

Modified Enlarged 36pt

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

AS Level Chemistry A (H032)

A Level Chemistry A (H432)

Data Sheet

INSTRUCTIONS

**Do NOT send this Data Sheet
for marking. Keep it in the
centre or recycle it.**

DC (PQ) 310294
© OCR 2021

CST263



© OCR 2021 Contact The OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

GENERAL INFORMATION

Molar gas volume = $24.0 \text{ dm}^3 \text{ mol}^{-1}$ at room temperature and pressure, RTP

Avogadro constant, $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$

**Specific heat capacity of water,
 $c = 4.18 \text{ J g}^{-1} \text{ K}^{-1}$**

**Ionic product of water,
 $K_w = 1.00 \times 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$ at 298 K**

1 tonne = 10^6 g

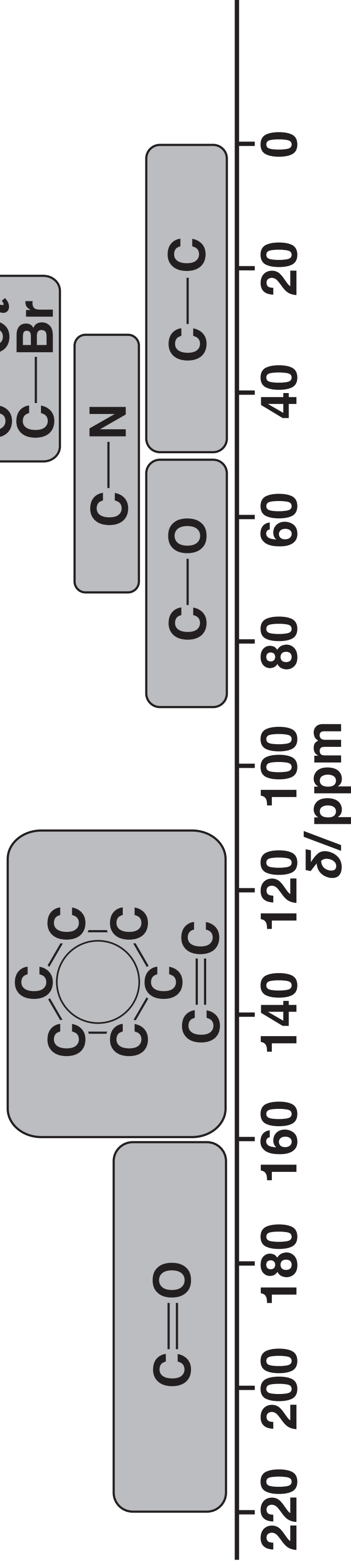
**Arrhenius equation: $k = Ae^{-E_a/RT}$
or $\ln k = -E_a/RT + \ln A$**

Gas constant, $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1}$

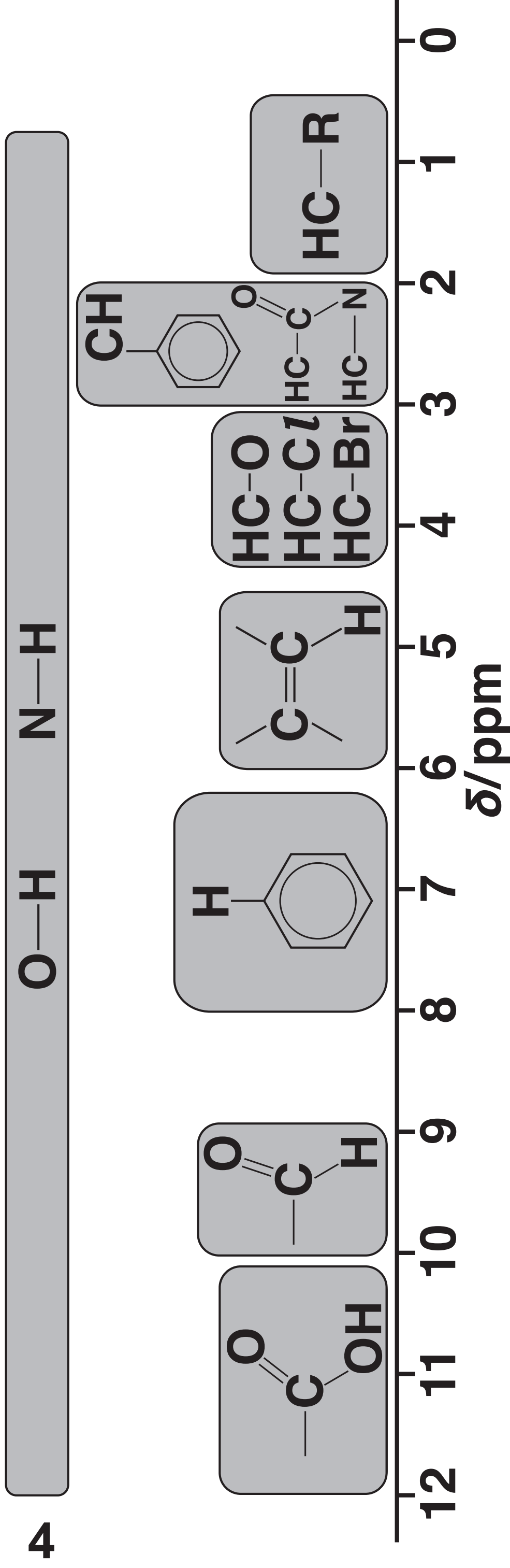
CHARACTERISTIC INFRARED ABSORPTIONS IN ORGANIC MOLECULES

BOND	LOCATION	WAVENUMBER / cm ⁻¹
C–C	Alkanes, alkyl chains	750–1100
C–X	Haloalkanes (X = Cl, Br, I)	500–800
C–F	Fluoroalkanes	1000–1350
C–O	Alcohols, esters, carboxylic acids	1000–1300
C=C	Alkenes	1620–1680
C=O	Aldehydes, ketones, carboxylic acids, esters, amides, acyl chlorides and acid anhydrides	1630–1820
aromatic C=C	Arenes	Several peaks in range 1450–1650 (variable)
C≡N	Nitriles	2220–2260
C–H	Alkyl groups, alkenes, arenes	2850–3100
O–H	Carboxylic acids	2500–3300 (broad)
N–H	Amines, amides	3300–3500
O–H	Alcohols, phenols	3200–3600

¹³C NMR chemical shifts relative to TMS



¹H NMR chemical shifts relative to TMS



Chemical shifts are variable and can vary depending on the solvent, concentration and substituents. As a result, shifts may be outside the ranges indicated above.

OH and NH chemical shifts are very variable and are often broad. Signals are not usually seen as split peaks.

Note that CH bonded to 'shifting groups' on either side, e.g. $\text{O}-\text{CH}_2-\text{C}=\text{O}$, may be shifted more than indicated above.

The Periodic Table of the Elements

(1)

(2)

(3)

(4)

(5)

(6)

(7)

(0)

Key																	
atomic number																	
Symbol																	
name																	
relative atomic mass																	
1																	
1	2																
3	4	12															18
Li lithium 6.9	Be beryllium 9.0																He helium 4.0
11	12	18															
Na sodium 23.0	Mg magnesium 24.3																Ne neon 20.2
19	20	36															
K potassium 39.1	Ca calcium 40.1	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
		Sc scandium 45.0	Ti titanium 47.9	V vanadium 50.9	Cr chromium 52.0	Mn manganese 54.9	Fe iron 55.8	Co cobalt 58.9	Ni nickel 58.7	Cu copper 63.5	Zn zinc 65.4	Ga gallium 69.7	Ge germanium 72.6	As arsenic 74.9	Se selenium 79.0	Br bromine 79.9	Kr krypton 83.8
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54
Rb rubidium 85.5	Sr strontium 87.6	Y yttrium 88.9	Zr zirconium 91.2	Nb niobium 92.9	Mo molybdenum 95.9	Tc technetium	Ru ruthenium 101.1	Rh rhodium 102.9	Pd palladium 106.4	Ag silver 107.9	Cd cadmium 112.4	In indium 114.8	Sn tin 118.7	Sb antimony 121.8	Te tellurium 127.6	I iodine 126.9	Xe xenon 131.3
55	56	57–71		73	74	75	76	77	78	79	80	81	82	83	84	85	86
Cs caesium 132.9	Ba barium 137.3	lanthanoids		Ta tantalum 180.9	W tungsten 183.8	Re rhenium 186.2	Os osmium 190.2	Ir iridium 192.2	Pt platinum 195.1	Au gold 197.0	Hg mercury 200.6	Tl thallium 204.4	Pb lead 207.2	Bi bismuth 209.0	Po polonium	At astatine	Rn radon
87	88	89–103		105	106	107	108	109	110	111	112						
Fr francium	Ra radium	actinoids		Rf rutherfordium	Sg seaborgium	Bh bohrium	Hs hassium	Mt meitnerium	Ds darmstadtium	Rg roentgenium	Cn copernicium						
57	58	59	60	61	62	63	64	65	66	67	68	69	70	71			
La lanthanum 138.9	Ce cerium 140.1	Pr praseodymium 140.9	Nd neodymium 144.2	Pm promethium 144.9	Sm samarium 150.4	Eu europium 152.0	Gd gadolinium 157.2	Tb terbium 158.9	Dy dysprosium 162.5	Ho holmium 164.9	Er erbium 167.3	Tm thulium 168.9	Yb ytterbium 173.0	Lu lutetium 175.0			
89	90	91	92	93	94	95	96	97	98	99	100	101	102	103			
Ac actinium	Th thorium 232.0	Pa protactinium	U uranium 238.1	Np neptunium	Pu plutonium	Am americium	Cm curium	Bk berkelium	Cf californium	Es einsteinium	Fm fermium	Md mendelevium	No nobelium	Lr lawrencium			