

# Advanced Subsidiary GCE (H033) Advanced GCE (H433)

## Data Sheet for Chemistry B



The information in this sheet is for the use of candidates following the Advanced Subsidiary GCE in Chemistry B (H033) course and Advanced GCE in Chemistry B (H433) course.

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Copies of this sheet may be used for teaching.

This document consists of 4 pages.

### General Information

Molar gas volume =  $24.0 \text{ dm}^3 \text{ mol}^{-1}$  at RTP

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

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

Planck constant,  $h = 6.63 \times 10^{-34} \text{ J Hz}^{-1}$

Speed of light in a vacuum,  $c = 3.00 \times 10^8 \text{ m s}^{-1}$

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

1 tonne =  $10^6 \text{ g}$

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

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

### Triplet base codes (codons) for some amino acids used in mRNA

Glycine	GGU
Alanine	GCC
Leucine	CUG
Serine	UCG
Aspartic acid	GAU
Glutamine	CAA
Valine	GUC

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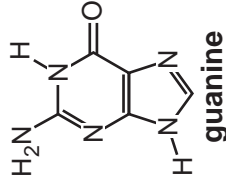
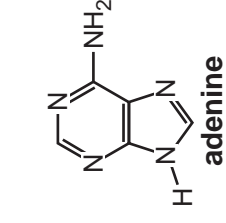
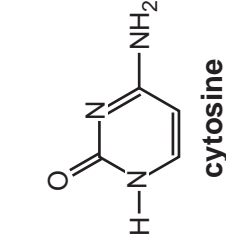
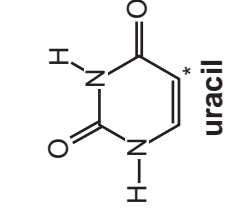
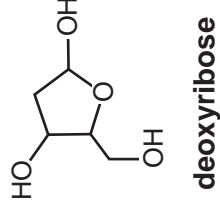
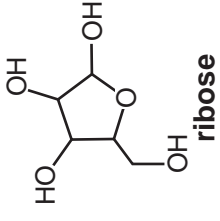
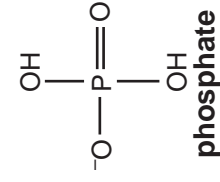
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### Characteristic infrared absorptions in organic molecules

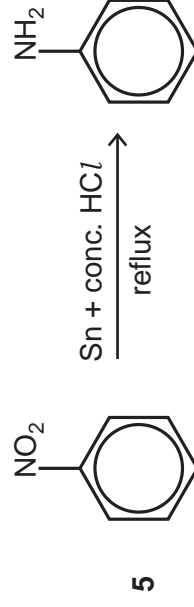
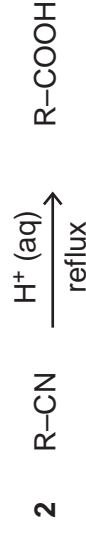
Bond	Location	Wavenumber/cm <sup>-1</sup>
C-H	Alkanes	2850–2950
	Alkenes, arenes	3000–3100
C-C	Alkanes	750–1100
	Alkenes	1620–1680
aromatic C=C	Arenes	Several peaks in range 1450–1650 (variable)
C=O	Aldehydes	1720–1740
	Ketones	1705–1725
	Carboxylic acids	1700–1725
	Esters	1735–1750
	Amides	1630–1700
	Acyl chlorides and acid anhydrides	1750–1820
C-O	Alcohols, ethers, esters and carboxylic acids	1000–1300
	Nitriles	2220–2260
C-X	Fluoroalkanes	1000–1350
	Chloroalkanes	600–800
	Bromoalkanes	500–600
O-H	Alcohols, phenols	3200–3600 (broad)
	Carboxylic acids	2500–3300 (broad)
N-H	Primary amines	3300–3500
	Amides	ca. 3500

### Monomers of DNA and RNA

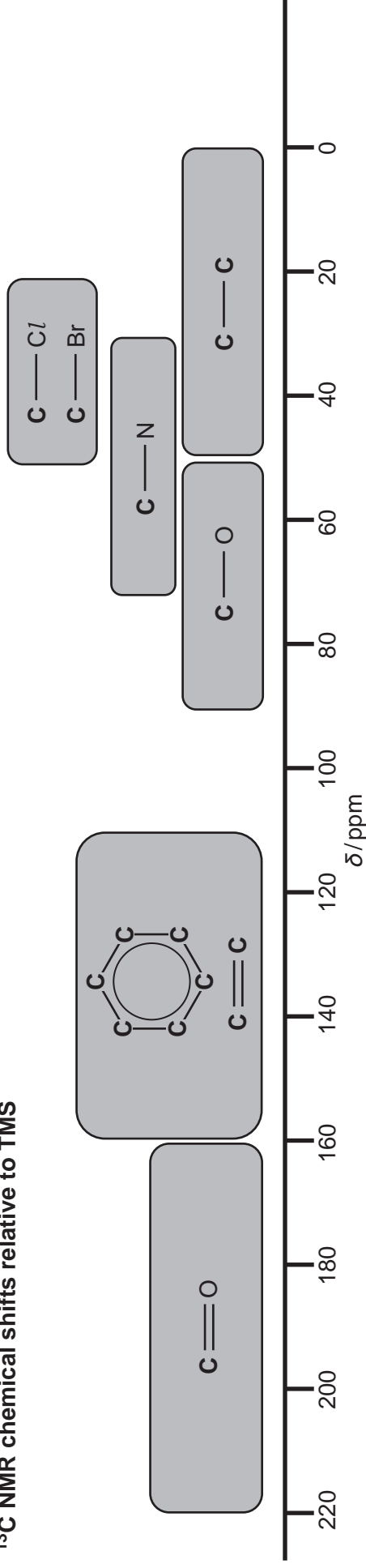


(thymine has a CH<sub>3</sub> at position \*)

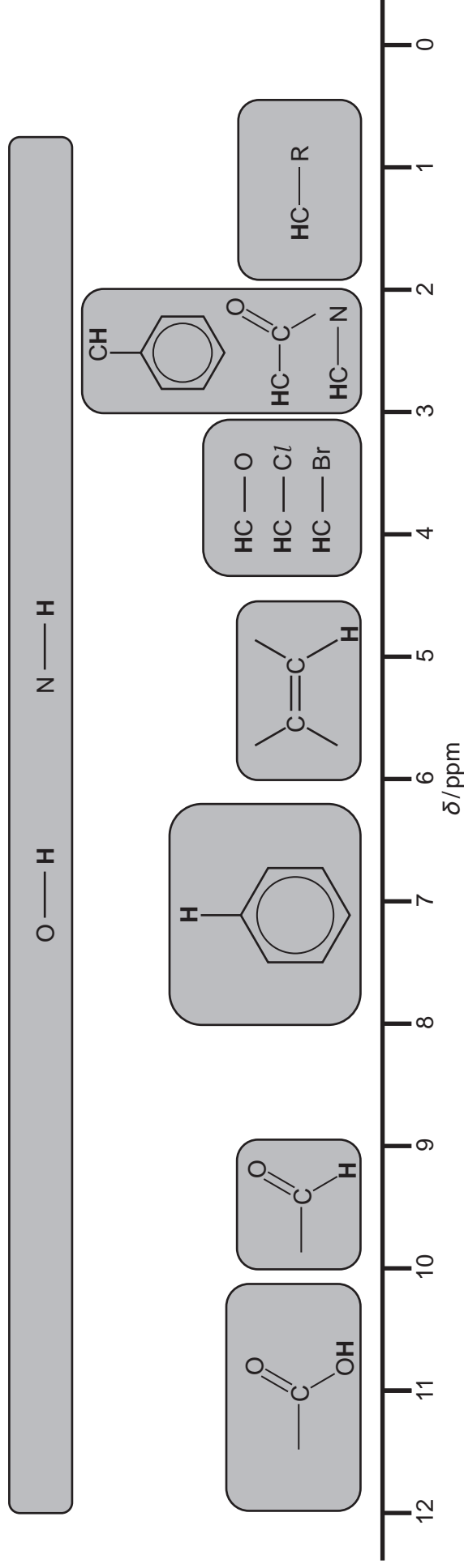
### Some useful organic reactions



### <sup>13</sup>C NMR chemical shifts relative to TMS



### <sup>1</sup>H 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—CH<sub>2</sub>—C=O, may be shifted more than indicated above.

