

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

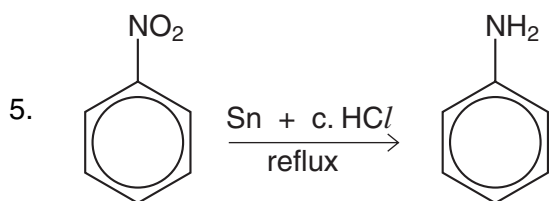
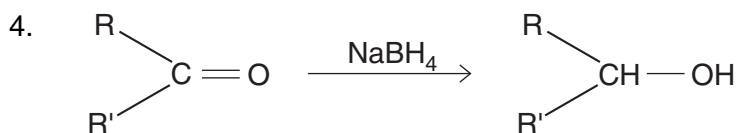
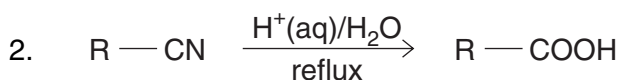
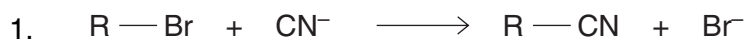
		Group																			
Period	1	1	2																		
		1	2	3	4	5	6	7	0												
1	2	3	4	5	6	7	8	9	10	18	36	54	86	118	150	182	206	222	254	286	304
2	3	4	5	6	7	8	9	10	11	19	37	55	87	119	151	183	209	226	258	290	318
3	4	5	6	7	8	9	10	11	12	20	38	56	88	120	152	184	210	227	260	292	320
4	5	6	7	8	9	10	11	12	13	21	39	57	89	121	153	185	211	228	262	294	322
5	6	7	8	9	10	11	12	13	14	22	40	58	90	122	154	186	212	229	264	296	324
6	7	8	9	10	11	12	13	14	15	23	41	59	91	123	155	187	213	230	266	298	326
7	8	9	10	11	12	13	14	15	16	24	42	60	92	124	156	188	214	231	268	300	328
8	9	10	11	12	13	14	15	16	17	25	43	61	93	125	157	189	215	232	270	302	330
9	10	11	12	13	14	15	16	17	18	26	44	62	94	126	158	190	216	233	272	304	332
10	11	12	13	14	15	16	17	18	19	27	45	63	95	127	159	191	217	234	274	306	334
11	12	13	14	15	16	17	18	19	20	28	46	64	96	128	160	192	218	235	276	308	336
12	13	14	15	16	17	18	19	20	21	29	47	65	97	129	161	193	219	236	278	310	338
13	14	15	16	17	18	19	20	21	22	30	48	66	98	130	162	194	220	237	280	312	340
14	15	16	17	18	19	20	21	22	23	31	49	67	99	131	163	195	221	238	282	314	342
15	16	17	18	19	20	21	22	23	24	32	50	68	100	132	164	196	222	239	284	316	344
16	17	18	19	20	21	22	23	24	25	33	51	69	101	133	165	197	223	240	286	318	346
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18	19	20	21	22	23	24	25	26	27	35	53	71	103	135	167	199	225	242	290	322	350
19	20	21	22	23	24	25	26	27	28	36	54	72	104	136	168	200	226	243	292	324	352
20	21	22	23	24	25	26	27	28	29	37	55	73	105	137	169	201	227	244	294	326	354
21	22	23	24	25	26	27	28	29	30	38	56	74	106	138	170	202	228	245	296	328	356
22	23	24	25	26	27	28	29	30	31	39	57	75	107	139	171	203	229	246	298	330	358
23	24	25	26	27	28	29	30	31	32	40	58	76	108	140	172	204	230	247	300	332	360
24	25	26	27	28	29	30	31	32	33	41	59	77	109	141	173	205	231	248	302	334	362
25	26	27	28	29	30	31	32	33	34	42	60	78	110	142	174	206	232	249	304	336	364
26	27	28	29	30	31	32	33	34	35	43	61	79	111	143	175	207	233	250	306	338	366
27	28	29	30	31	32	33	34	35	36	44	62	80	112	144	176	208	234	251	308	340	368
28	29	30	31	32	33	34	35	36	37	45	63	81	113	145	177	209	235	252	310	342	370
29	30	31	32	33	34	35	36	37	38	46	64	82	114	146	178	210	236	253	312	344	372
30	31	32	33	34	35	36	37	38	39	47	65	83	115	147	179	211	237	254	314	346	374
31	32	33	34	35	36	37	38	39	40	48	66	84	116	148	180	212	238	255	316	348	376
32	33	34	35	36	37	38	39	40	41	49	67	85	117	149	181	213	239	256	318	350	378
33	34	35	36	37	38	39	40	41	42	50	68	86	118	150	182	214	240	257	320	352	380
34	35	36	37	38	39	40	41	42	43	51	69	87	119	151	183	215	241	258	322	354	382
35	36	37	38	39	40	41	42	43	44	52	70	88	120	152	184	216	242	259	324	356	384
36	37	38	39	40	41	42	43	44	45	53	71	89	121	153	185	217	243	260	326	358	386
37	38	39	40	41	42	43	44	45	46	54	72	90	122	154	186	218	244	262	328	360	388
38	39	40	41	42	43	44	45	46	47	55	73	91	123	155	187	219	245	264	330	362	390
39	40	41	42	43	44	45	46	47	48	56	74	92	124	156	188	220	246	266	332	364	392
40	41	42	43	44	45	46	47	48	49	57	75	93	125	157	189	221	247	268	334	366	394
41	42	43	44	45	46	47	48	49	50	58	76	94	126	158	190	222	248	270	336	368	396
42	43	44	45	46	47	48	49	50	51	59	77	95	127	159	191	223	249	272	338	370	398
43	44	45	46	47	48	49	50	51	52	60	78	96	128	160	192	224	250	274	340	372	400
44	45	46	47	48	49	50	51	52	53	61	79	97	129	161	193	225	251	276	342	374	402
45	46	47	48	49	50	51	52	53	54	62	80	98	130	162	194	226	252	278	344	376	404
46	47	48	49	50	51	52	53	54	55	63	81	99	131	163	195	227	253	280	346	378	406
47	48	49	50	51	52	53	54	55	56	64	82	100	132	164	196	228	254	282	348	380	408
48	49	50	51	52	53	54	55	56	57	65	83	101	133	165	197	229	255	284	350	382	

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

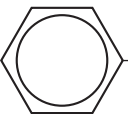
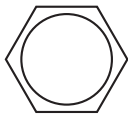
M Medium
S Strong
* hydrogen-bonded

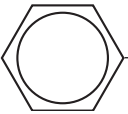
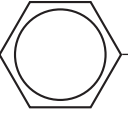
Some useful organic reactions



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
$\begin{array}{c} \\ \text{R}-\text{C}-\text{N}-\text{CH}_3 \\ \\ \text{O} \end{array} \text{ (amide)}$	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.