

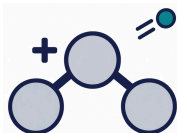
Spectra Summary Map

Edexcel A Level Chemistry · Topic 7 Modern Analytical Techniques I

1 The molecular ion

7A.1

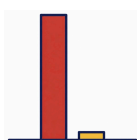
- $M \rightarrow M^+ + e^-$
- Highest major peak: $m/z = M_r$
- Base peak: the tallest (100%)
- Cl: M, M+2 3 : 1; Br: 1 : 1



2 The M+1 peak

7A.1

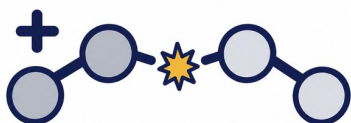
- ^{13}C is about 1.1% of carbon
- $n \approx (M+1 \div M) \times 100 \div 1.1$
- More carbons: taller M+1
- Fits the formula to M_r



3 Fragmentation

7A.1

- $M^+ \rightarrow X^+ + Y^+$
- Only the **ion** is detected
- Gap from M: the group lost
- Isomers: different fragments



4 Infrared absorption

7B.2

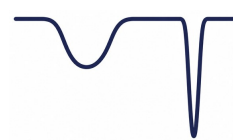
- Bonds **stretch** and **bend**
- Same frequency IR: absorbed
- Dip = low **transmittance**
- Below 1500: **fingerprint**



5 Reading IR spectra

7B.2

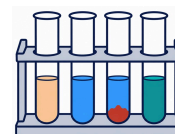
- C=O 1740–1700 (by group)
- O–H alcohol 3550–3230
- O–H acid 3300–2500, very broad
- Absent bands count too



6 Core Practical 7

CP7

- Bromine water: **C=C**
- Dichromate: 1°/2° alcohol, CHO
- Benedict's: **CHO**; NaHCO_3 : **COOH**
- PCl_5 : $-\text{OH}$; AgNO_3 : $\text{C}-\text{X}$



Fragments and absorptions m/z values from the mass spectrum; IR ranges from the data booklet (cm^{-1})

m/z	Ion	Bond	Range / cm^{-1}
15	CH_3^+	C–H (alkane)	2962–2853
29	C_2H_5^+ or CHO^+	C=C	1669–1645
31	CH_2OH^+	O–H (alcohol)	3550–3230
43	C_3H_7^+ or CH_3CO^+	C=O (ketone)	1720–1700
45	COOH^+	O–H (acid)	3300–2500
57	C_4H_9^+ or $\text{C}_2\text{H}_5\text{CO}^+$	N–H (amine)	3500–3300

Worked examples

Counting carbons

- peak heights: M^+ 30, $M+1$ 1.3
- $(1.3 \div 30) \times 100 \div 1.1$
- **4 carbons:** $\text{C}_4\text{H}_8\text{O}$

Which propanol?

- both M_r 60
- base peak 31: CH_2OH^+
- **propan-1-ol**

An unknown

- Benedict's brick red; M^+ 58
- IR 1730, 2720; no O–H
- **propanal**

NMR spectroscopy and chromatography follow in Topic 19; mass spectra of elements were met in Topic 1.



Online Learning System · onlinelearningsystem.net · © 2026 Online Learning System. All rights reserved. Not for redistribution.