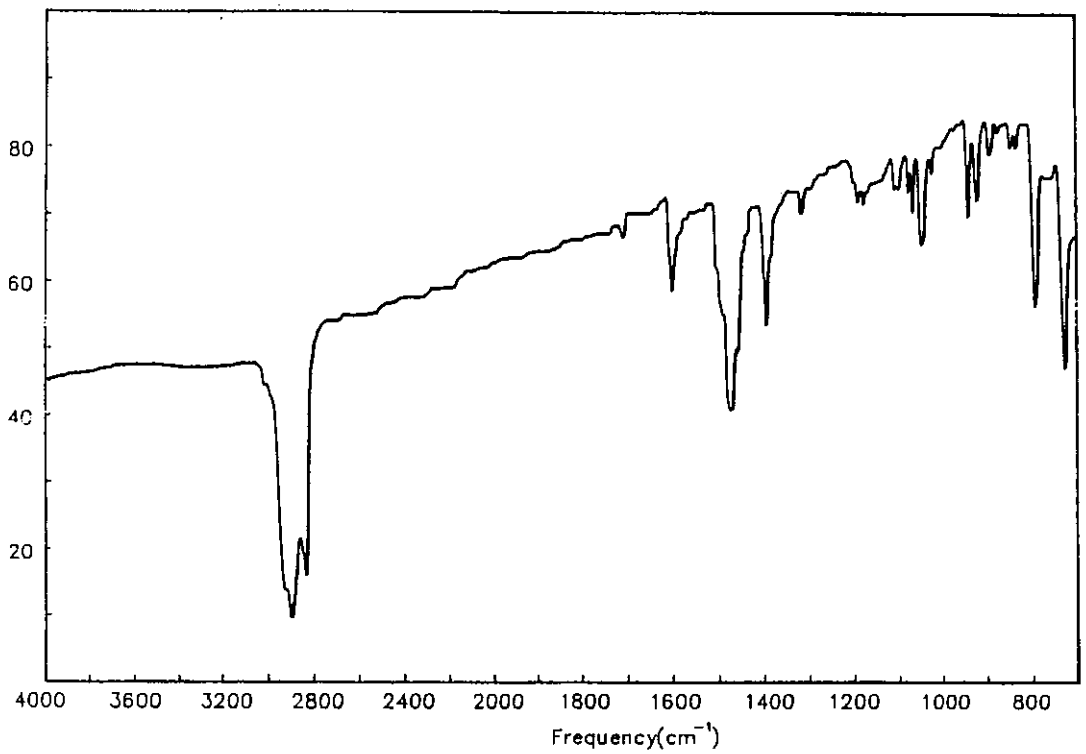

d
d
d
q
t
s
80
70
60
50
40
PPM

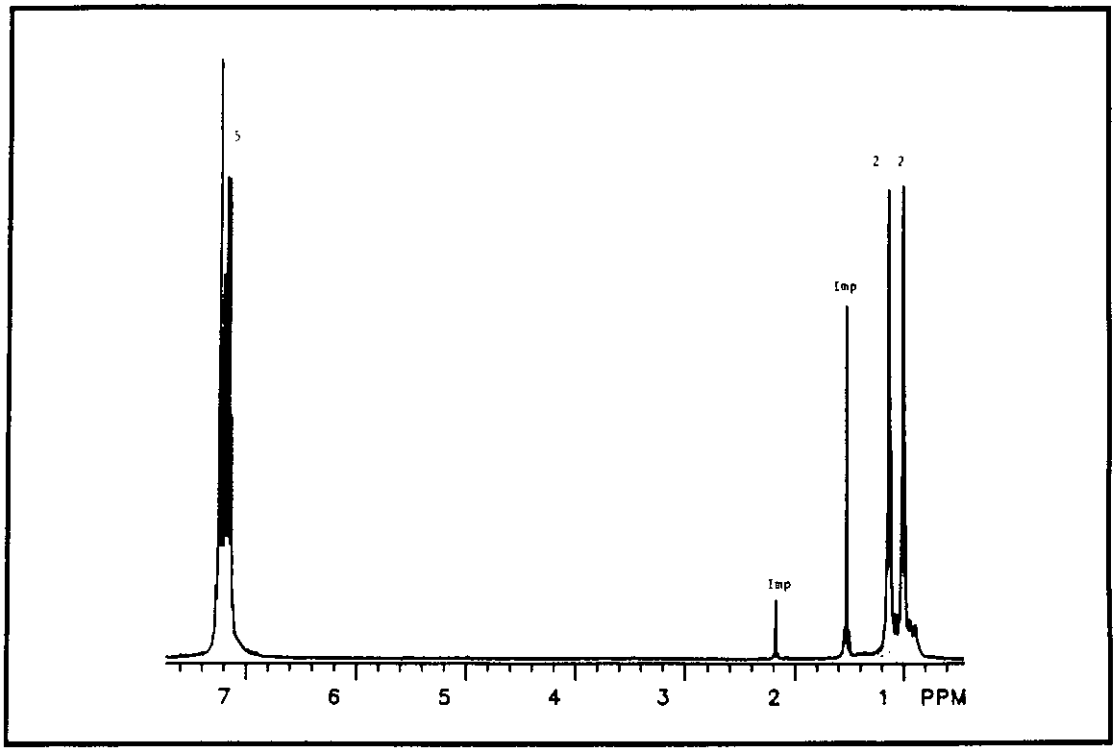
Problem 122

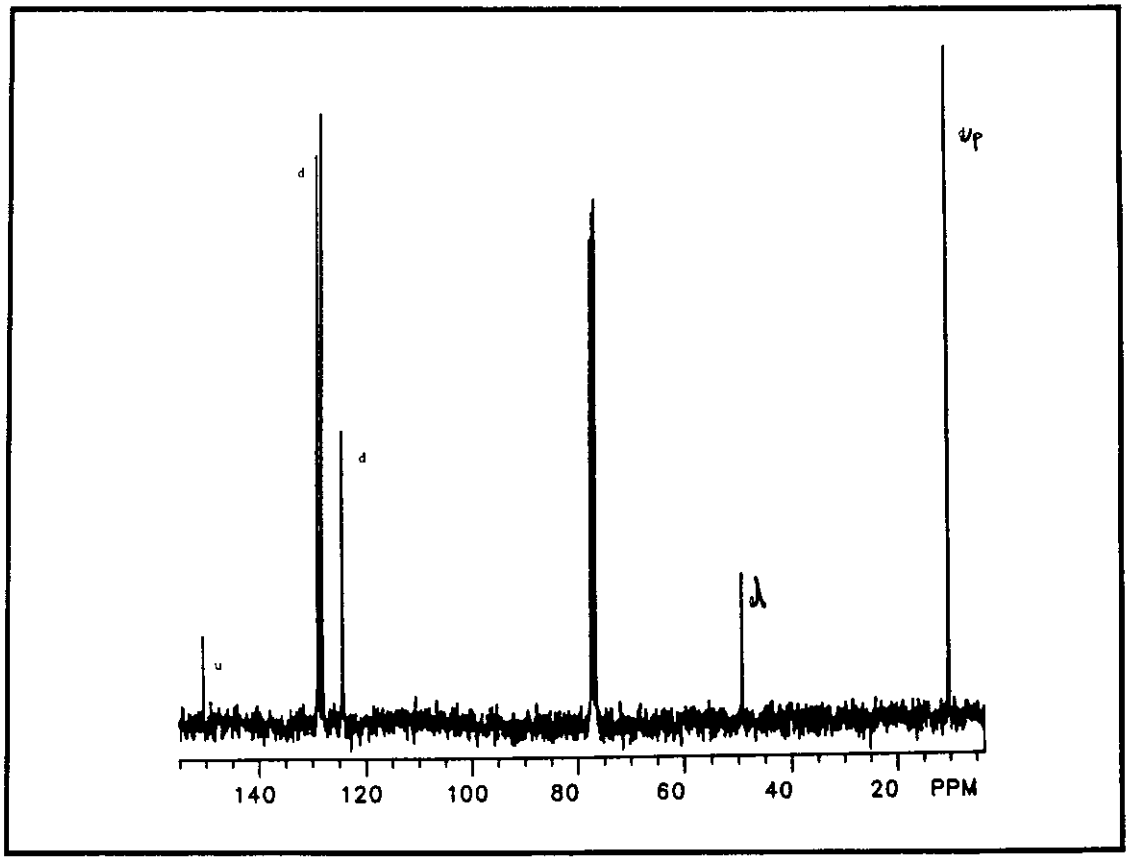
Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 50.2% C; 3.3% H; 46.6 % Hg

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
32	0.10	66	0.32	99	0.02	129	6.07	192	0.29	233	0.68
38	0.22	73	0.07	100	0.04	130	13.32	193	0.68	234	0.51
39	3.48	74	0.83	100	0.02	131	1.57	194	0.33	281	0.02
40	0.30	75	1.06	101	0.40	132	0.02	198	0.57	432	0.62
41	0.31	76	1.75	102	4.16	141	0.70	199	0.94	433	1.15
44	0.34	77	3.45	103	1.37	142	0.74	200	1.31	434	1.58
50	1.47	78	2.29	104	3.38	143	4.63	201	0.76	435	1.07
51	4.22	79	0.16	105	0.70	144	0.57	202	1.72	436	1.94
52	1.10	85	0.02	113	0.48	155	0.27	203	0.34	437	0.38
53	0.11	86	0.30	115	76.28	156	0.96	204	0.96		
57	0.19	87	0.65	116	17.60	157	0.31	205	3.14		
61	0.16	88	0.49	117	100.00	165	0.12	206	7.49		
62	1.26	89	5.52	118	10.39	178	0.42	207	1.91		
63	4.24	90	0.84	119	0.56	179	0.45	208	0.15		
64	0.75	91	27.61	127	0.18	190	0.05	219	3.33		
65	4.57	92	2.13	128	1.30	191	0.80	220	0.58		




5
2
2
Imp
Imp
7
6
5
4
3
2
1
PPM


d
d
u
140
120
100
80
60
40
20
PPM

Problem 123

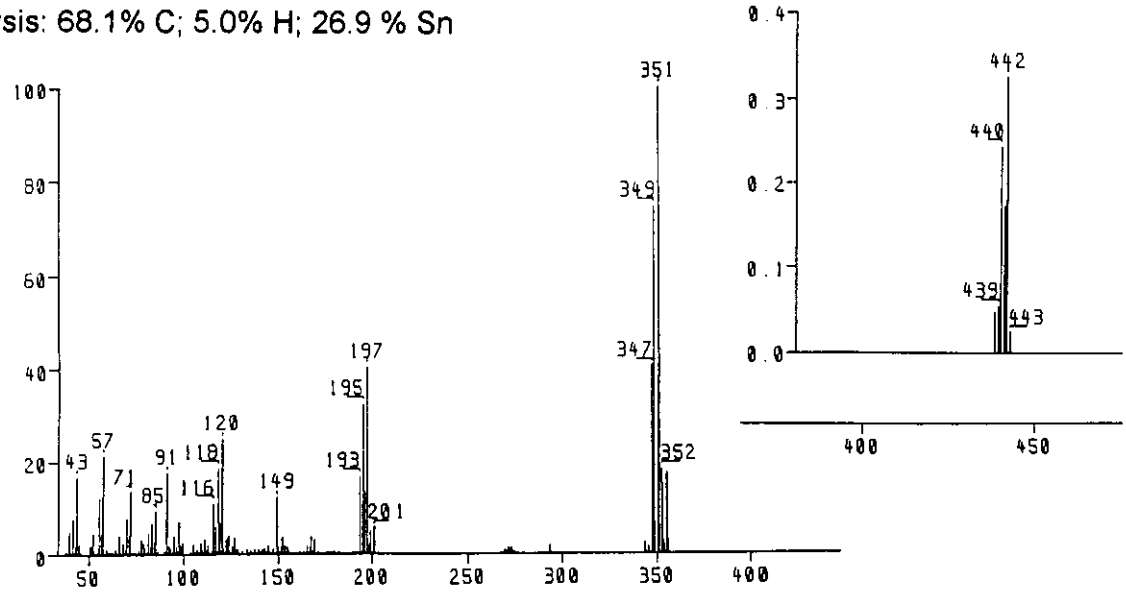
Exact Mass: na

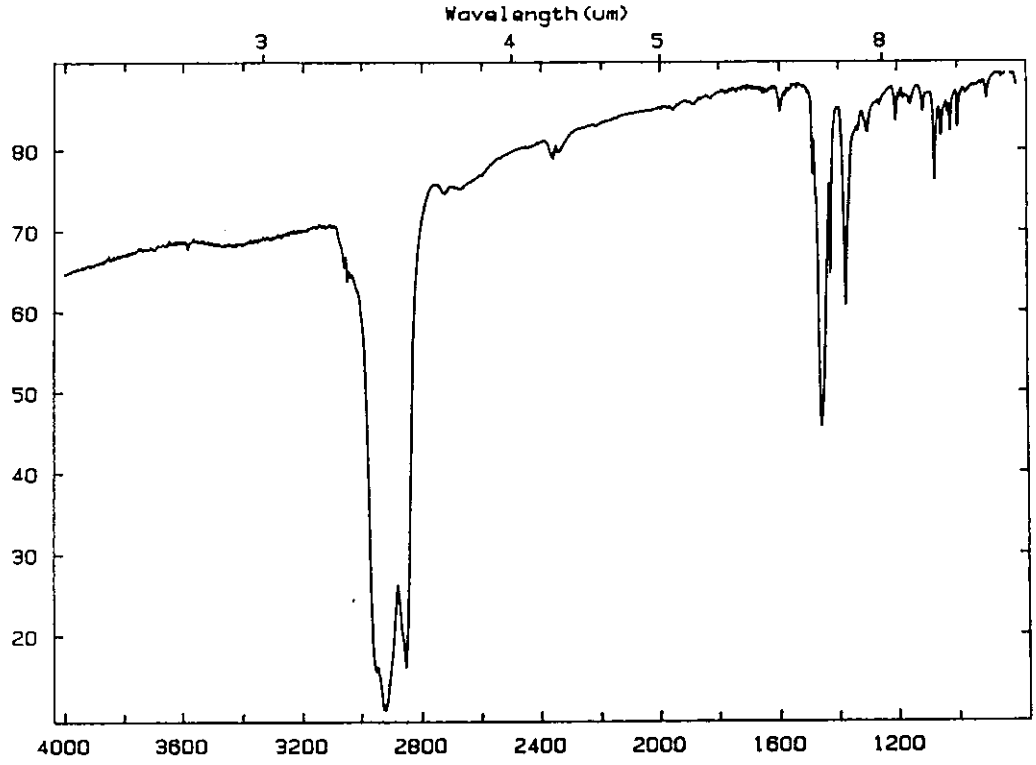
IR: nujol

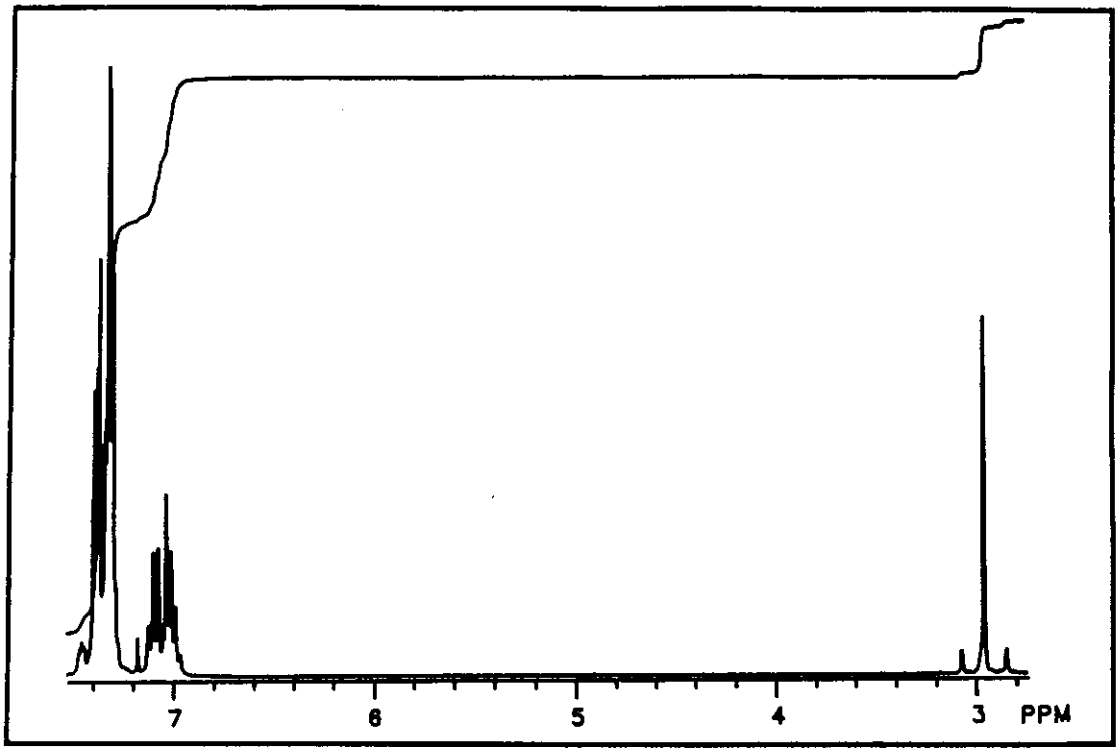
^{1}H NMR: $CDCl_3$

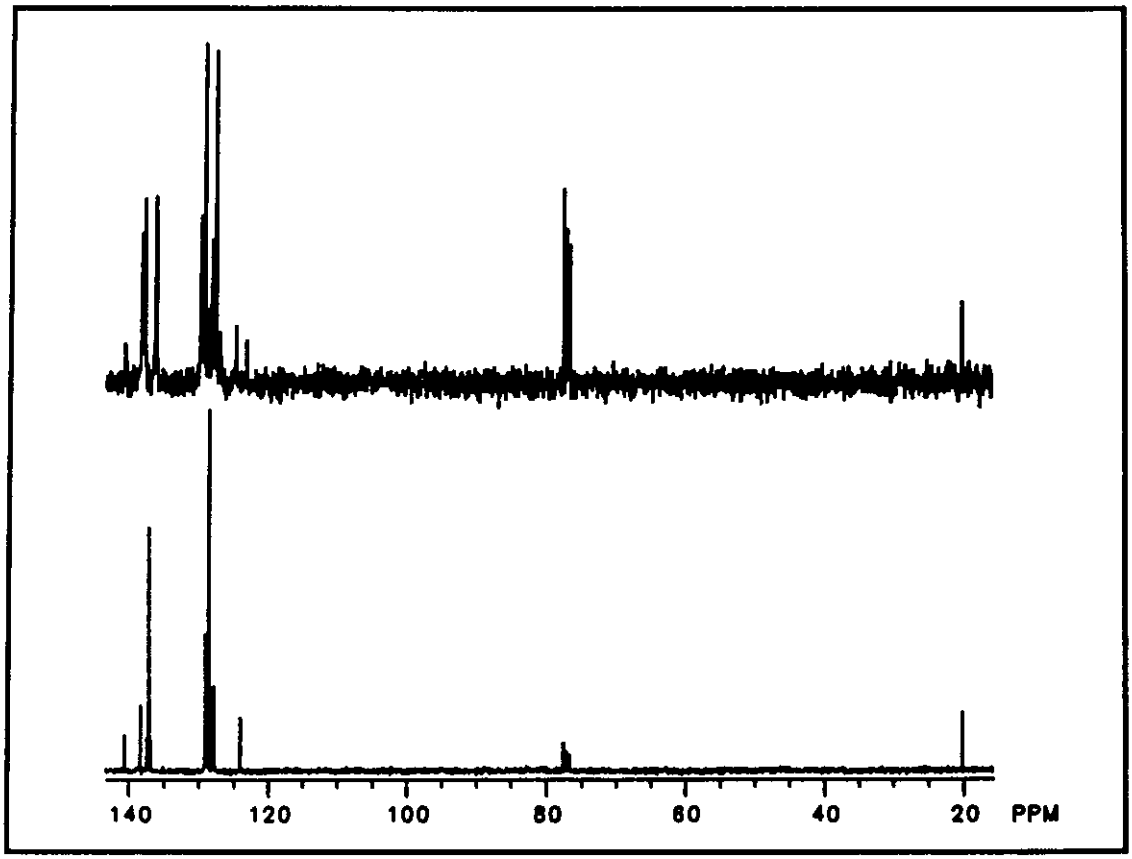
^{13}C NMR: $CDCl_3$

Analysis: 68.1% C; 5.0% H; 26.9 % Sn



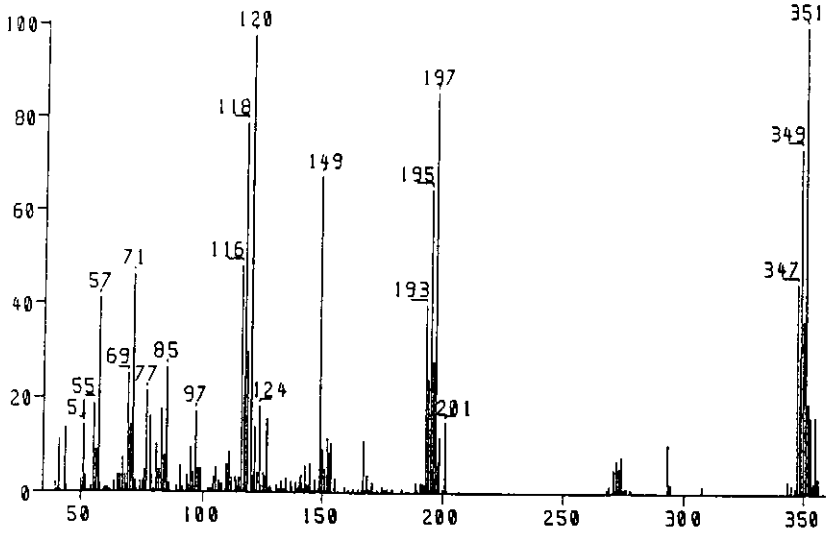


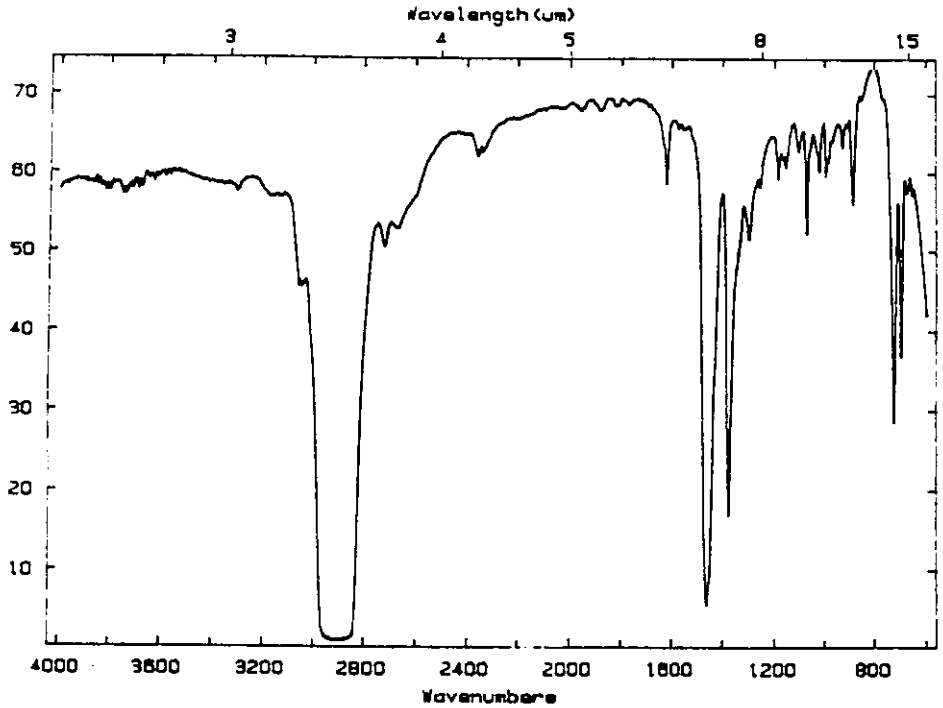

7
6
5
4
3
PPM

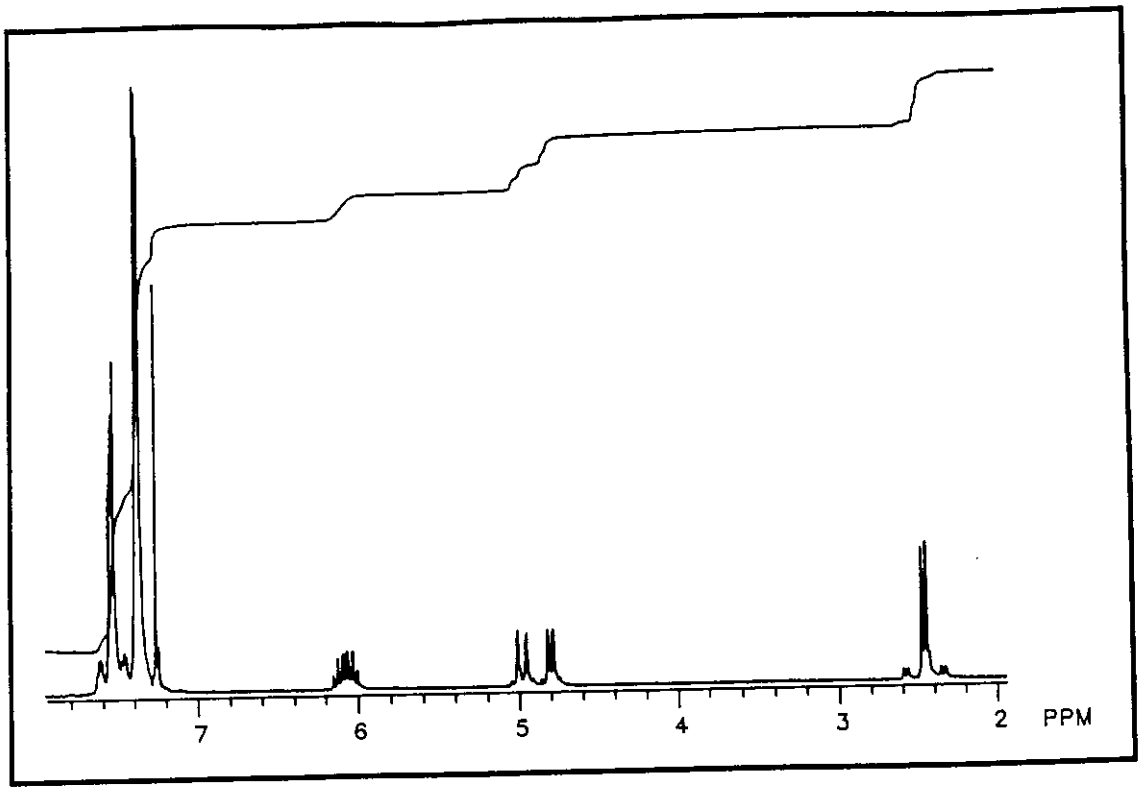

140
120
100
80
60
40
20
PPM

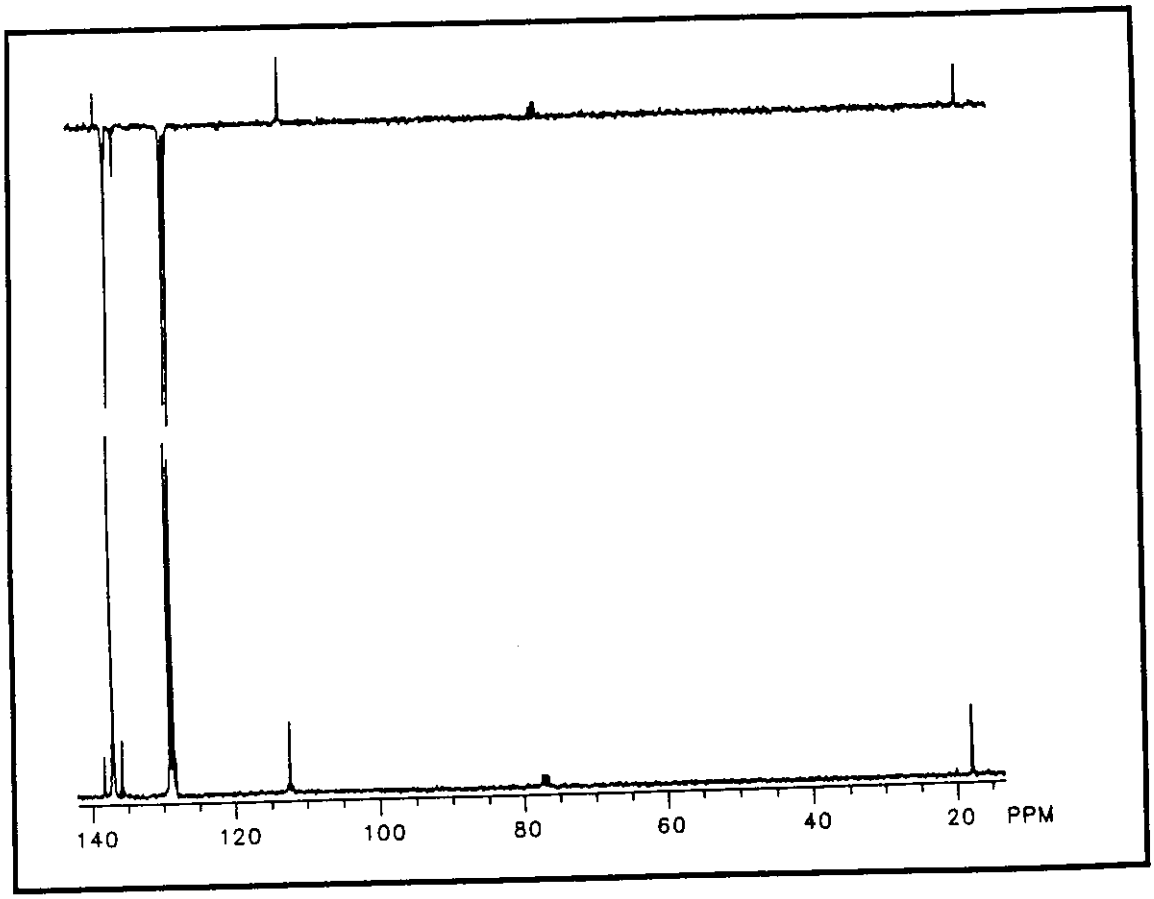
Problem 124

Exact Mass: 391.08
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 64.3% C; 5.1% H; 30.6 % Sn
Other: Mass Spectra parent peak is not observed






7
6
5
4
3
2
PPM

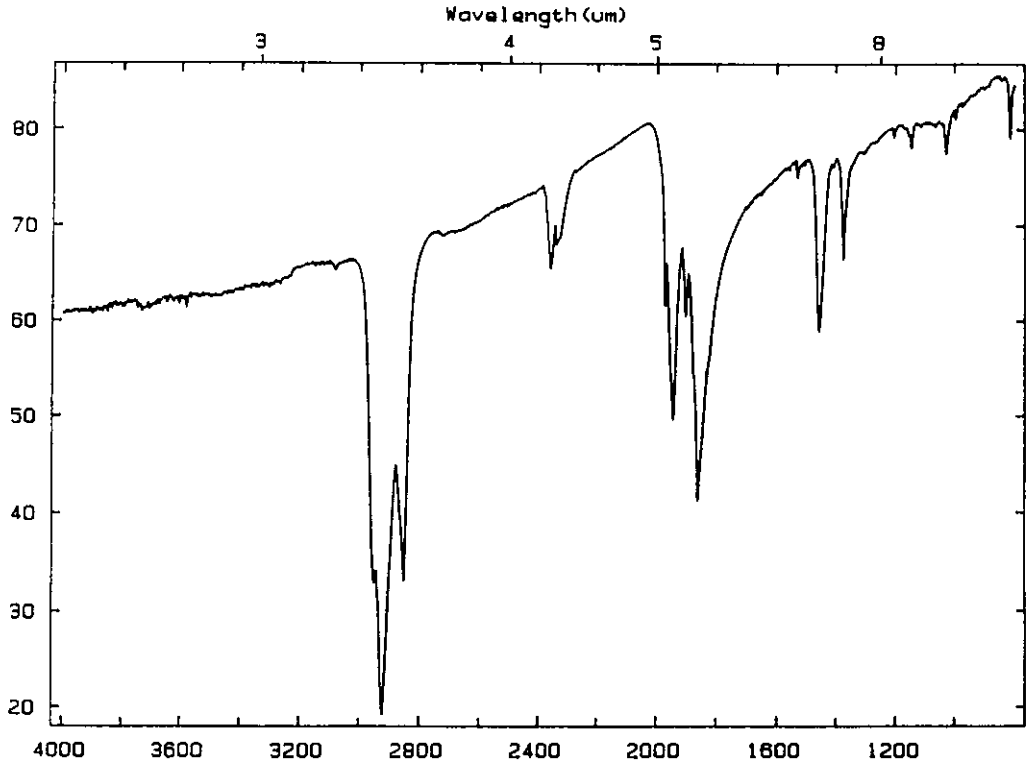

140
120
100
80
60
40
20
PPM

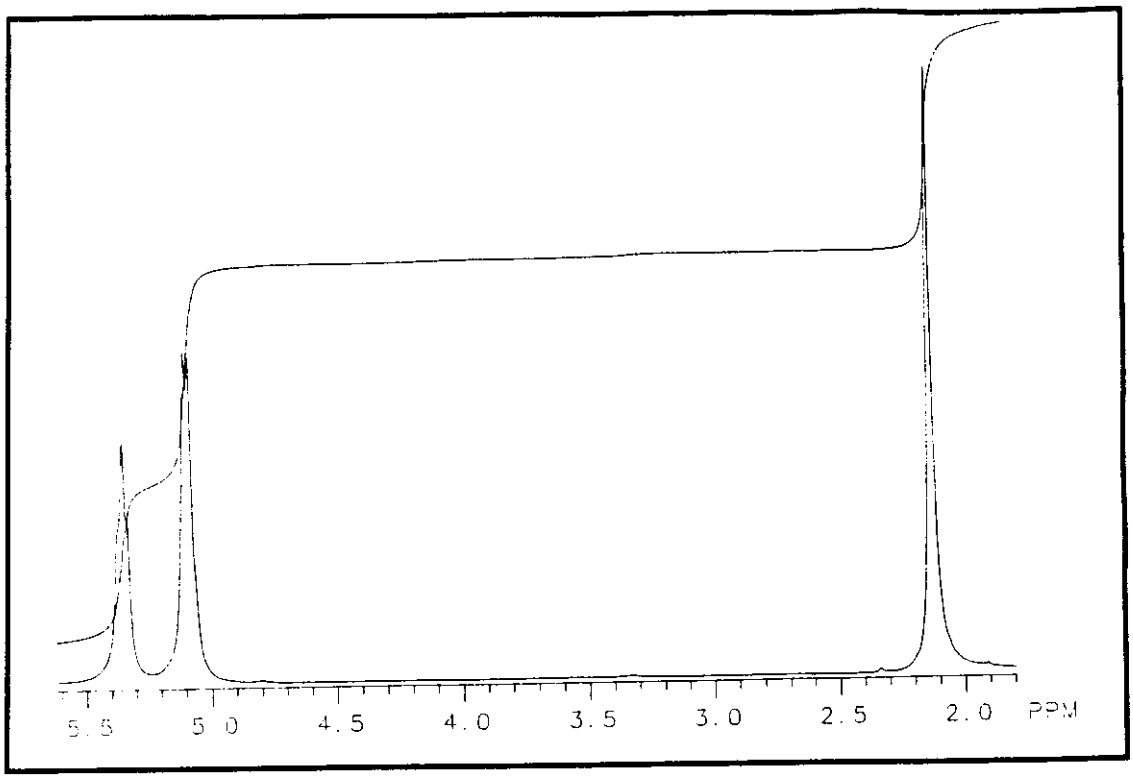
Problem 125

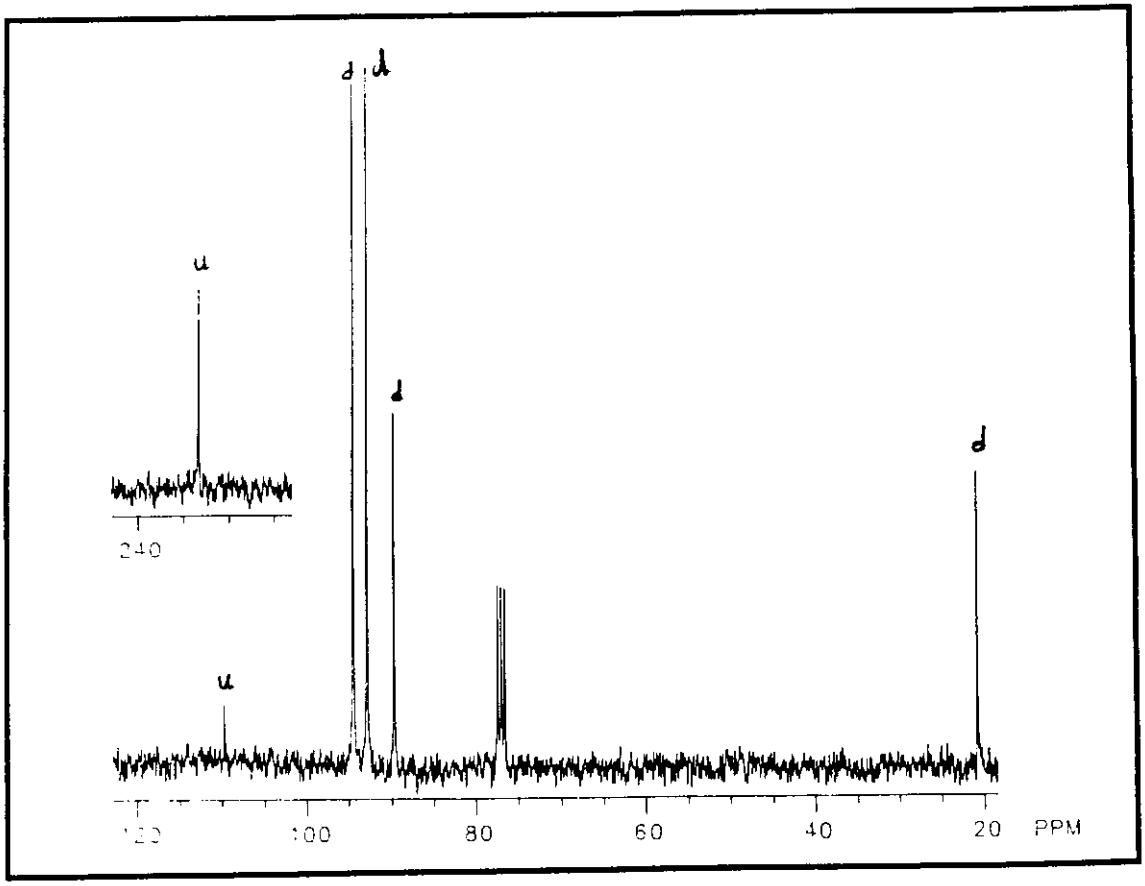
Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 53.0% C; 3.1% H; 23.0 % Cr

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
38	0.73	64	1.34	80	8.83	102	0.33	145	17.41	201	0.47
39	3.20	65	4.00	81	1.28	103	1.02	146	3.54	207	6.25
40	0.81	66	1.09	82	0.35	104	0.29	147	0.39	208	1.35
41	0.47	67	0.29	86	0.50	108	0.59	170	0.59	209	0.88
50	6.12	72	0.65	88	0.27	115	0.37	171	1.13	226	2.86
51	2.48	73	0.29	89	1.91	116	0.44	172	7.56	228	53.47
52	100.00	74	0.38	90	2.96	117	0.28	173	1.65	229	12.17
53	13.27	75	0.55	91	10.28	133	0.46	174	0.40	230	2.76
54	3.28	76	0.43	92	4.95	141	0.26	177	0.34	231	0.31
61	0.51	77	6.10	93	0.43	142	4.60	191	0.64		
62	1.04	78	1.91	100	0.30	143	3.44	193	0.34		
63	2.39	79	0.54	101	0.91	144	88.51	200	2.08		




5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
PPM


d
d
u
d
d
240
u
100
80
60
40
20
PPM

Problem 126

Exact Mass: na

IR: neat

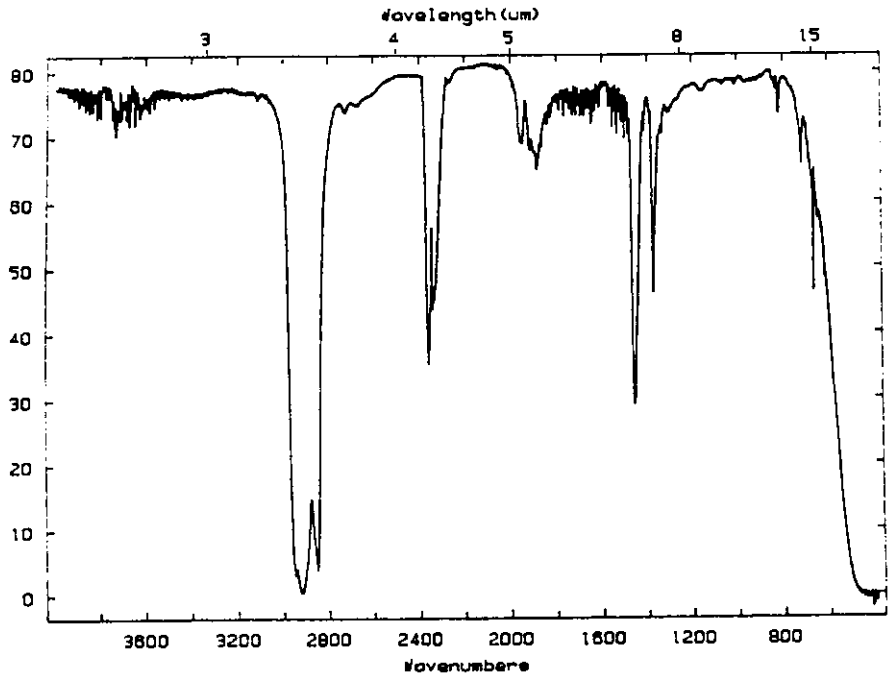
^{1}H NMR: $CDCl_3$

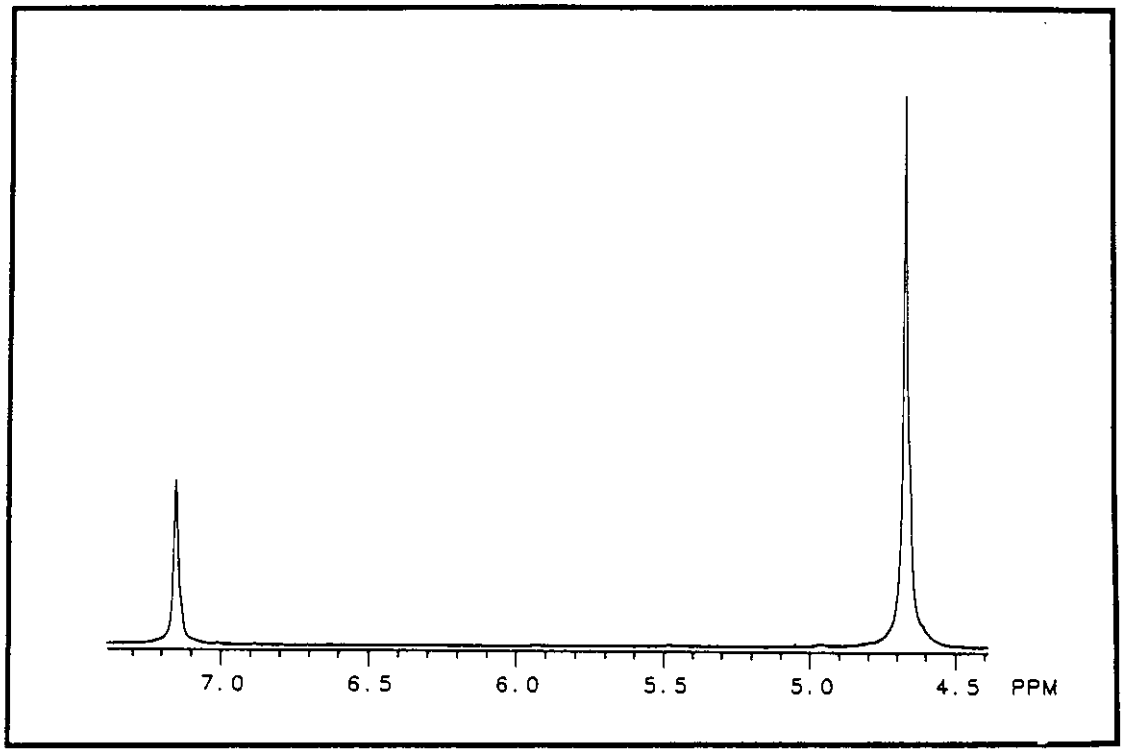
^{13}C NMR: $CDCl_3$

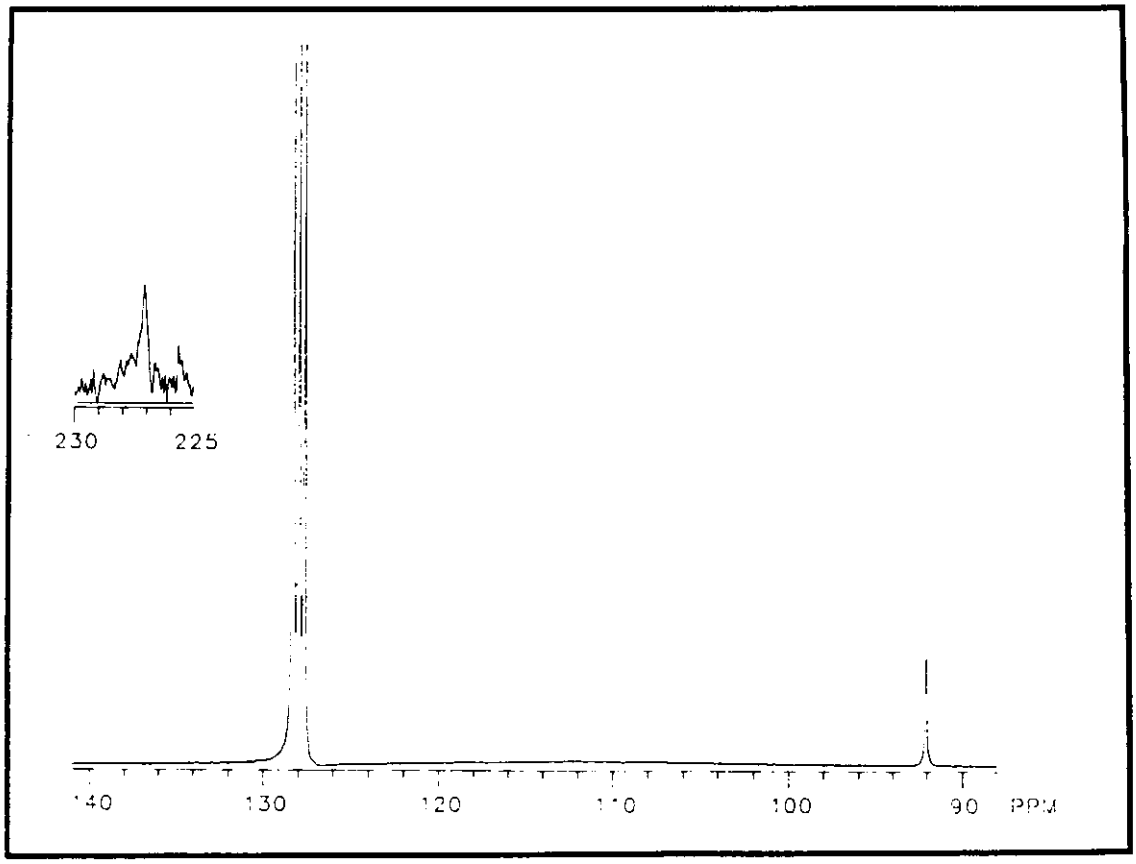
Analysis: na

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
28	100.00	162	8.30	241	6.33	317	20.12	376	13.34	468	2.96
32	8.57	163	12.85	243	5.75	318	25.85	377	8.88	487	1.17
39	15.58	165	5.61	244	6.89	319	29.36	378	19.55	488	1.49
40	8.18	189	5.41	245	6.60	320	32.38	379	13.01	489	1.06
65	7.25	190	6.20	247	5.45	321	28.84	380	13.38	490	2.05
66	66.61	191	7.85	266	7.83	322	35.39	381	12.69	491	3.06
67	9.26	193	7.40	267	5.12	323	28.76	382	13.00	492	1.40
84	13.23	194	5.36	268	6.81	324	35.01	431	5.77	493	1.86
86	9.23	213	8.05	269	5.00	325	25.13	433	10.32	494	1.07
132	6.00	215	10.36	270	6.92	326	14.95	434	7.38	495	2.46
133	6.66	216	9.28	293	5.33	327	7.70	435	9.95	496	2.72
157	7.98	217	17.28	296	6.18	328	10.76	437	9.51	497	1.11
159	5.96	218	8.78	297	5.04	373	5.94	438	6.10	498	1.53
160	8.96	219	21.50	314	10.00	374	8.40	439	5.08		
161	14.44	221	8.75	316	8.32	375	6.17	467	2.25		




7.0
6.5
6.0
5.5
5.0
4.5
PPM


230
225
140
130
120
110
100
90
PPM

Problem 127

Exact Mass: na

IR: neat

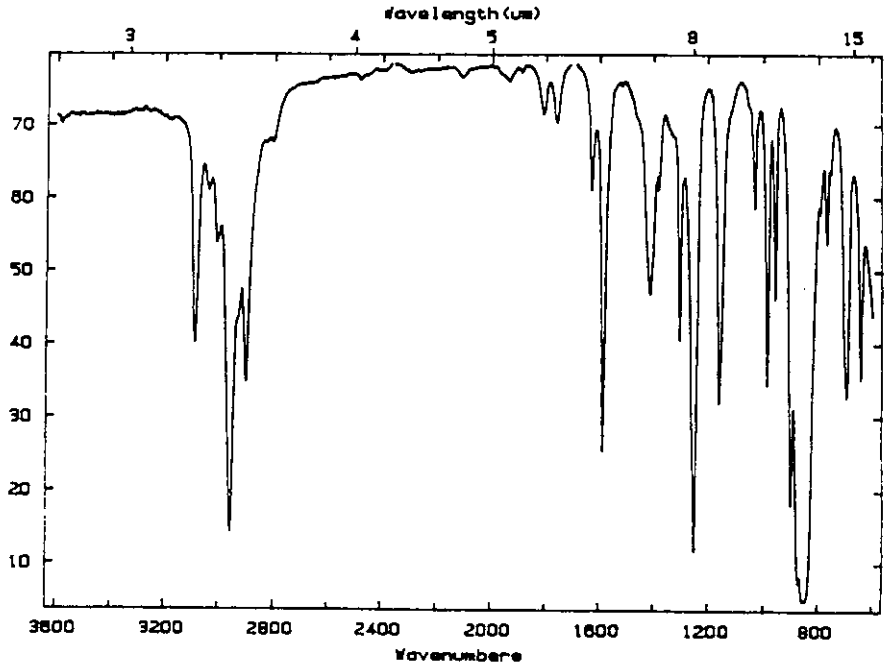
^{1}H NMR: $CDCl_3$

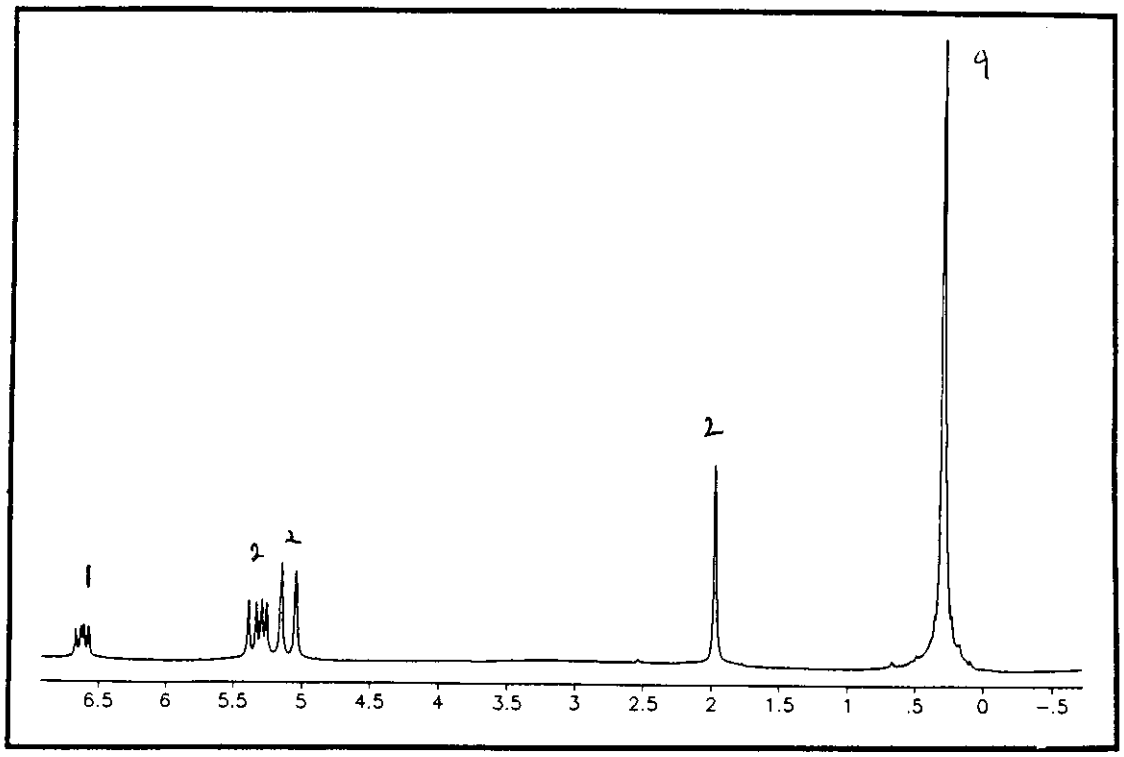
^{13}C NMR: $CDCl_3$

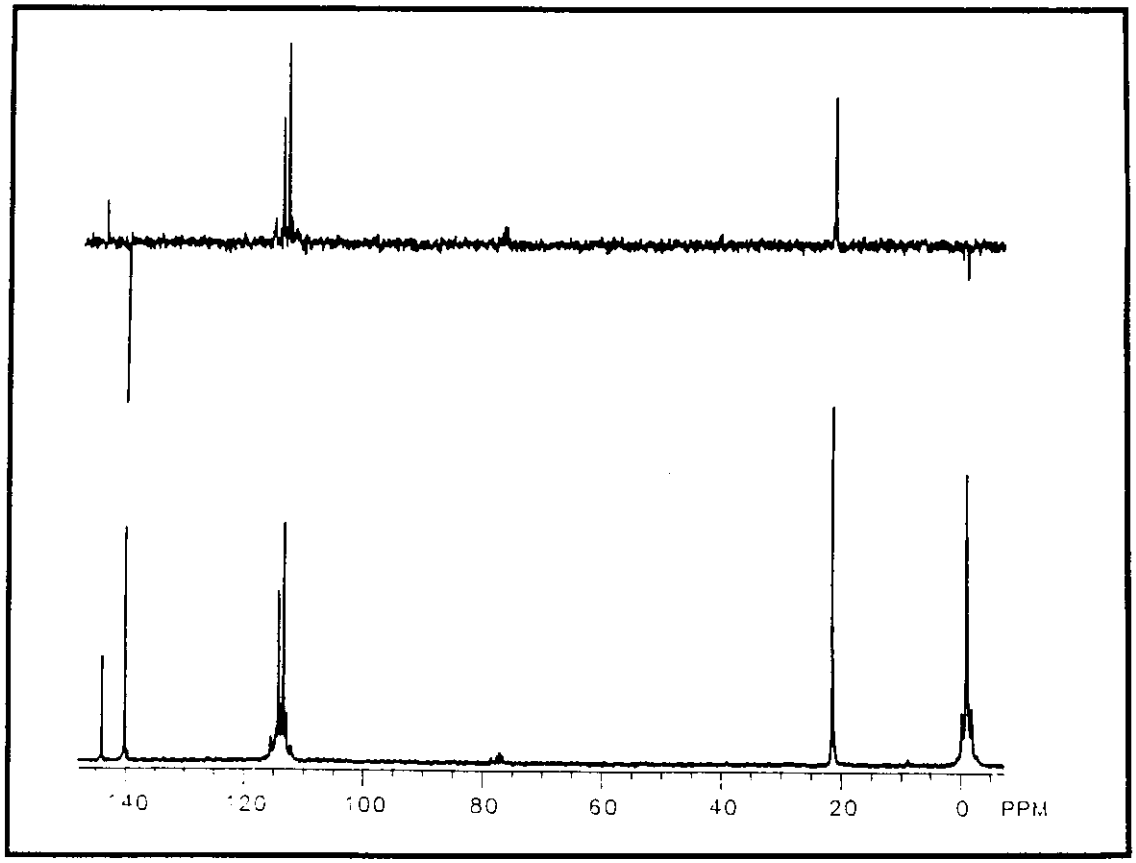
Analysis: 66.6 % C; 11.2 % H; 22.4 % Si

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
30	0.33	45	14.70	56	0.55	68	0.50	85	3.07	112	0.81
31	2.58	46	1.01	57	1.92	69	2.34	86	0.31	123	0.64
38	0.47	47	0.49	58	2.33	70	0.81	93	0.50	125	8.24
39	4.77	50	0.42	59	14.83	71	1.87	95	1.34	126	1.09
40	0.77	51	0.81	60	1.16	73	100.00	96	0.33	127	0.34
41	3.48	52	0.51	61	0.57	74	9.93	97	9.33	140	10.46
42	1.74	53	3.11	65	0.99	75	4.18	98	5.96	141	1.46
43	13.40	54	0.75	66	1.17	81	1.13	99	1.69	142	0.43
44	4.05	55	3.86	67	2.63	83	2.23	109	1.93	143	0.04




9
2
2
2
1
6.5
6
5.5
5
4.5
4
3.5
3
2.5
2
1.5
1
.5
0
-.5

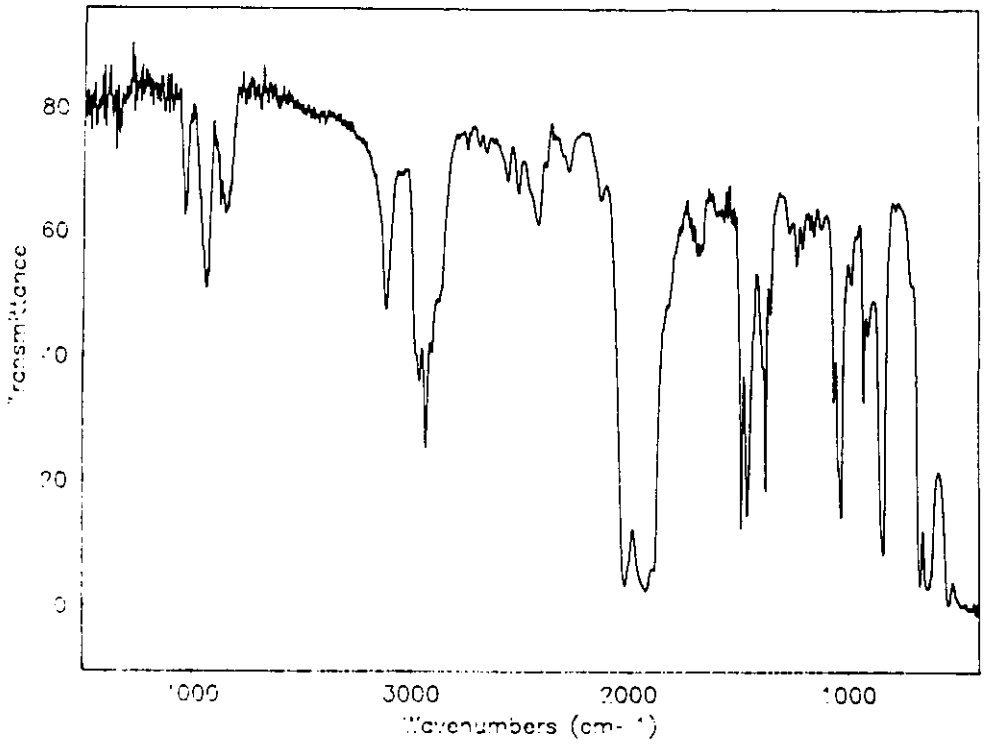

140
120
100
80
60
40
20
0
PPM

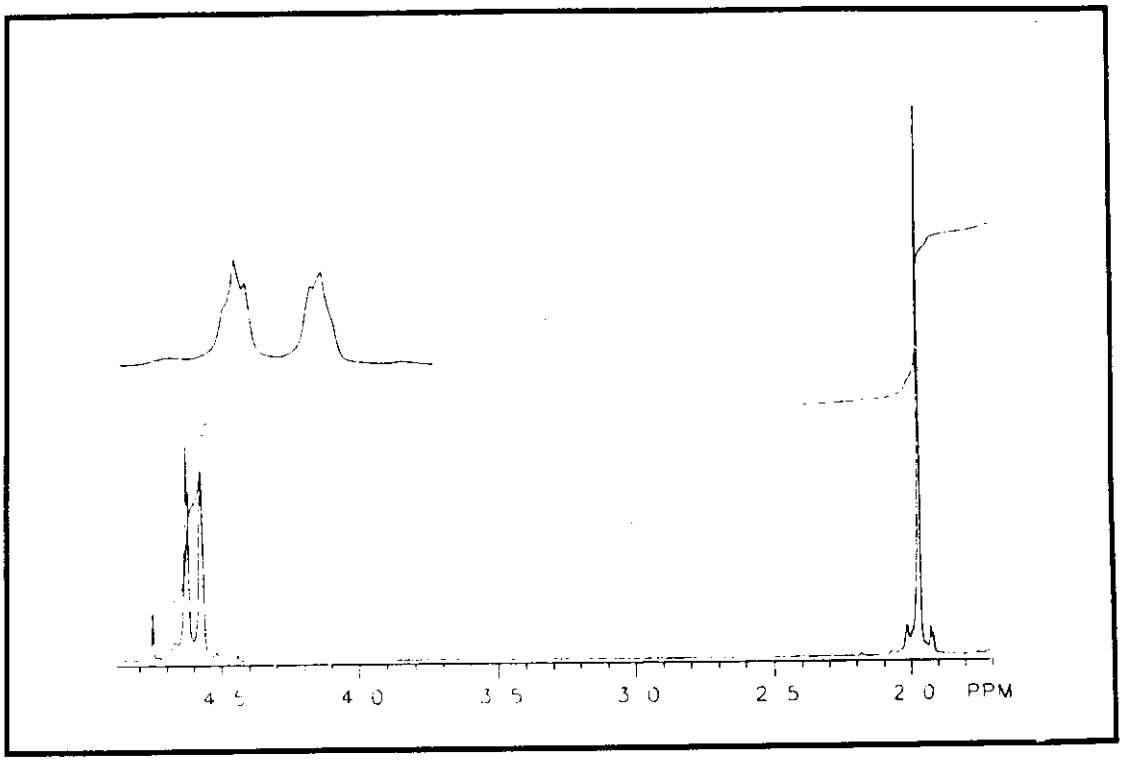
Problem 128

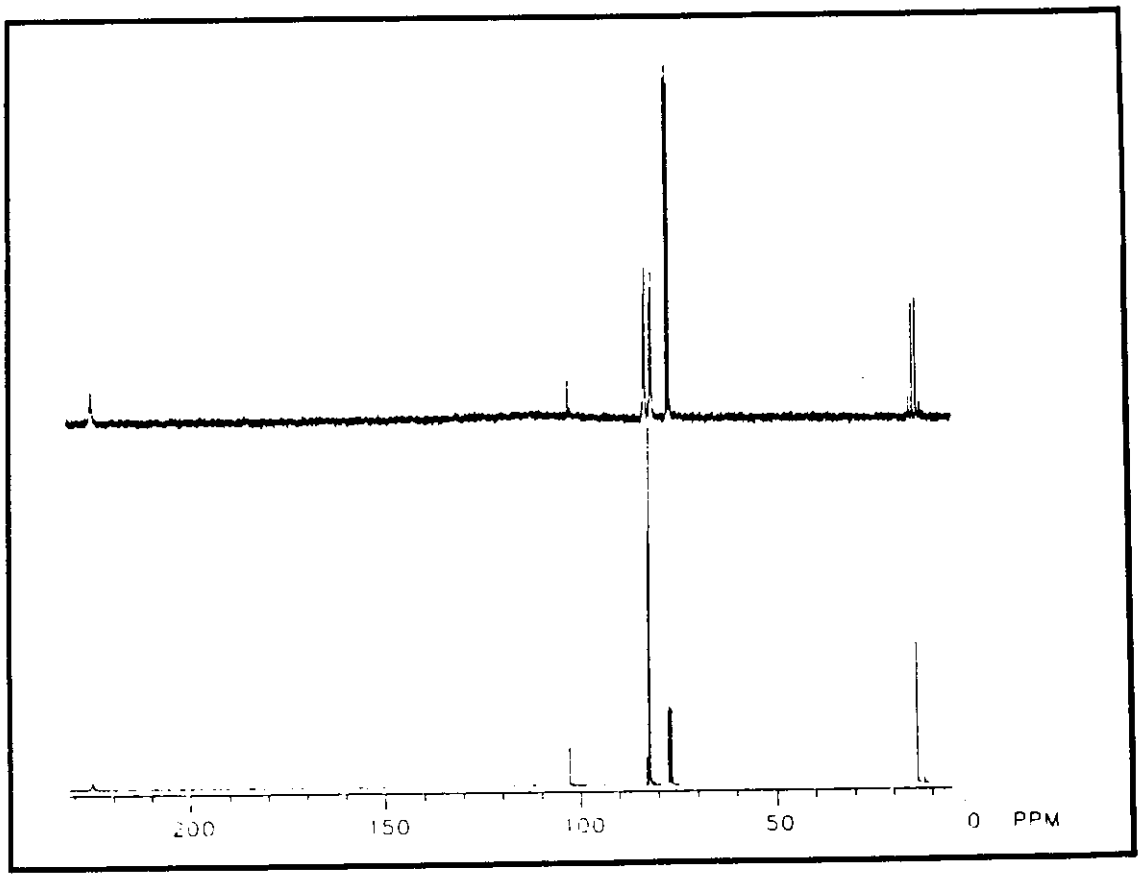
Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 49.6 % C; 3.2 % H; 25.2 % Mn

Mass Spectral Data

m/e		m/e		m/e		m/e		m/e	
32	0.45	56	15.07	80	8.84	95	0.46	190	2.00
39	1.20	67	1.30	81	1.76	104	0.82	218	27.23
50	0.98	68	0.97	82	0.58	106	0.58	219	2.87
51	1.63	69	0.60	83	0.92	134	100.00		
52	1.13	77	8.51	92	0.74	135	6.57		
53	1.05	78	2.55	93	2.21	162	24.76		
55	41.12	79	23.20	94	0.69	163	1.79		




4 5
4 0
3 5
3 0
2 5
2 0
PPM

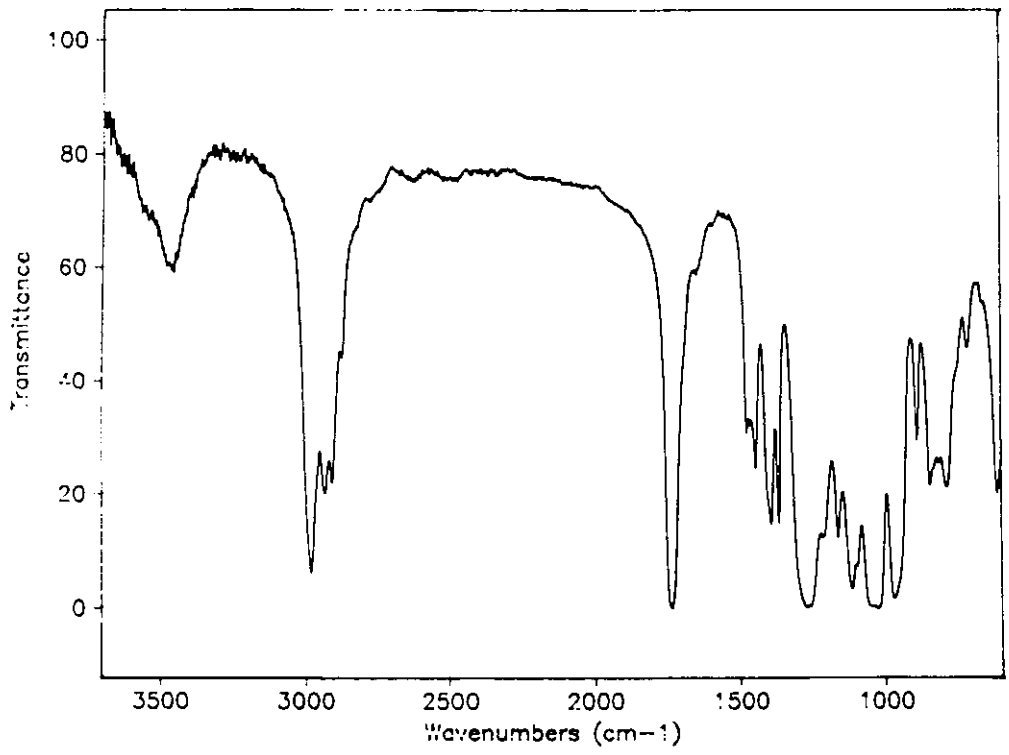

200
150
100
50
0
PPM

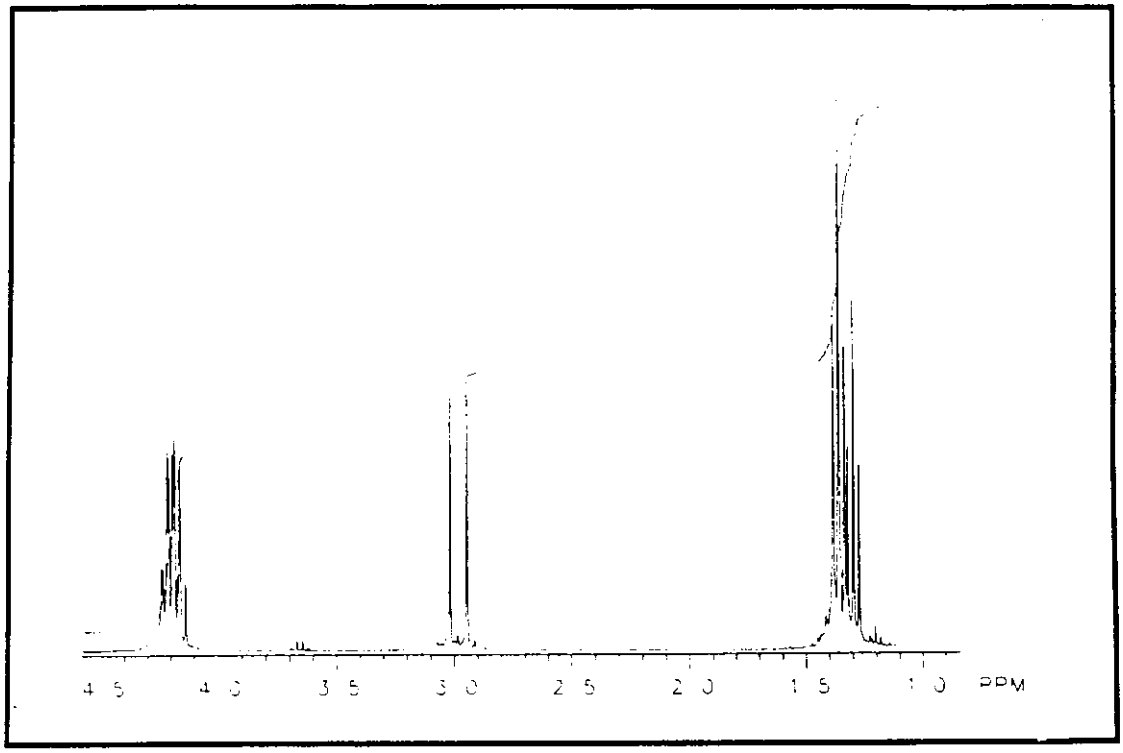
Problem 129

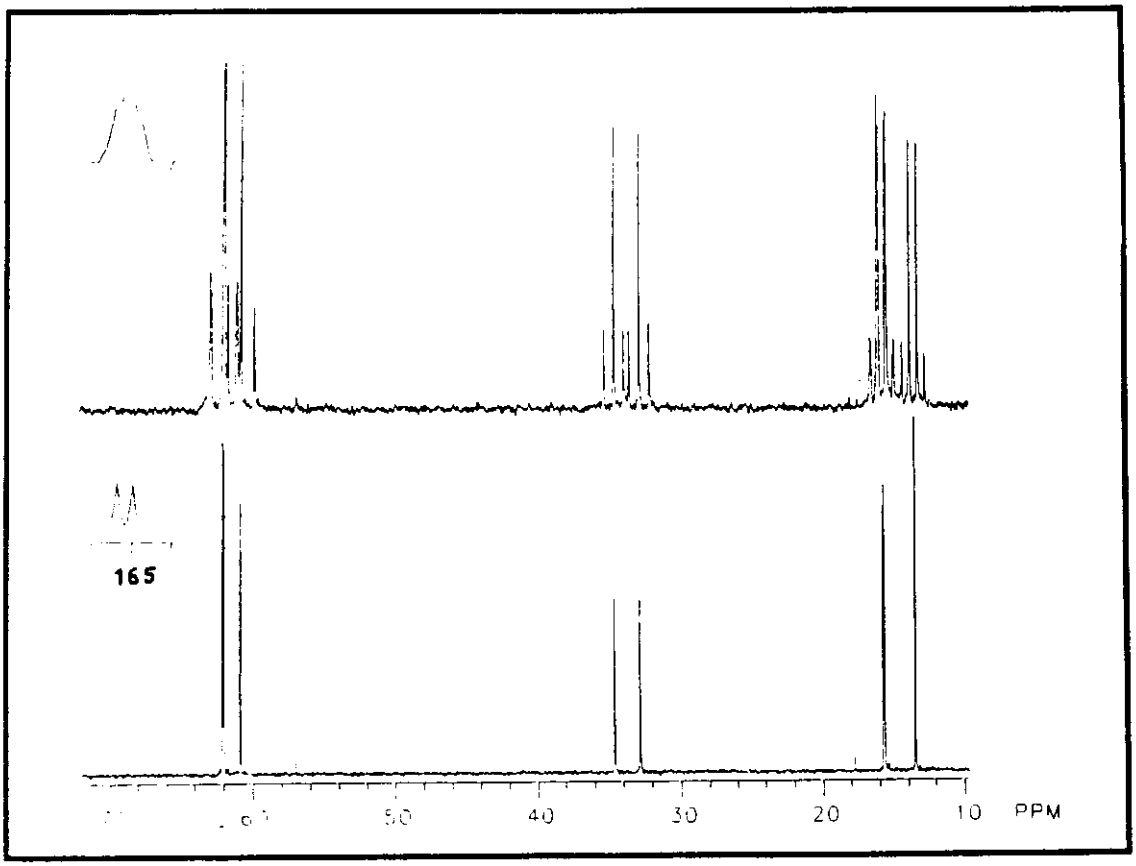
Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 42.8 % C; 7.7 % H; 13.8 % P

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z	
30	2.19	59	2.58	83	0.96	107	1.63	135	1.10	170	1.24
31	11.45	60	6.78	88	29.27	108	5.77	136	1.22	179	55.53
41	2.12	61	6.33	89	1.79	109	40.22	137	10.43	180	9.53
42	29.36	65	20.85	91	9.79	110	1.46	138	0.99	181	1.03
43	15.87	70	4.78	93	3.66	111	1.33	141	8.08	197	57.58
44	1.59	77	1.47	95	4.70	121	2.41	149	2.00	198	3.97
45	13.14	78	11.89	96	10.56	122	9.83	151	55.29	224	2.51
47	8.69	79	3.88	97	17.21	123	100.00	152	43.71	225	2.90
48	3.27	80	5.97	99	10.45	124	6.13	153	3.11	226	0.25
49	1.68	81	37.98	105	21.19	125	20.09	155	2.90		
55	1.17	82	2.01	106	5.90	127	5.10	169	25.89		

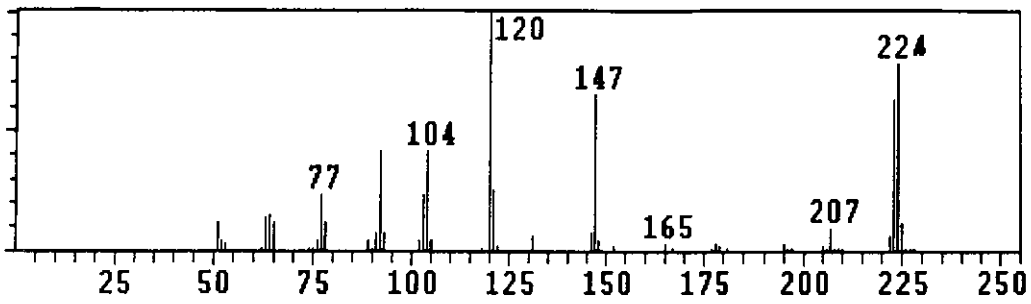


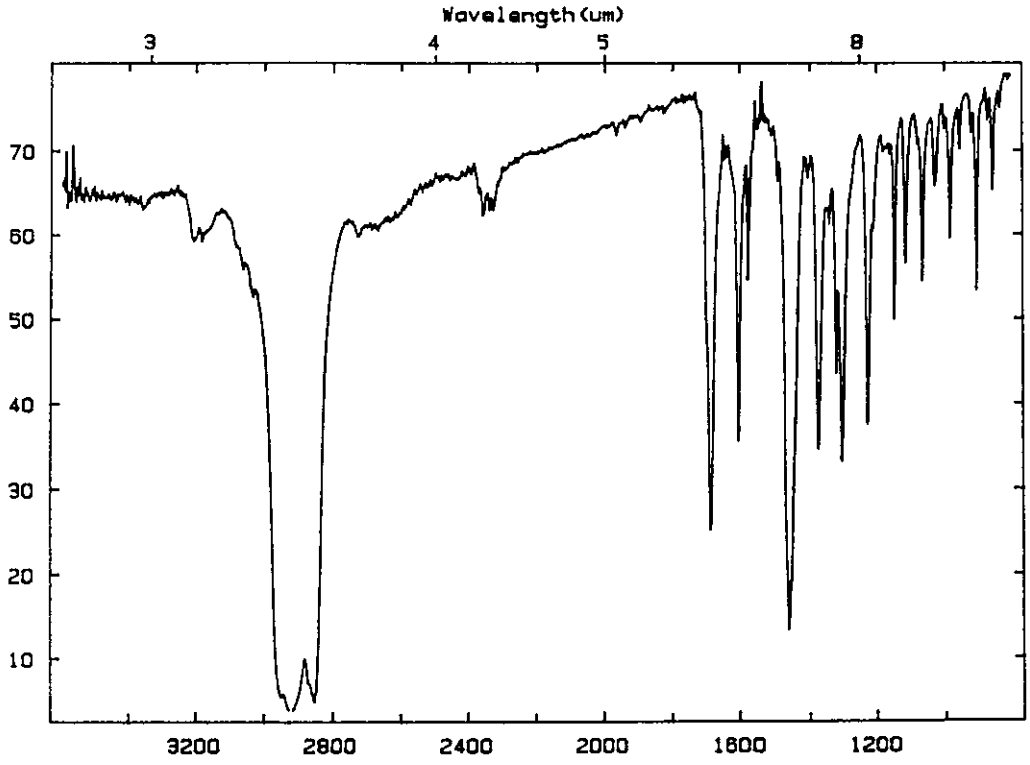

4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
PPM

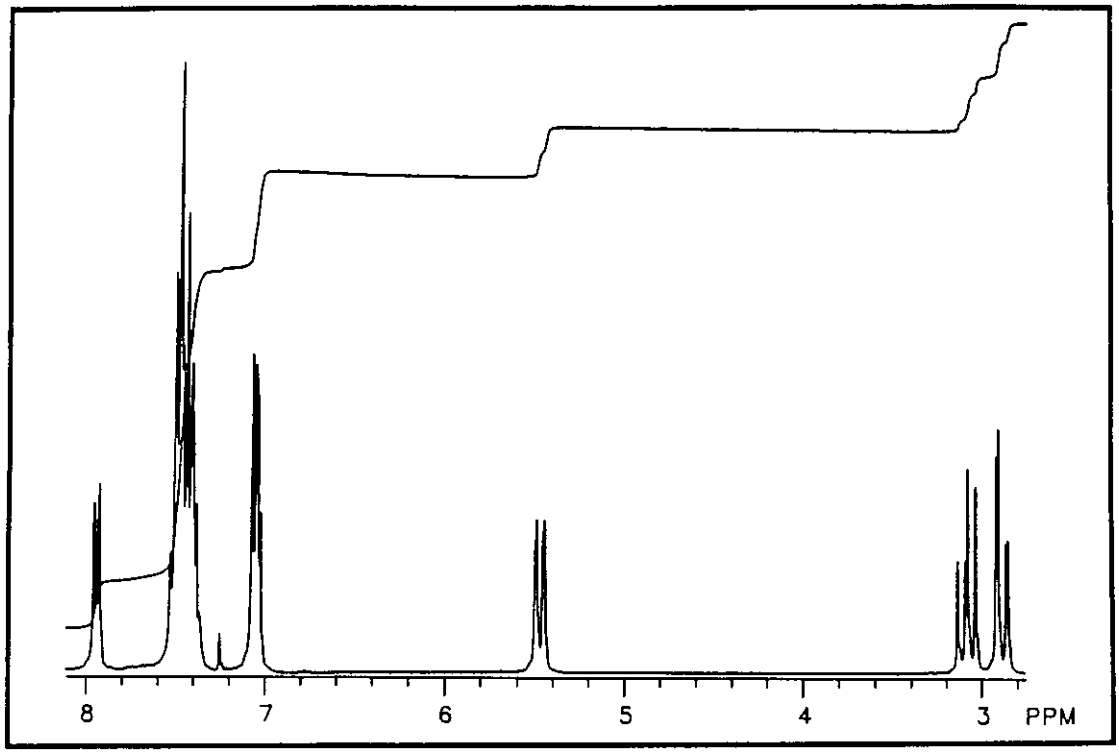

165
50
40
30
20
10
PPM

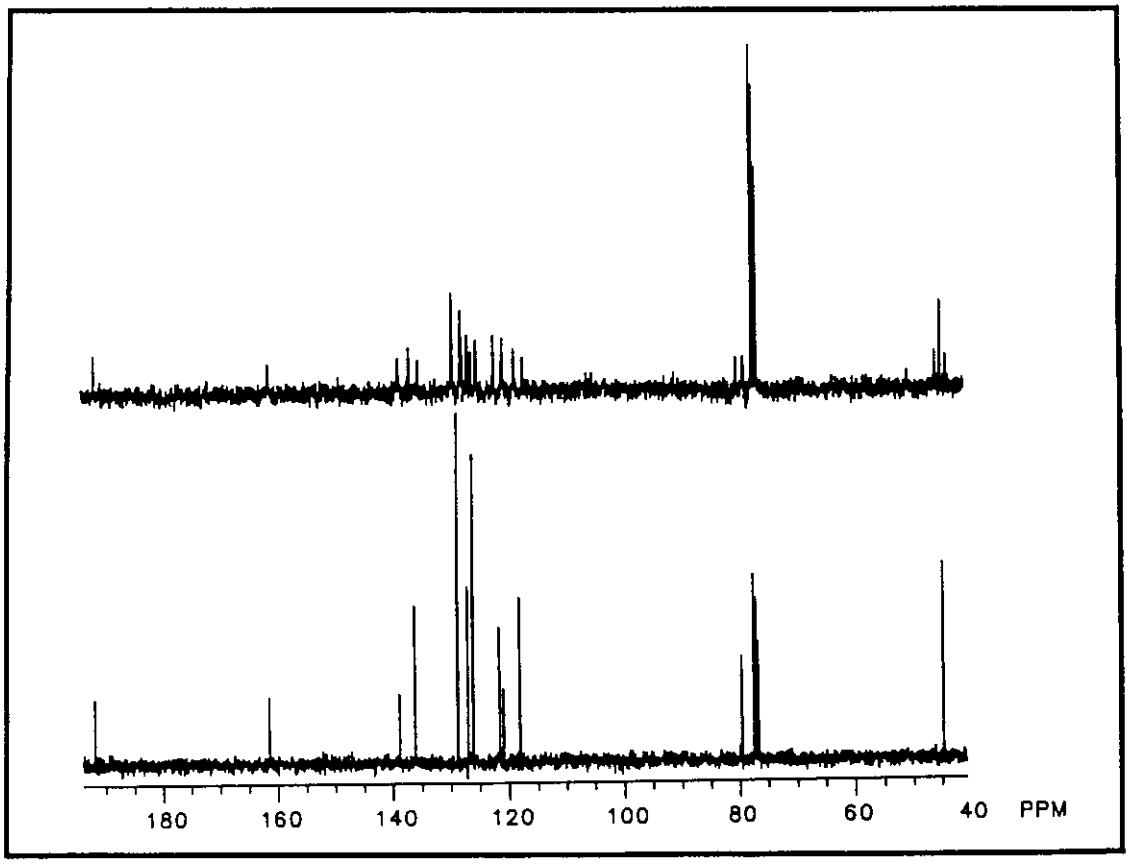
Problem 130

Exact Mass: na
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 80.3% C; 5.4% H





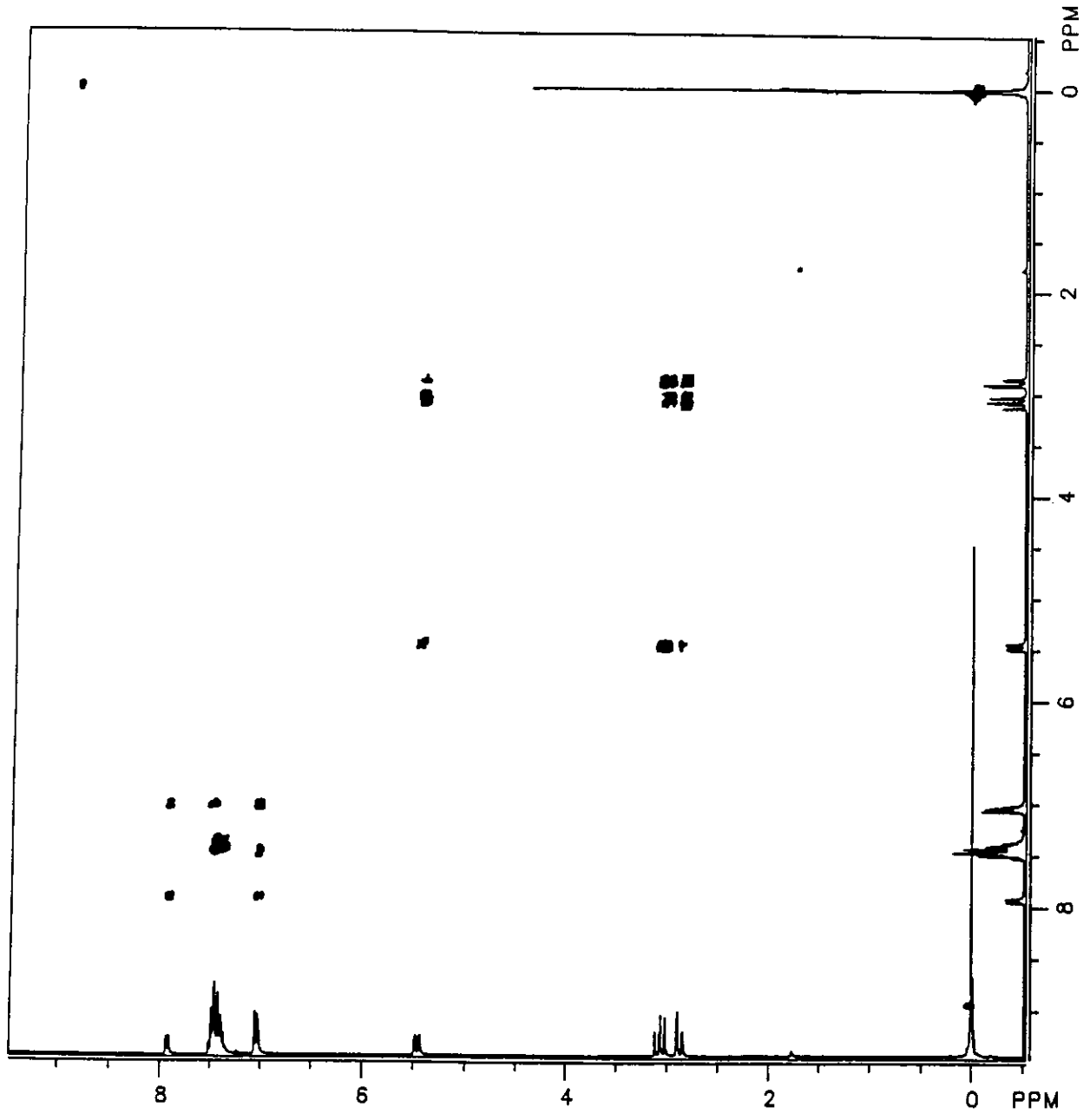

8
7
6
5
4
3
PPM


180
160
140
120
100
80
60
40
PPM

Problem 130 (Continued)

2D NMR Plot

Homocosy

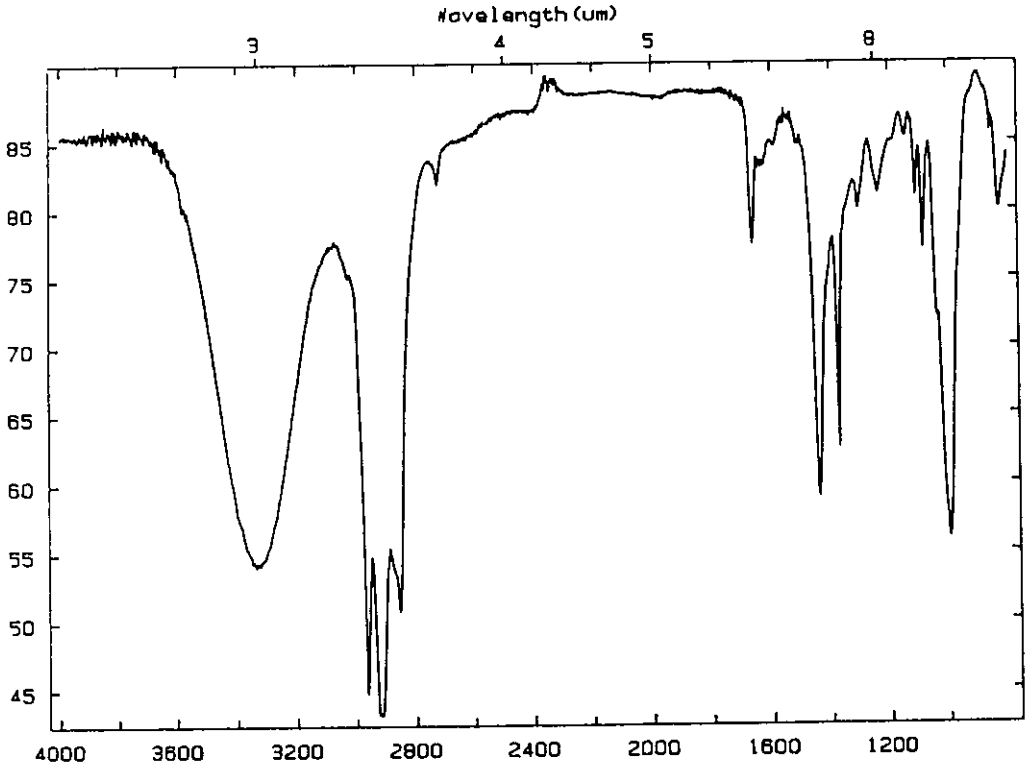


Problem 131

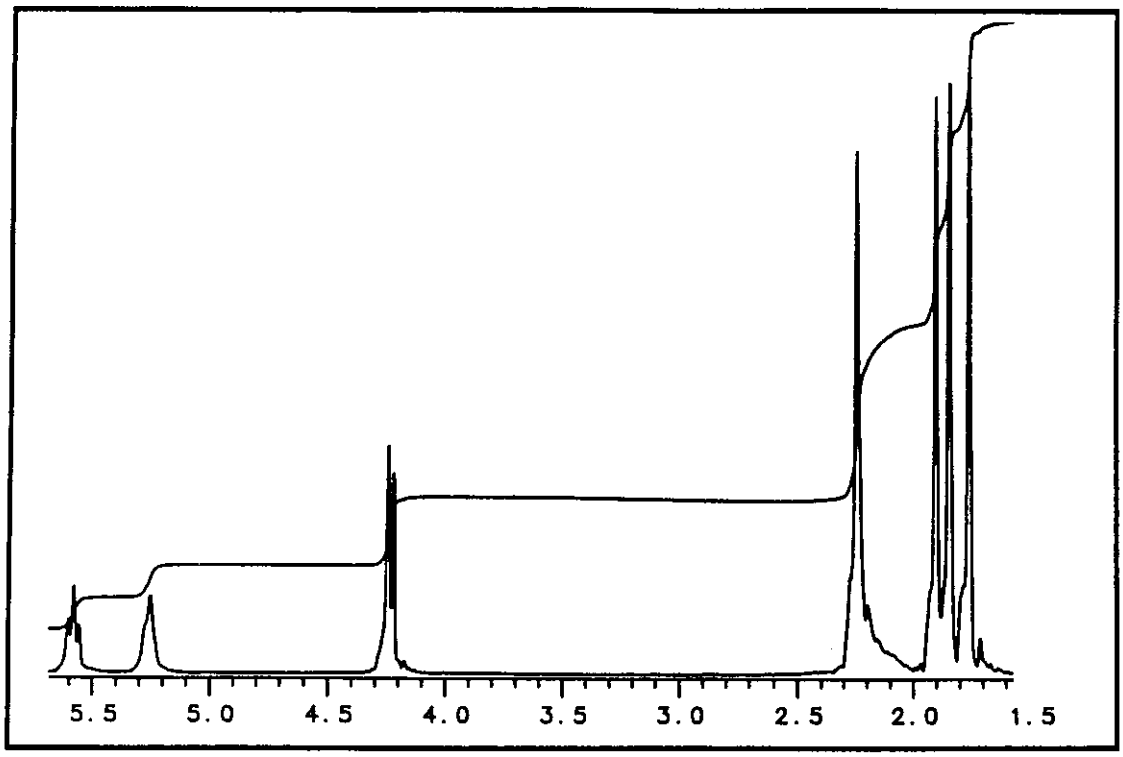
Exact Mass: na
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 77.9% C; 11.8% H

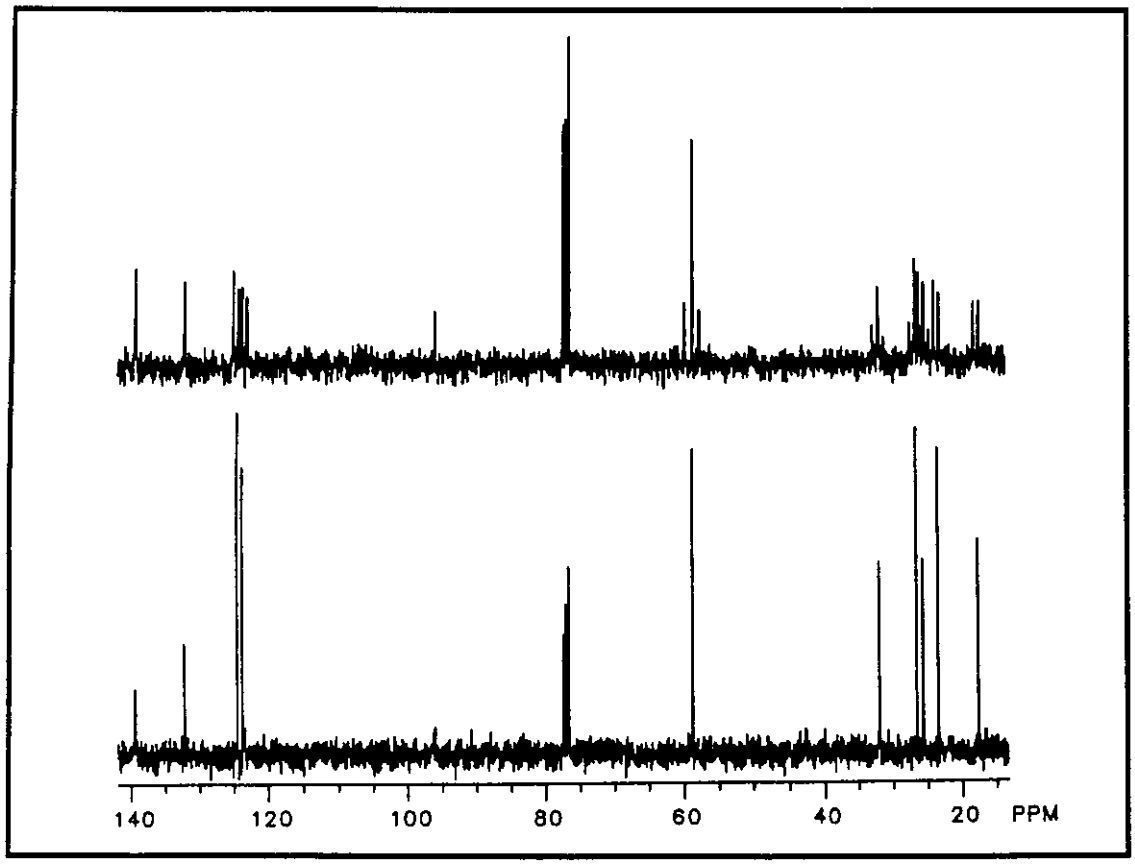
Mass Spectral Data

m/z		m/z		m/z	
30	2.41	65	6.74	96	8.09
31	1.66	66	3.72	108	12.23
39	9.51	67	39.56	109	1.89
41	15.19	68	3.43	122	9.82
42	4.90	69	1.82	124	5.25
43	2.56	79	3.24	138	10.93
44	2.08	80	3.50	152	100.00
52	1.99	81	2.18	153	54.38
53	3.69	93	2.86	154	5.49
54	8.87	94	17.96		
55	9.87	95	18.22		



Problem 131 (Continued)

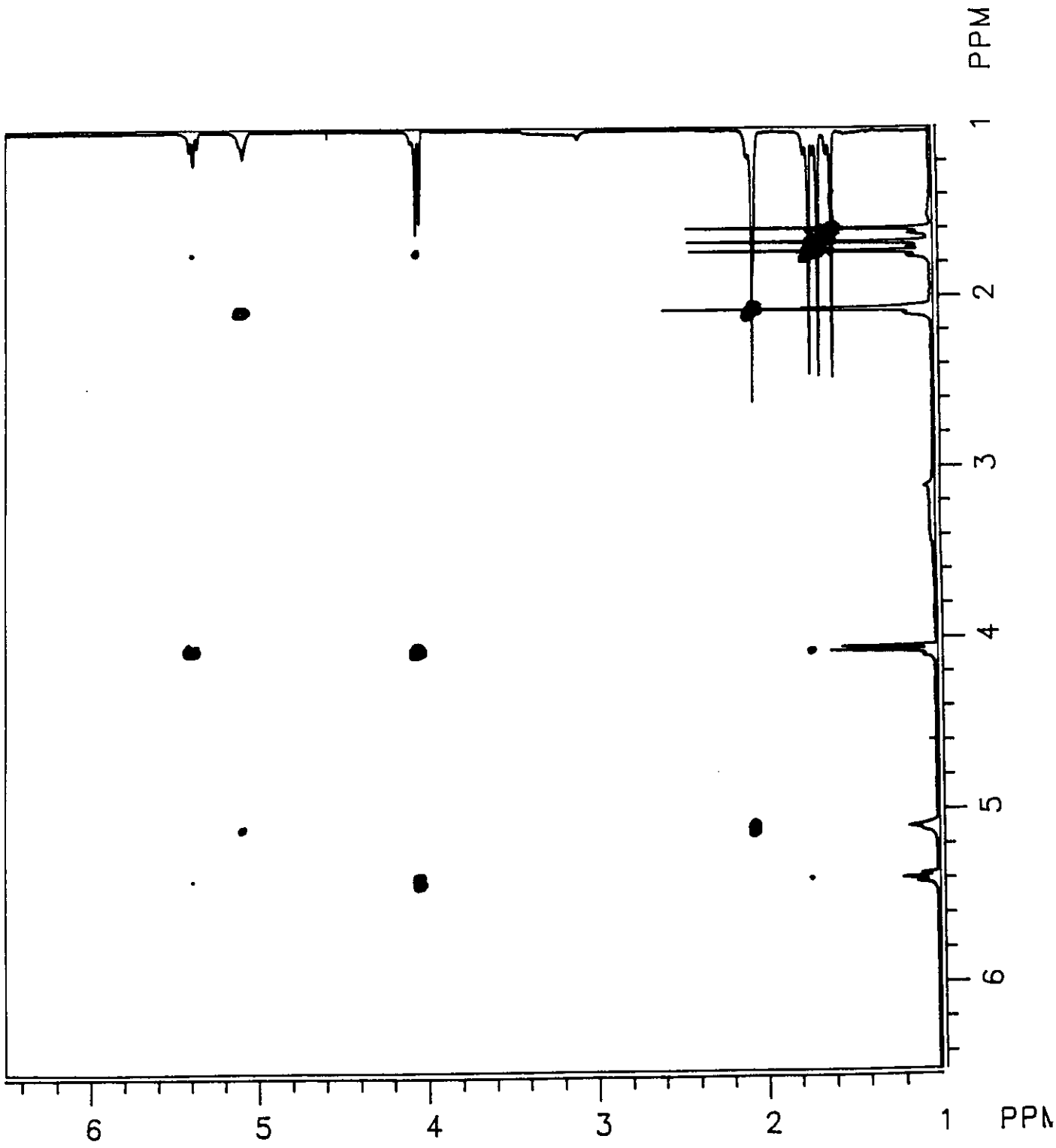




Problem 131 (Continued)

2D NMR Plot

Homocosy

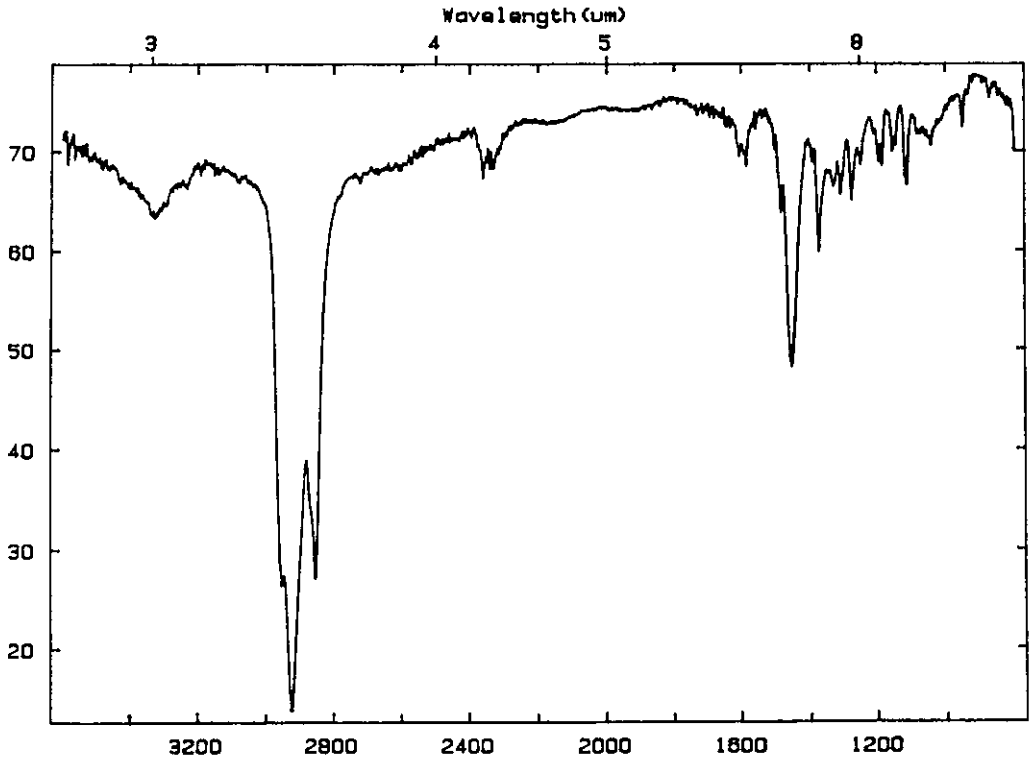


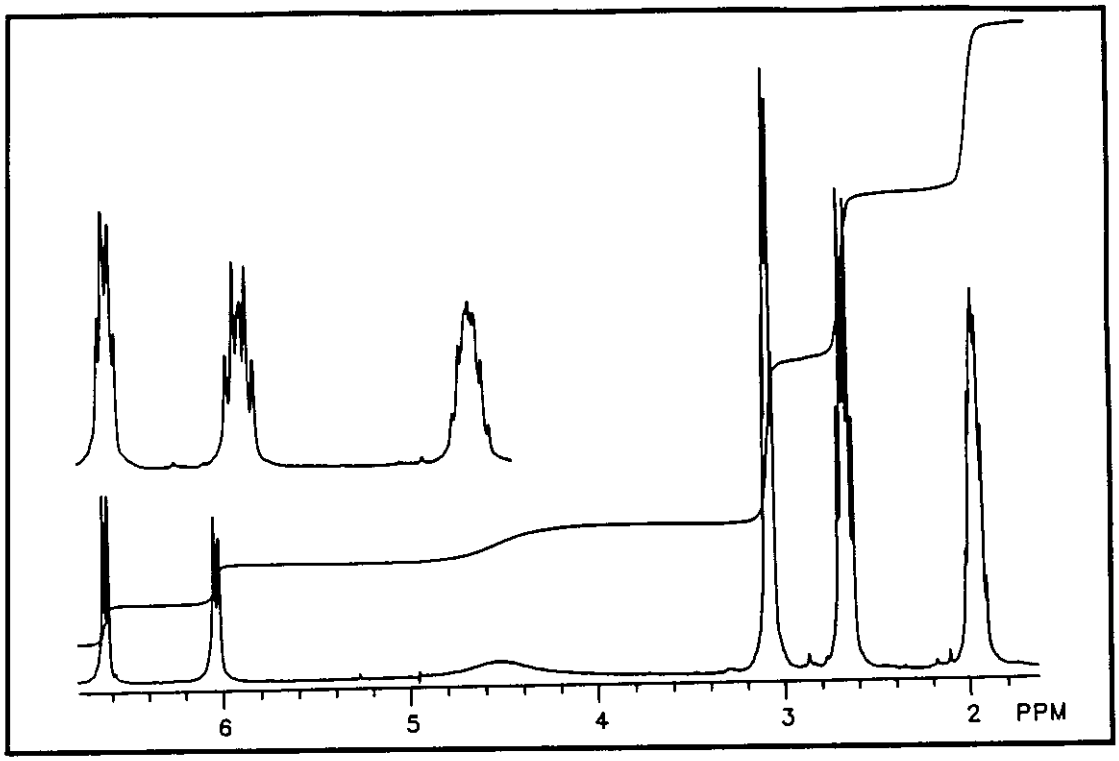
Problem 132

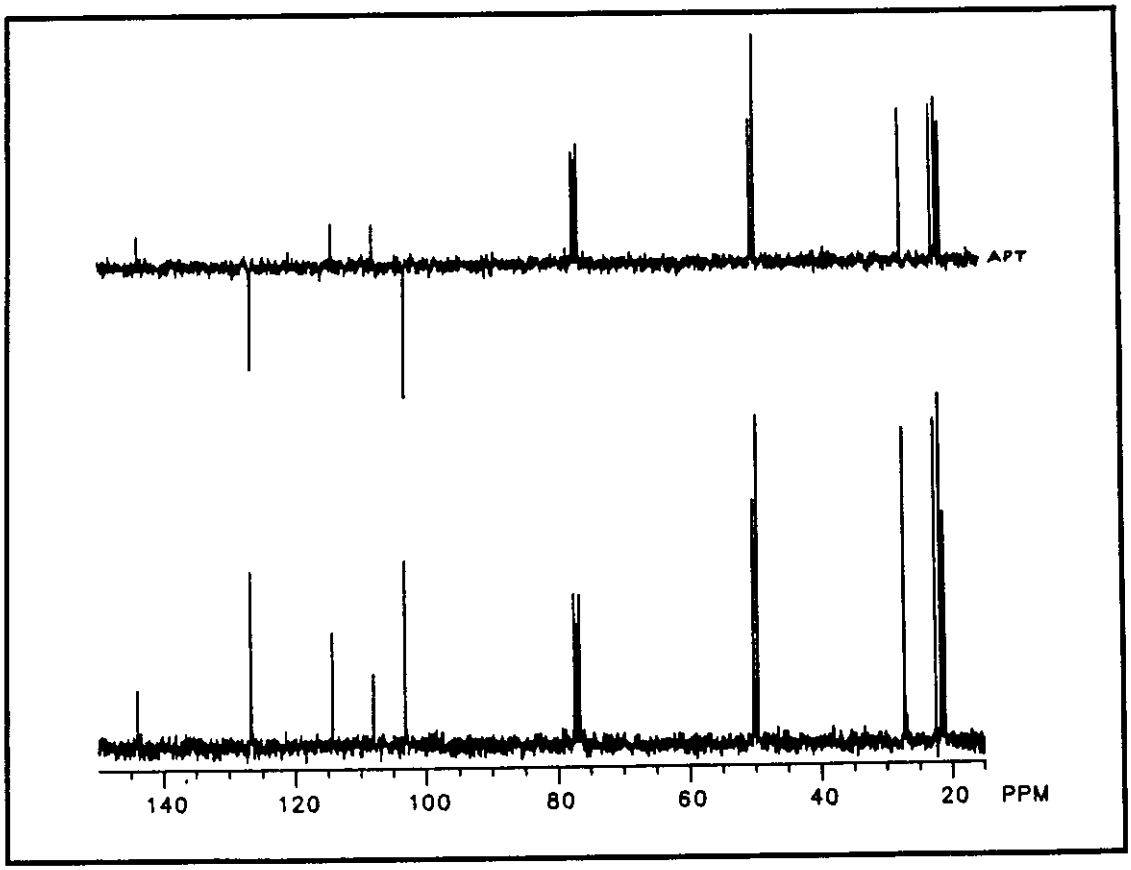
Exact Mass: na
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 76.2% C; 8.0% H; 7.4% N

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z		m/z	
39	2.71	69	2.34	81	1.49	104	1.27	131	1.87	156	1.02	174.1	2.31
41	2.82	69.1	1.15	83.5	1.48	105.1	1.91	132.1	3.89	158	4.3	186	7.03
42	1.13	71.1	1.6	89	1.21	115	2.77	133	3.37	159	2.21	187	1.57
43.1	1.93	71.5	1.56	91	2.72	116.1	1.32	134	1.15	160	29.08	188	100
51	2.47	77	5.26	93.5	2.91	117.1	4.21	142	1.12	161.1	5.81	189	93.39
52	1.32	77.5	1.21	94	1.05	118.1	1.86	143	1.32	162.1	1.71	190.1	11.49
53.1	1.73	78	2	94.5	3.51	119	1.04	144	2.24	163	1.04	191	1.05
55.1	1.51	79	1.81	95	1.38	128	1.12	145	1.9	170	2.34		
57.1	2.47	79.5	1.75	97.1	1.01	129	1.04	146	5.26	171	1.09		
63.1	1.35	80	1.25	99	1.15	130.1	4.2	147	1.89	172.1	5.64		
65.1	2.37	80.5	4.53	103	2.22	131	1.43	154	1.16	173.1	3.64		



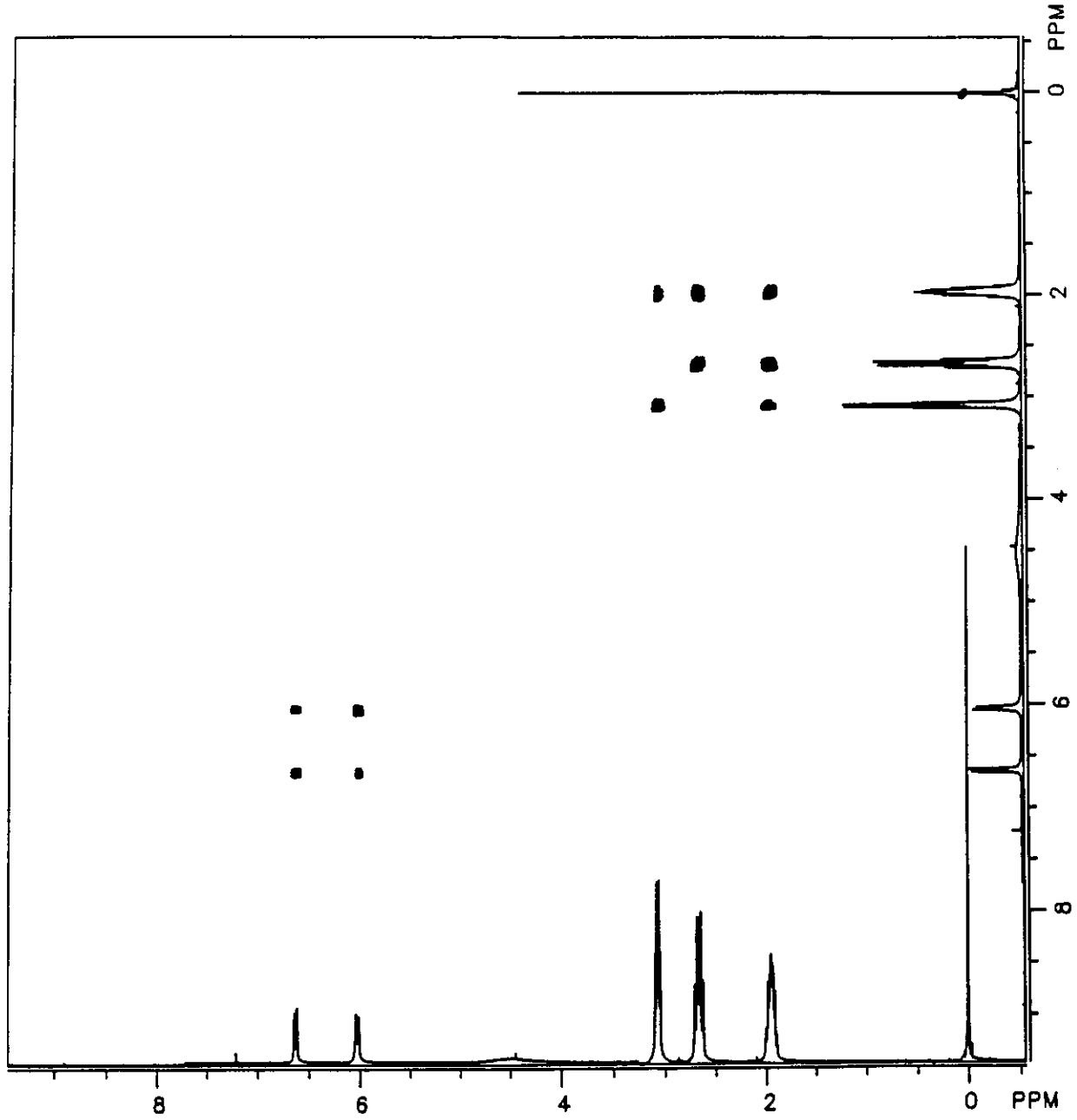

6
5
4
3
2
PPM


APT
140
120
100
80
60
40
20
PPM

Problem 132 (Continued)

2D NMR Plot

Homocosy

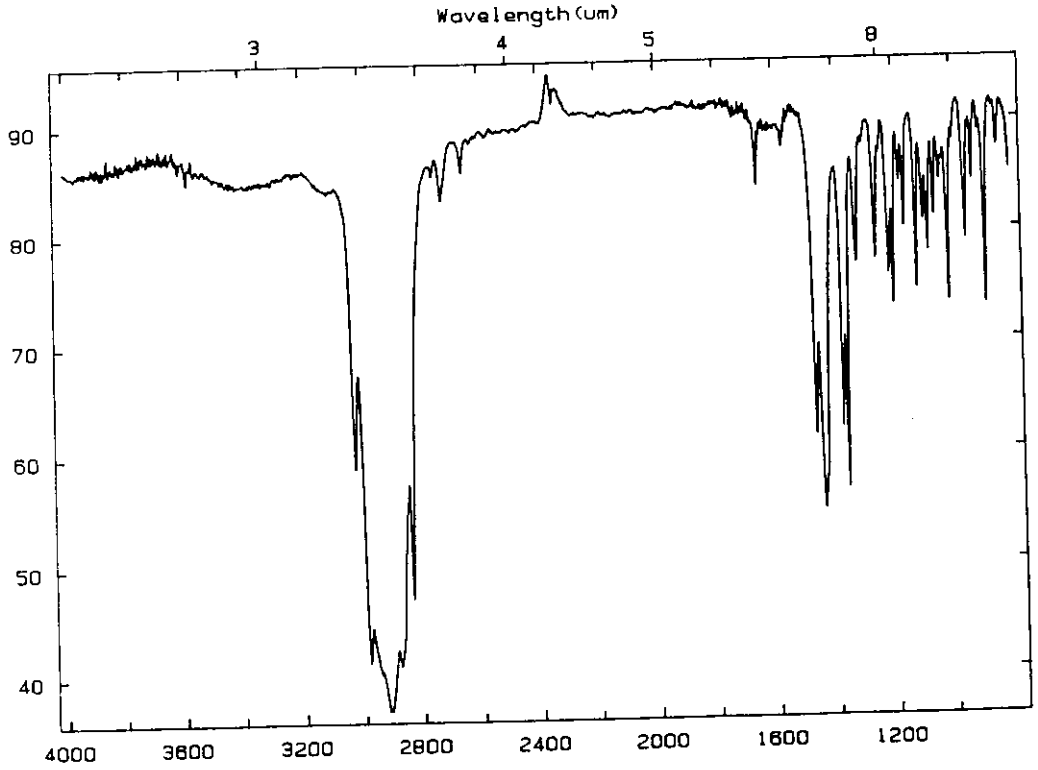


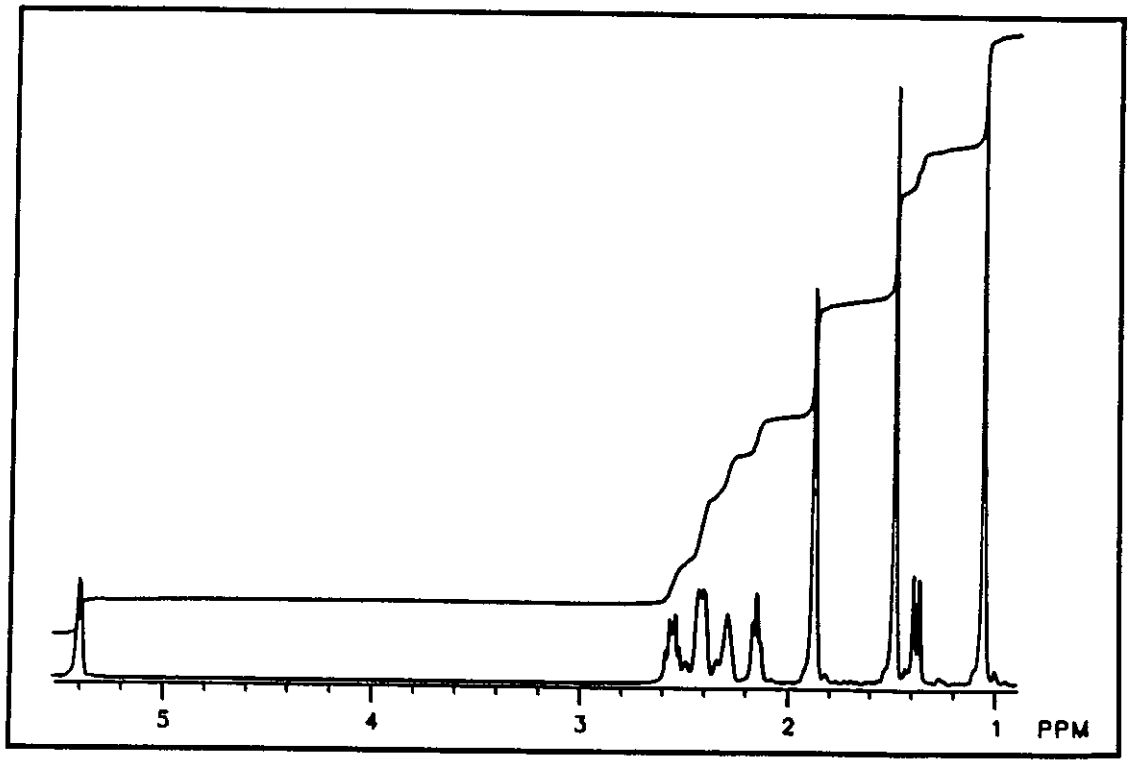
Problem 133

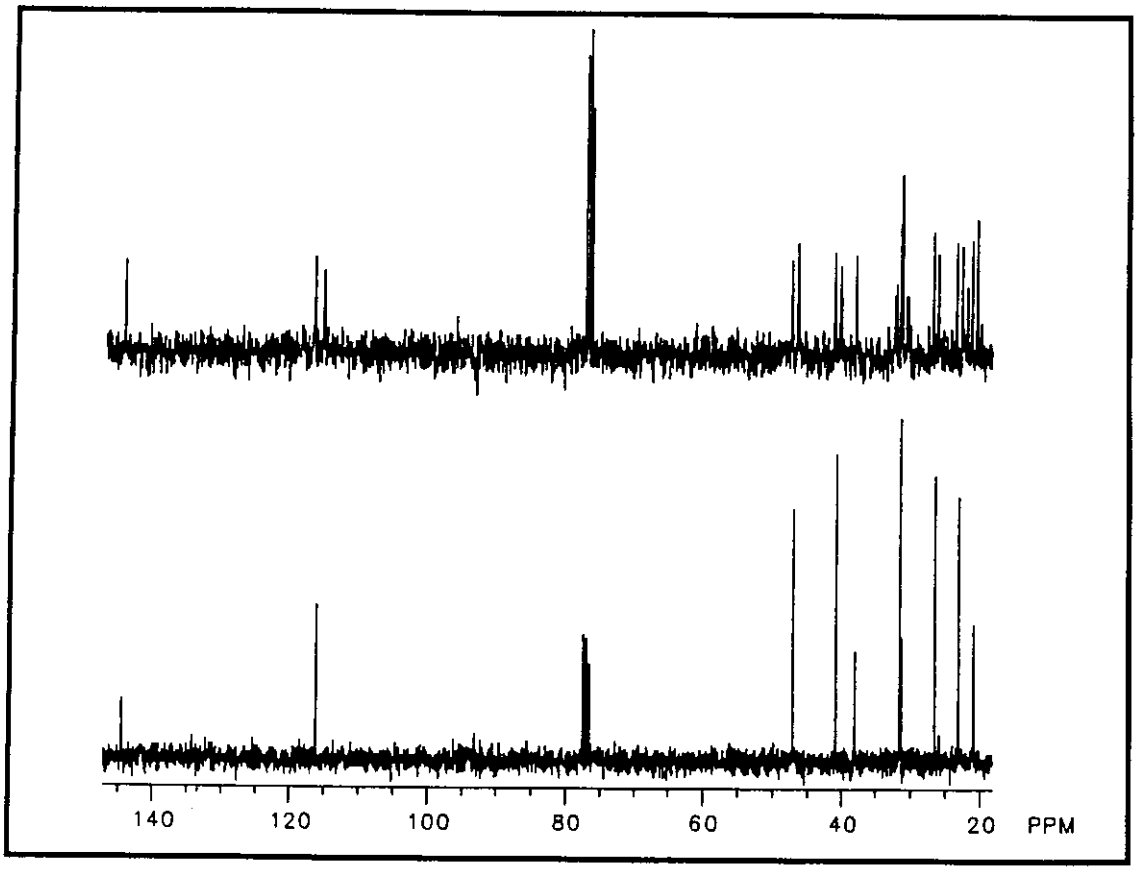
Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 88.2% C; 11.6% H

Mass Spectral Data

m/z		m/z		m/z		m/z		m/z		m/z		m/z	
30	0.22	51	7.92	67	9.30	81	3.27	95	1.18	115	0.63	137	0.82
32	0.02	53	10.81	68	3.98	82	0.37	96	0.09	116	0.14	138	0.05
37	0.53	54	1.36	69	0.96	83	0.08	101	0.03	117	0.43	375	0.16
38	2.19	55	6.52	70	0.11	85	0.04	102	0.26	119	1.77		
40	4.23	56	0.49	73	0.06	86	0.11	103	1.95	120	0.01		
41	24.76	58	0.64	74	0.39	87	0.13	104	0.49	121	10.34		
42	1.82	61	0.20	75	.0.39	89	0.64	105	9.42	122	1.04		
43	8.24	62	0.81	76	0.02	91	40.38	106	2.35	123	0.05		
44	0.31	63	2.61	77	31.97	92	37.00	107	4.78	128	0.02		
49	0.02	64	0.69	79	25.53	93	100.00	108	1.06	133	0.01		
50	2.61	65	2.01	80	9.97	94	9.10	109	0.23	136	7.36		



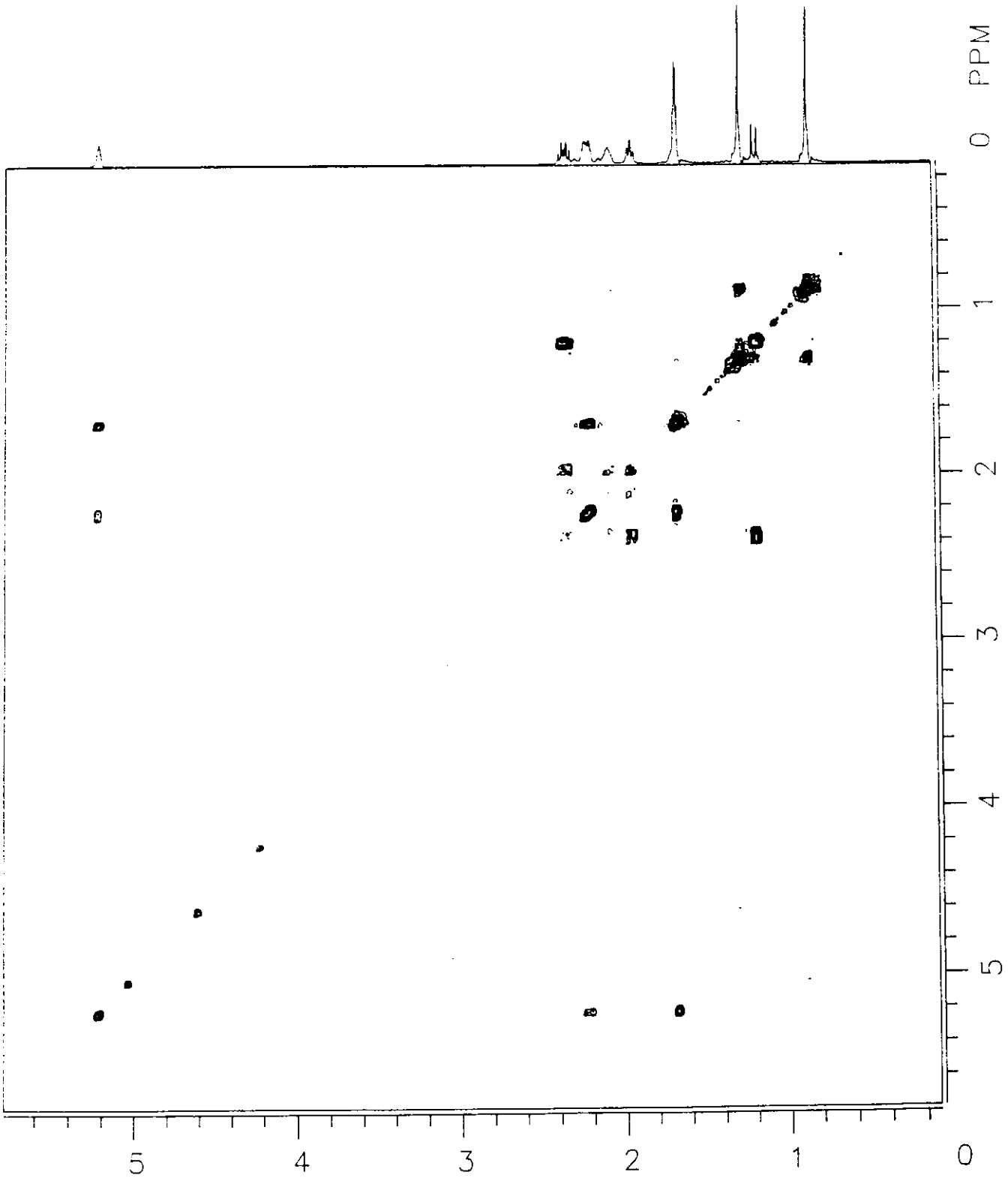

5
4
3
2
1
PPM


140
120
100
80
60
40
20
PPM

Problem 133 (Continued)

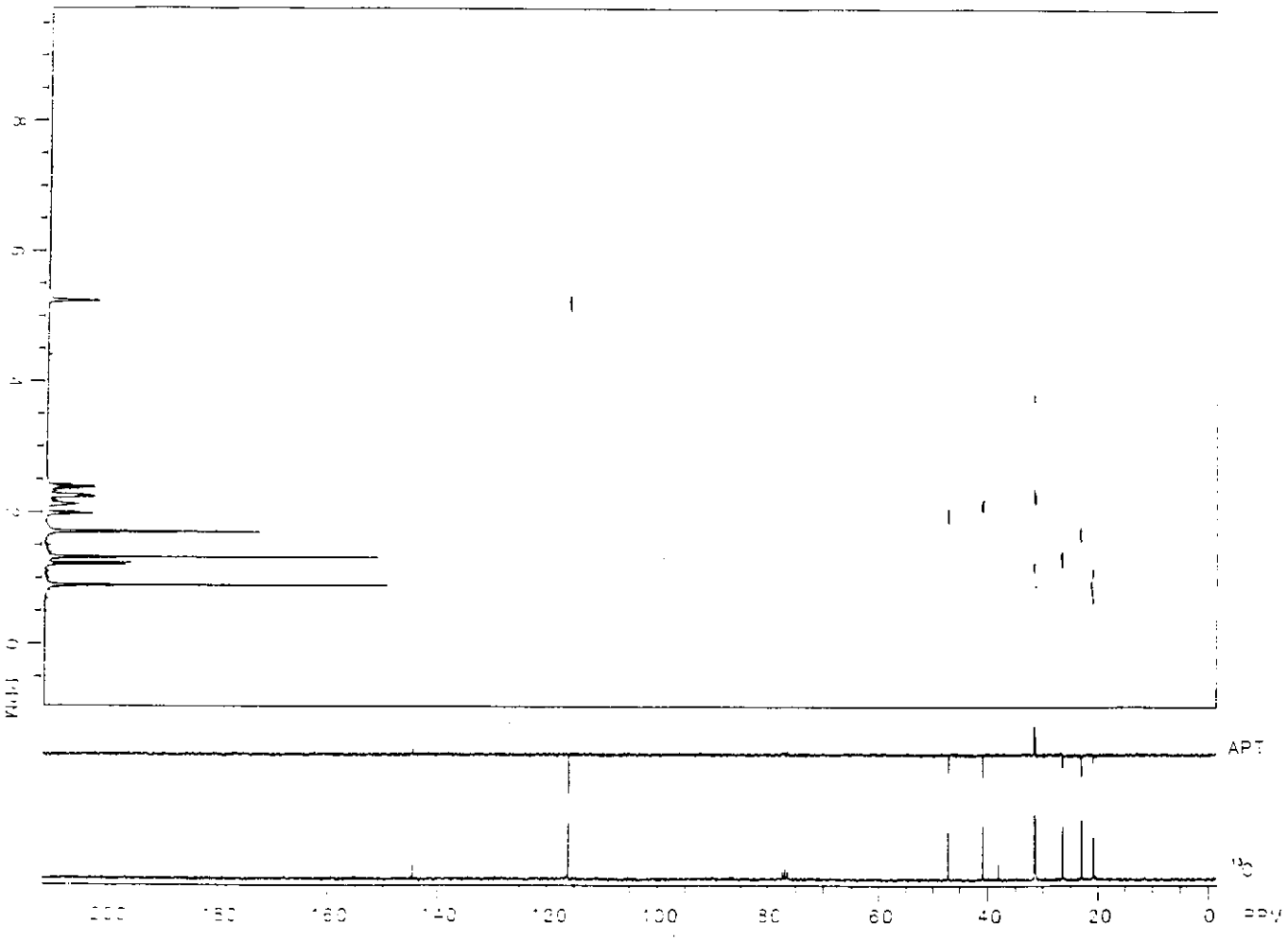
2D NMR Plot

Homocosy



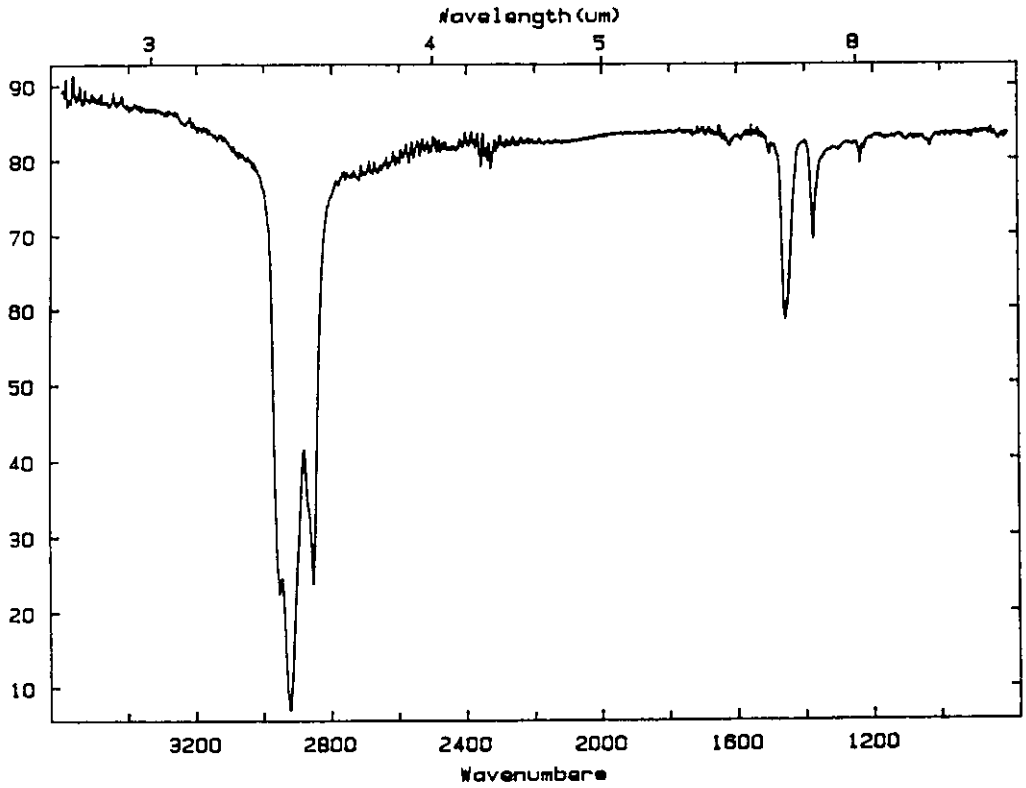
Problem 133 (Continued)

2D NMR Plot



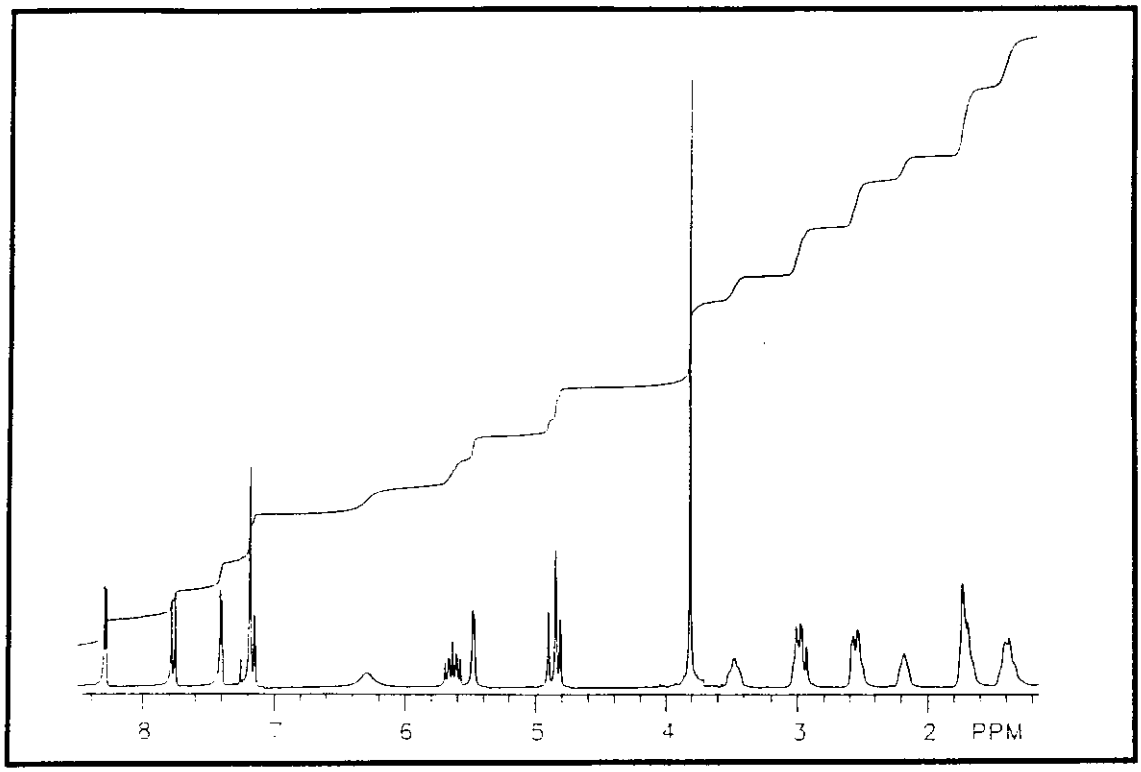
Problem 134

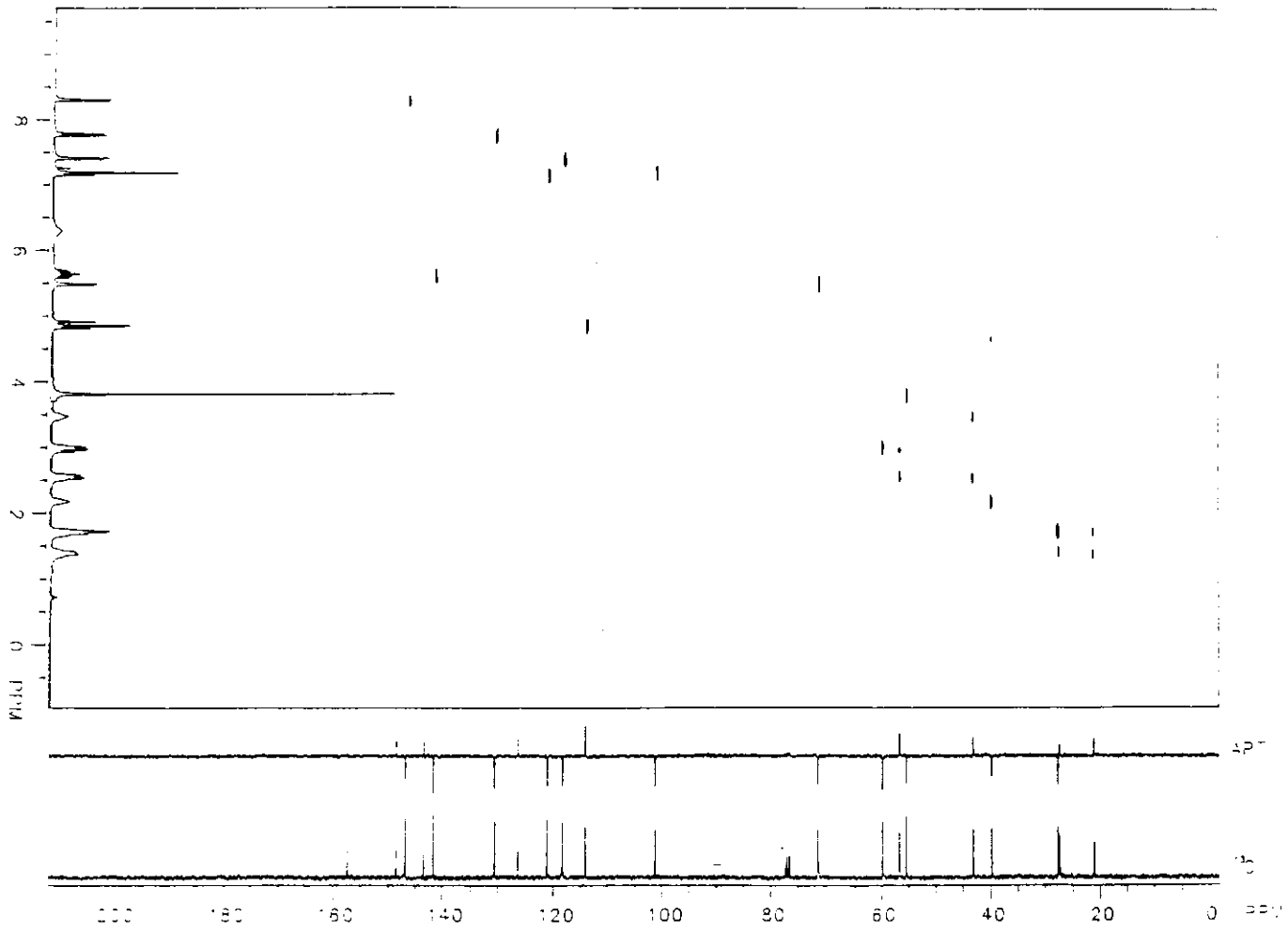
Exact Mass:
IR: nujol
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 74.1% C; 7.5% H; 8.6 N



Problem 134 (Continued)

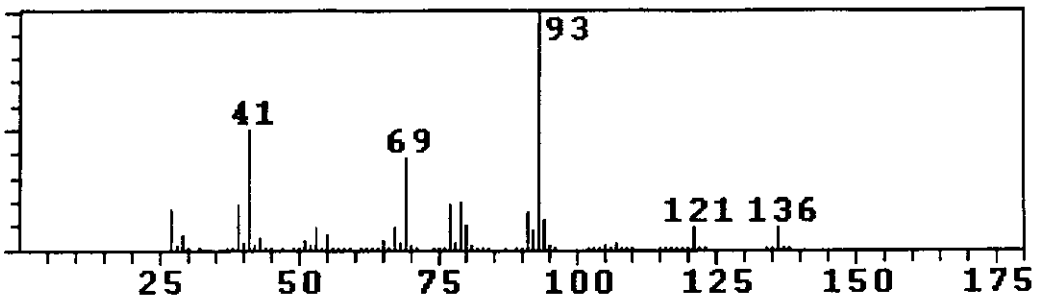
2D NMR Plot

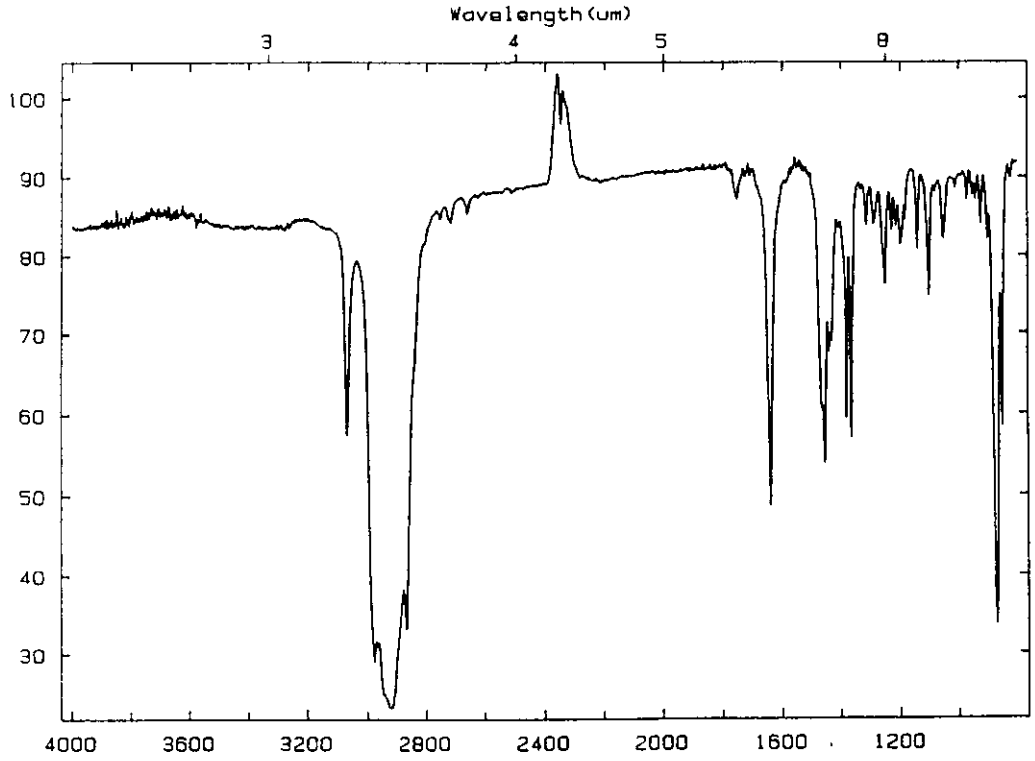


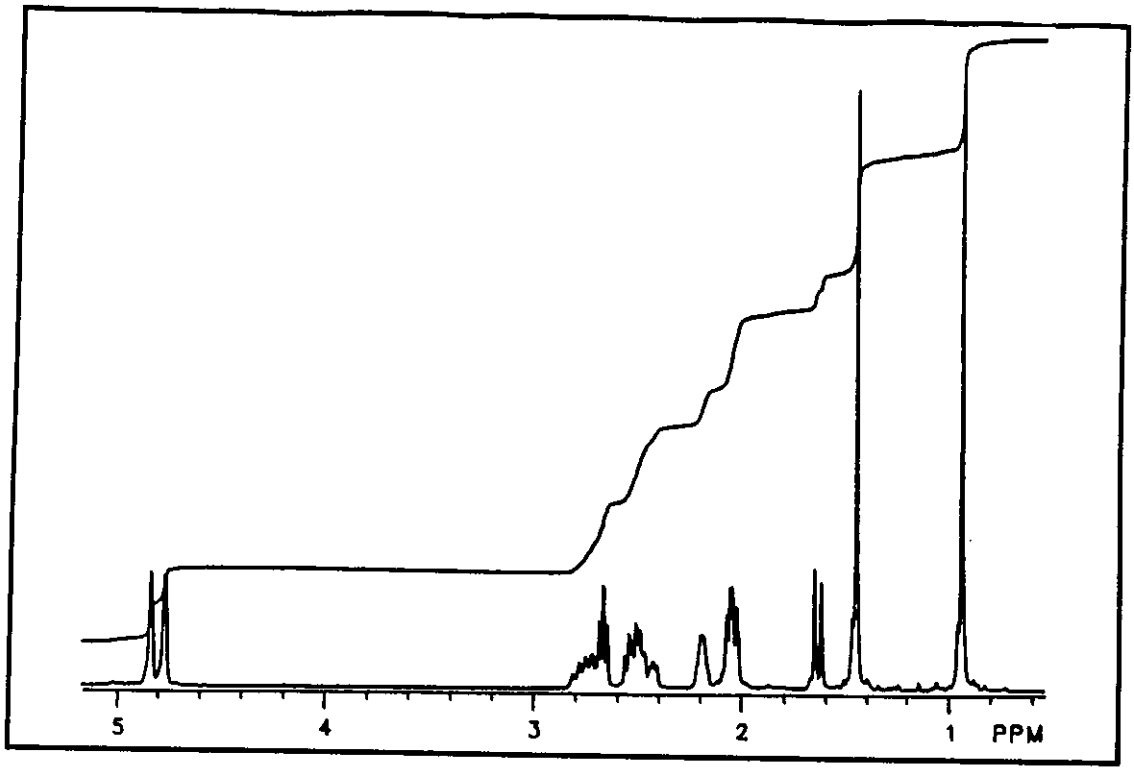


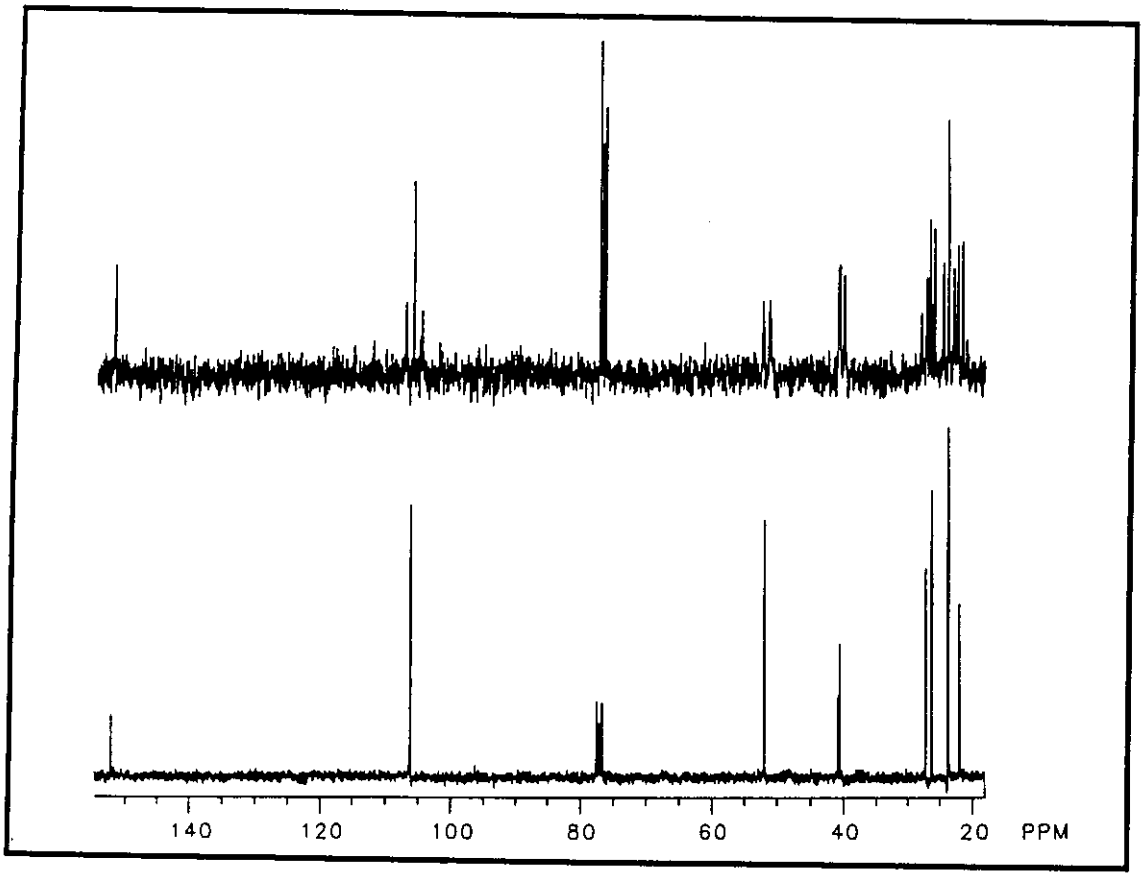
Problem 135

Exact Mass: na
IR: neat
^{1}H NMR: $CDCl_3$
^{13}C NMR: $CDCl_3$
Analysis: 88.2 % C; 11.4 % H



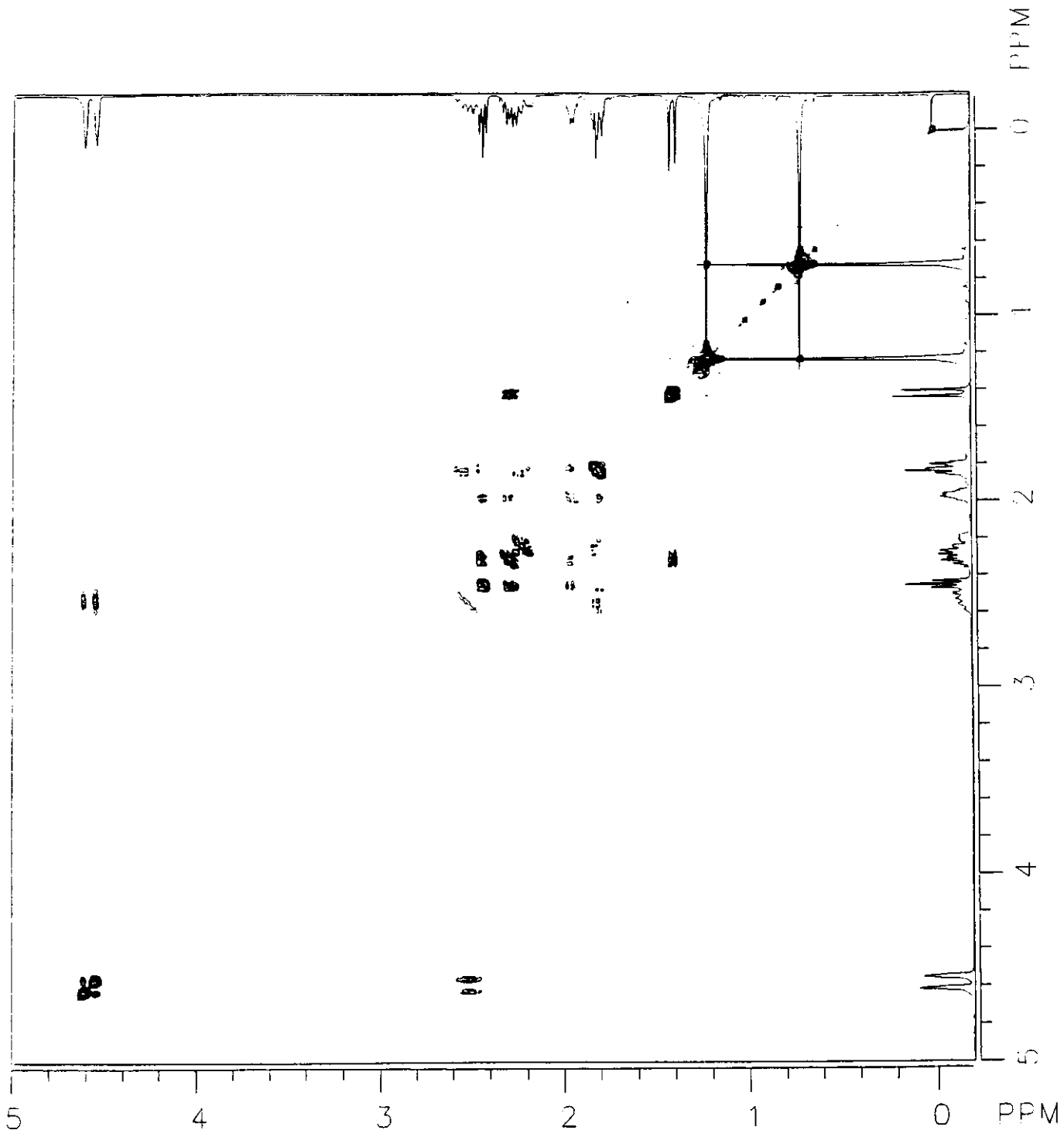



5
4
3
2
1
PPM


140
120
100
80
60
40
20
PPM

Problem 135 (Contunued)

2D NMR Plot



Problem 135 (Contunued)

2D NMR Plot