Chromatography

June 2007/4

(c) Amino acids may also be separated by using two-dimensional paper chromatography. This involves putting a spot of the mixture on the corner of a piece of chromatography paper and allowing a solvent to soak up the paper. The paper is then dried, turned through 90° and placed in a second solvent. This method gives better separation than a one solvent method.

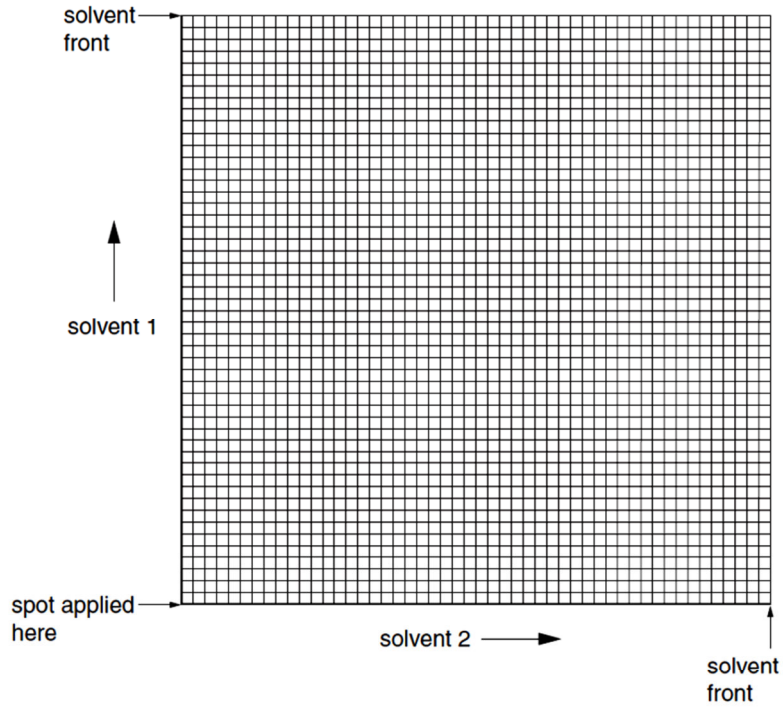
(i) Paper chromatography relies on partition between the solvent applied and another phase.

What is this second phase? .....

(ii) The table below shows the R_f values for some amino acids in two different solvents.

amino acid	R_f solvent 1	R_f solvent 2
A	0.1	0.2
B	0.0	0.4
C	0.3	0.0
D	0.8	0.9
E	0.6	0.5

Use the grid below to plot the positions of the amino acids after two-dimensional paper chromatography using solvent 1 followed by solvent 2.



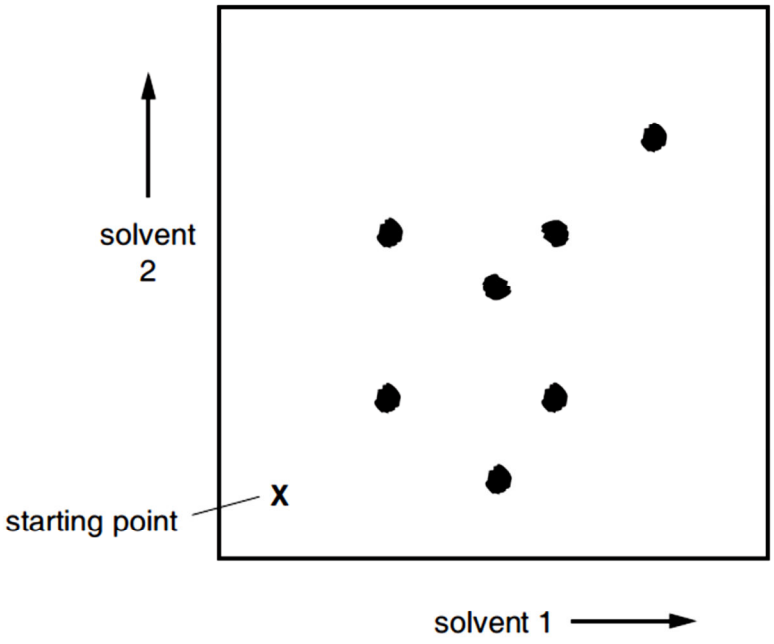
(iii) Which amino acid travelled fastest in **both** solvents? .....

(iv) Which amino acid did not move at all in solvent 2? .....

[5]

[Total: 10]

(c) The diagram shows the result of two-way paper chromatography.



(i) How many spots were there after the first solvent had been used?

.....

(ii) Circle the spot that moved very little in solvent 2, but moved a greater distance in solvent 1.

(iii) Draw a square around the spot that could be separated from the rest by using **only** solvent 1.

[3]

[Total: 11]

10 Instrumental methods of analysis have become increasingly important in recent years. The use of chromatography to separate substances, and NMR spectroscopy to identify them, has become routine in many laboratories.

(a) Chromatography relies on either partition or adsorption to help separate substances.

(i) Briefly explain how each method brings about separation.

partition .....

.....

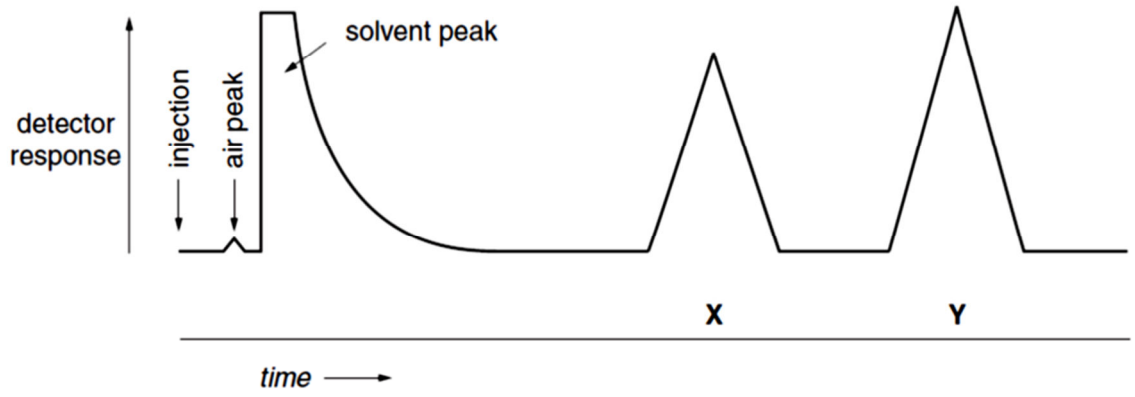
adsorption .....

.....

(ii) The table shows three different techniques of chromatography. Identify which separation method, *partition or adsorption*, applies to each.

technique	separation method
paper chromatography	
thin-layer chromatography	
gas/liquid chromatography	

(iii) The diagram represents the output from gas/liquid chromatography carried out on a mixture.



Determine the percentage of each of the two components **X** and **Y** in the mixture.

[5]

8 Chromatography is an important analytical technique in chemistry. There is a number of techniques under the general heading of chromatography.

(a) Paper and gas chromatography rely on partition to separate the components in a mixture, whereas thin-layer chromatography uses adsorption.

Explain what is meant by **(i)** *partition* and **(ii)** *adsorption*, in the context of chromatography.

(i) partition .....

.....

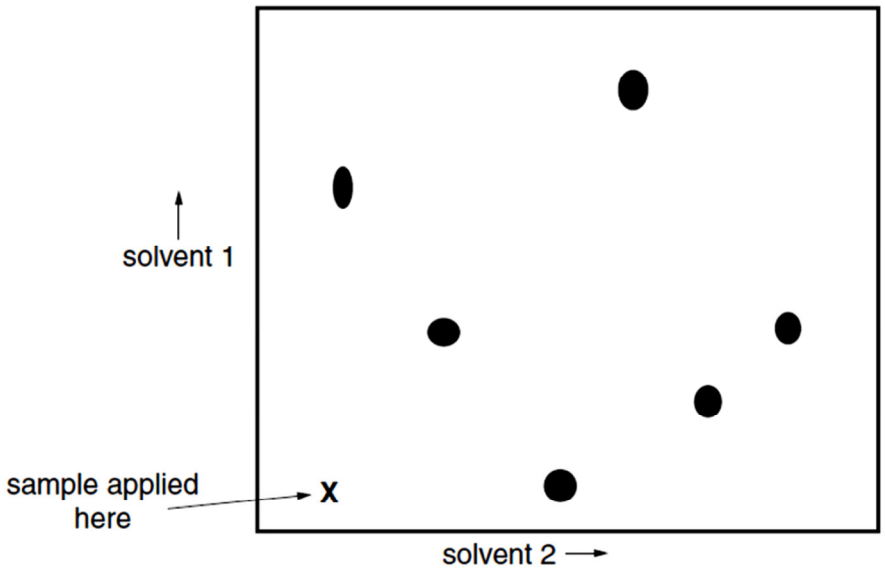
.....

(ii) adsorption .....

.....

.....[2]

(b) In paper or thin-layer chromatography, better separation may be achieved by running the chromatogram in one solvent, then turning the paper at right angles and running it in a second solvent. The chromatogram below was produced in this way.



(i) Ring the spot which was insoluble in solvent 1.

(ii) Label as **A** and **B** the spots which were **not** resolved using solvent 1.

[2]