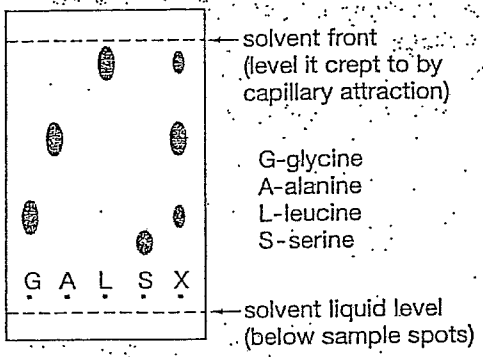
Exercises

19 Paper chromatography was used to identify the amino acids present in a sample, X. The unknown sample and samples of four known amino acids were run under identical conditions, with the spots of sample being placed near the bottom of a sheet of filter paper which was then dipped into a suitable solvent: the solvent crept up the paper by capillary attraction. After development (to make the spots visible) the chromatogram was as shown below. Which amino acids are present in the unknown sample?



20 In Figure 14.5(b) the standard sample contained leucine, alanine, glycine, serine, lysine and aspartic acid. The order of their rates of travel up a paper under the conditions used is the order of listing: leucine is the fastest, aspartic acid the slowest. By comparing the location of spots on the chromatogram, identify the amino acids present in Samples X and Y.

***21** In a paper chromatography experiment using a stationary phase that is more polar than the mobile phase, which of the three amino acids, alanine, serine, aspartic acid, moves the greatest distance and which the least (in a given time)? Explain why.

22 The isoelectric points for some amino acids are given in Table 14.1. For each of the amino acids:

a glycine ***b** alanine **c** cysteine ***d** lysine

draw the structure of the predominant species present in a solution of pH:

i 2.0 **ii** 6.0 **iii** 11.0

23 You may use Table 14.1 for this question.

a In an electrophoresis experiment in a solution buffered at pH 4.0:

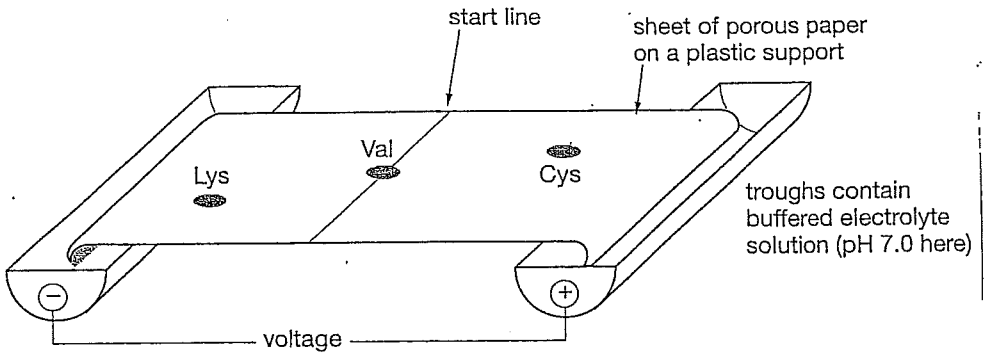
i Towards which electrode will each of the amino acids, glycine, valine and phenylalanine, migrate? Why?

ii Of these three amino acids which will migrate the greatest distance in a given time and which the least? Explain.

b Using Figure 14.7 if necessary, towards which electrode in an electrophoresis experiment will aspartic acid migrate in a solution buffered at pH of:

i 1.0 **ii** 3.0 **iii** 8.0 **iv** 11.0

c How would the distance moved (in a given time) by aspartic acid in a buffer at pH 11.0 compare with the distance travelled in a buffer at pH 8.0? Explain.



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a In an electrophoresis experiment in a solution buffered at pH 4.0:

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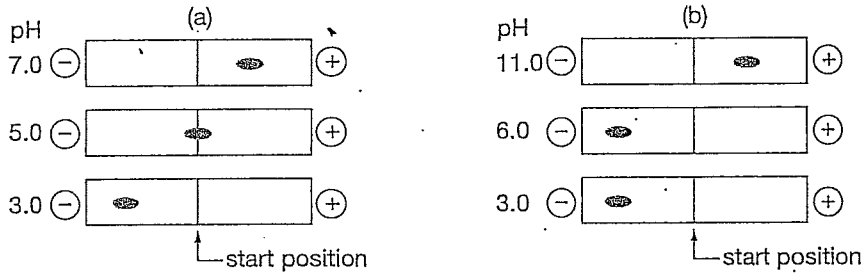
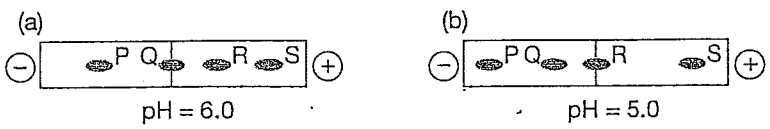
24 a In order to identify an amino acid Q, a chemist ran electrophoresis experiments on it using buffers at pHs 7.0, 5.0 and 3.0. The developed electrophoresis strips are shown at (a) below. Which of the amino acids in Table 14.1 is Q most likely to be? Explain.



***b** Electrophoresis experiments were run on another amino acid T, using buffers at pH 11.0, 6.0 and 3.0. Results are shown at (b) above. Identify T from the amino acids in Table 14.1. Explain your reasoning.

***25 a** To identify the amino acids present in a mixture, a chemist ran an electrophoresis experiment using a buffer of pH 6.0. The result was as in (a) below. If the only possibilities are the amino acids in Table 14.1, identify as many spots (labelled P, Q, R, S) as you can. (You will not be able to identify all of them from this one experiment.)



b The chemist repeated the experiment at pH 5.0 and obtained the result in (b) above. If possible identify additional spots and suggest possibilities for spot(s) you are unable to identify. Explain the basis of your identifications.