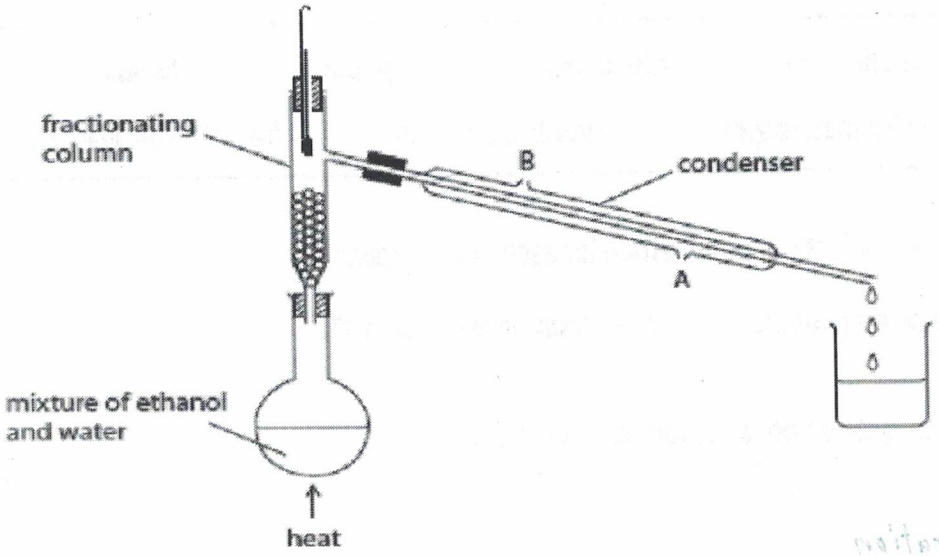
2 This apparatus is used to separate a mixture of ethanol (boiling point 78 °C) and water (boiling point 100 °C).



(a) What is the name of this method of separation?

(1)

Fractional Distillation

(b) Why can ethanol and water be separated by this method?

(1)

Due to a difference in boiling points, ethanol will pass through the fractionating column while water vapor will condense

(c) Suggest why water should enter the condenser at A rather than B.

(1)

Water should enter at A so that the Condensor chamber will remain constantly full of water

(d) Explain why the first liquid to be collected in the beaker is mostly ethanol.

(1)

The glass beads helps the water vapor condense and fall back into the original solution.

(Total for Question 2 = 4 marks)

1 The box shows some methods that can be used in separating mixtures.

crystallisation	dissolving	evaporation	filtration
paper chromatography	simple distillation	fractional distillation	

From the box, select the best method for each of the separations.

You may use each method once, more than once or not at all.

(a) Removing sand from a mixture of sand and water.

(1)

Filtration

(b) Obtaining pure water from a salt solution.

(1)

Simple Distillation

(c) Extracting the red dye from a sample of rose petals.

(1)

Dissolving

(d) Separating the coloured dyes in a sample of green ink.

(1)

Paper Chromatography

(e) Obtaining ethanol (alcohol) from a mixture of ethanol and water.

(1)

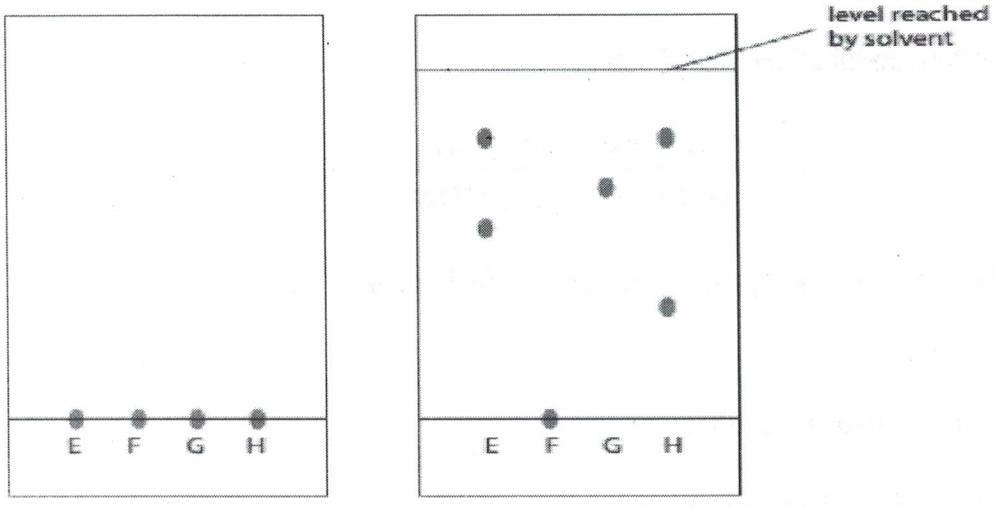
Fractional Distillation

(Total for Question 1 = 5 marks)

(c) Food colourings contain one or more food dyes.

A student used paper chromatography to separate the dyes contained in food colourings. She placed spots of three known food colourings (E, F and G) and one unknown food colouring (H) on the chromatography paper.

The diagram shows the appearance of the paper before and after her experiment.



(i) Describe how the student should complete the experiment after placing the four spots on the paper.

(3)

The student should place the paper in the solvent and allow the solvent to migrate up the paper until the solvent front reaches a desired location

(ii) Suggest why food colouring F did not move during the experiment.

(1)

F did not move most likely because it is not soluble in the solvent

(iii) How many food dyes are there in food colouring E?

(1)

2

(iv) How many known food dyes are there in food colouring H?

(1)

One

(v) Dyes are often identified by their R_f values.

$$R_f = \frac{\text{distance moved by dye}}{\text{distance moved by solvent}}$$

Record the results for the dye in G and calculate its R_f value.

(3)

distance moved by dye in mm	31
distance moved by solvent in mm	46
R_f value of G	0.67

(Total for Question 2 = 14 marks)