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Data Sheet for Chemistry B (Salters)

(version 2.2)

5097417607

GCE Advanced Level and Advanced Subsidiary

Chemistry B (Salters) (H035, H435)

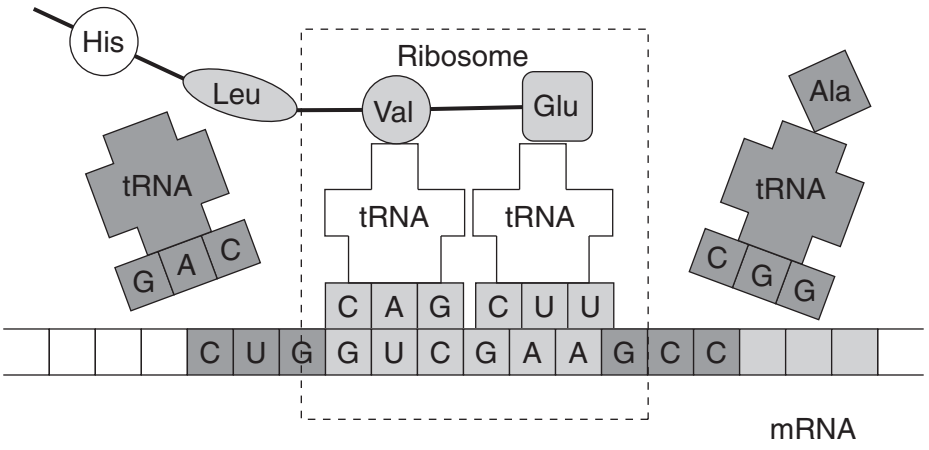
Chemistry units F331–F336

The information in this sheet is for the use of candidates following Chemistry B (Salters) (H035/H435). Copies of this sheet may be used for teaching.

Instructions to Exams Officer/Invigilator

- A copy of this Data Sheet will be included as an insert with each question paper. This should be given up to the Invigilator at the end of the examination.
- **Do not send this Data Sheet for marking; it should be retained in the centre or destroyed.**

Diagram to illustrate protein synthesis



ADAPTED FROM SALTERS' ADVANCED CHEMISTRY: CHEMICAL STORYLINES BY GEORGE BURTON. REPRINTED BY PERMISSION OF HARCOURT EDUCATION

Characteristic infrared absorption in organic molecules

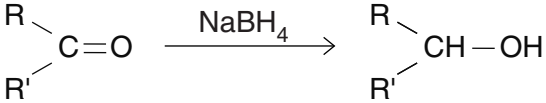
bond	location	wavenumber/cm^{-1}	intensity	
C—H	alkanes	2850–2950	M–S	M medium
	alkenes, arenes	3000–3100	M–S	S strong
	alkynes	*ca.* 3300	S	* hydrogen bonded
C═C	alkenes	1620–1680	M	
	arenes	several peaks in range 1450–1650	variable	
C≡C	alkynes	2100–2260	M	
C═O	aldehydes	1720–1740	S	
	ketones	1705–1725	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	
	chloroalkanes	600–800	S	
	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	

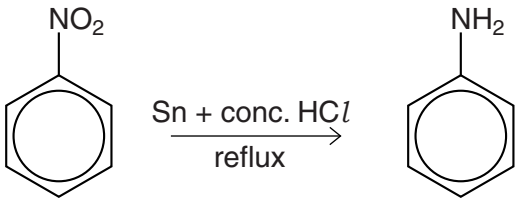
Some useful organic reactions

1 $R\text{–}Br + CN^- \longrightarrow R\text{–}CN + Br^-$

2 $R\text{–}CN \xrightarrow[\text{reflux}]{H^+ (aq)/H_2O} R\text{–}COOH$

3 $RCHO \xrightarrow{NaBH_4} RCH_2OH$

4 

5 

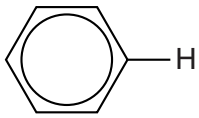
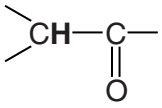
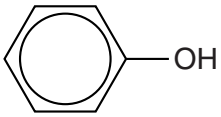
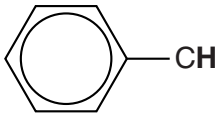
6 $R\text{–}COOH + SCl_2O \longrightarrow R\text{–}COCl + SO_2 + HCl$

7 $R\text{–}OH \xrightarrow{NaBr/\ c.H_2SO_4} R\text{–}Br$

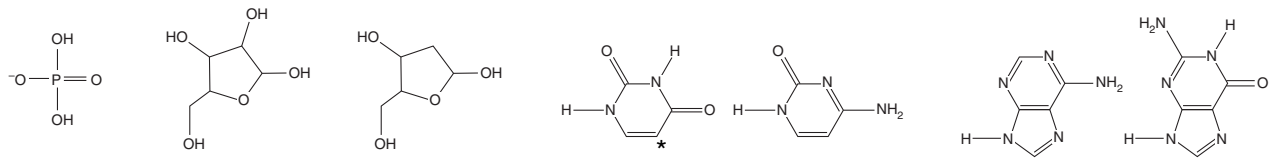
Chemical shifts for some types of protons (^{1}H) in NMR spectra

Chemical shifts are for hydrogen (^{1}H) relative to TMS (tetramethylsilane).

They are typical values and can vary slightly depending on the solvent, concentration and substituents.

type of proton	chemical shift, δ/ppm	type of proton	chemical shift, δ/ppm
C**H**$_3$—C	0.7–1.6		6.4–8.2
C—C**H**$_2$—C C—C**H**—C C	1.4–2.3	—C—C**H**O	9.4–10.0
 carbonyls esters amides acids	2.0–2.7	—C—O**H**	0.5–4.5*
—C**H**—N amines amides	2.3–2.9		4.5–10.0*
	2.3–3.0	—C—N**H**	1.0–5.0*
—O—C**H** alcohols esters ethers	3.3–4.8	—CO—N**H**	5.0–12.0*
—C**H**—C*l* or Br	3.0–4.2	—CO—O**H**	9.0–15.0*
—C**H**═C**H**—	4.5–6.0	*these signals are *very* variable (sometimes outside these limits) and often broad.	

Monomers of DNA and RNA



phosphate **ribose** **deoxyribose** **uracil** **cytosine** **adenine** **guanine**

(thymine has a CH_3 at position *)

The Periodic Table of the Elements

1	2											3	4	5	6	7	0
											1.0 **H** hydrogen 1						4.0 **He** helium 2
6.9 **Li** lithium 3	9.0 **Be** beryllium 4											10.8 **B** boron 5	12.0 **C** carbon 6	14.0 **N** nitrogen 7	16.0 **O** oxygen 8	19.0 **F** fluorine 9	20.2 **Ne** neon 10
23.0 **Na** sodium 11	24.3 **Mg** magnesium 12											27.0 **Al** aluminium 13	28.1 **Si** silicon 14	31.0 **P** phosphorus 15	32.1 **S** sulfur 16	35.5 **Cl** chlorine 17	39.9 **Ar** argon 18
39.1 **K** potassium 19	40.1 **Ca** calcium 20	45.0 **Sc** scandium 21	47.9 **Ti** titanium 22	50.9 **V** vanadium 23	52.0 **Cr** chromium 24	54.9 **Mn** manganese 25	55.8 **Fe** iron 26	58.9 **Co** cobalt 27	58.7 **Ni** nickel 28	63.5 **Cu** copper 29	65.4 **Zn** zinc 30	69.7 **Ga** gallium 31	72.6 **Ge** germanium 32	74.9 **As** arsenic 33	79.0 **Se** selenium 34	79.9 **Br** bromine 35	83.8 **Kr** krypton 36
85.5 **Rb** rubidium 37	87.6 **Sr** strontium 38	88.9 **Y** yttrium 39	91.2 **Zr** zirconium 40	92.9 **Nb** niobium 41	95.9 **Mo** molybdenum 42	[98] **Tc** technetium 43	101.1 **Ru** ruthenium 44	102.9 **Rh** rhodium 45	106.4 **Pd** palladium 46	107.9 **Ag** silver 47	112.4 **Cd** cadmium 48	114.8 **In** indium 49	118.7 **Sn** tin 50	121.8 **Sb** antimony 51	127.6 **Te** tellurium 52	126.9 **I** iodine 53	131.3 **Xe** xenon 54
132.9 **Cs** caesium 55	137.3 **Ba** barium 56	138.9 **La*** lanthanum 57	178.5 **Hf** hafnium 72	180.9 **Ta** tantalum 73	183.8 **W** tungsten 74	186.2 **Re** rhenium 75	190.2 **Os** osmium 76	192.2 **Ir** iridium 77	195.1 **Pt** platinum 78	197.0 **Au** gold 79	200.6 **Hg** mercury 80	204.4 **Tl** thallium 81	207.2 **Pb** lead 82	209.0 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radius 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112–116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

140.1 **Ce** cerium 58	140.9 **Pr** praseodymium 59	144.2 **Nd** neodymium 60	144.9 **Pm** promethium 61	150.4 **Sm** samarium 62	152.0 **Eu** europium 63	157.2 **Gd** gadolinium 64	158.9 **Tb** terbium 65	162.5 **Dy** dysprosium 66	164.9 **Ho** holmium 67	167.3 **Er** erbium 68	168.9 **Tm** thulium 69	173.0 **Yb** ytterbium 70	175.0 **Lu** lutetium 71
232.0 **Th** thorium 90	[231] **Pa** protactinium 91	238.1 **U** uranium 92	[237] **Np** neptunium 93	[242] **Pu** plutonium 94	[243] **Am** americium 95	[247] **Cm** curium 96	[245] **Bk** berkelium 97	[251] **Cf** californium 98	[254] **Es** einsteinium 99	[253] **Fm** fermium 100	[256] **Md** mendelevium 101	[254] **No** nobelium 102	[257] **Lr** lawrencium 103