Solutions

Each answer shows the steps, then the **result**.

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

3.5

(a)

- The mobile phase is an **inert carrier gas** such as nitrogen or helium, which sweeps the vaporised sample through the column; the stationary phase is a high-boiling **liquid** coated on an inert solid support; components separate because each spends a different fraction of its time dissolved in the liquid rather than moving with the gas

(b)

- Total area $= 132 + 396 + 132 = 660$; peak 1 $= \dfrac{132}{660} = 20\%$, peak 2 $= \dfrac{396}{660} = 60\%$, peak 3 $= 20\%$. The assumption is that the **detector responds equally** to each component, so peak area is proportional to the amount present

(c)

- That component is the most soluble in the liquid stationary phase, or has the strongest intermolecular attraction to it; it therefore spends the greatest fraction of its time dissolved and the least moving with the carrier gas; so it takes longest to reach the detector

(d)

- A retention time is only characteristic **under identical conditions** — column, temperature and flow rate — and two different compounds can share one, so a peak alone names nothing. Coupling the column to a **mass spectrometer** (GC–MS) gives each peak a fragmentation pattern that identifies it