OCR
RECOGNISING ACHIEVEMENT

Data Sheet for Chemistry B (Salters)

(version 2.0)

OCE/10218

GCE Advanced Level and Advanced Subsidiary

Chemistry B (Salters) (H035, H435)

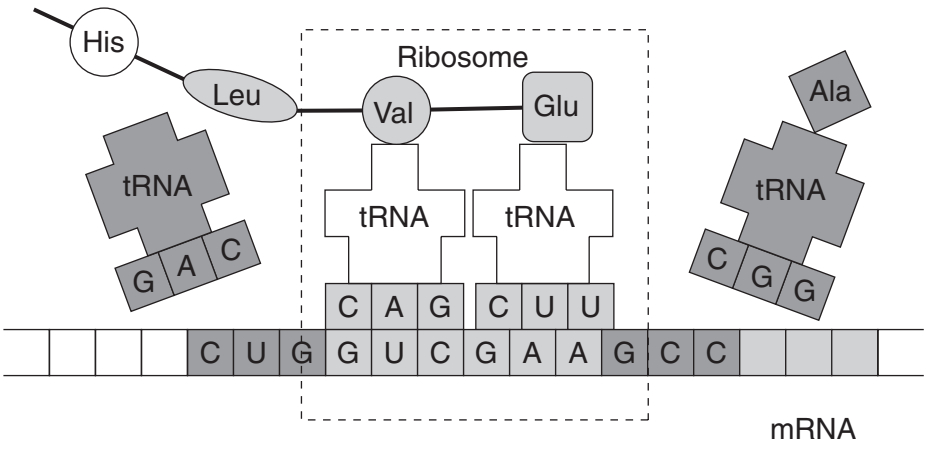
Chemistry units F331–F336

The information in this sheet is for the use of candidates following Chemistry B (Salters) H035 and H435

A copy of this sheet will be included as an insert with each unit paper.

Copies of this sheet may be used for teaching.

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

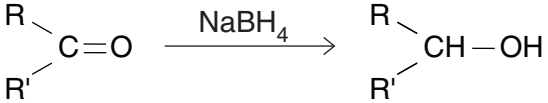
bond	location	wavenumber/cm^{-1}	intensity	
C—H	alkanes	2850–2950	M–S	M medium
	alkenes, arenes	3000–3100	M–S	S strong
	alkynes	*ca.* 3300	S	* hydrogen bonded
C=C	alkenes	1620–1680	M	
	arenes	several peaks in range 1450–1650	variable	
C≡C	alkynes	2100–2260	M	
C=O	aldehydes	1720–1740	S	
	ketones	1705–1725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

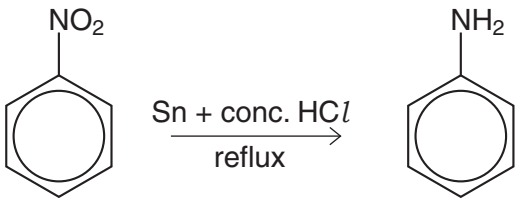
Some useful organic reactions

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 

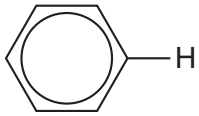
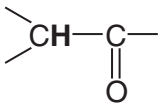
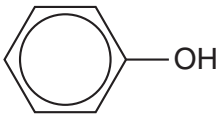
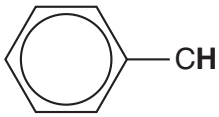
6 $R\text{–}COOH + SCl_2O \longrightarrow R\text{–}COCl + SO_2 + HCl$

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

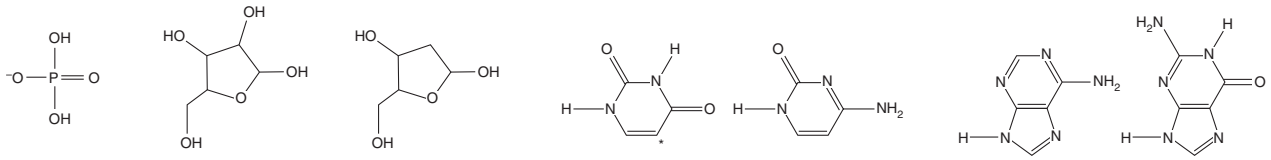
Chemical shifts for some types of protons (^{1}H) in NMR spectra

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
CH_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