

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced Subsidiary GCE (H032)

Advanced GCE (H432)

Data Sheet for Chemistry A

MODIFIED ENLARGED

The information in this sheet is for the use of candidates following the Advanced Subsidiary GCE in Chemistry A (H032) course and Advanced GCE in Chemistry A (H432) course.

The data in this sheet will be printed for distribution with the examination papers.

Copies of this sheet may be used for teaching.

INSTRUCTIONS TO EXAMS OFFICER/INVIGILATOR

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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

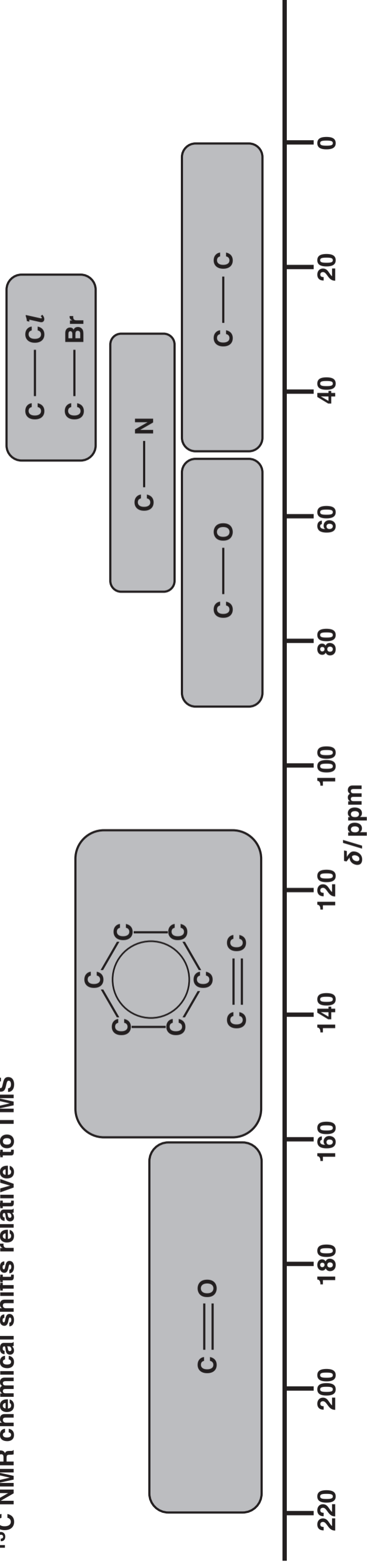
Arrhenius equation: $k = Ae^{-E_a/RT}$ or $\ln k = -E_a/RT + \ln A$

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

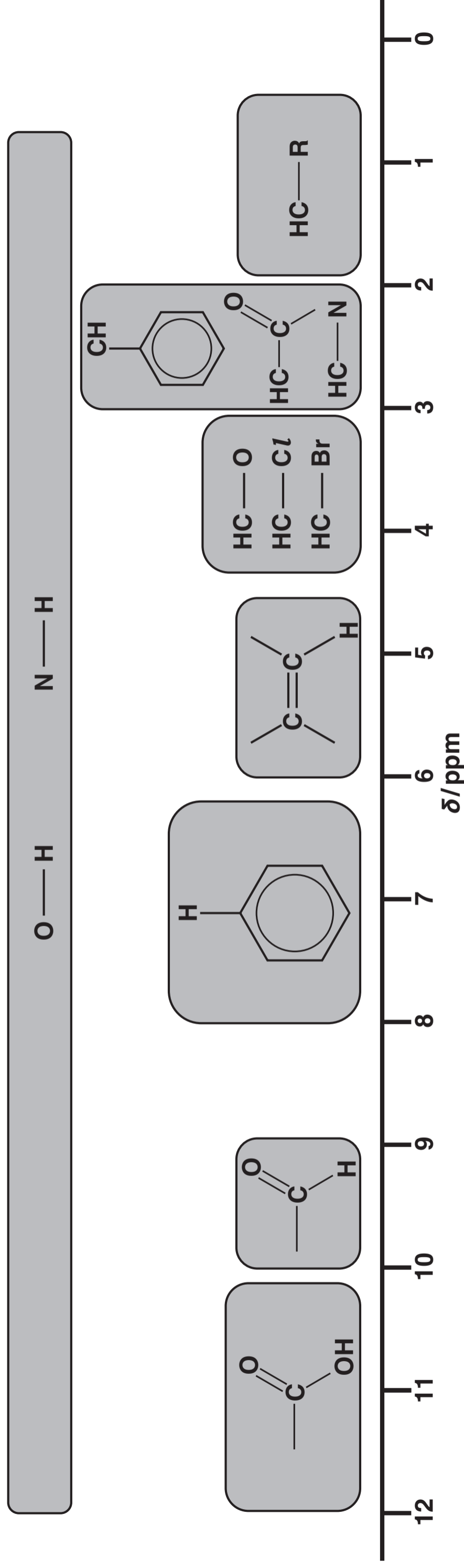
CHARACTERISTIC INFRARED ABSORPTIONS IN ORGANIC MOLECULES

| 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 |

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. O—CH₂—C=O, may be shifted more than indicated above.

The Periodic Table of the Elements

(1)

(2)

(3)

(4)

(5)

(6)

(7)

(0)

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