

Advanced Subsidiary GCE (H032) Advanced GCE (H432)

Data Sheet for Chemistry A



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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

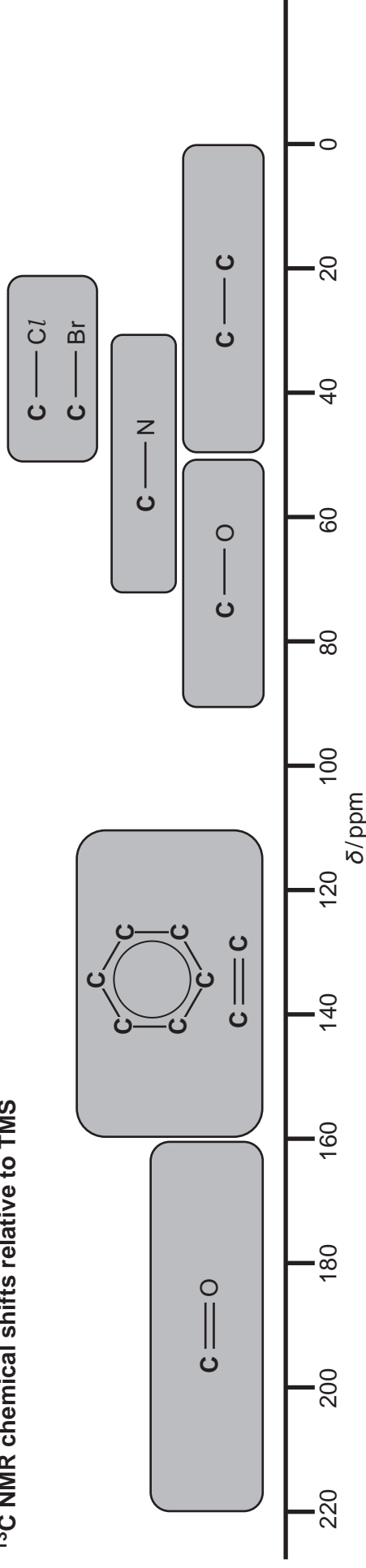
Arrhenius equation: $k = Ae^{-E_a/RT}$ or $\ln k = -E_a/RT + \ln A$

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

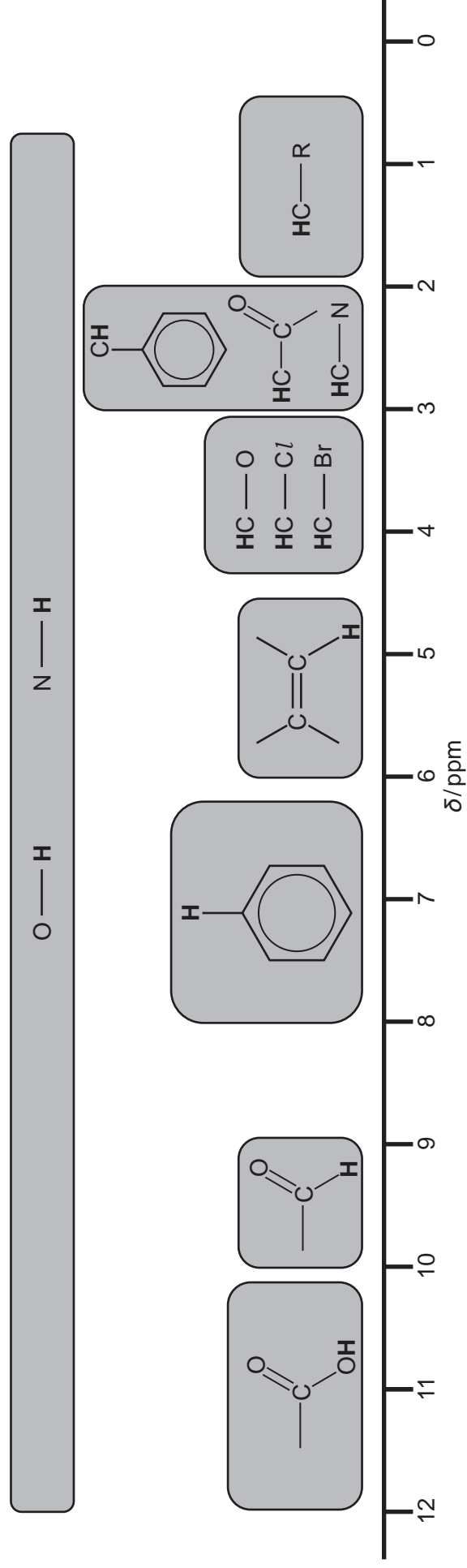
Characteristic infrared absorptions in organic molecules

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

^{13}C 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.

