STUDY FORMULA BOOKLET

Edexcel AS Chemistry 8CH0 data booklet

The 8CH0 data booklet prints four constants, electronegativities, IR data and the periodic table; every calculation equation, including pV = nRT and Q = mcΔT, must be learned.

IN THE BOOKLET printed in the official booklet LEARN IT not printed: students must recall it

Based on the official **Pearson Edexcel Level 3 Advanced Subsidiary GCE in Chemistry (8CH0) Data Booklet, Issue 1, Summer 2016**, with what to learn and exam tips added by CuratedPrep.

Physical constants

Avogadro constant (L)	$L = 6.02 \times 10^{23}\ \text{mol}^{-1}$	IN THE BOOKLET
Elementary charge (e)	$e = 1.60 \times 10^{-19}\ \text{C}$	IN THE BOOKLET
Gas constant (R)	$R = 8.31\ \text{J mol}^{-1}\ \text{K}^{-1}$	IN THE BOOKLET
Molar volume of a gas at room temperature and pressure (r.t.p.) Use 24, not 22.4: the booklet gives the r.t.p. value only.	$V_\text{m} = 24\ \text{dm}^3\ \text{mol}^{-1}$	IN THE BOOKLET
Volume unit conversion	$1\ \text{dm}^3 = 1000\ \text{cm}^3 = 0.001\ \text{m}^3$	IN THE BOOKLET

Pauling electronegativities

Pauling electronegativity index, laid out by period (row) and group (column, numbered 1 to 18). No value is printed for the noble gases helium to radon, so only the symbol is shown. Lanthanum (La) sits in group 3.

Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	H 2.1																	He
2	Li 1.0	Be 1.5											B 2.0	C 2.5	N 3.0	O 3.5	F 4.0	Ne
3	Na 0.9	Mg 1.2											Al 1.5	Si 1.9	P 2.1	S 2.5	Cl 3.0	Ar
4	K 0.8	Ca 1.0	Sc 1.3	Ti 1.5	V 1.6	Cr 1.6	Mn 1.5	Fe 1.8	Co 1.8	Ni 1.8	Cu 1.9	Zn 1.6	Ga 1.6	Ge 2.0	As 2.0	Se 2.4	Br 2.8	Kr
5	Rb 0.8	Sr 1.0	Y 1.2	Zr 1.3	Nb 1.6	Mo 2.1	Tc 1.9	Ru 2.2	Rh 2.2	Pd 2.2	Ag 1.9	Cd 1.6	In 1.7	Sn 1.9	Sb 1.9	Te 2.1	I 2.5	Xe
6	Cs 0.7	Ba 0.9	La 1.1	Hf 1.3	Ta 1.5	W 2.3	Re 1.9	Os 2.2	Ir 2.2	Pt 2.2	Au 2.5	Hg 2.0	Tl 1.6	Pb 1.8	Bi 1.9	Po 2.0	At 2.2	Rn

Infrared spectroscopy

Correlation of infrared absorption wavenumbers with molecular structure. Each range is printed from the higher to the lower wavenumber.

Vibration	Group	Wavenumber range / cm^{-1}
C-H stretching	Alkane	2962 to 2853
C-H stretching	Alkene	3095 to 3010
C-H stretching	Alkyne	3300
C-H stretching	Arene	3030
C-H stretching	Aldehyde	2900 to 2820 and 2775 to 2700
C-H bending	Alkane	1485 to 1365
C-H bending	Arene, 5 adjacent hydrogen atoms	750 and 700
C-H bending	Arene, 4 adjacent hydrogen atoms	750
C-H bending	Arene, 3 adjacent hydrogen atoms	780

Vibration	Group	Wavenumber range / cm^{-1}
C-H bending	Arene, 2 adjacent hydrogen atoms	830
C-H bending	Arene, 1 isolated hydrogen atom	880
N-H stretching	Amine	3500 to 3300
N-H stretching	Amide	3500 to 3140
O-H stretching	Alcohols and phenols	3750 to 3200
O-H stretching	Carboxylic acids	3300 to 2500
C=C stretching	Isolated alkene	1669 to 1645
C=C stretching	Arene	1600, 1580, 1500, 1450
C=O stretching	Aldehydes, saturated alkyl	1740 to 1720
C=O stretching	Ketones, alkyl	1720 to 1700
C=O stretching	Ketones, aryl	1700 to 1680
C=O stretching	Carboxylic acids, alkyl	1725 to 1700
C=O stretching	Carboxylic acids, aryl	1700 to 1680
C=O stretching	Carboxylic acid anhydrides	1850 to 1800 and 1790 to 1740
C=O stretching	Acyl halides, chlorides	1795
C=O stretching	Acyl halides, bromides	1810
C=O stretching	Esters, saturated	1750 to 1735
C=O stretching	Amides	1700 to 1630
Triple bond stretching	C≡N	2260 to 2215
Triple bond stretching	C≡C	2260 to 2100

The periodic table of the elements

Groups 1 to 18 as printed (the booklet also numbers the main groups 1 to 7 and 0). Relative atomic masses exactly as printed: square brackets mean the mass of the most stable isotope. Elements with atomic numbers 112 to 116 have been reported but are not fully authenticated, so none is printed.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H hydrogen 1.0				Z Sym name A_r	atomic number · symbol · name · relative atomic mass												2 He helium 4.0
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 Sc scandium 45.0	22 Ti titanium 47.9	23 V vanadium 50.9	24 Cr chromium 52.0	25 Mn manganese 54.9	26 Fe iron 55.8	27 Co cobalt 58.9	28 Ni nickel 58.7	29 Cu copper 63.5	30 Zn zinc 65.4	31 Ga gallium 69.7	32 Ge germanium 72.6	33 As arsenic 74.9	34 Se selenium 79.0	35 Br bromine 79.9	36 Kr krypton 83.8
37 Rb rubidium 85.5	38 Sr strontium 87.6	39 Y yttrium 88.9	40 Zr zirconium 91.2	41 Nb niobium 92.9	42 Mo molybdenum 95.9	43 Tc technetium [98]	44 Ru ruthenium 101.1	45 Rh rhodium 102.9	46 Pd palladium 106.4	47 Ag silver 107.9	48 Cd cadmium 112.4	49 In indium 114.8	50 Sn tin 118.7	51 Sb antimony 121.8	52 Te tellurium 127.6	53 I iodine 126.9	54 Xe xenon 131.3
55 Cs caesium 132.9	56 Ba barium 137.3	57 La lanthanum 138.9	72 Hf hafnium 178.5	73 Ta tantalum 180.9	74 W tungsten 183.8	75 Re rhenium 186.2	76 Os osmium 190.2	77 Ir iridium 192.2	78 Pt platinum 195.1	79 Au gold 197.0	80 Hg mercury 200.6	81 Tl thallium 204.4	82 Pb lead 207.2	83 Bi bismuth 209.0	84 Po polonium [209]	85 At astatine [210]	86 Rn radon [222]
87 Fr francium [223]	88 Ra radium [226]	89 Ac actinium [227]	104 Rf rutherfordium [261]	105 Db dubnium [262]	106 Sg seaborgium [266]	107 Bh bohrium [264]	108 Hs hassium [277]	109 Mt meitnerium [268]	110 Ds darmstadtium [271]	111 Rg roentgenium [272]							

			58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium [147]	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175	
			90 Th thorium 232	91 Pa protactinium [231]	92 U uranium 238	93 Np neptunium [237]	94 Pu plutonium [242]	95 Am americium [243]	96 Cm curium [247]	97 Bk berkelium [245]	98 Cf californium [251]	99 Es einsteinium [254]	100 Fm fermium [253]	101 Md mendelevium [256]	102 No nobelium [254]	103 Lr lawrencium [257]	

Amount of substance and solutions

Not printed in the booklet: it gives constants and data only.

Amount from mass
n in mol, m in g, M (molar mass) in g mol^{-1}.
$$n = \frac{m}{M}$$
LEARN IT

Concentration of a solution
c in mol dm^{-3}, V in dm^3. Divide cm^3 by 1000.
$$c = \frac{n}{V}$$
LEARN IT

Concentration in g dm^{-3}
Multiply the concentration in mol dm^{-3} by the molar mass.
$$\text{concentration (g dm}^{-3}) = c \times M$$
LEARN IT

Amount from a volume of solution in cm^3
Use for titration calculations; V in cm^3.
$$n = c \times \frac{V}{1000}$$
LEARN IT

Number of particles
L is the Avogadro constant (given).
$$N = nL$$
LEARN IT

Amount of gas from volume at r.t.p.
V in dm^3; 24 dm^3 mol^{-1} is the r.t.p. molar volume (given).
$$n = \frac{V}{24}$$
LEARN IT

Relative atomic mass from isotopes
Take the abundances from a mass spectrum or from the question.
$$A_\text{r} = \frac{\sum(\text{isotopic mass} \times \text{abundance})}{\sum \text{abundance}}$$
LEARN IT

Percentage yield
$$\text{percentage yield} = \frac{\text{actual yield}}{\text{theoretical yield}} \times 100\%$$
LEARN IT

Atom economy Written out in the specification, but not printed in the data booklet.	$\text{atom economy} = \dfrac{\text{molar mass of the desired product}}{\text{sum of the molar masses of all products}} \times 100\%$	LEARN IT
Percentage uncertainty Double the uncertainty of a single reading when two readings are subtracted, for example the start and end of a burette.	$\text{percentage uncertainty} = \dfrac{\text{absolute uncertainty}}{\text{measured value}} \times 100\%$	LEARN IT

Gases

Ideal gas equation p in Pa, V in m^3, T in K, R = 8.31 J mol^{-1} K^{-1} (given). Also used to find a molar mass.	$pV = nRT$	LEARN IT
Molar mass from a gas measurement Rearranged from pV = nRT with n = m/M.	$M = \dfrac{mRT}{pV}$	LEARN IT

Energetics

Heat energy transferred m in g of water or solution, c in J g^{-1} K^{-1} (the value is not printed in the booklet), Q in J.	$Q = mc\Delta T$	LEARN IT
Enthalpy change from an experiment n is the amount in mol of the limiting reagent. Convert J to kJ and give a sign and units (kJ mol^{-1}. Use minus when the temperature rises.	$\Delta H = -\dfrac{Q}{n}$	LEARN IT
Enthalpy change of reaction from formation data Hess's law; elements in their standard states have zero enthalpy of formation.	$\Delta_r H = \sum \Delta_f H(\text{products}) - \sum \Delta_f H(\text{reactants})$	LEARN IT
Enthalpy change of reaction from combustion data	$\Delta_r H = \sum \Delta_c H(\text{reactants}) - \sum \Delta_c H(\text{products})$	LEARN IT
Enthalpy change of reaction from mean bond enthalpies Gaseous species only. The booklet prints no bond enthalpy table: the values are given in the question.	$\Delta_r H = \sum E(\text{bonds broken}) - \sum E(\text{bonds formed})$	LEARN IT

Kinetics

Average rate of reaction Units mol dm^{-3} s^{-1}. For a rate at one time, draw a tangent and take its gradient.	$\text{rate} = \dfrac{\Delta[\text{concentration}]}{\Delta t}$	LEARN IT

Equilibria

Kc expression For a A + b B ⇌ c C + d D, at equilibrium. Pure solids and liquids in heterogeneous systems are left out.	$K_c = \dfrac{[\mathrm{C}]^c[\mathrm{D}]^d}{[\mathrm{A}]^a[\mathrm{B}]^b}$	LEARN IT

Analysis

Relative molecular mass from a mass spectrum The molecular ion is the peak with the highest m/z (ignoring small isotope peaks).	$M_r = m/z$ of the molecular ion M^+	LEARN IT

Learn these: not in the booklet

Standard conditions

100 kPa and a specified temperature, usually 298 K (the specification wording). The booklet only prints the r.t.p. molar volume.

Specific heat capacity of water

4.18 J g^{-1} K^{-1}. The specification's list of constants prints it, but the data booklet itself does not, so learn it or use the value the question gives.

Temperature conversion

$$T/\mathrm{K} = \theta/^{\circ}\mathrm{C} + 273$$

Pressure conversion

$$1\ \mathrm{kPa} = 1000\ \mathrm{Pa}$$

Use pascals and cubic metres in pV = nRT.

Sub-atomic particles

Proton: relative mass 1, charge +1. Neutron: relative mass 1, charge 0. Electron: relative mass 1/1836, charge -1.

Oxidation numbers

Sum equals the charge on the species; H is +1 (-1 in metal hydrides); O is -2 (-1 in peroxides); fluorine is -1.

First ionisation energy

$$\mathrm{X(g)} \rightarrow \mathrm{X^{+}(g)} + \mathrm{e^{-}}$$

Per mole of gaseous atoms; successive ionisation energies remove one more electron each time.

Standard enthalpy changes

Formation: one mole of a compound from its elements in their standard states. Combustion: one mole burnt completely in oxygen. Neutralisation: one mole of water formed from an acid and an alkali.

Mean bond enthalpy

The average energy to break one mole of a bond in the gaseous state, averaged over a range of compounds.

Kinetics: effect of temperature

A higher temperature gives more molecules with energy at or above the activation energy (Maxwell-Boltzmann curve), so the rate rises.

Mass spectrum of chlorine and bromine

Cl: M and M+2 peaks in a 3 : 1 ratio. Br: M and M+2 in a 1 : 1 ratio. Cl_2 molecule ions at 70, 72 and 74 in the ratio 9 : 6 : 1.

Using the booklet in the exam

- The booklet holds tables only. Write every calculation equation from memory and take only the numbers from the tables.
- Use 24 dm^3 mol^{-1} for gas volumes at r.t.p. and R = 8.31 J mol^{-1} K^{-1} with pV = nRT: both are printed, and 22.4 is not.
- Give IR answers as a range from the table: match the bond or group to its row, then compare with the peak you are given.
- The booklet gives no bond enthalpy, ionisation energy or specific heat capacity data; the question gives what you need, or you must recall it.
- Use electronegativity differences to judge bond polarity: the larger the difference, the more polar the bond.

Based on: Pearson Edexcel, Pearson Edexcel Level 3 Advanced Subsidiary GCE in Chemistry (8CH0) Data Booklet, Issue 1, Summer 2016. Statistical tables are calculated by CuratedPrep to the same layout. Updated 31 October 2026. Always practise with the version of the official booklet your exam uses. More free sheets and topic worksheets at curatedprep.com.