

UNIVERSITI SAINS MALAYSIA

Peperiksaan Semester Pertama
Sidang 1999/2000

Oktober 1999

KOT 222 : Kimia Organik II

Masa : 3 jam

Jawab Sebarang LIMA soalan.

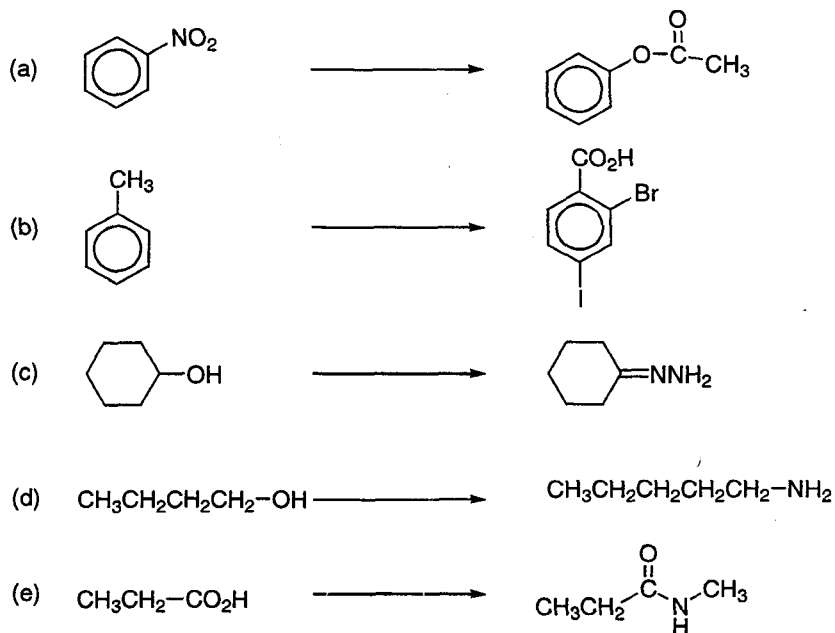
Hanya LIMA jawapan pertama sahaja yang akan diperiksa.

Jawab tiap-tiap soalan pada muka surat yang baru.

Kertas ini mengandungi TUJUH soalan semuanya (7 muka surat)

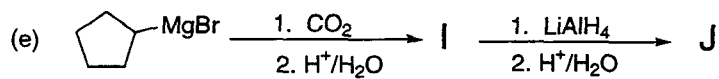
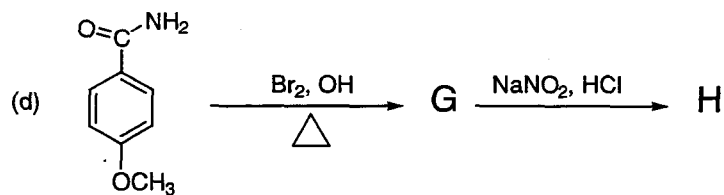
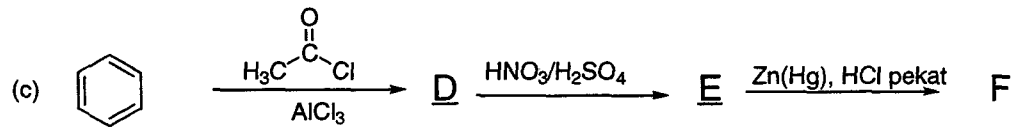
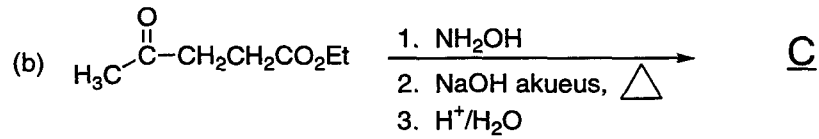
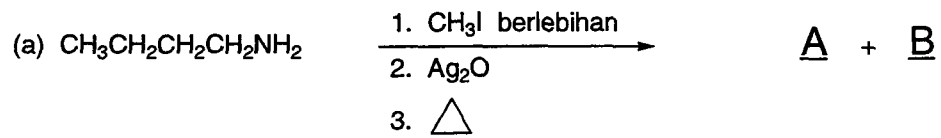
Lampiran : Jadual-jadual spektroskopi disertakan di muka surat terakhir.

1. Sarankan skema sintesis untuk setiap sebatian berikut dengan menggunakan bahan pemula yang diberikan. Anda boleh gunakan sebarang bahan takorganik atau organik lain. (Mekanisme tidak diperlukan).



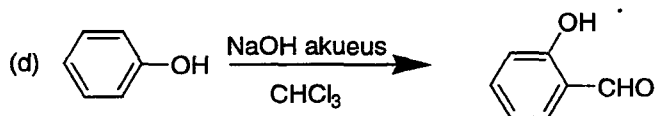
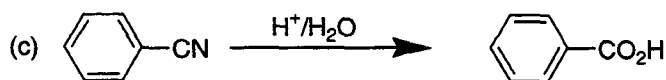
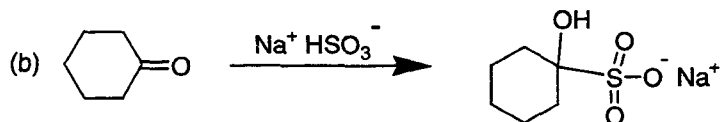
(20 markah)

2. Ramalkan hasil utama yang terbentuk dalam setiap tindak balas yang berikut;



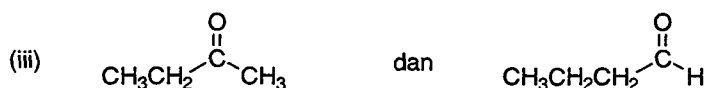
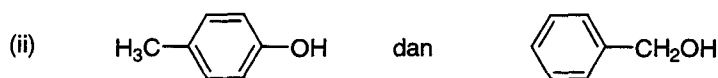
(20 markah)

3. Berikan mekanisme bagi setiap tindak balas yang berikut;



(20 markah)

4. (a) Bincangkan secara ringkas bagaimana satu ujian kimia boleh digunakan untuk membezakan sebatian-sebatian dalam setiap pasangan yang berikut. Tunjukkan persamaan yang terlibat.



(10 markah)

4. (b) Berikan penjelasan terhadap perkara-perkara berikut. Gunakan contoh sebenar jika perlu.

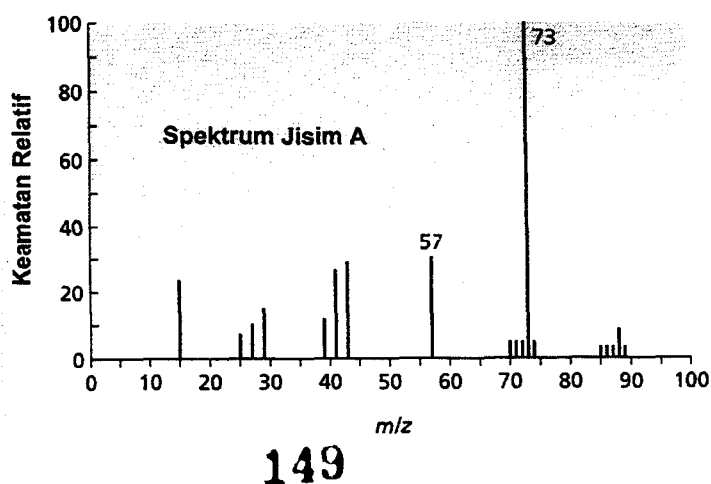
- Darjah Kebebasan Getaran Molekul (Molecular Vibrational Degree of Freedom)
- Orbital Molekul Takterisi Terendah (Lowest Unoccupied Molecular Orbital)
- Ion metastabil (metastable ions)
- Nyahpemerisaian (Deshielding)

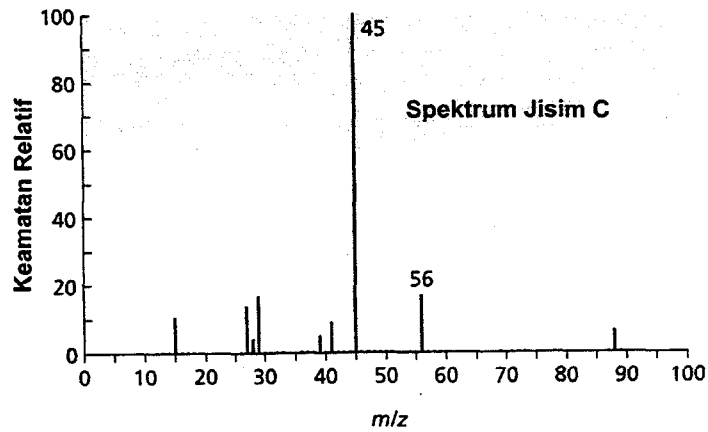
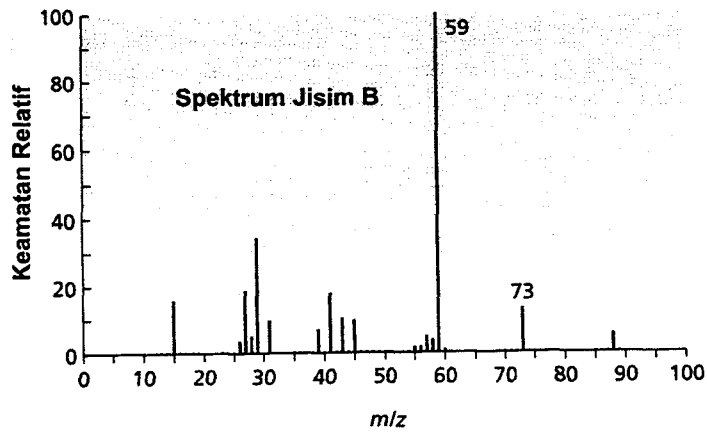
(10 markah)

5. (a) Tiga spektrum jisim di bawah adalah untuk 1-metoksibutana, 2-metoksibutana dan 2-metoksi-2-metilpropana.

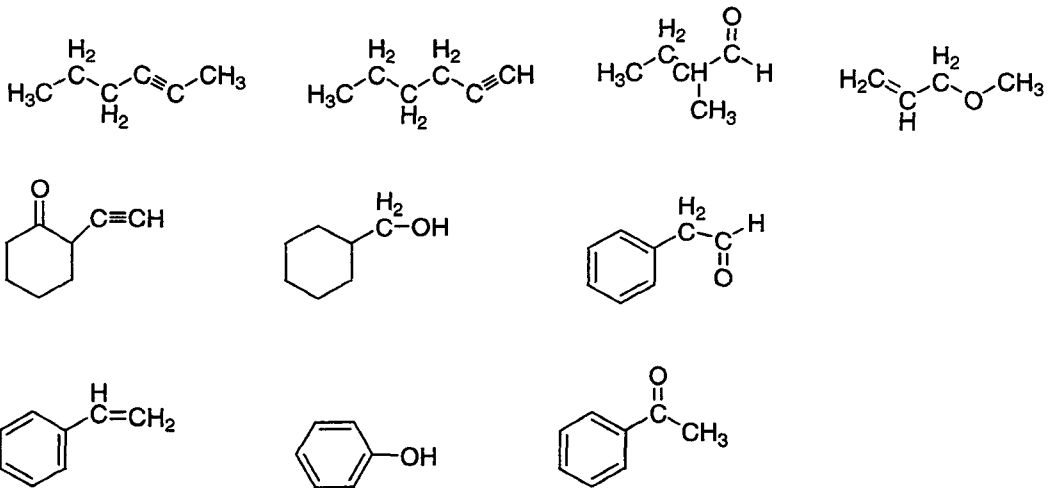
- Padankan sebatian-sebatian ini dengan spektrum jisim masing-masing.
- Lukiskan struktur ion bagi puncak asas di dalam setiap spektrum.

(10 markah)



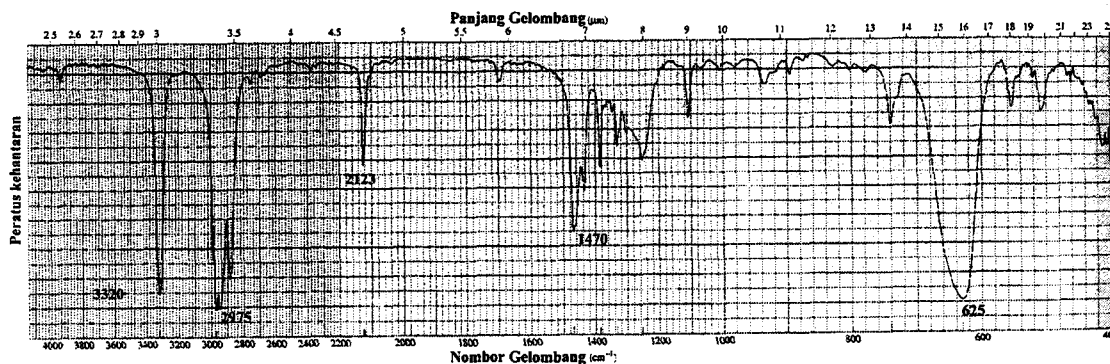
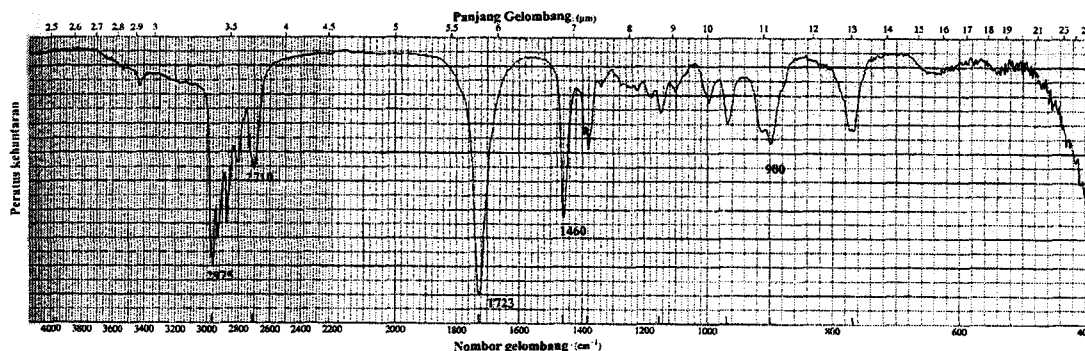


(b) Dua spektrum inframerah di bawah adalah bagi dua dari senarai sebatian berikut.



- i) Padankan struktur dengan spektrum masing-masing.
- ii) Cadangkan jenis getaran bagi puncak-puncak yang telah ditandakan dengan nombor gelombang di dalam setiap spektrum.

(10 markah)

SPEKTRUM INFRAMERAH 1 (untuk soaln 5b)**SPEKTRUM INFRAMERAH 2 (untuk soaln 5b)**

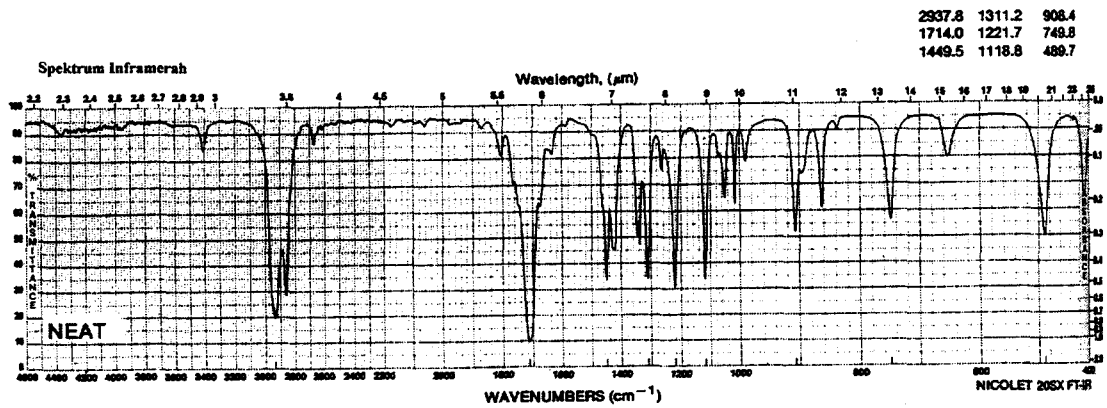
6. Tentukan struktur sebatian-sebatian dari data ^1H -nmr berikut:

- $\text{C}_4\text{H}_8\text{Br}_2$: δ (ppm) 1.97 (6H, s); 3.89 (2H, s).
- $\text{C}_8\text{H}_9\text{Br}$: δ (ppm) 2.01 (3H, d); 5.14 (1H, q); 7.35 (5H, s).
- $\text{C}_5\text{H}_{10}\text{O}_2$: δ (ppm) 1.15 (3H, t); 1.25 (3H, t); 2.33 (2H, q); 4.13 (2H, q).
- C_8H_{10} : δ (ppm) 1.25 (3H, t); 2.2.71 (2H, q); 7.18 (5H, s)
- $\text{C}_8\text{H}_{10}\text{O}$: δ (ppm) 3.32 (3H, s); 4.43 (2H, s); 7.22 (5H, s)
- $\text{C}_{10}\text{H}_{13}\text{Cl}$: δ (ppm) 1.57 (6H, s); 3.07 (2H, s); 7.27 (5H, s)
- $\text{C}_4\text{H}_7\text{BrO}_2$: δ (ppm) 1.08 (3H, t); 2.07 (2H, kuintet); 4.23 (1H, t); 10.97 (1H, s)
- $\text{C}_8\text{H}_{11}\text{NO}$: δ (ppm) 1.37 (3H, t); 3.28 (2H, s, lebar); 3.92 (2H, q); 6.85 (4 H, dublet dublet)

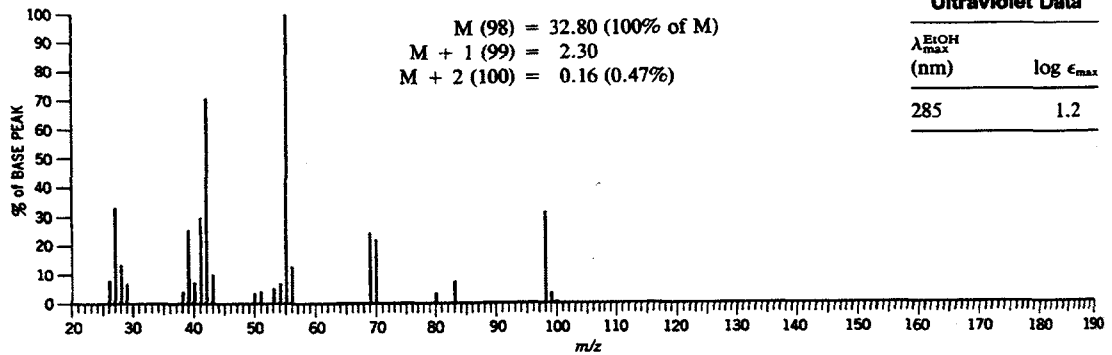
(20 markah)

7. Tentukan struktur sebatian X ini berdasarkan set spectrum berikut. Anda perlu tunjukkan bagaimana anda merumuskan jawapan anda itu.

(20 markah)

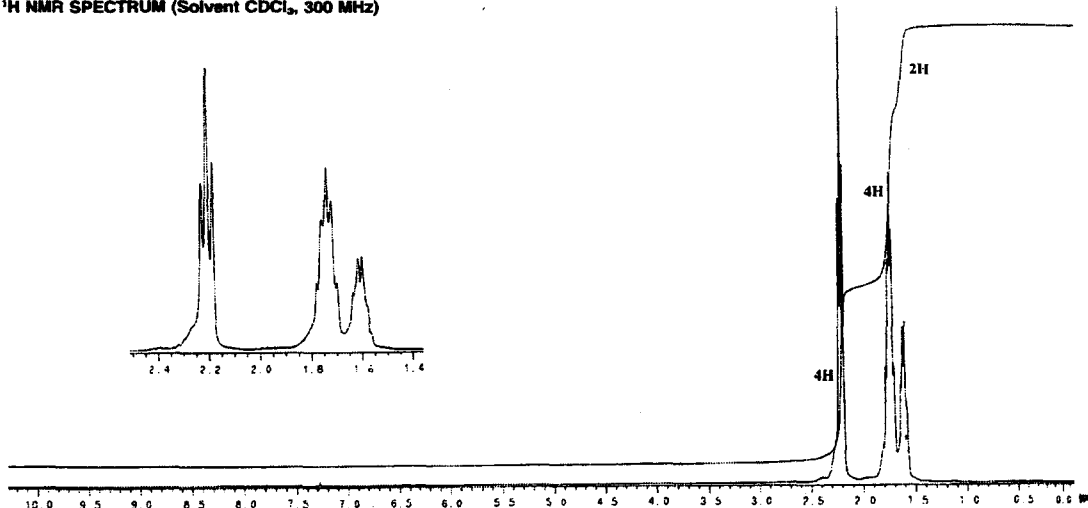


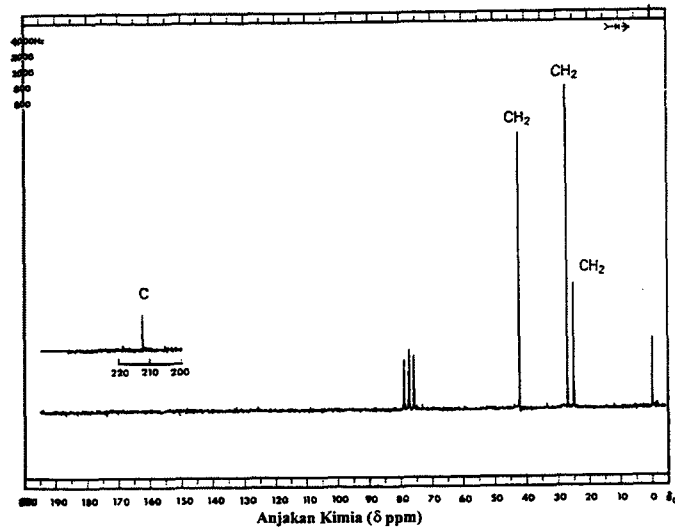
MASS SPECTRAL DATA (Relative Intensities)



Ultraviolet Data	
λ_{max} (nm)	log ϵ_{max}
285	1.2

¹H NMR SPECTRUM (Solvent CDCl₃, 300 MHz)



Spektrum ^{13}C -nmr

Lampiran : Jadual-Jadual Spektroskopi

^1H NMR		Penyerapan Inframerah cm^{-1}	^{13}C NMR		
	δ (ppm)			δ (ppm)	
RCH_3	0.9	$=\text{C}-\text{H}$	3020 - 3080 (m)	$\text{C}-\text{I}$	0 - 40
R_2CH_2	1.3	$=\text{C}-\text{H}$	675-1000	$\text{C}-\text{Br}$	25 - 65
R_3CH	1.5	$\text{C}=\text{C}$	1640-1680	$\text{C}-\text{Cl}$	35 - 80
$\text{C}=\text{C}-\text{H}$	4.6-5.9	$\equiv\text{C}-\text{H}$	3300	$-\text{CH}_3$	8 - 30
$\text{C}\equiv\text{C}-\text{H}$	2.0-3.0	$=\text{C}-\text{H}$	600-700	$-\text{CH}_2-$	15 - 55
$\text{Ar}-\text{H}$	6.0-8.5	$\text{C}\equiv\text{C}$	2100-2260	$-\text{CH}-$	20 - 60
$\text{Ar}-\text{C}-\text{H}$	2.2-3.0	$\text{Ar}-\text{H}$	3000-3100	$\equiv\text{C}$	65 - 85
$\text{C}=\text{C}-\text{CH}_3$	1.7	$\text{Ar}-\text{H}$	675-870	$=\text{C}$	100 - 150
$\text{H}-\text{C}-\text{F}$	4.0-4.5	$\text{C}=\text{C}$	1500-1600	$\text{C}-\text{O}$	40 - 80
$\text{H}-\text{C}-\text{Cl}$	3.0 - 4.0	$\text{O}-\text{H}$	3610 - 3640	$\text{C}=\text{O}$	170 - 210
$\text{H}-\text{C}-\text{Br}$	2.5-4.0	$\text{O}-\text{H}$	3200 - 3600 (lebar)	$\text{C}(\text{Ar})$	110 - 160
$\text{H}-\text{C}-\text{I}$	2.0-4.0	$\text{C}-\text{O}$	1080-1300	$\text{C}-\text{N}$	30 - 65
$\text{H}-\text{C}-\text{OH}$	3.4 - 4.0	$\text{C}=\text{O}$	1690 - 1760 (s)	$\text{C}\equiv\text{N}$	110 - 125
$\text{H}-\text{C}-\text{OR}$	3.3-4.0	$\text{O}-\text{H}(\text{asid})$	2500 - 3000 (lebar)		
$\text{RCOO}-\text{C}-\text{H}$	3.7-4.1	$\text{C}-\text{O}$	1080-1300		
$\text{H}-\text{C}-\text{COOR}$	2.0-2.2	$\text{C}=\text{O}$	1690-1760		
$\text{H}-\text{C}-\text{COOH}$	2.0-2.6	$\text{N}-\text{H}$	3300 - 3600		
$\text{H}-\text{C}-\text{C}=\text{O}$	2.0-2.7	$\text{C}-\text{N}$	1180-1360		
$\text{R}-\text{CHO}$	9.0-10.0	$-\text{NO}_2$	1515-1560		
$\text{R}-\text{OH}$	1.0-5.5		1345-1385		
$\text{Ar}-\text{OH}$	4.0-12.0				
$\text{C}=\text{C}-\text{OH}$	15-17				
RCOOH	10.5 - 12.0				
RNH_2	1.0 - 5.0				

Berat Atom Tepat	
H	= 1.0
C	= 12.0
N	= 14.0
O	= 16.0
F	= 19.0
Cl	= 35.45
Br	= 79.9
I	= 126.9
Si	= 28.0
P	= 31.0
S	= 32.0