

Data Sheet for Chemistry (Salters)

GCE Advanced level and Advanced Subsidiary

Chemistry (Salters) 3887, 7887

Chemistry units 2848–2855

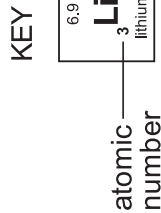
The information in this Sheet is for the use of candidates following Chemistry (Salters) 3887 or 7887.

Clean copies of this Sheet must be issued to candidates in the examination room, and must be given up to the Invigilator at the end of the examination.

Copies of this Sheet may be used for teaching.


The Periodic Table

Period	1	2	3	4	5	6	7	8	9	10	11	12							
1	Li 3 lithium	Be 4 beryllium											He 2 helium						
2	Li 3 lithium	Be 4 beryllium	p block										Ne 10 neon						
3	Na 11 sodium	Mg 12 magnesium	d block										Ar 18 argon						
4	K 19 potassium	Ca 20 calcium	Sc 21 scandium	Ti 22 titanium	V 23 vanadium	Cr 24 chromium	Mn 25 manganese	Fe 26 iron	Co 27 cobalt	Ni 28 nickel	Cu 29 copper	Zn 30 zinc	Ga 31 gallium	Ge 32 germanium	As 33 arsenic	Se 34 selenium	Br 35 bromine	Kr 36 krypton	
5	Rb 37 rubidium	Sr 38 strontium	Y 39 yttrium	Zr 40 zirconium	Nb 41 niobium	Mo 42 molybdenum	Tc 43 technetium	Ru 44 ruthenium	Rh 45 rhodium	Pd 46 palladium	Ag 47 silver	Cd 48 cadmium	In 49 indium	Sn 50 tin	Sb 51 antimony	Te 52 tellurium	I 53 iodine	Xe 54 xenon	
6	Cs 55 caesium	Ba 56 barium	La 57 lanthanum	Hf 72 hafnium	Ta 73 tantalum	W 74 tungsten	Re 75 rhenium	Os 76 osmium	Ir 77 iridium	Pt 78 platinum	Au 79 gold	Hg 80 mercury	Tl 81 thallium	Pb 82 lead	Bi 83 bismuth	Po 84 polonium	At 85 astatine	Rn 86 radon	
7	Fr 87 francium	Ra 88 radium	Ac 89 actinium	Rf 104 rutherfordium	Db 105 dubnium	Sg 106 seaborgium	Bh 107 bohrium	Hs 108 hassium	Mt 109 meitnerium	Uun 110 ununilium	Uuu 111 unununium	Uub 112 ununbium	Uuq 114 ununquadium	Po 116 ununhexium	Uuh 116 ununhexium	Uuo 118 ununoctium			
													f block						
													Lanthanide elements						
													Actinide elements						
													f block						



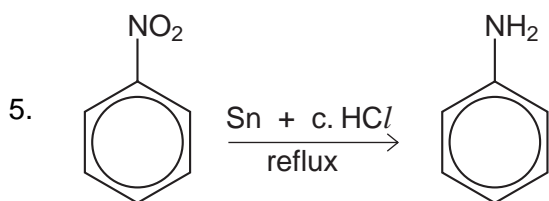
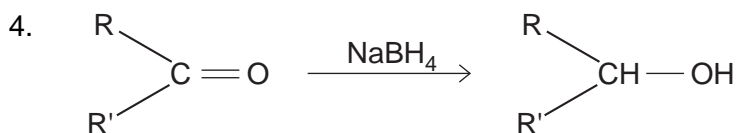
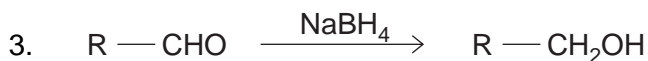
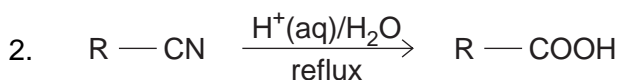
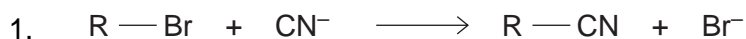
An entry in brackets indicates the mass number of the longest-lived isotope of an element with no stable isotopes.

Characteristic i.r. absorptions in organic molecules

Bond	Location	Wavenumber/cm ⁻¹	Intensity
C—H	alkanes	2850–2950	M–S
	alkenes, arenes	3000–3100	M–S
	alkynes	ca 3300	S
C=C	alkenes	1620–1680	M
	arenes	several peaks in range 1450–1650	variable
C≡C	alkynes	2100–2260	M
C=O	aldehydes	1720–1740	S
	ketones	1705–1725	S
	carboxylic acids	1700–1725	S
	esters	1735–1750	S
	amides	1630–1700	M
C—O	alcohols, ethers, esters	1050–1300	S
C≡N	nitriles	2200–2260	M
C—F	fluoroalkanes	1000–1400	S
C—Cl	chloroalkanes	600–800	S
C—Br	bromoalkanes	500–600	S
O—H	alcohols, phenols	3600–3640	S
	* alcohols, phenols	3200–3600	S (broad)
	* carboxylic acids	2500–3200	M (broad)
N—H	primary amines	3300–3500	M–S
	amides	ca 3500	M

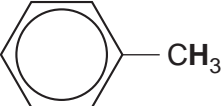
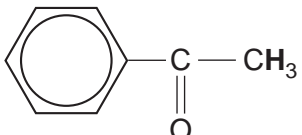
M Medium
S Strong
* hydrogen-bonded

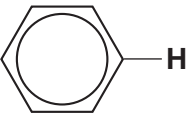
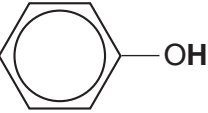
Some useful organic reactions



Chemical shifts for some type of protons (^1H) in n.m.r. spectra

Chemical shifts are for hydrogen (^1H) relative to TMS (tetramethylsilane).
R represents an alkyl group.

Type of proton	Chemical shift (δ) in approximate region of
$\text{R}-\text{CH}_3$	0.8–1.2
$\text{R}-\text{CH}_2-\text{R}$	1.4
$\begin{array}{c} \text{R} \\ \\ \text{R}-\text{CH}-\text{R} \end{array}$	1.5
$\begin{array}{c} \\ >\text{C}=\text{C}-\text{CH}_3 \end{array}$	1.6
$\begin{array}{c} \\ >\text{C}=\text{C}-\text{CH}_2-\text{R} \end{array}$	2.3
	2.3
$\begin{array}{c} \text{R}-\text{C}-\text{CH}_3 \\ \\ \text{O} \end{array}$	2.2
$\begin{array}{c} \text{R}-\text{C}-\text{CH}_2-\text{R} \\ \\ \text{O} \end{array}$	2.4
	2.6
$\begin{array}{c} >\text{N}-\text{CH}_3 \\ \text{(amine)} \end{array}$	2.3
$\begin{array}{c} >\text{N}-\text{CH}_2-\text{R} \\ \text{(amine)} \end{array}$	2.5
$\begin{array}{c} \\ \text{R}-\text{C}-\text{N}-\text{CH}_3 \\ \\ \text{O} \end{array}$ (amide)	2.9

Type of proton	Chemical shift (δ) in approximate region of
$-\text{O}-\text{CH}_3$ (alcohol)	3.3
$-\text{O}-\text{CH}_2-\text{R}$ (alcohol)	3.6
$\begin{array}{c} \text{R}-\text{C}-\text{O}-\text{CH}_3 \\ \\ \text{O} \end{array}$ (ester)	3.7
$\text{R}-\text{CH}_2-\text{Cl}$	3.6
$\text{R}-\text{CH}_2-\text{Br}$	3.5
$\text{R}-\text{CH}=\text{CH}-\text{R}$	4.5–6.0
$\begin{array}{c} \text{R}-\text{CH}=\text{CH}-\text{C}- \\ \\ \text{O} \end{array}$	6.0–8.0
	6.0–9.0
$\begin{array}{c} \text{R}-\text{C}=\text{O} \\ \\ \text{H} \end{array}$ (aldehyde)	10.0
$\text{R}-\text{OH}$	0.5–4.5*
	4.5–10.0*
$\text{R}-\text{NH}_2$ (amine)	0.5–6.0*
$\begin{array}{c} \text{R}-\text{C}-\text{NH}_2 \\ \\ \text{O} \end{array}$ (amide)	5–12*
$\begin{array}{c} \text{R}-\text{C}-\text{OH} \\ \\ \text{O} \end{array}$ (acid)	9–15*

* Signals from hydrogens in $-\text{OH}$ and $-\text{NH}-$ groups in alcohols, phenols, carboxylic acids, amines and amides are very variable and often broad. The chemical shift is sensitive to temperature, nature of the solvent and the concentration. The stronger the hydrogen bonding the larger the chemical shift.

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