A-LEVEL CHEMISTRY • EXERCISE SHEET

37.2 Gas/liquid chromatography

Name: _____ Class: _____ Date: _____ **Total: 9 marks**

KEY WORDS retention time 保留时间 • stationary phase 固定相 • mobile phase 流动相 • gas/liquid chromatograph • chromatography 色谱

Objective

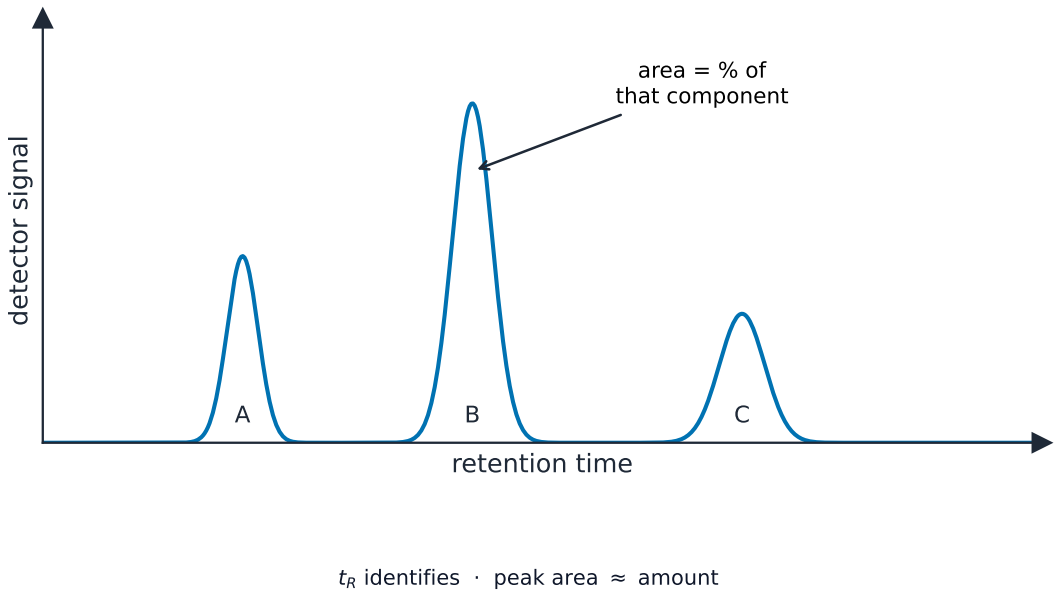
Build the skills to answer exam questions on **gas/liquid chromatography** 气液色谱 (GLC) — the phases, **retention time** 保留时间, and reading peak areas.

You must be able to:

- identify the stationary and mobile phases in GLC
- explain what retention time depends on
- use peak areas to find the composition of a mixture

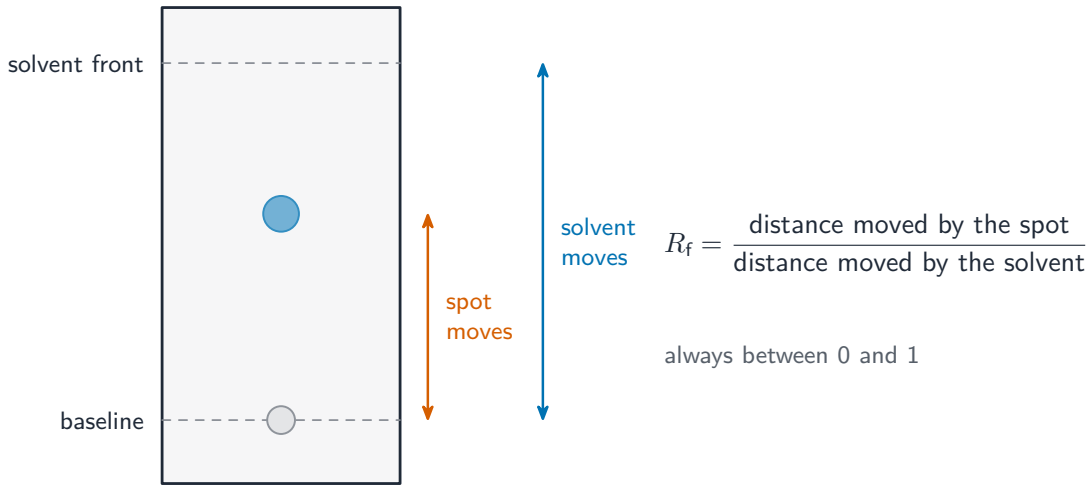
1 Worked examples

Reading a chromatogram



t_R identifies · peak area ≈ amount

Each component gives a peak at its own retention time; the peak area is its percentage in the mixture



GLC alongside TLC as a chromatographic method

- **stationary phase:** a high-boiling non-polar liquid on a solid support; **mobile phase:** an unreactive carrier gas.
- **retention time** = how long a component takes to pass through; more interaction with the stationary phase → **longer** retention time.
- **peak area** = the proportion (percentage) of that component.

2 Practice

2.1 Name the mobile phase in GLC. [1]

2.2 State what the **area** of a GLC peak tells you. [1]

3 Exam-style questions

3.1 In GLC, a component that interacts **more** with the stationary phase has a: [1]

- **A** shorter retention time
- **B** longer retention time
- **C** larger R_f
- **D** smaller peak area

3.2 The **percentage** of each component in a mixture is found from the: [1]

- **A** retention time
- **B** number of peaks
- **C** area under each peak
- **D** height of the baseline

3.3 A GLC trace of a three-component mixture has peak areas 5, 3 and 2 units.

(a) Calculate the percentage of the first component. [2]

(b) State which component left the column **last**, given it interacted most with the stationary phase. [1]

3.4 Explain why different components of a mixture have different retention times. [2]

Solutions

2.1 an unreactive carrier gas.

2.2 the percentage (proportion) of that component in the mixture.

3.1 B. More interaction with the stationary phase → longer retention time.

3.2 C. The area under each peak gives the percentage.

3.3 (a) total area $= 5 + 3 + 2 = 10$; first component $= \dfrac{5}{10} \times 100 = 50\%$.
(b) the component with the **longest** retention time / smallest R_f-type behaviour — the one that interacts most strongly.

3.4 each component interacts to a different extent with the stationary phase; the more it interacts, the more it is held back, so it takes longer to pass through.