



KS3 Science

Separation Techniques

Question Paper

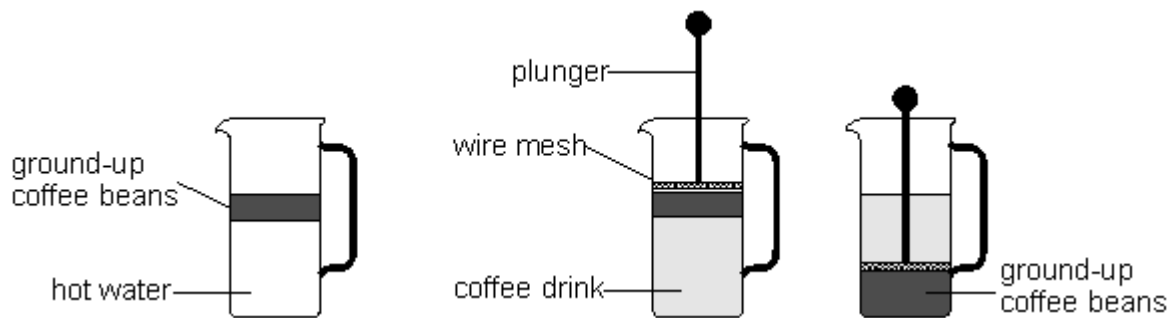
Time available: 41 minutes

Marks available: 57 marks

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1.

Russell put ground-up coffee beans in a coffee maker and added hot water.



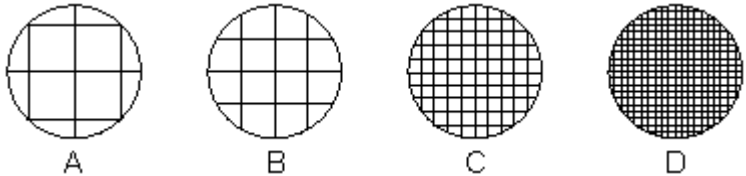
He pushed the plunger down. This separated the coffee drink from the ground-up coffee beans.

(a) How could Russell see that some coffee had dissolved in the water?

.....

1 mark

(b) The end of the plunger is a circle of wire mesh.

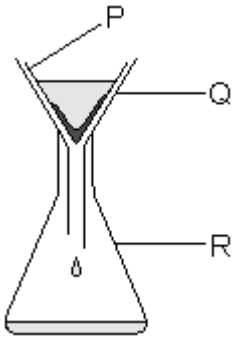


(i) Which mesh would be best to separate the coffee drink from all the ground-up coffee beans? Write the letter.

.....

1 mark

(ii) This method of making coffee uses a type of filter. The apparatus used for filtration in a school laboratory is drawn below.

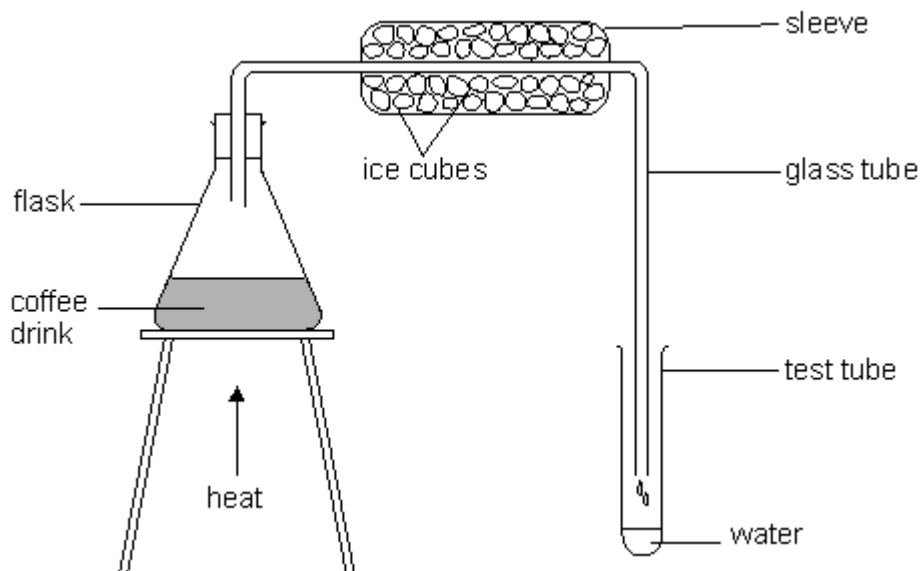


Which part of the apparatus above works in the same way as the wire mesh? Write the letter.

.....

1 mark

- (c) Russell wanted to separate the water from the coffee drink. He set up the apparatus shown below.



- (i) Why did Russell put ice cubes around the glass tube?

.....

1 mark

- (ii) Choose words from the box below to fill the gaps in the following sentences.

an acid	a gas	a liquid	a solid
condensation	crystallisation	evaporation	filtration

Russell heats the water. Water in the drink changes from

..... into

This change of state is called

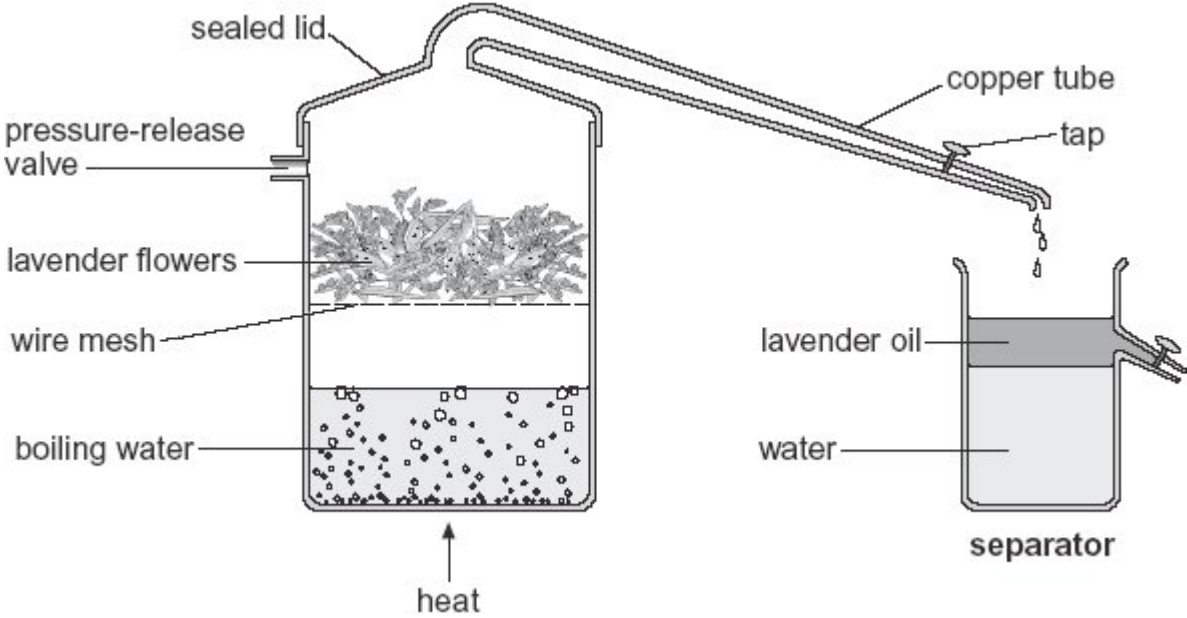
Water vapour changes into liquid. This change of state is called

.....

4 marks
maximum 8 marks

2.

Lavender oil is a perfume obtained from lavender flowers. Steam at 100°C is passed through the flowers in the apparatus below.



not to scale

Water vapour and lavender oil vapour pass down a copper tube towards a separator.

(a) (i) The lavender flowers are heated in a container with a sealed lid.

Why must the lid be sealed?

.....
.....

1 mark

(ii) What would happen if the container did **not** have a pressure-release valve?

.....
.....

1 mark

(b) Lavender oil vapour and water vapour cool as they pass down the copper tube. A mixture of lavender oil and water collects in the separator.

(i) What is the change in the physical state of both lavender oil vapour and water vapour as they cool?

from to

1 mark

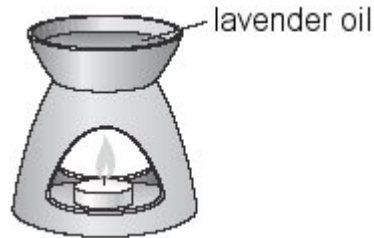
(ii) Look at the separator.

How does this show that the water is denser than lavender oil?

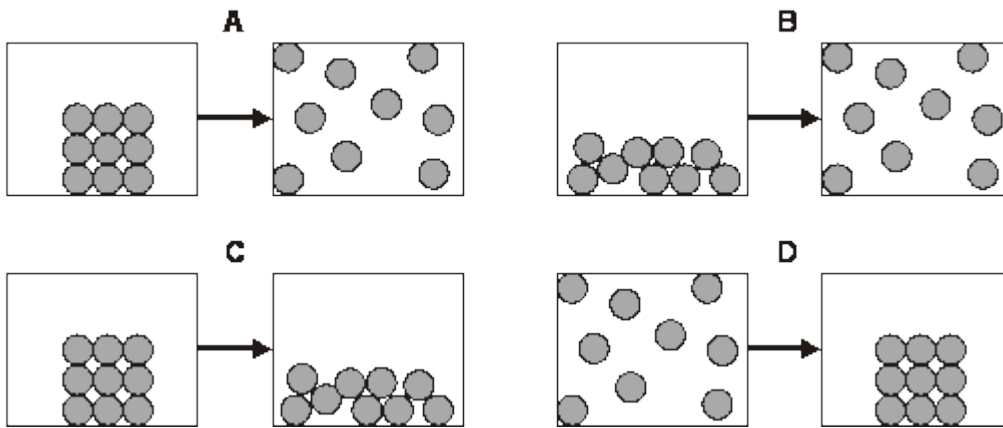
.....
.....

1 mark

(c) Rosie poured some lavender oil into an oil burner.
She heated it with a candle.



The oil changed state.



Which diagram represents this change of state?
Write the letter.

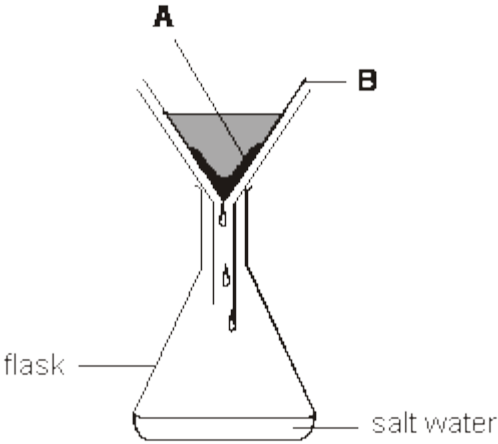
.....

1 mark
maximum 5 marks

3.

Chris collected some sea water near a beach.
The sea water had salt dissolved in it. It had sand mixed in it.

(a) Chris separated the sand from the salt water as shown below.



(i) What is this method of separation called?
Tick the correct box.

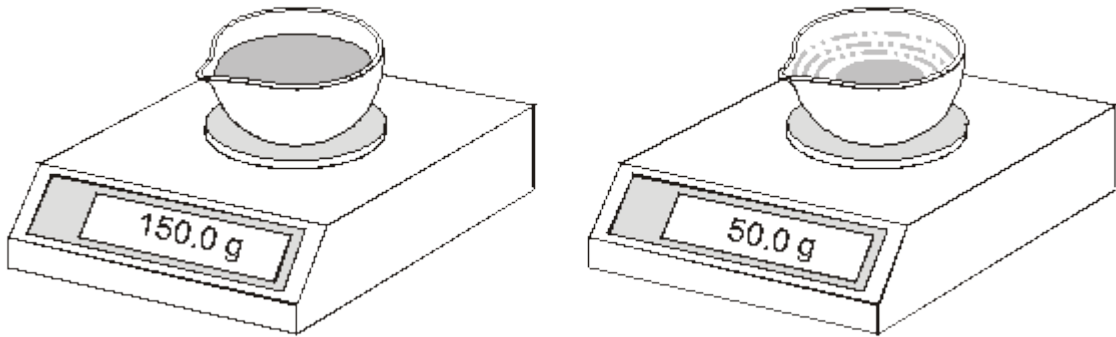
- | | | | |
|----------------|--------------------------|--------------|--------------------------|
| chromatography | <input type="checkbox"/> | distillation | <input type="checkbox"/> |
| filtration | <input type="checkbox"/> | magnetism | <input type="checkbox"/> |

(ii) What is substance A?
.....

(iii) What is the part labelled B?
.....

3 marks

(b) Chris poured some of the salt water from the flask into a dish.
He put the dish on a balance and left it in a warm room for a week.



- (i) Look at the two readings on the balance.

Work out the decrease in mass.

..... g

- (ii) After one week there was a white solid but **no** liquid in the dish.
What had happened to the water in the dish?

.....

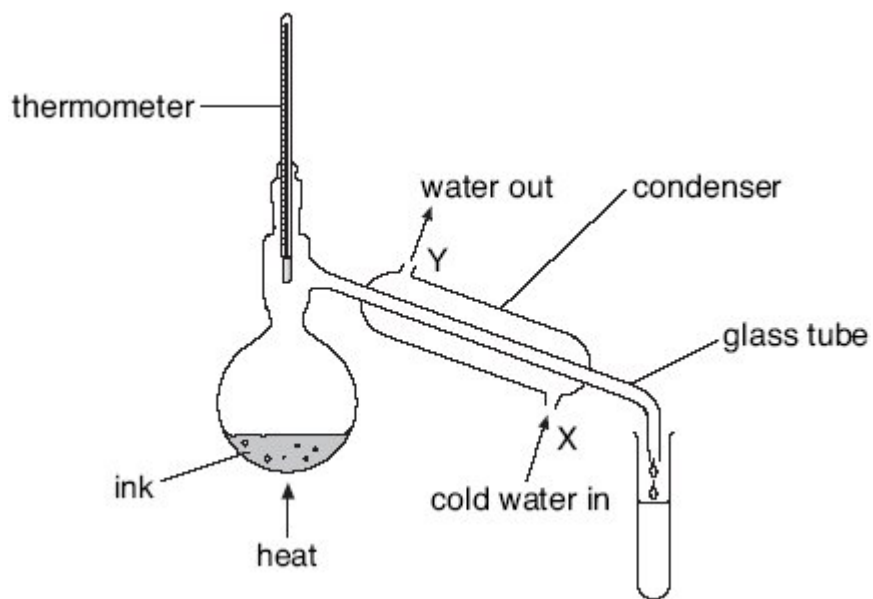
- (iii) What was the white solid left in the dish?

.....

3 marks
maximum 6 marks

4.

Rema used the apparatus below to distil 100 cm³ of water-soluble ink.



apparatus A

not to scale

(a) Which processes occur during distillation?

Tick the correct box.

condensation then evaporation

evaporation then condensation

melting then boiling

melting then evaporation

1 mark

(b) Give the name of the colourless liquid that collects in the test-tube.

.....

1 mark

(c) What would the temperature reading be on the thermometer when the ink has been boiling for two minutes?

.....°C

1 mark

(d) (i) Water at 15°C enters the condenser at X.
Predict the temperature of the water when it leaves the condenser at Y.

.....°C

Explain this change of temperature.

.....

.....

1 mark

(ii) Give **two** ways in which the water vapour changes as it passes down the glass tube in the condenser.

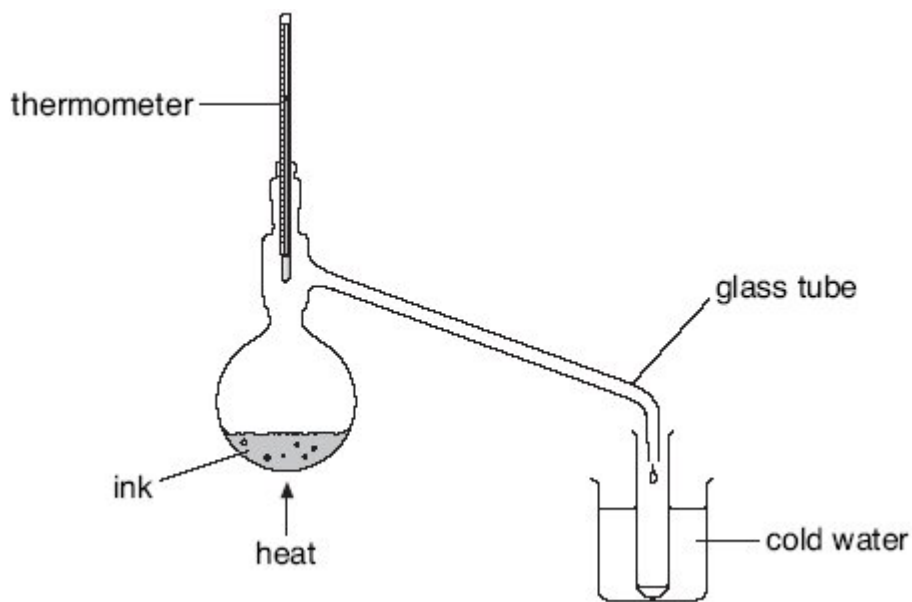
1.

1 mark

2.

1 mark

(e) Peter used the apparatus below to distil 100 cm³ of water-soluble ink.



apparatus B

not to scale

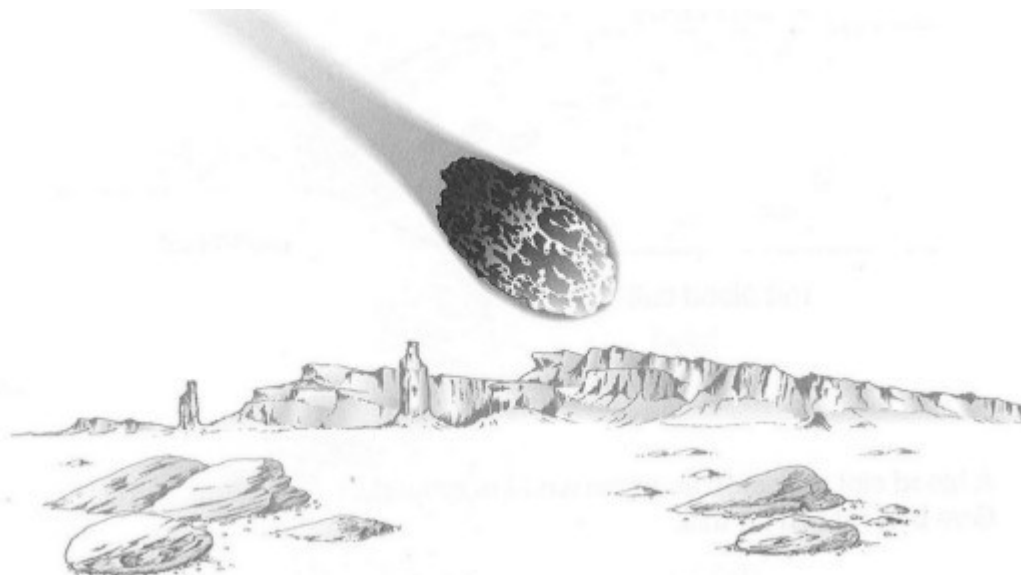
Why is the condenser in **apparatus A** better than the glass tube and beaker of water in **apparatus B**?

.....

.....

1 mark
maximum 7 marks

- 5.** A meteorite landed on Earth. It contained a new element. Scientists called the element jovium.



(a) The list below shows some properties of jovium.

Which **two** properties suggest that jovium could be a metal?

Tick **two** boxes.

It has a high melting point.

It does **not** stick to a magnet.

It is a blue solid.

It is a good conductor of heat and electricity.

It glows in the dark.

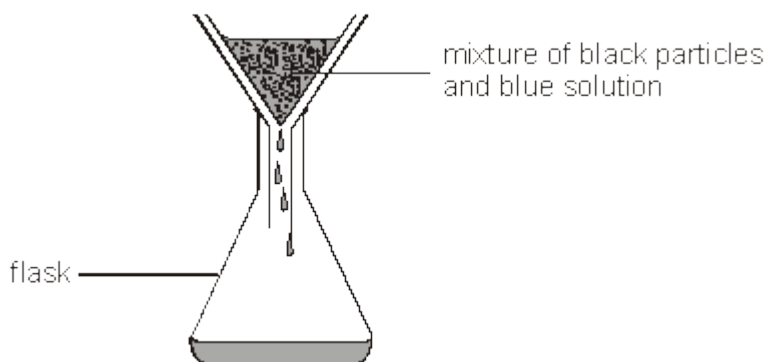
2 marks

(b) A scientist put a piece of the meteorite in water and stirred it.
This produced a blue solution with tiny, solid, black particles in it.

He separated the black particles from the blue solution using the apparatus below.

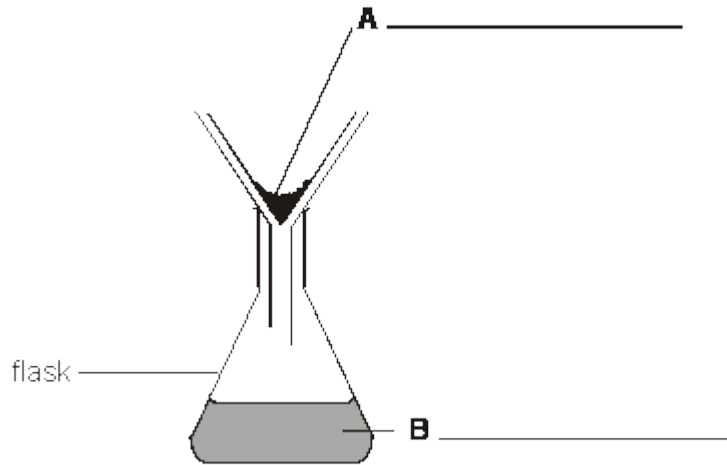
(i) Give the name of this method of separation.

.....



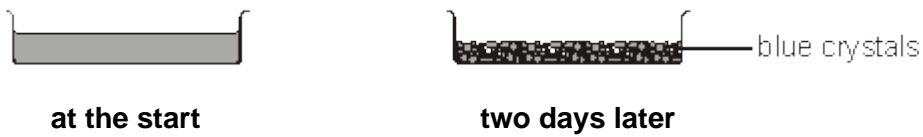
1 mark

- (ii) The diagram below shows the results.
What do the labels A and B show? Write your answers on the lines.



2 marks

- (c) The scientist poured the contents of the flask into a dish.
Two days later there were blue crystals in the dish, but **no** liquid.



What happened to the liquid in the dish?

.....

1 mark
maximum 6 marks

6.

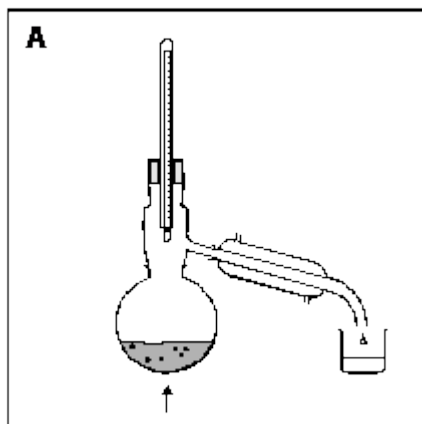
Diagrams A, B and C show three pieces of apparatus for separating substances.

- (a) Draw a line from each apparatus to the name of the method of separation.
Draw only three lines.

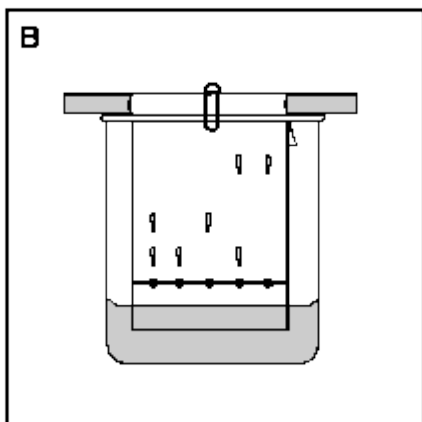
diagram of apparatus

method of separation

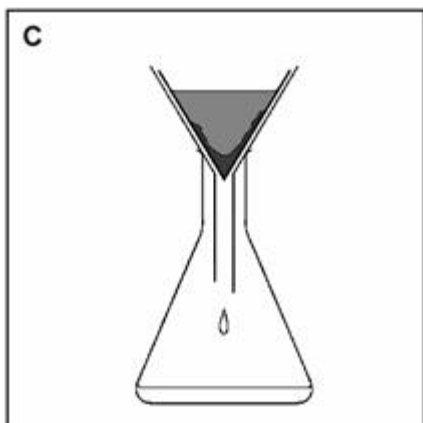
chromatography



distillation



filtration



crystallisation

3 marks

(b) Debbie has a mixture of sand and salt water.
Look at the diagrams in part (a).

(i) Which apparatus would Debbie use to separate the sand from the salt water?
Give the correct letter.

.....

1 mark

(ii) Which apparatus would she use to separate pure water from the salt water?
Give the correct letter.

.....

1 mark

Maximum 5 marks

7.

Kerry made some copper sulphate crystals. She wrote a description of what she did.

I heated some dilute sulphuric acid in a beaker and added some copper oxide to it. I stirred the mixture until it became a clear blue colour. I added more copper oxide until no more would react and then filtered the mixture into a dish. A black solid was left on the filter paper. I left the solution in the dish for a week and saw that the liquid had gone and blue crystals were left.

Use the information in Kerry's description to answer the questions below.

(a) What colour is:

(i) copper sulphate solution?

.....

1 mark

(ii) copper oxide?

.....

1 mark

(b) Write down a word equation for the reaction which took place in the beaker.

..... + → + water

1 mark

(c) Why did Kerry have to filter the mixture?

.....
.....

1 mark

Maximum 4 marks

8.

John ground some coffee beans into little pieces. He put them into a coffee filter and poured 800 cm³ of boiling water over them to make a jug of coffee.



(a) Complete the sentences below. For each sentence, choose **one** of the following words.

insoluble soluble solution solvent

(i) The liquid in the jug is brown because parts of the coffee beans are in water.

1 mark

(ii) Some bits of coffee beans are left on the filter because they are in water.

1 mark

(iii) The brown liquid which drips through the filter is a of coffee.

1 mark

(b) How could John get dry, solid coffee from the brown liquid in the jug of coffee?

.....
.....

1 mark

(c) John tried making coffee in the same way using cold water. He used 800 cm^3 of cold water and the same amount of ground up coffee beans.

(i) The liquid in the jug was a lighter colour. Why was this?

.....
.....

1 mark

(ii) How much solid coffee could John get back from this liquid?

Tick the correct box.

more than before

the same as before

less than before

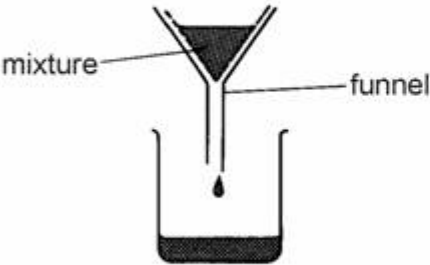
none

1 mark

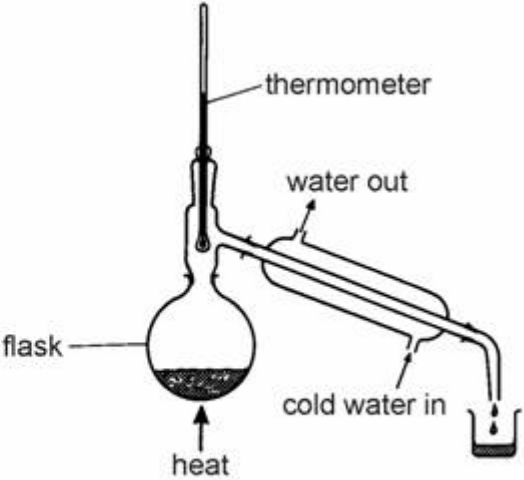
Maximum 6 marks

9.

The following diagrams show two methods of separating substances.



method 1



method 2

(a) What is the name of each method?

Method 1 is

1 mark

Method 2 is

1 mark

(b) (i) Tick one box to show which of the mixtures can be separated by method 1.

- sugar and salt
- sand and water
- dissolved salt and water
- sand and iron filings
- sugar and salt, both dissolved in water

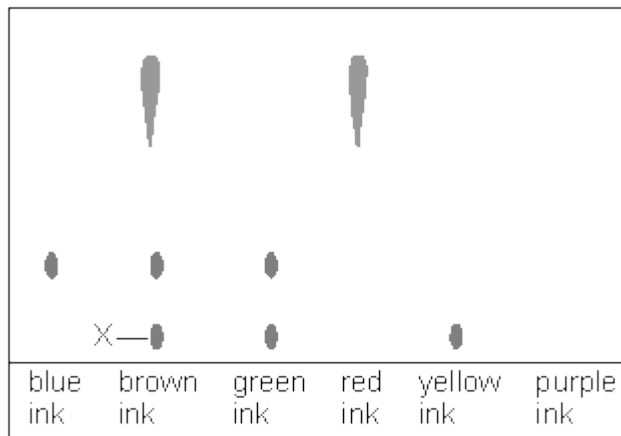
1 mark

(ii) From the list give a mixture which can be separated by method 2 but not by method 1.

.....

1 mark

- (c) Chromatography was used to analyse some soluble inks. The results are shown below.



- (i) A purple ink is a dissolved mixture of the red dye and the blue dye. On the right of the diagram draw the pattern you would expect to see for purple ink.

1 mark

- (ii) Which **three** inks contain only one dye?

.....

1 mark

- (iii) What colour is spot **X**?

.....

1 mark

Maximum 7 marks

10.

Good quality water is needed for a healthy life.

In the United Kingdom, obtaining safe water for drinking is as simple as turning on a tap. The water is made safe to drink by water companies.

However, in many parts of Africa and Asia, water used for drinking is contaminated and untreated. It is estimated that 2.2 million people die each year as a result of drinking contaminated water.



*DADA DANESHANANDA, Man with filtered water from the Mafi-Zongo water project. www.amurt.net/africa/ghana/2005
www.accesstuition.com*

(a) Sea water is **not** used as drinking water.

Suggest why.

.....
.....

(1)

(b) Explain why water for drinking is filtered and then treated with chlorine.

.....
.....
.....
.....

(2)

(Total 3 marks)