

S

93102R



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

Scholarship 2021 Chemistry

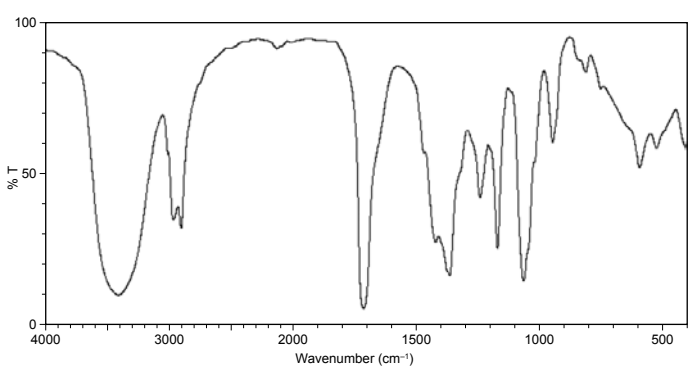
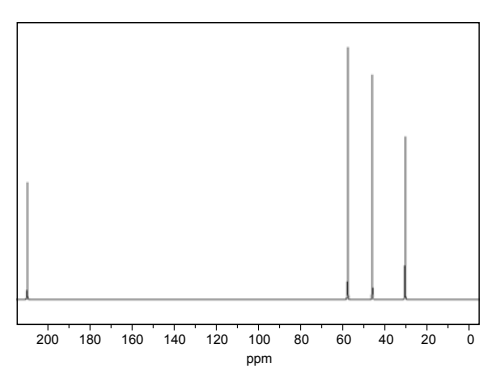
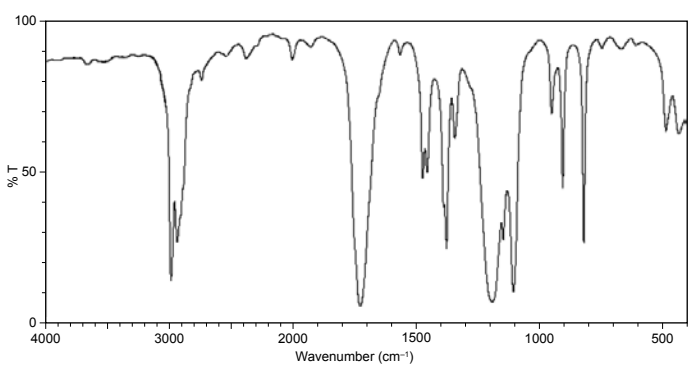
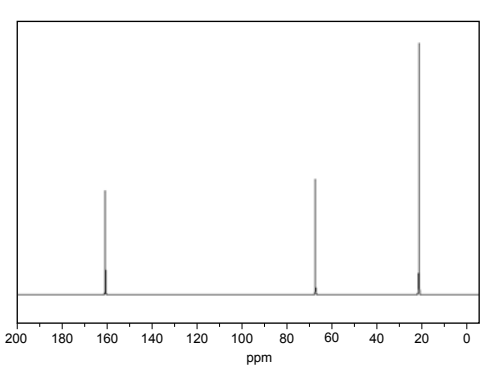
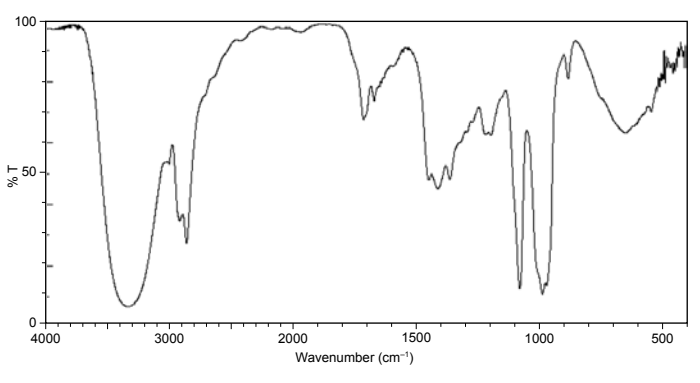
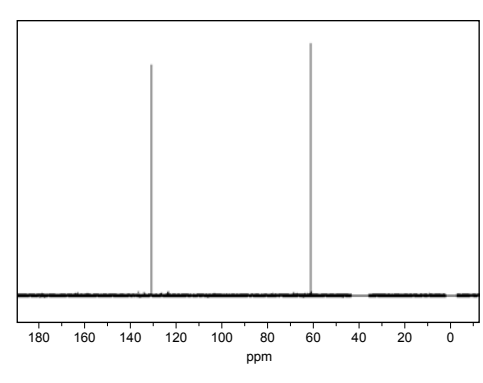
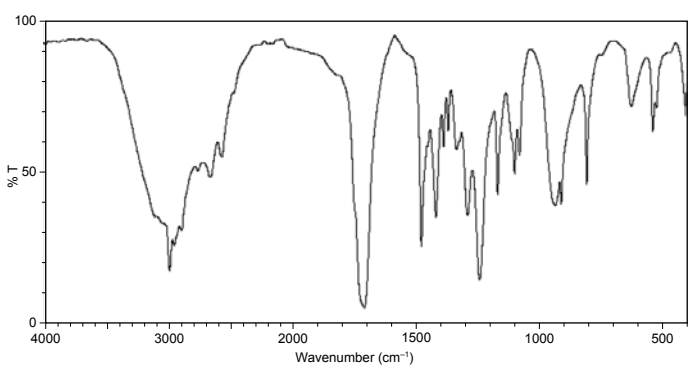
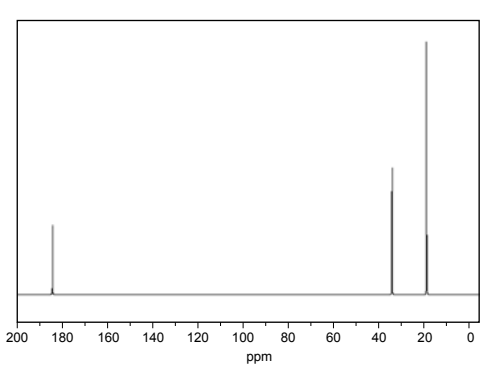
RESOURCE BOOKLET

Refer to this booklet to answer the questions for Scholarship Chemistry.

Check that this booklet has pages 2–4 in the correct order and that none of these pages is blank.

YOU MAY KEEP THIS BOOKLET AT THE END OF THE EXAMINATION.

IR AND ^{13}C NMR SPECTRA FOR QUESTION FOUR (c)

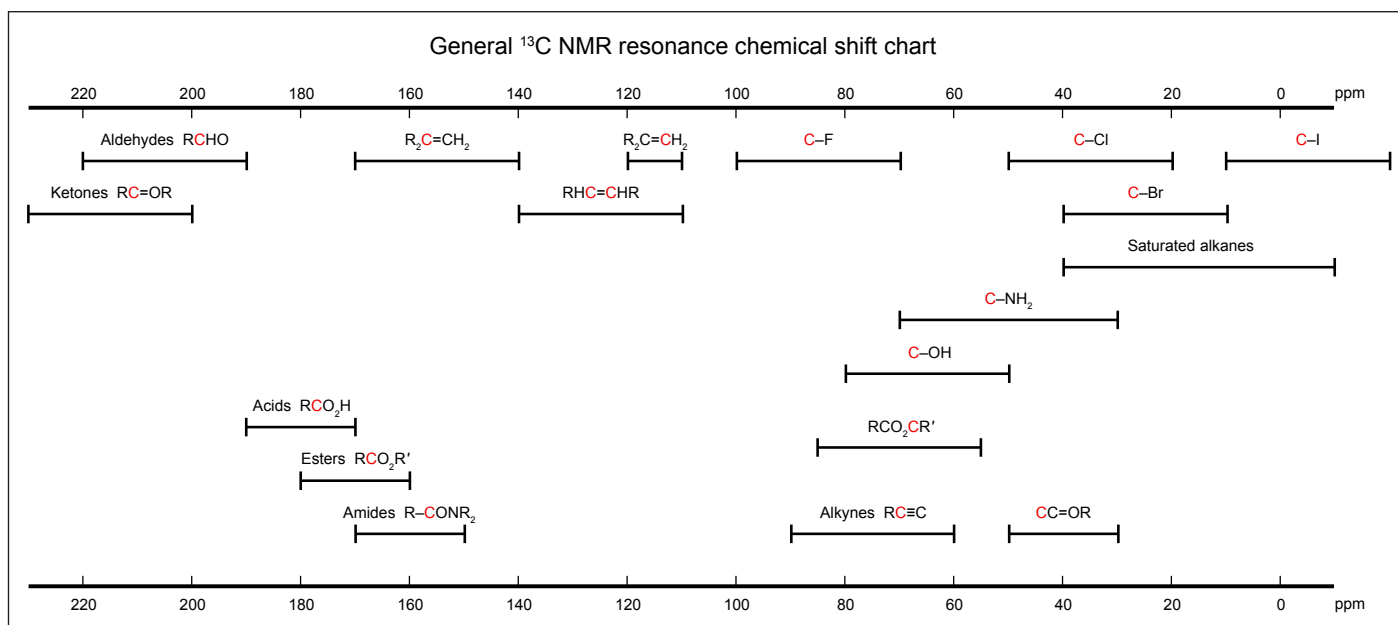
Compound	IR spectra	^{13}C NMR spectra
A		
B		
C		
D		

SPECTROSCOPY DATA SHEET

INFRARED SPECTROSCOPY

Functional group	Vibration	Wavenumber/ cm ⁻¹	Functional group	Vibration	Wavenumber/ cm ⁻¹
Alkane	C–H stretch	2950–2800 (s)	Aldehyde	C=O stretch	1725 (s)
Alkene	C=C–H stretch	3100–3010 (s)	Ketone	C=O stretch	1715 (s)
	C=C stretch	1690–1630 (m)	Carboxylic acid	O–H stretch	3400 (s)
Alkyl halide	C–F stretch	1400–1000 (s)		C=O stretch	1730–1700 (s)
	C–Cl stretch	785–540 (m-w)		C–O stretch	1320–1210 (s)
	C–Br stretch	650–510 (s-m)	Acid chloride	C=O stretch	1810–1775 (s)
	C–I stretch	600–485 (s-m)		C–Cl stretch	730–550 (s-m)
Alcohol	O–H stretch	3600–3300 (s)	Ester	C=O stretch	1750–1735 (s)
	C–O stretch	1260–1000 (s)		C–O stretch	1260–1160 (s)
Amine	N–H stretch (1 per bond)	3500–3300 (s-w)	Amide	N–H stretch	3500–3200 (s)
	N–H bend	1640–1500 (s)		C=O stretch	1680–1630 (s)
	C–N stretch	1200–1025 (s)			

¹³C NMR RESONANCE SHIFTS



PERIODIC TABLE OF THE ELEMENTS

Atomic number		Relative atomic mass																																									
1		2																																									
H 1.0		He 4.0																																									
3		4																5		6																							
Li 6.9		Be 9.0																B 10.8		C 12.0																							
11		12																13		14		15		16		17		18															
Na 23.0		Mg 24.3																Al 27.0		Si 28.1		P 31.0		S 32.1		Cl 35.5		Ar 40.0															
19		20																21		22		23		24		25		26		27		28		29		30							
K 39.1		Ca 40.1																Sc 45.0		Ti 47.9		V 50.9		Cr 52.0		Mn 54.9		Fe 55.9		Co 58.9		Ni 58.7		Cu 63.6		Zn 65.4							
37		38																39		40		41		42		43		44		45		46		47		48		49					
Rb 85.5		Sr 87.6																Y 88.9		Zr 91.2		Nb 92.9		Mo 95.9		Tc 98.9		Ru 101		Rh 103		Pd 106		Ag 108		Cd 112							
55		56																71		72		73		74		75		76		77		78		79		80		81					
Cs 133		Ba 137																Lu 175		Hf 179		Ta 181		W 184		Re 186		Os 190		Ir 192		Pt 195		Au 197		Hg 201							
87		88																103		104		105		106		107		108		109		110		111		112		113					
Fr 223		Ra 226																Lr 262		Rf 261		Db 262		Sg 263		Bh 264		Hs 265		Mt 268		Ds 271		Rg 272		Cn 277							
57		58																59		60		61		62		63		64		65		66		67		68		69		70			
Lanthanide Series		La 139																Ce 140		Pr 141		Nd 144		Pm 147		Sm 150		Eu 152		Gd 157		Tb 159		Dy 163		Ho 165		Er 167		Tm 169		Yb 173	
89		90																91		92		93		94		95		96		97		98		99		100		101		102			
Actinide Series		Ac 227																Th 232		Pa 231		U 238		Np 237		Pu 239		Am 241		Cm 244		Bk 249		Cf 251		Es 252		Fm 257		Md 258		No 259	