

Modified Enlarged 24pt
OXFORD CAMBRIDGE AND RSA EXAMINATIONS
AS Level Chemistry B (H033)
A Level Chemistry B (H433)

Data Sheet

INSTRUCTIONS

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

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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 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

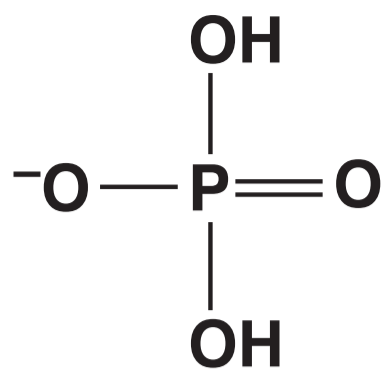
Glutamine CAA

Valine GUC

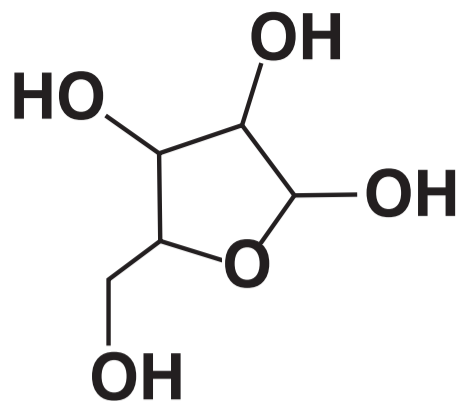
CHARACTERISTIC INFRARED ABSORPTIONS IN ORGANIC MOLECULES

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

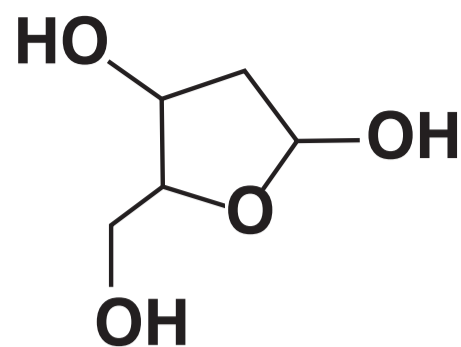
MONOMERS OF DNA AND RNA



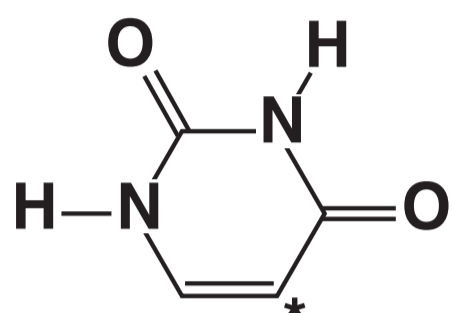
PHOSPHATE



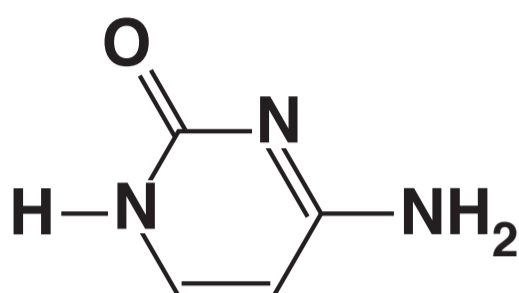
RIBOSE



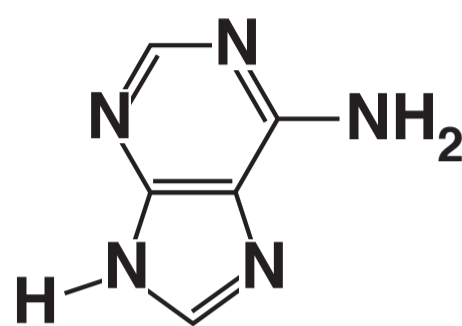
DEOXYRIBOSE



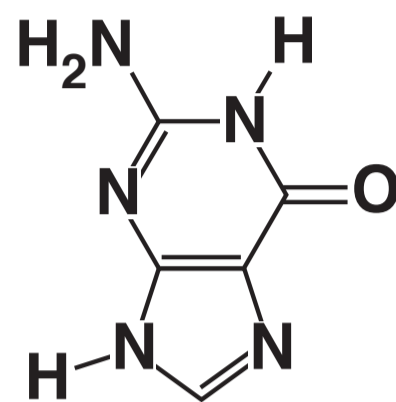
URACIL



CYTOSINE



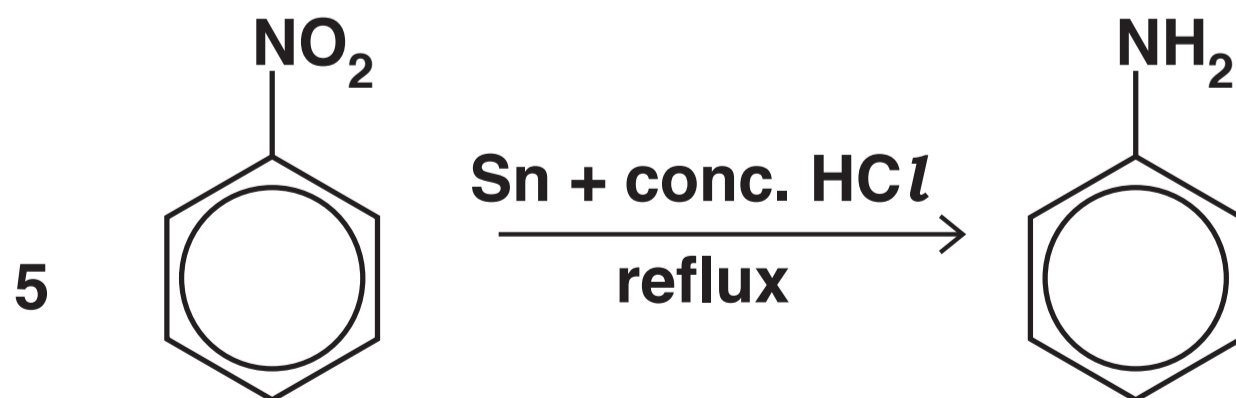
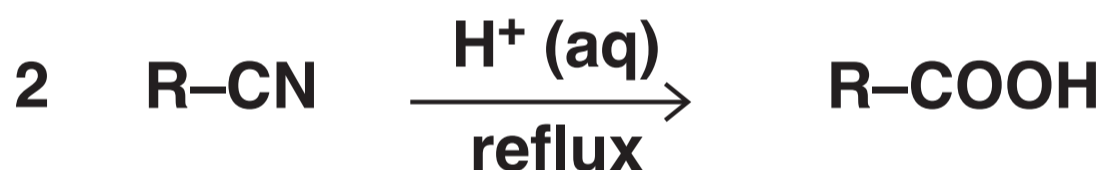
ADENINE



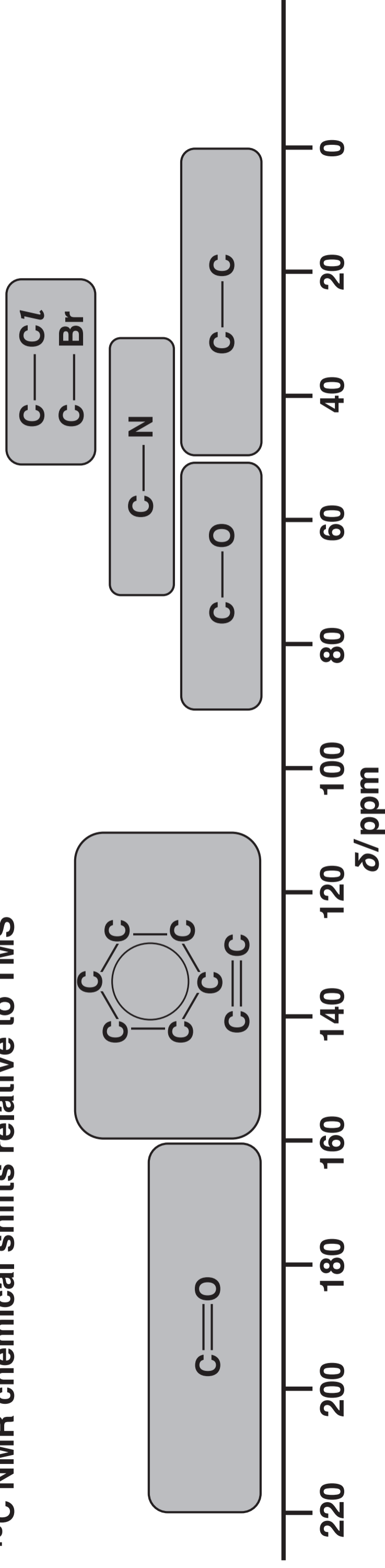
GUANINE

(thymine has a CH₃ at position *)

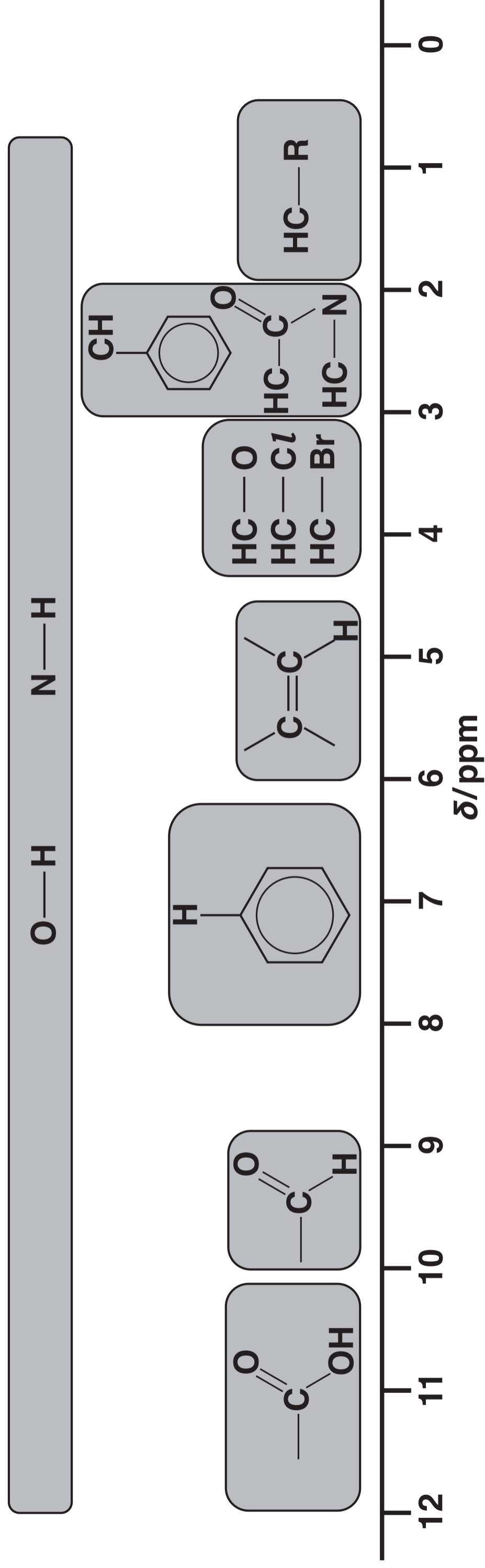
SOME USEFUL ORGANIC REACTIONS



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)

1		Key atomic number Symbol name relative atomic mass										18											
1	H hydrogen 1.0											2	He helium 4.0										
2																							
3	Li lithium 6.9	4	Be beryllium 9.0								5	B boron 10.8	6	C carbon 12.0	7	N nitrogen 14.0	8	O oxygen 16.0	9	F fluorine 19.0	10	Ne neon 20.2	
11	Na sodium 23.0	12	Mg magnesium 24.3								13	Al aluminium 27.0	14	Si silicon 28.1	15	P phosphorus 31.0	16	S sulfur 32.1	17	Cl chlorine 35.5	18	Ar argon 39.9	
19	K potassium 39.1	20	Ca calcium 40.1	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	
37	Rb rubidium 85.5	38	Sr strontium 87.6	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	
55	Cs caesium 132.9	56	Ba barium 137.3	57–71 lanthanoids	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89–103 actinoids	
87	Fr francium	88	Ra radium	89–103 actinoids	104	105	106	107	108	109	110	111	112		114		116						

57	La lanthanum 138.9	58	Ce cerium 140.1	59	Pr praseodymium 140.9	60	Nd neodymium 144.2	61	Pm promethium 144.9	62	Sm samarium 150.4	63	Eu europium 152.0	64	Gd gadolinium 157.2	65	Tb terbium 158.9	66	Dy dysprosium 162.5	67	Ho holmium 164.9	68	Er erbium 167.3	69	Tm thulium 168.9	70	Yb ytterbium 173.0	71	Lu lutetium 175.0
89	Ac actinium	90	Th thorium 232.0	91	Pa protactinium	92	U uranium 238.1	93	Np neptunium	94	Pu plutonium	95	Am americium	96	Cm curium	97	Bk berkelium	98	Cf californium	99	Es einsteinium	100	Fm fermium	101	Md mendelevium	102	No nobelium	103	Lr lawrencium