

Methods of Purification and Analysis

Question Paper

Level	O Level
Subject	Chemistry
Exam Board	Cambridge International Examinations
Topic	Experimental Chemistry
Sub-Topic	Methods of Purification and Analysis
Booklet	Question Paper

Time Allowed: 32 minutes

Score: /27

Percentage: /100

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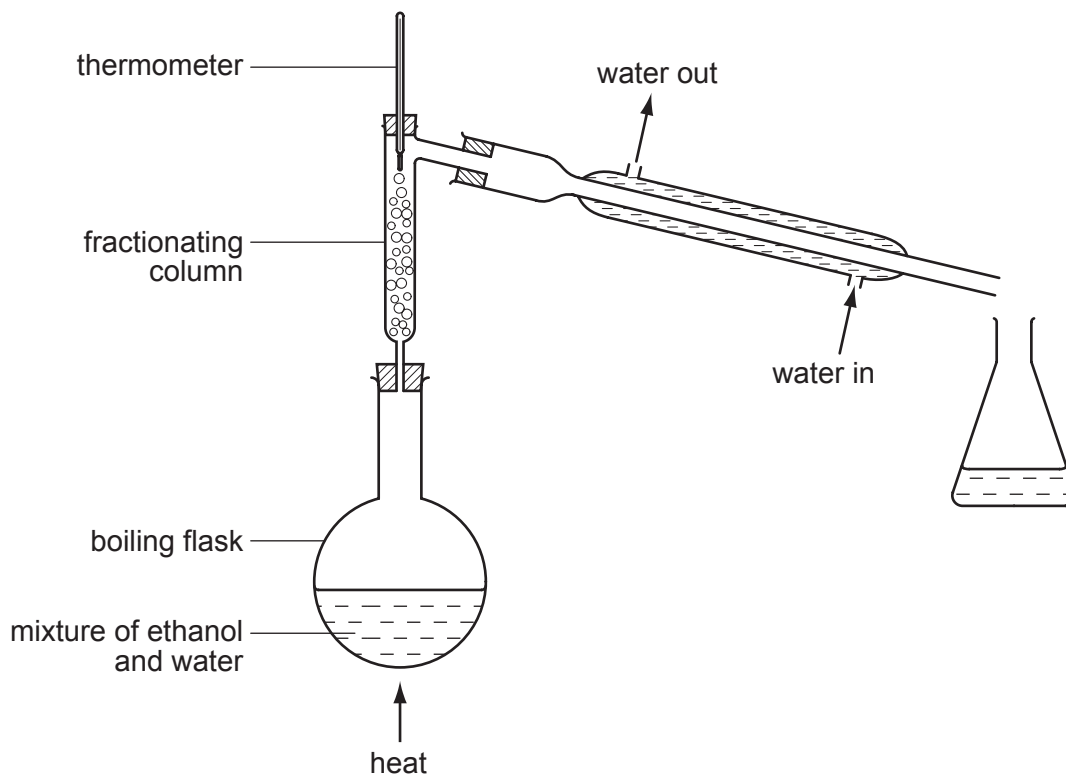
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- 1 How can a pure sample of barium sulfate be obtained from barium carbonate?
 - A Dissolve it in dilute hydrochloric acid, add dilute sulfuric acid, filter and crystallise.
 - B Dissolve it in dilute hydrochloric acid, add dilute sulfuric acid, filter and wash.
 - C Dissolve it in water, add dilute sulfuric acid, filter and crystallise.
 - D Dissolve it in water, add dilute sulfuric acid, filter and wash.

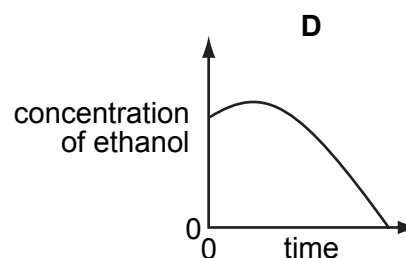
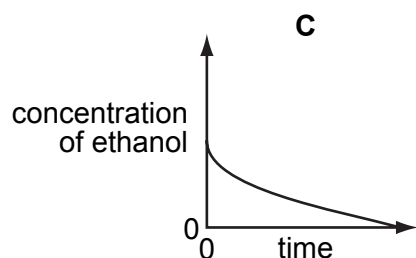
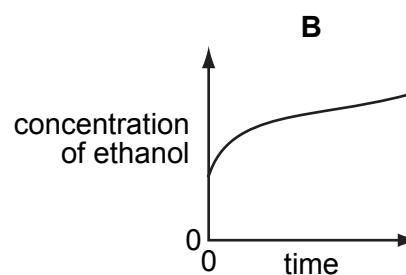
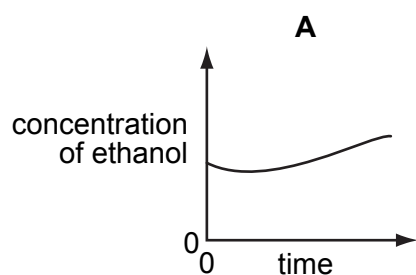
- 2 Which property of a liquid ester can be used to check its purity before use as a food flavouring?
 - A boiling point
 - B colour
 - C smell
 - D solubility in water

- 3 In which method of separation are R_f values used?
 - A chromatography
 - B crystallisation
 - C filtration
 - D fractional distillation

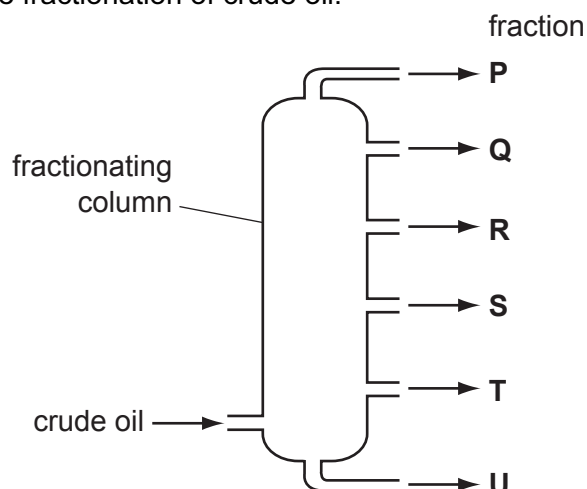
- 4 The apparatus shown is used to distil a dilute solution of ethanol in water.
[B.P.: ethanol, 78 °C; water 100 °C]



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



5 The diagram shows the fractionation of crude oil.

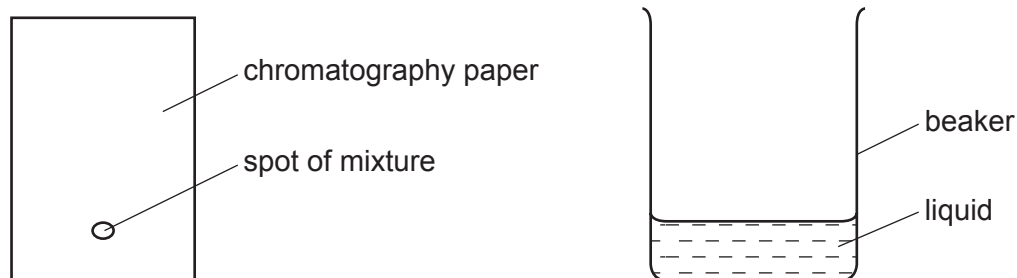


Which row explains why fraction **R** is collected above fraction **S**?

	boiling point of R	average molecular mass of R
A	higher than S	greater than S
B	higher than S	smaller than S
C	lower than S	greater than S
D	lower than S	smaller than S

6 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.

- 7 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?

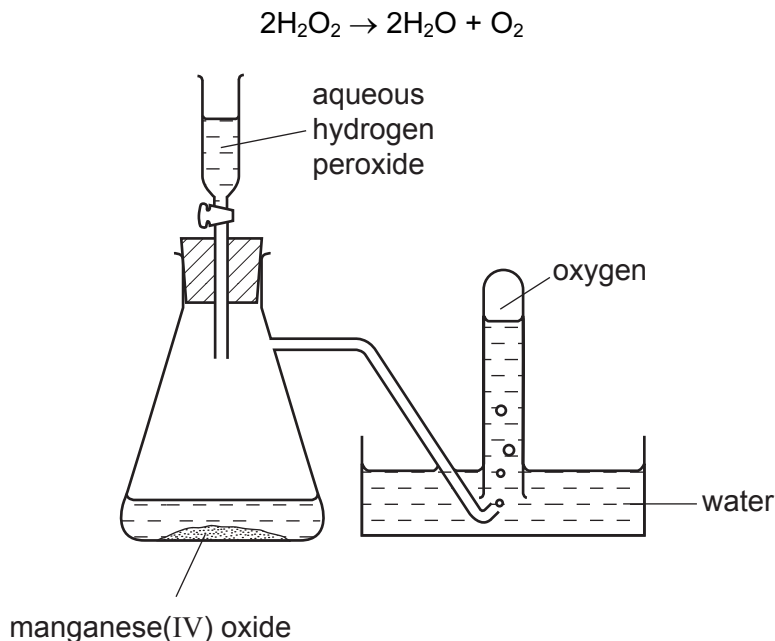
- A filtration
- B fractional distillation
- C paper chromatography
- D recrystallisation

- 8 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

- 9 Oxygen was prepared from hydrogen peroxide, with manganese(IV) oxide as catalyst. The oxygen was collected as shown in the diagram.



The first few tubes of gas were rejected because the gas was contaminated by

- A hydrogen.
 - B hydrogen peroxide.
 - C nitrogen.
 - D water vapour.
- 10 The two statements are about the fractional distillation of crude oil. The statements may or may not be correct. They may or may not be linked.

statement 1 Fractional distillation is used to separate crude oil into useful fractions.

statement 2 The fractions with lower boiling points are found at the top of the fractionating column.

What is correct about these two statements?

- A Both statements are correct and statement 2 explains statement 1.
- B Both statements are correct but statement 2 does not explain statement 1.
- C Statement 1 is correct but statement 2 is incorrect.
- D Statement 1 is incorrect but statement 2 is correct.

11 The boiling points of various gases found in the air are shown below.

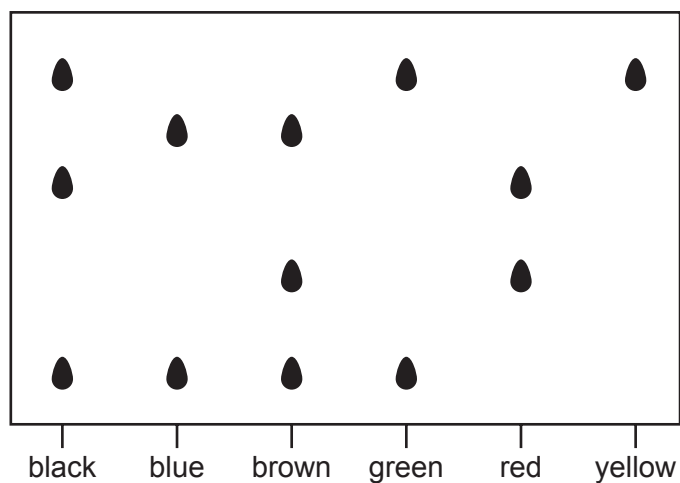
	°C
argon	-186
carbon dioxide	-78
nitrogen	-198
oxygen	-183

If the air is cooled, the first substance to condense is water.

If the temperature is lowered further, what is the next substance to condense?

- A argon
- B carbon dioxide
- C nitrogen
- D oxygen

12 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.

13 The table gives the properties of four substances.

Which substance is a solid metal at room temperature?

	melting point /°C	boiling point /°C	electrical conductivity when solid	electrical conductivity when molten
A	808	1465	x	✓
B	98	890	✓	✓
C	119	445	x	x
D	-39	357	✓	✓

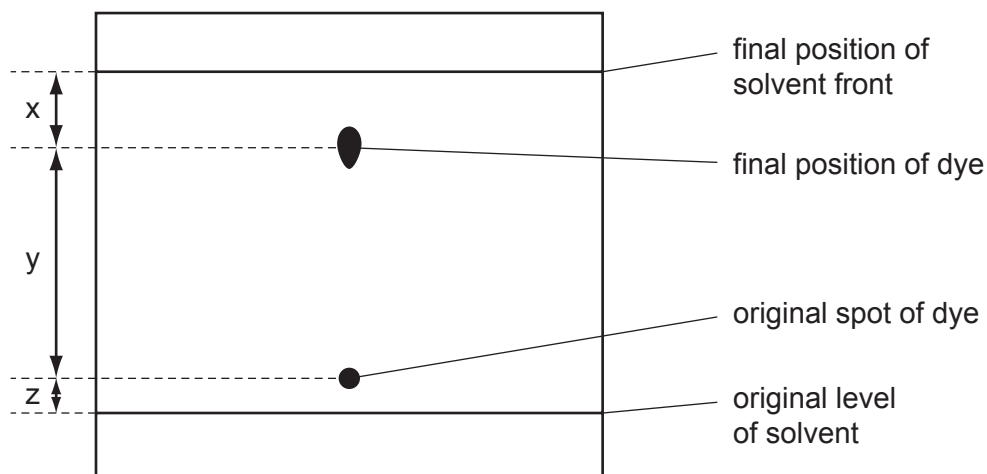
key

✓ = conducts

x = does not conduct

14 The diagram shows the chromatogram obtained by analysis of a single dye.

Three measurements are shown.



How is the R_f value of the dye calculated?

A $\frac{x}{x+y}$

B $\frac{y}{x+y}$

C $\frac{x}{x+y+z}$

D $\frac{y}{x+y+z}$

- 15 The table shows the boiling points of the elements found in a sample of liquid air.

element	argon	helium	neon	nitrogen	oxygen
boiling point/°C	-186	-269	-246	-196	-183

Which elements would be gaseous at -190°C ?

- A argon, helium and nitrogen
 - B argon, nitrogen and oxygen
 - C helium, neon and nitrogen
 - D helium, neon and oxygen
- 16 Which method could be used to obtain charcoal from a mixture of powdered charcoal with sodium chloride?
- A chromatography
 - B filtration after shaking with water
 - C heating the mixture
 - D distillation
- 17 Which property shows that a liquid is pure?
- A It turns anhydrous copper(II) sulphate blue.
 - B It is colourless and odourless.
 - C It has no effect on red or blue litmus paper.
 - D It boils at a fixed temperature at a given pressure.
- 18 A test-tube containing a liquid **X** is placed in a beaker of boiling water. The liquid **X** starts to boil immediately.

What is the boiling point of liquid **X**?

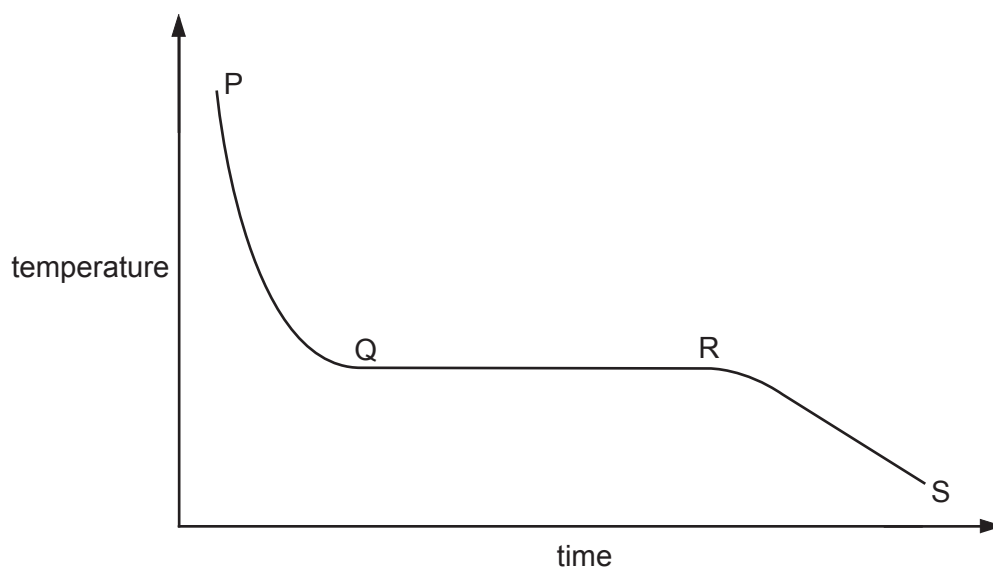
- A 100°C
- B above 100°C
- C between 0°C and room temperature
- D between room temperature and 100°C

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

- A It freezes at exactly 0°C .
- B It turns anhydrous copper(II) sulphate blue.
- C It turns cobalt(II) chloride paper pink.
- D When it evaporates, it leaves no residue.

20 A sample of a pure compound is heated until it is completely molten and the compound is then allowed to cool until it is completely solid again.

The graph shows how the temperature of the compound changes with time.



When are liquid and solid both present?

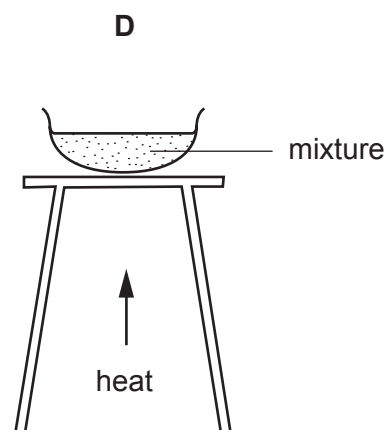
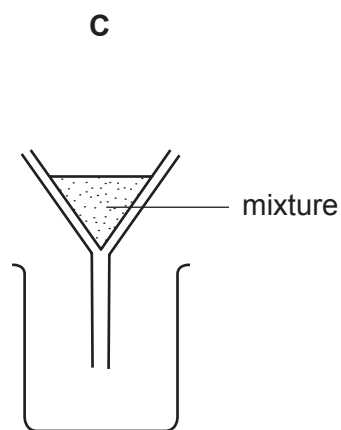
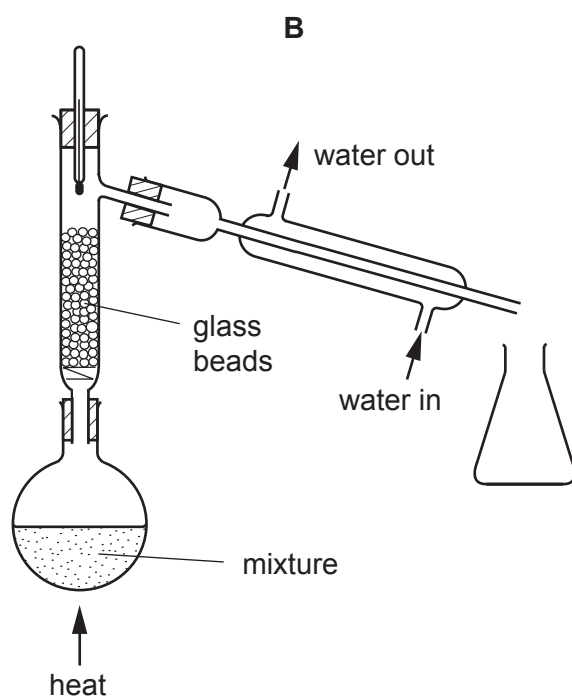
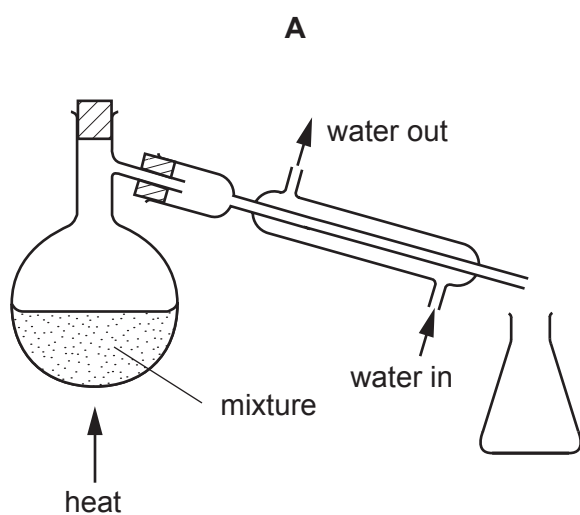
- A P to Q and R to S
- B P to Q
- C Q to R
- D R to S

21 Which of the following is a pure compound?

- A ethanol
- B petrol
- C steel
- D tap water

22 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 diagram shows the method most suitable for separating **X** from a mixture of **X** and water?



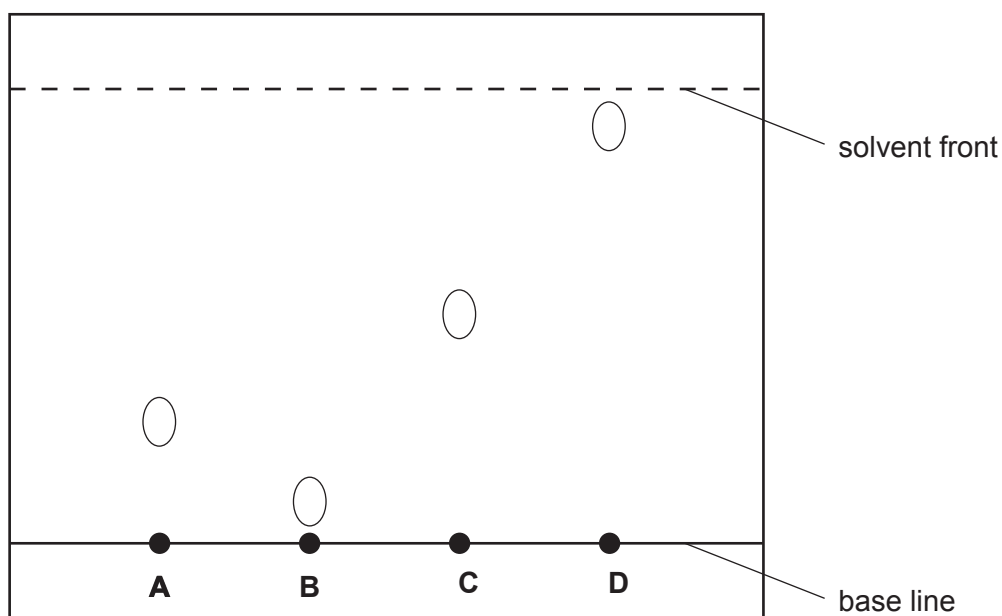
23 Which of the following is the best method of obtaining pure water from ink?

- A chromatography
- B distillation
- C filtration
- D freezing

24 The diagram shows the chromatogram of four different sugars using the same solvent.

Glucose has an R_f value of 0.5.

Which sugar is glucose?

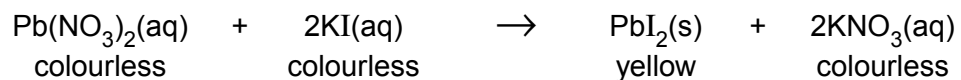


25 A liquid boils at a temperature of 100°C .

Which other property of the liquid proves that it is pure water?

- A It does not leave a residue when boiled.
- B It freezes at 0°C .
- C It is neither acidic nor alkaline.
- D It turns white anhydrous copper(II) sulphate blue.

- 26 The equation for the reaction between aqueous lead(II) nitrate and aqueous potassium iodide is shown.



Which method could be used to separate the products?

- A chromatography
 - B crystallisation
 - C distillation
 - D filtration
- 27 What is the most suitable way of investigating the different food colourings in some drinks?
- A crystallisation
 - B filtration
 - C fractional distillation
 - D paper chromatography