



# **Data Sheet for Chemistry A**

**(version 2.2)**

GCE Advanced Level and Advanced Subsidiary

**Chemistry A (H034, H434)**

Chemistry A units F321–F326

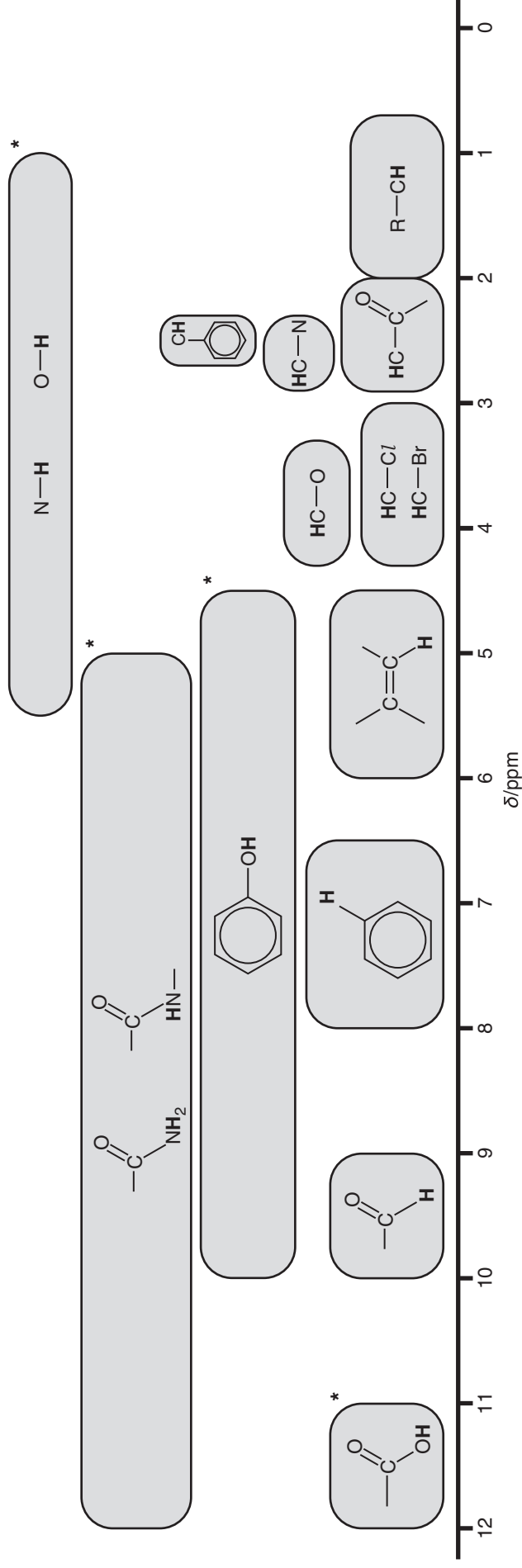
The information in this sheet is for the use of candidates following Chemistry A (H034 and H434). Copies of this sheet may be used for teaching.

**Instructions to Exams Officer/Invigilator**

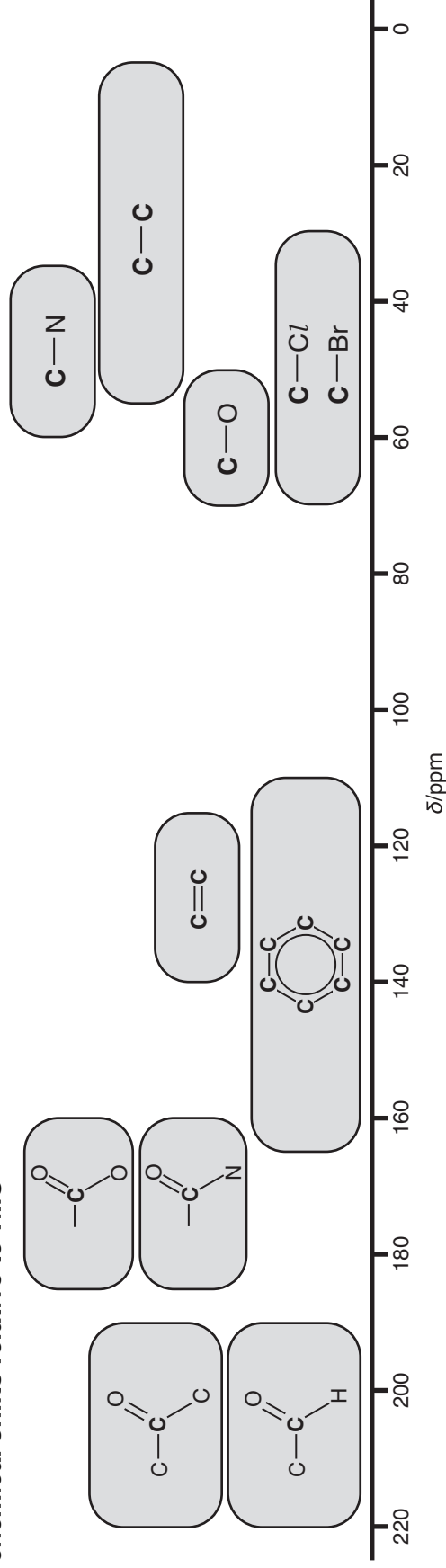
- **Do not send this Data Sheet for marking; it should be retained in the centre or destroyed.**

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.

## $^1\text{H}$ NMR chemical shifts relative to TMS



## $^{13}\text{C}$ NMR chemical shifts relative to TMS



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

\*OH and NH chemical shifts are very variable (sometimes outside these limits) and are often broad. Signals are not usually seen as split peaks.

# The Periodic Table of the Elements

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

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

## General Information

- 1 mol of gas molecules occupies  $24.0 \text{ dm}^3$  at room temperature and pressure, RTP.
- Avogadro constant,  $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$ .
- Ionic product of water,  $K_w = 1.00 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$ .

## Characteristic infrared absorptions in organic molecules

bond	location	wavenumber/ $\text{cm}^{-1}$
C—O	alcohols, esters, carboxylic acids	1000–1300
C=O	aldehydes, ketones, carboxylic acids, esters, amides	1640–1750
C—H	organic compound with a C—H bond	2850–3100
O—H	carboxylic acids	2500–3300 (very broad)
N—H	amines, amides	3200–3500
O—H	alcohols, phenols	3200–3550 (broad)



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