Sc!ence

Name: …… **( )**

Class: ……

Date: …… **/** …… **/** ……

Multiple-Choice Questions on Separation Techniques

1. It is suspected that a lollipop contains traces of a poisonous green dye (boiling point 73°C) as well as two harmless orange and red dyes (boiling points 69°C and 73°C respectively). What is the best method by which the green dye may be detected?

A filtration

B fractional distillation

C paper chromatography

D crystallisation

2. Which process is involved in **all** of the following?

1 obtaining copper(II) sulfate crystals from aqueous copper(II) sulfate

2 obtaining ethanol from the fermentation of glucose

3 obtaining nitrogen from liquid air

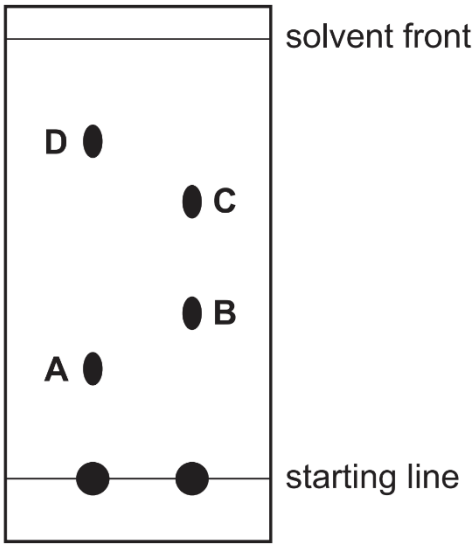
A crystallisation

B evaporation

C filtration

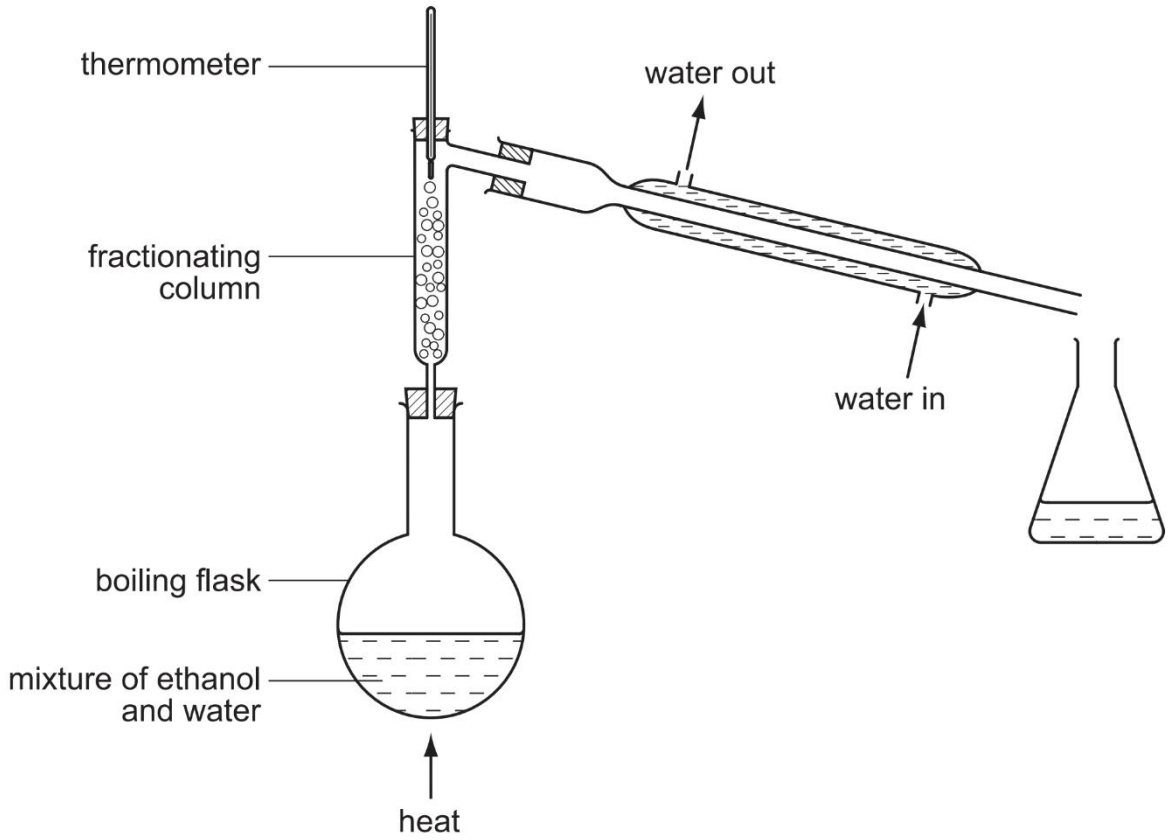
D fractional distillation

3. Some substances may be separated using paper chromatography. The diagram shows the results of running two mixtures in a suitable solvent. Which spot has an R_f value of 0.37?

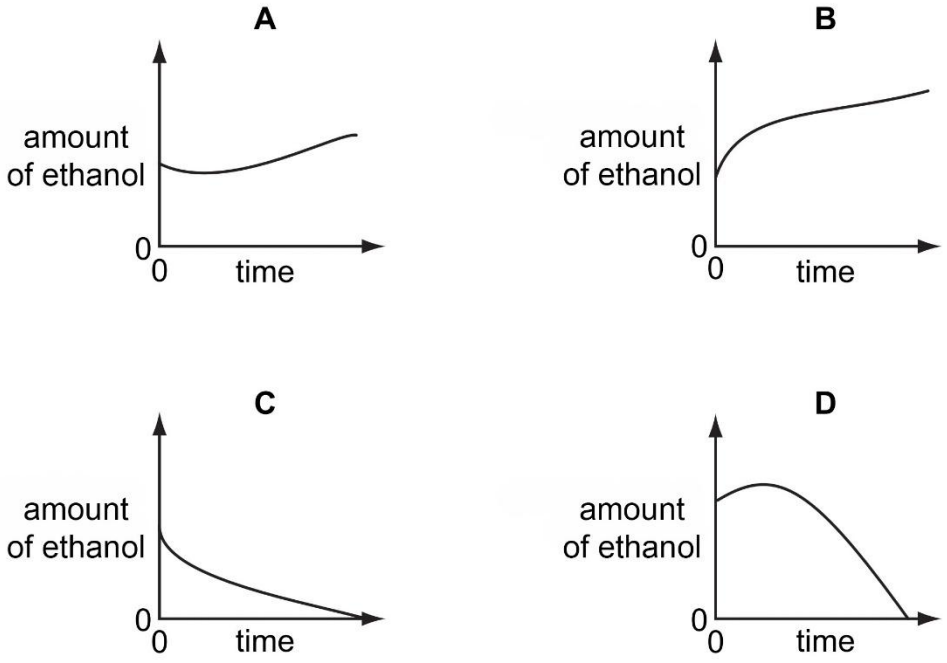


4. The apparatus shown is used to distil a dilute solution of ethanol in water.

The boiling point of ethanol = 78 °C and the boiling point of water = 100 °C.



Which graph shows the change in the amount of the ethanol in the boiling flask as the distillation proceeds?



5. A mixture of three liquids is separated by fractional distillation. Which statements are correct?

1 The mixture boils at constant temperature throughout the separation.

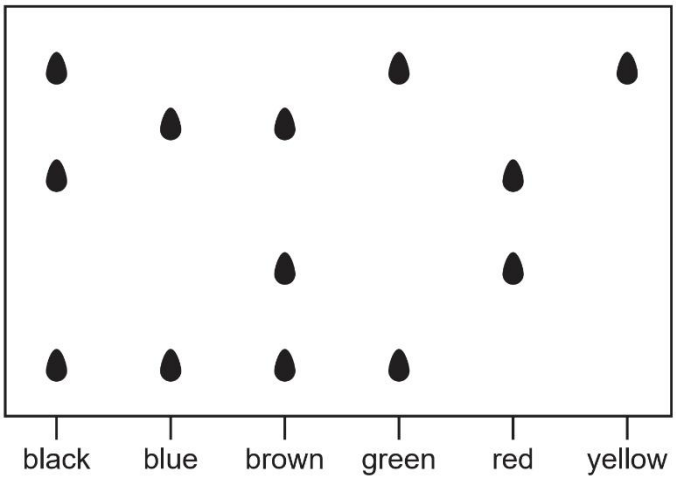
2 The temperature at which the mixture boils increases during the separation.

3 The liquid with the highest boiling point is collected first.

4 The liquid with the lowest boiling point is collected first.

A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 2 and 4

6. The diagram shows a chromatogram of several inks.



Which statement is correct?

A Black ink can be made by mixing green, red and yellow inks.

B Brown ink can be made by mixing blue and red inks.

C Yellow ink can be used to make brown ink.

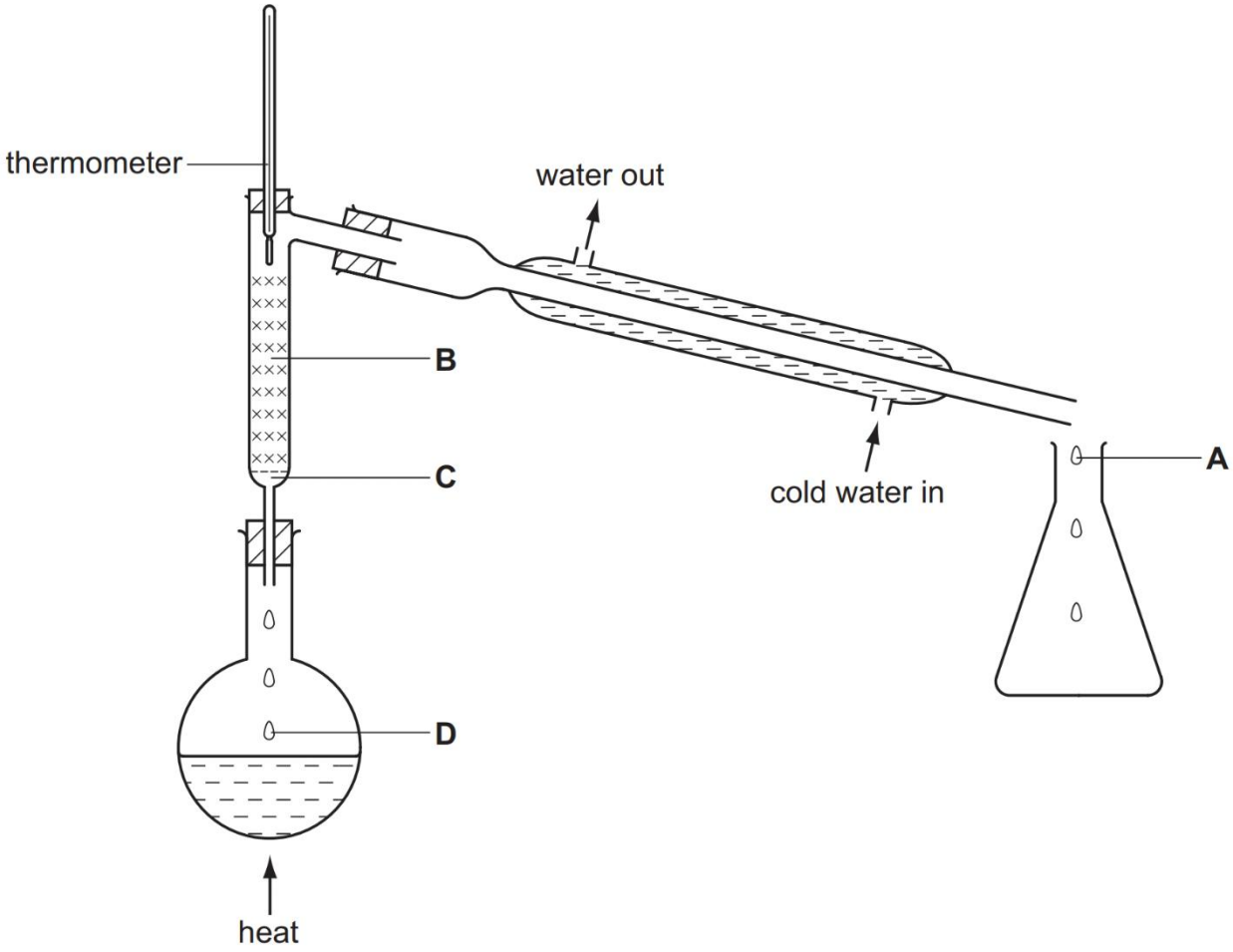
D Yellow ink may be present in green ink.

7. Copper(II) sulfate crystals are separated from sand using the four processes listed below.

In which order are these processes used?

	1st	2nd	3rd	4th
A	filtering	dissolving	crystallising	evaporating
B	filtering	dissolving	evaporating	crystallising
C	dissolving	evaporating	filtering	crystallising
D	dissolving	filtering	evaporating	crystallising

8. A mixture containing equal volumes of two liquids that mix completely but do not react together is placed in the apparatus shown and heated until the thermometer first shows a steady reading. At which position will there be the highest proportion of the liquid with the higher boiling point?



9. In which method of separation are R_f values used?

A Chromatography

B Crystallisation

C Filtration

D Fractional distillation

10. Which mixture can be separated into its components by adding water, stirring and filtering?

A Calcium carbonate and sodium chloride

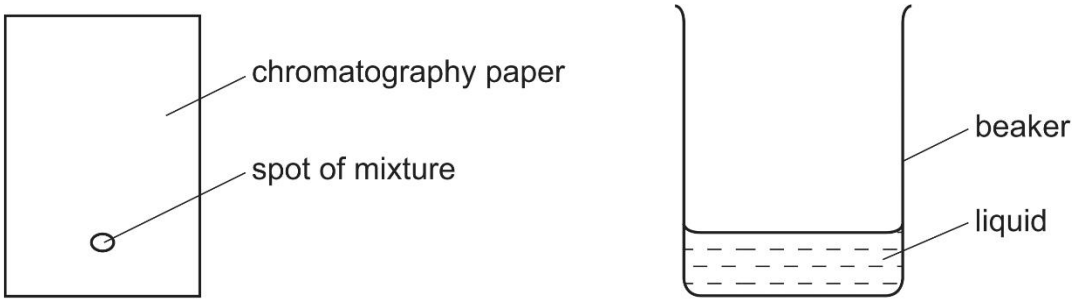
B Magnesium and iron

C Sodium chloride and copper(II) sulfate

D Sulfuric acid and hydrochloric acid

11. A mixture of two substances is spotted onto a piece of chromatography paper.

The paper is inserted into a beaker containing a liquid.



For separation of the substances to occur the spot of mixture must…

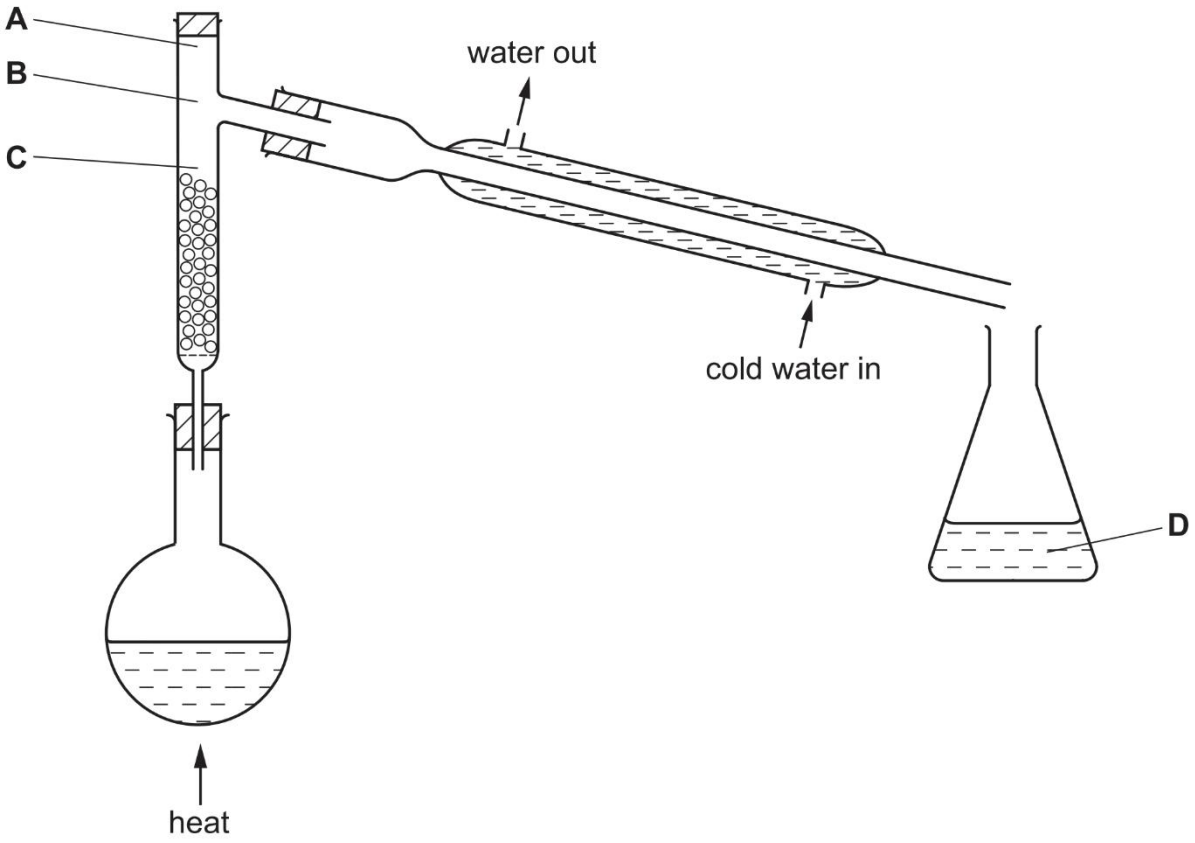
A Be placed so that the spot is just below the level of the liquid.

B Be soluble in the liquid.

C Contain substances of the same R_f values.

D Contain substances that are coloured.

12. The fractional distillation apparatus shown is being used to separate a mixture of two liquids. A thermometer is missing from the apparatus.Where should the bulb of the thermometer be placed?



13. Which of the following does **not** make use of filtration?

1 Making a cup of tea using a teabag.

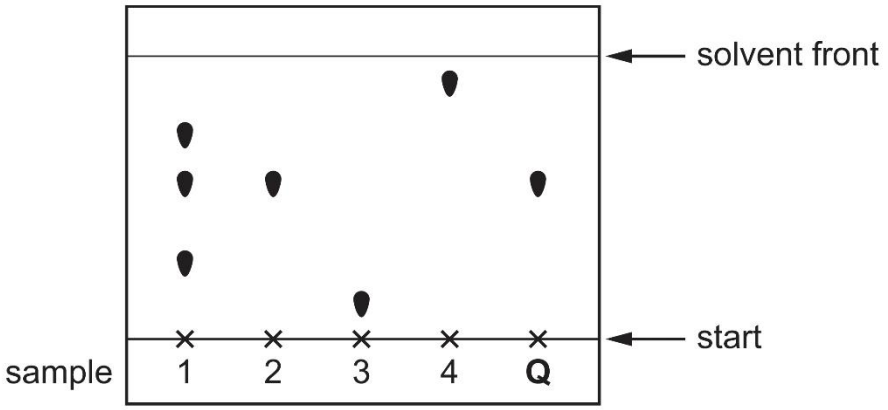
2 Separating dust and dirt from air in a vacuum cleaner.

3 Using a sieve to remove pulp from fruit juice.

4 Obtaining salt from a salt solution.

A 2 only **B** 4 only **C** 1 and 3 only **D** 2 and 4 only

14. Four samples are spotted onto chromatography paper. It is known that one of these samples is pure compound **Q**. A separate sample of pure compound **Q** is also spotted onto the paper. The paper is placed in a solvent. The diagram shows the chromatogram produced.



Which statement is correct?

A Sample 2 has travelled the furthest and sample 3 is pure compound **Q**.

B Sample 3 has travelled the furthest and sample 2 is pure compound **Q**.

C Sample 4 has travelled the furthest and sample 1 is pure compound **Q**.

D Sample 4 has travelled the furthest and sample 2 is pure compound **Q**.

15. Which methods of separation require a change of state from liquid to gas?

1 paper chromatography

2 crystallisation

3 distillation

4 filtration

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 and 4

16. Chromatography can be used to separate and identify dyes present in a mixture.

Which statement is correct?

A A dye with an R_f value of 1.2 can be present in a mixture.

B A dye could have a different R_f value if a different solvent was used.

C All blue dyes have the same R_f value.

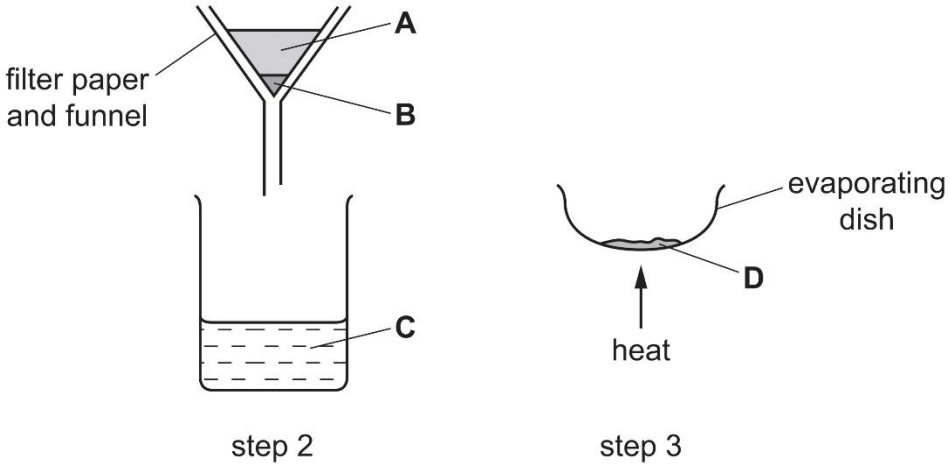
D Chromatography can only be used for coloured substances such as dyes.

17. A mixture of sand and sodium chloride can be separated in three steps.

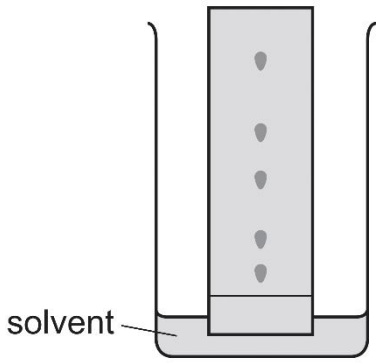
Step 1 is to add water to the mixture.

The diagram shows step 2 and step 3.

Where is pure sodium chloride collected?



18. A Chemist wishes to separate and identify a mixture of substances using paper chromatography. The diagram shows the apparatus used. The solvent is water.



The solvent front is allowed to reach the top of the paper before the chemist removes the paper from the solvent. Which problem does this cause?

A This causes the spot nearest the bottom of the paper to catch up with the spot above it.

B This makes it impossible to calculate R_f values.

C This makes it impossible to use a locating agent.

D This results in a safety hazard caused by solvent fumes.

19. Oxygen can be separated from nitrogen by the fractional distillation of liquid air. Why is this separation possible?

A By volume, air contains about 80% nitrogen.

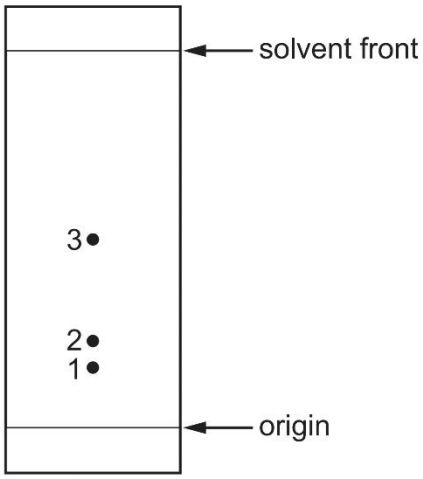
B Oxygen has a higher density than nitrogen.

C Oxygen and nitrogen are in different Groups of the Periodic Table.

D Oxygen and nitrogen have different boiling points.

20. The diagram represents a chromatogram of the colourless acids present in a drink. The chromatogram has been treated with a locating agent.

A table of R_f values for the possible acids is given.



acid	R_f value
tartaric	0.14
citric	0.16
malic	0.23
lactic	0.45
succinic	0.50

Which acids are present in the drink?

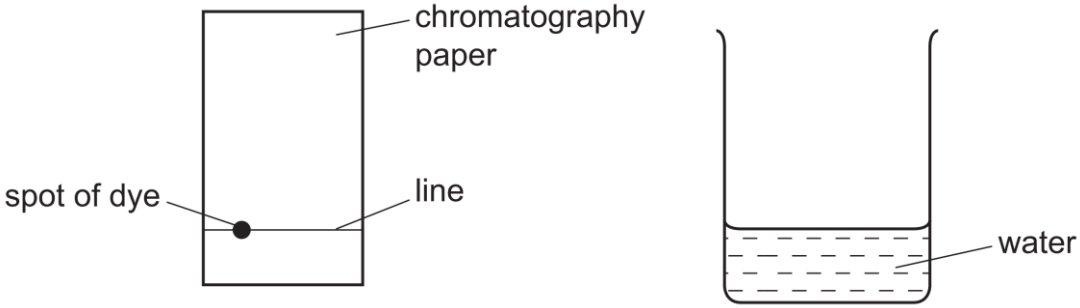
A Citric acid, malic acid and lactic acid

B Citric acid, malic acid and succinic acid

C Malic acid, lactic acid and succinic acid

D Tartaric acid, citric acid and malic acid

21. A sample of a dye is investigated by chromatography. A line is drawn across a piece of chromatography paper, and a spot of the dye is placed on it. The paper is then placed in water.



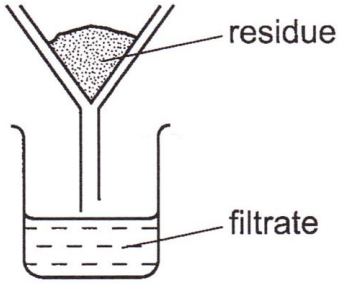
Which option is correct?

	what is used to draw the line	position of spot
A	ink	above the level of the water
B	ink	below the level of the water
C	pencil	above the level of the water
D	pencil	below the level of the water

22. The table shows the colours and solubilities in water of four solids.

solid	colour	solubility in water
W	blue	insoluble
X	blue	soluble
Y	white	insoluble
Z	white	soluble

A mixture containing two of the solids is added to excess water, stirred and filtered.
A blue filtrate and white residue are obtained.



Which solids are present in the mixture?

A **W** and **X** **B** **W** and **Y** **C** **X** and **Y** **D** **X** and **Z**

23. Substance **X** melts at 53°C and boils at 100°C. It does not dissolve in water and it does not react with water. Which one of the following is the **most suitable** method for separating **X** from a mixture of **X** and water at room temperature?

A Chromatography **B** Crystallisation
C Distillation **D** Filtration

24. A liquid is thought to be pure ethanoic acid. Which one of the following is the best way to test its purity?

A Measure its boiling point.
B See if it reacts with magnesium.
C See if it reacts with sodium carbonate.
D See if it turns damp blue litmus paper red.

25. To help diagnose illness, Doctors often need to know which amino acids are present in blood or urine. Which method is commonly used to separate and identify amino acids?

A Chromatography **B** Distillation
C Filtration **D** Sublimation

26. Which of the following is the best method for obtaining water from ink?

A Chromatography **B** Distillation

C Filtration **D** Sublimation

27. What properties must two liquids have in order for them to be separated by chromatography?

A They are both liquids.

B They are both soluble in the same solvent.

C They have different densities.

D They have different colours.

28. What is the best way to remove insoluble solids from muddy water?

A Chromatography **B** Distillation

C Evaporation **D** Filtration

29. Which test could be used to show that a sample of water is pure?

A It freezes at exactly 0 °C.

B Salt and sugar both dissolve in it.

C It turns anhydrous copper(II) sulphate from white to blue.

D When it evaporates, it leaves no residue.

30. The reaction between aqueous lead(II) nitrate and aqueous potassium iodide can be represented as:

$Pb(NO_3)_2(aq)$	+	$2KI(aq)$	$\rightarrow$	$PbI_2(s)$	+	$2KNO_3(aq)$
colourless		colourless		yellow		colourless

Which method could be used to separate the products?

A Chromatography **B** Crystallisation

C Distillation **D** Filtration

31. Which of the following substances may be condensed using a water-cooled condenser?

	substance	melting point / °C	boiling point / °C
A	butane	–135	–0.5
B	pentane	–130	+36
C	hydrogen chloride	–115	–85
D	ammonia	–78	–33

32. The diagram below shows a tap funnel.

Which pair of chemicals can be separated using a tap funnel?

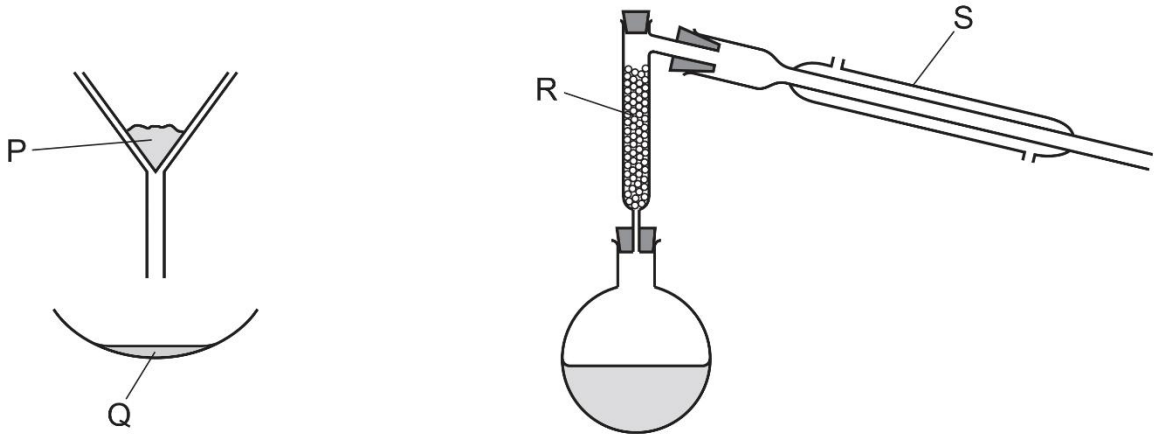
A Two miscible liquids.

B Two immiscible liquids.

C A solvent and a soluble solute.

D A solvent and an insoluble solute.

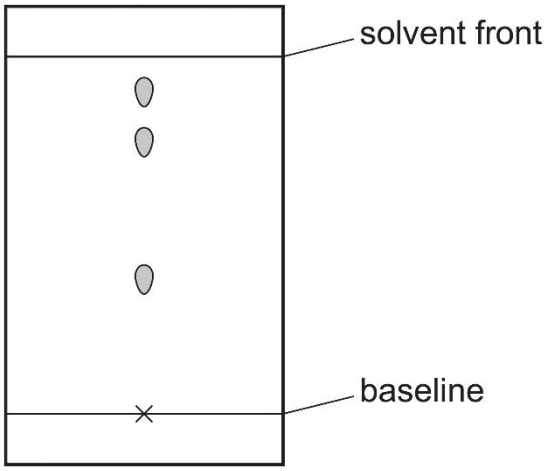
33. The apparatus used to separate a mixture of sand, methanol and ethanol is shown.



Which row identifies the labels on the diagrams?

	P	Q	R	S
A	filtrate	residue	condenser	fractionating column
B	filtrate	residue	fractionating column	condenser
C	residue	filtrate	condenser	fractionating column
D	residue	filtrate	fractionating column	condenser

34. A student attempted to separate **four** coloured dyes using chromatography. The result of her **unsuccessful** attempt is shown below.



Which change should the student make so that **all four** dyes can be separated?

A Measure the R_f value of each spot carefully.

B Run the chromatogram for a longer time.

C Run the chromatogram using a different solvent.

D Use a locating agent.

35. The solubilities of three different chemicals; **X**, **Y** and **Z**, in two different solvents; water and ethanol, are summarised in the table below.

chemical	solubility in water	solubility in ethanol
X	✓	✗
Y	✗	✓
Z	✓	✓

Key:

✓ = chemical is soluble in the solvent

✗ = chemical is insoluble in the solvent

Which statement about a mixture of **X**, **Y** and **Z** is correct?

A Add ethanol, stir and filter. The crystallised filtrate is pure **Z**.

B Add ethanol, stir and filter. The dry residue is pure **X**.

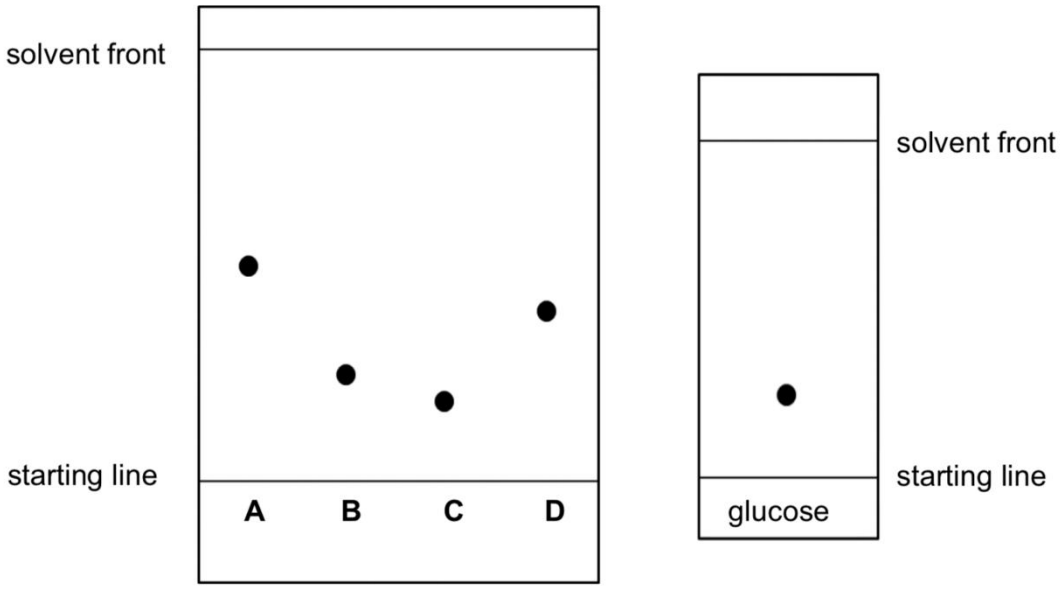
C Add water, stir and filter. The crystallised filtrate is pure **Y**.

D Add water, stir and filter. The dry residue is pure **Z**.

36. The diagram below shows two separate chromatograms and both chromatograms used the same solvent.

The chromatogram on the left shows four unknown sugars: **A**, **B**, **C** and **D**. The chromatogram on the right shows glucose.

Which sugar (**A**, **B**, **C** or **D**) is glucose?



- Scan the QR Code below to view the answers to this assignment.

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