37. Analytical techniques

37.1 Thin-layer chromatography

Paper 4

Question Paper

1 **(f)** Thin-layer and gas-liquid chromatography can be used to analyse mixtures of substances.

Each type of chromatography makes use of a stationary phase and a mobile phase.

(i) Complete Table 6.1 with an example of each of these.

Table 6.1

	stationary phase	mobile phase
thin-layer chromatography		
gas-liquid chromatography		

[1]

(ii) An unknown amino acid is analysed using thin-layer chromatography. Two chromatographs of the unknown amino acid and four reference amino acids, **P**, **Q**, **R** and **S**, are obtained using two different solvents.

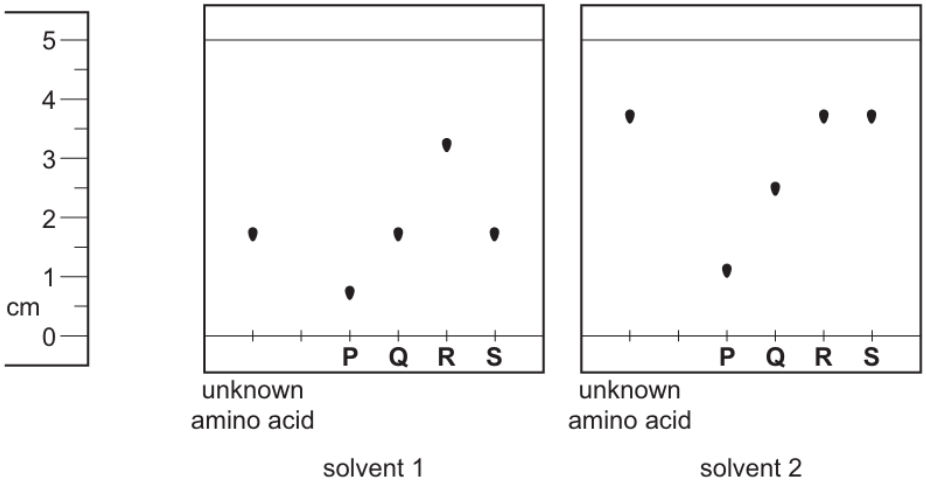

Fig. 6.4

Identify the unknown amino acid. Justify your answer.

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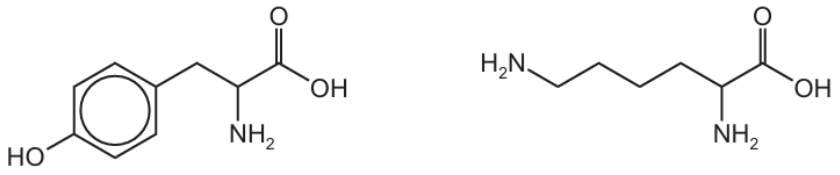
..... [1]

2 Tyrosine and lysine, shown in Fig. 9.1, are naturally occurring amino acids found in proteins.



tyrosine lysine

Fig. 9.1

(d) A mixture of tyrosine and lysine can be separated by thin-layer chromatography. Under certain conditions the R_f value of lysine is 0.14 and the R_f value of tyrosine is 0.45.

(i) Explain what is meant by R_f value.

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..... [1]

(ii) Suggest an explanation for the difference in R_f values.

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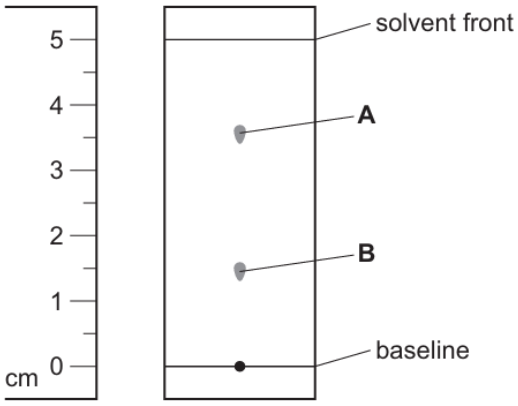
..... [1]

3 **(a)** Amino acids can be separated by thin-layer chromatography. A mixture of amino acids is analysed using this technique.

The chromatogram obtained is shown, drawn to scale. The table shows some R_f values for different amino acids in the solvent used.



amino acid	R_f value
alanine	0.40
glutamic acid	0.29
leucine	0.71
valine	0.61

(i) Use the chromatogram and the R_f values to deduce the amino acid responsible for spot **A** and spot **B**.

amino acid responsible for spot **A** .....

amino acid responsible for spot **B** .....

[1]

(ii) A second chromatogram of the same mixture is taken using a **more polar** solvent.

Predict the effect on the R_f values of the amino acids. Explain your reasoning.

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..... [1]