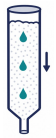
Chromatography Map

AQA A-level Chemistry · 3.3.16 Chromatography

1 Two phases

3.3.16

- **Stationary** phase stays put
- **Mobile** phase moves through it
- Separation: **solubility** v **retention**
- Polar compounds held by **silica**



2 Thin-layer chromatography

3.3.16

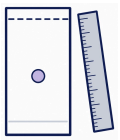
- Solid (silica) **on a plate**
- Solvent moves **up** the plate
- Pencil baseline; solvent below it; lid
- Colourless spots: **UV** or iodine

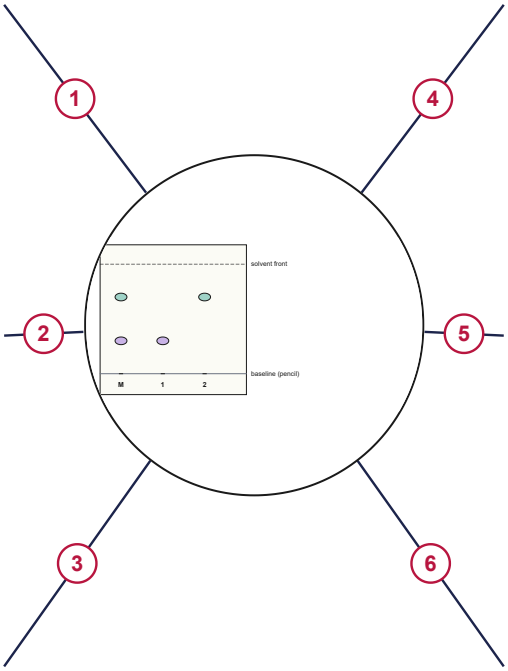


3 R_f values

3.3.16

- R_f = **spot ÷ solvent front**
- Both from the **baseline**
- Compare with **standards**
- Same solvent; no units





4 Column chromatography

3.3.16

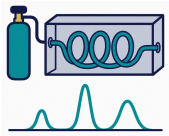
- Solid **packed in a column**
- Solvent moves **down**
- Least held component **leaves first**
- Fractions **collected** separately



5 Gas chromatography

3.3.16

- Mobile: **inert gas** under pressure
- Stationary: solid or **liquid-coated** solid
- **Retention time**: injection to peak
- Identify: **standards**, same conditions



6 GC–MS

3.3.16

- GC **separates**; MS **identifies**
- M^+ and fragments v a **database**
- Retention times are not unique
- Forensics, **drug testing**



Three techniques compared

what each one uses and measures

Technique	Stationary / mobile phase	Identify by
TLC	silica on a plate / solvent moving up	R_f v standards
Column	packed silica / solvent moving down	order of elution; collect
GC	solid or liquid-coated solid / inert gas	retention time v standards
GC–MS	as GC, then a mass spectrometer	mass spectrum of each peak

Worked examples

An R_f value

- spot 2.7 cm; front 6.0 cm
- 2.7 ÷ 6.0
- **R_f = 0.45**

Order out of a column

- hexane and hexan-1-ol, silica
- the alcohol H-bonds to silica
- **hexane first**

Identify by GC

- mixture peaks at 2.1 and 3.4 min
- standards, same column and conditions: ethanol 2.1, propan-1-ol 3.4, butan-1-ol 5.0
- **ethanol and propan-1-ol**

Extension: beyond the AQA specification

- GC peak **area** ∝ amount (equal detector response assumed)
- Peak areas 24, 48, 8: total 80, so 30%, 60%, 10%

Amino acids are separated by TLC in 3.3.13; chromatography checks the purity of a synthesis product in 3.3.14.

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