7.2.3 Pure Substances

57 minutes

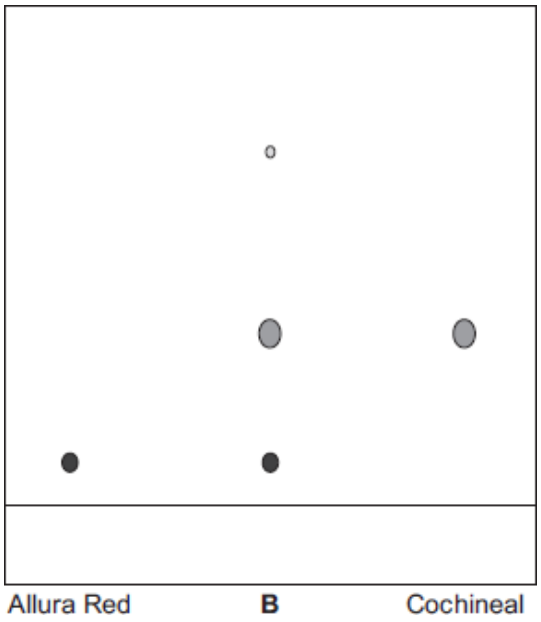
61 marks

Q1. A company making sweets uses different colour additives in different countries. In some countries the company uses Allura Red to colour sweets red.

Some European countries recommend children do **not** eat Allura Red. In Europe the company uses Cochineal instead of Allura Red to colour sweets red.

A different red food colouring, **B**, was compared with Cochineal and Allura Red using paper chromatography.

The diagram shows the results.



(a) (i) How can you tell from the diagram that the three food colourings are **not** the same?

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(2)

(ii) The red food colouring, **B**, is **not** suitable for use in sweets sold in European countries.

Suggest **one** reason why.

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(1)

(b) Give **two** reasons why food scientists use instrumental methods instead of paper chromatography to analyse food colourings.

1 .....

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2 .....

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(2)
(Total 5 marks)

Q2. 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

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

Suggest why.

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(1)

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

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(2)
(Total 3 marks)

Q3.

Why blue sweets are turning white

A recent study identified a possible harmful effect on chlidren's nervous systems by some artificial colours. Two of these colours are Brilliant Blue (E133) and Quinoline Yellow (E104). Both are artificial colours because they are made from coal. The company is to stop producing the blue sweets because it is removing all artificial colours and there is no natural blue alternative.

(a) Suggest why it is important to be able to identify the colour additives in food.

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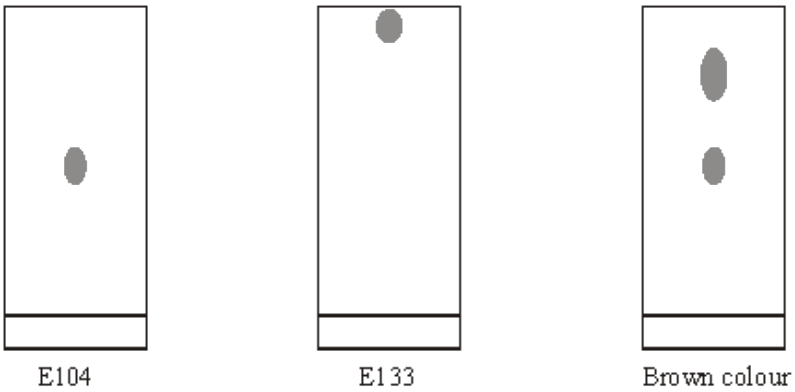
(1)

(b) A brown colour used in sweets was analysed using chromatography. The results were compared with those from E104 and E133.



What do the results tell you about the brown colour and its suitability for use in sweets?

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(3)

(c) Once all the unsuitable colours are removed, the company claims that its sweets are now 'free from artificial colours'.

Does this mean that the sweets contain no additives? Explain your answer.

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(2)
(Total 6 marks)

Q4. Read the following information and then answer the questions.

Chlorine – for better, for worse?

Chlorine is used to make bleaches, plastics and medicines. Swimming pool water is often treated with chlorine.

Chlorine is used to make water safe to drink. It is relatively cheap and easy to use. People who drink untreated water risk dying from typhoid and cholera.

However, chlorine is a poisonous chemical. It causes breathing difficulties and can kill people. Some people are also allergic to chlorine.

(a) How does chlorine make water safe to drink?

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(1)

(b) The amount of chlorine in swimming pool water should be carefully monitored and controlled.

Explain why.

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(2)

(c) Developing countries are likely to choose chlorination as their method of making water safe to drink.

Suggest why.

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(1)

(d) A government is setting up an enquiry into the safety of using chlorine.

(i) Suggest why people from all political parties should be represented.

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(1)

(ii) Suggest why the opinion of a well-respected scientist might change the outcome of any discussion.

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(1)

(iii) The decision taken about the safety of using chlorine should be based on evidence and data rather than on hearsay and opinion.

Suggest why.

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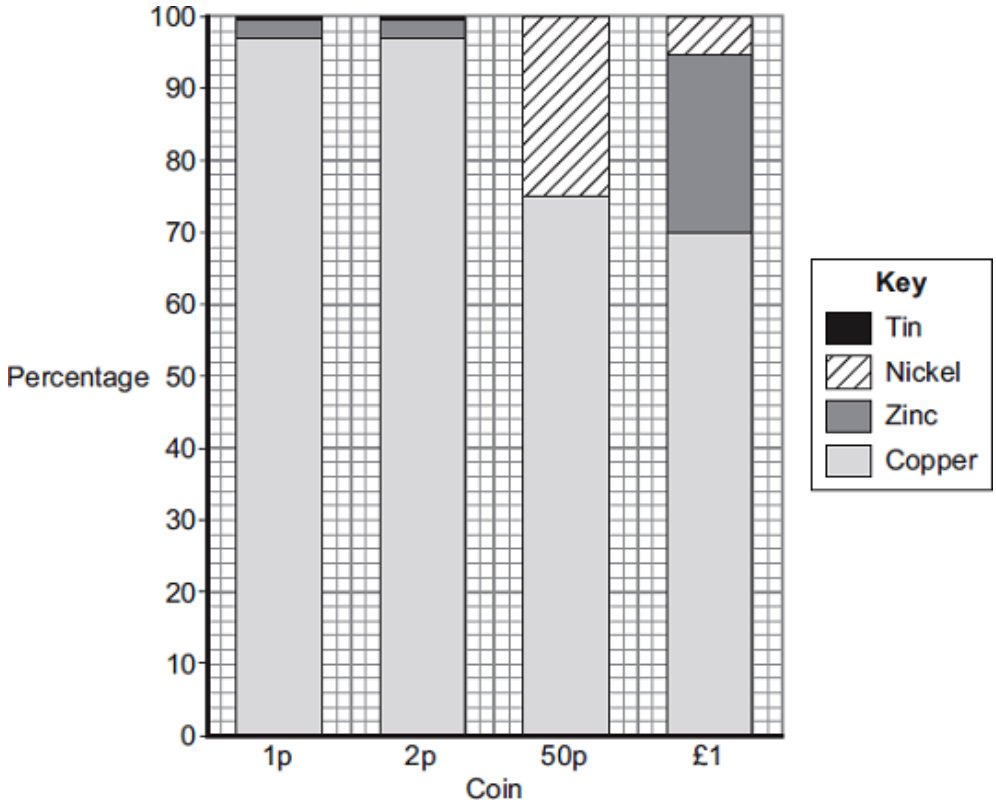
(1)
(Total 7 marks)

Q5. This is the headline from a newspaper:

'Why is a 2p coin worth 3.3p?'

(a) The bar chart shows the percentage of metals in UK coins in 1991.



Use the bar chart to answer these questions.

(i) Which metal is in all of these coins?

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(1)

(ii) Which coin does **not** contain zinc?

.....

(1)

(iii) What is the percentage of nickel in a 50 p coin?

Percentage = ... %

(1)

(iv) Draw a ring around the correct metal to complete the sentence.

Pure copper is too soft to be used for 1 p and 2 p coins.

Copper is mixed with zinc and

iron
nickel
tin

for 1 p and 2 p coins.

(1)

(b) The value of the metal in 2 p coins, made in 1991, is now 3.3 p.

Suggest why a 2 p coin made in 1991 is worth 3.3 p.

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(1)
(Total 5 marks)

Q6. Most water contains dissolved compounds.

The concentrations of these dissolved compounds are higher in sea water than in drinking water.

(a) (i) Draw a ring around the correct answer to complete the sentence.

Pure water can be obtained from sea water by

distillation.
filtration.
neutralisation.

(1)

(ii) What is the boiling point of pure water? ..... °C

(1)

(b) A student wanted to find out how much solid was dissolved in sea water.

This is the method the student used:

- measure the mass of an empty evaporating basin
- measure 25 cm^3 of sea water and pour it into the evaporating basin
- heat the evaporating basin gently until all of the water has evaporated
- measure the mass of the evaporating basin containing the solid residue.

(i) What piece of apparatus would be suitable for measuring 25 cm^3 of sea water?

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(1)

(ii) How could the student check that all of the water had evaporated?

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(2)

(iii) The results the student obtained using 25 cm^3 of sea water are:

mass of empty evaporating basin = 23.21 g
mass of evaporating basin and dry solid residue = 24.04 g

Calculate the mass of solid dissolved in 1000 cm^3 of the sea water.

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Mass dissolved in 1000 cm^3 = ... g

(2)

(c) In many countries chlorine is added to drinking water supplies.

Why is chlorine added to drinking water?

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(1)

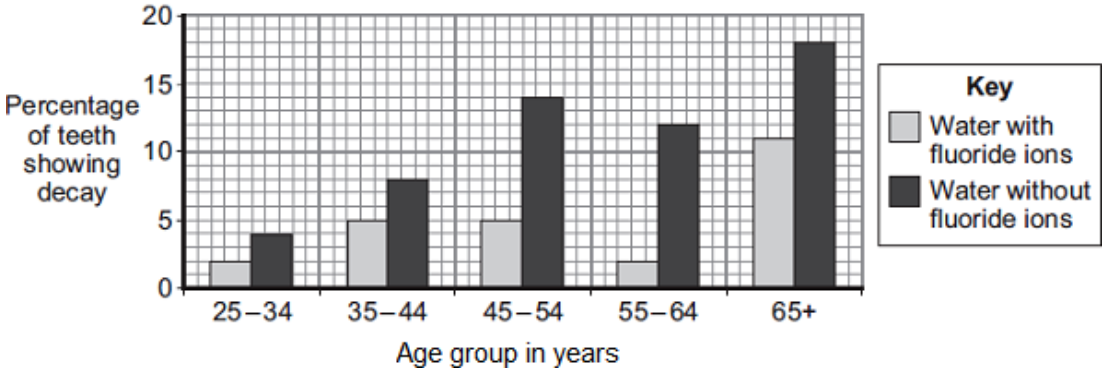
(d) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Compounds containing fluoride ions are added to some drinking water supplies.

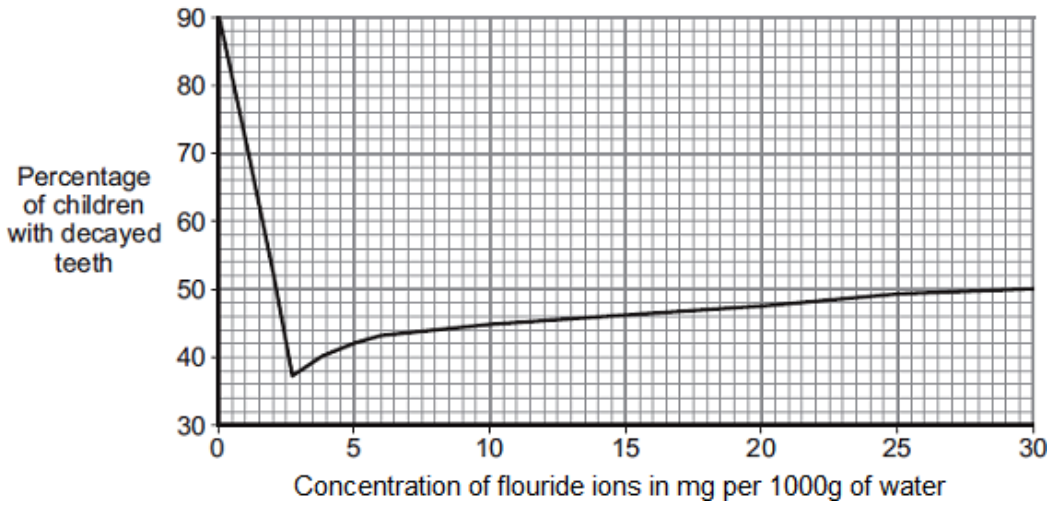
Many scientists have done research into the effects of fluoride ions in drinking water.

Graphs 1, **2** and **3** show some of the results obtained.

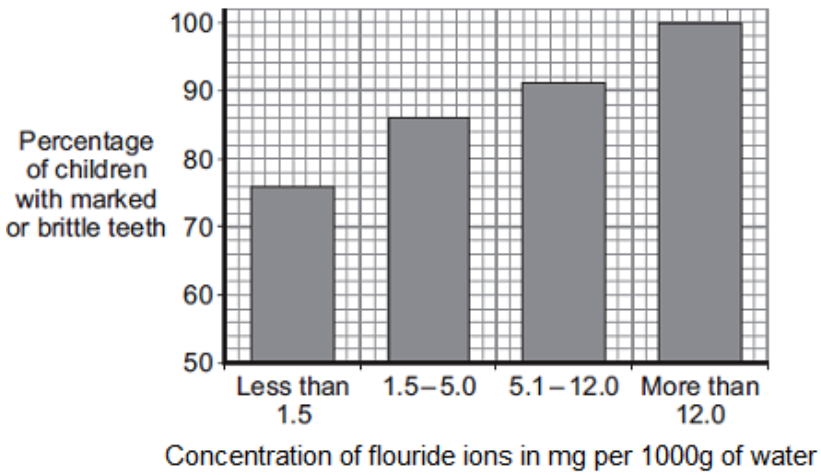
Graph 1



Graph 2



Graph 3



Evaluate the advantages and disadvantages of adding fluoride ions to drinking water.

You should support your answer with evidence from **all three** graphs.

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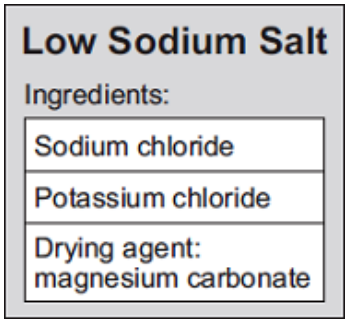
(6)
(Total 14 marks)

Q7. Low sodium salt is used on food. This label is from a packet of low sodium salt.



A chemist tests the low sodium salt for the substances on the label.

(a) The chemist tests for sodium ions and potassium ions using a flame test.

Draw a ring around the correct answer to complete each sentence.

(i) In a flame test, sodium ions produce a lilac / red / yellow colour.

(1)

(ii) In a flame test, potassium ions produce a lilac / red / yellow colour.

(1)

(b) The chemist added hydrochloric acid to low sodium salt. Carbon dioxide gas was produced.

Describe the test for carbon dioxide and give the result of the test.

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(2)

(c) The chemist made a solution of low sodium salt.

(i) Tick (✓) **one** box to show the chemical used to test for chloride ions.

	Tick (✓)
Barium chloride solution	
Silver nitrate solution	
Sodium sulfate solution	

(1)

(ii) Sodium hydroxide solution is used to test for magnesium ions.

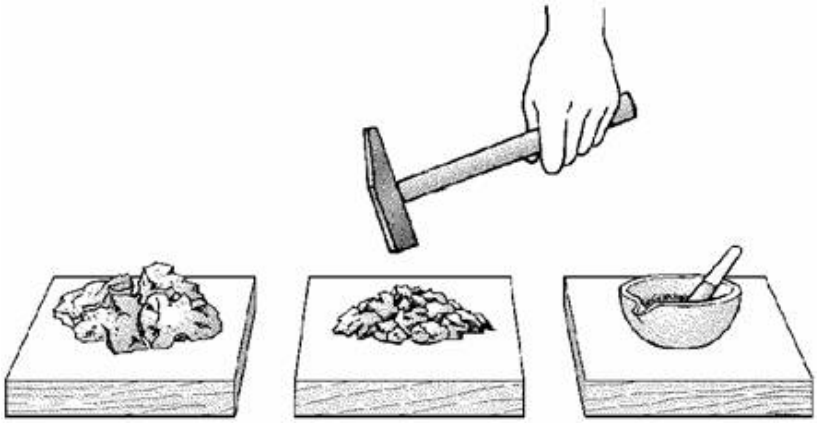
Draw a ring around the colour of precipitate produced by this test.

brown **green** **white**

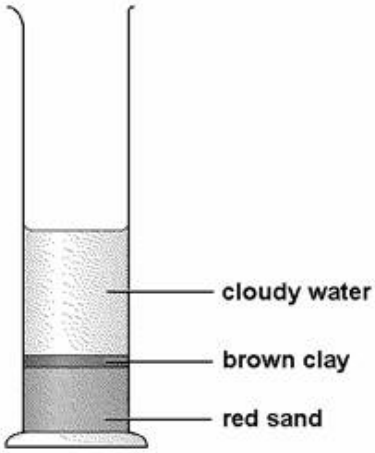
(1)
(Total 6 marks)

Q8. Linda had a piece of red sandstone.

She hammered it into pieces and then ground them into a powder using a pestle and mortar.



She put the powder into a measuring cylinder with water and shook the mixture. The contents settled.



(a) Linda said her results showed that sandstone is a mixture of two substances.

How could she tell, from the results, that sandstone is a mixture of substances?

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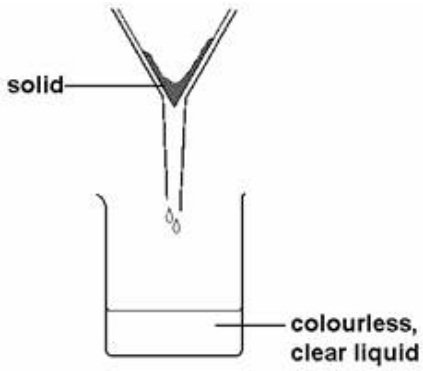
1 mark

(b) Linda then poured the cloudy water from the measuring cylinder through filter paper in a filter funnel.



She said there might be salts dissolved in the colourless, clear liquid that came through the filter.

(i) What could Linda do to find out if there were salts dissolved in the colourless, clear liquid?

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1 mark

(ii) What would she see if there had been salts dissolved in the colourless, clear liquid?

.....

.....

1 mark

(c) Sandstone is a sedimentary rock. Four stages in the formation of sedimentary rock are listed below.
They are **not** in the correct order.

compacted **deposited** **weathered** **transported**

Put these stages in the correct order. One has been done for you.

stage 1 .....**weathered**.....

stage 2 .....

stage 3 .....

stage 4 .....

1 mark
Maximum 4 marks

Q9. The drawing shows a gold mask from a tomb in Egypt. The gold is still shiny after thousands of years.

(a) What is pure gold? Tick the correct box.

a compound	☐	a mixture	☐
an element	☐	a solution	☐

1 mark

(b) The list shows some of the properties of gold.

It conducts electricity. **It melts at 1064°C.** **It is yellow.**

It is easily scratched. **It stays shiny.** **It conducts heat.**

(i) Which **one** of these properties shows that gold does **not** react with oxygen in the air?

.....

1 mark

(ii) Which **two** of the properties above are properties of **all** metals?

1. .....

2. .....

2 marks

(c) Old iron objects from tombs in Britain are often covered with rust.
Iron reacts with oxygen when it rusts.

What else is needed for iron to go rusty? Choose **one** substance from the list below.

lead **nitrogen** **carbon dioxide** **water**

.....

1 mark

(d) A box contains a collection of metal objects from a tomb.

What piece of equipment would you use to separate the iron objects from the other metal objects?

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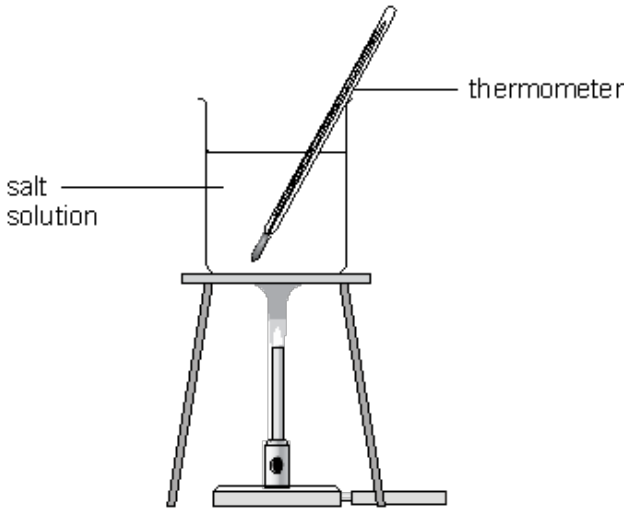
1 mark
Maximum 6 marks

Q10. Neera and Tom dissolved different masses of salt in 500 cm^3 of water.
They measured the temperature at which each salt solution boiled.



(a) They wrote down the variables that might affect the investigation.

temperature of the laboratory	mass of salt dissolved in water	starting temperature of the water
boiling point of salt solution	volume of water	type of salt used

(i) What is the independent variable (the variable they changed) in their investigation?

.....

1 mark

(ii) What is the dependent variable (the variable they measured) in their investigation?

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1 mark

(iii) Which variable above would affect the experiment the least?

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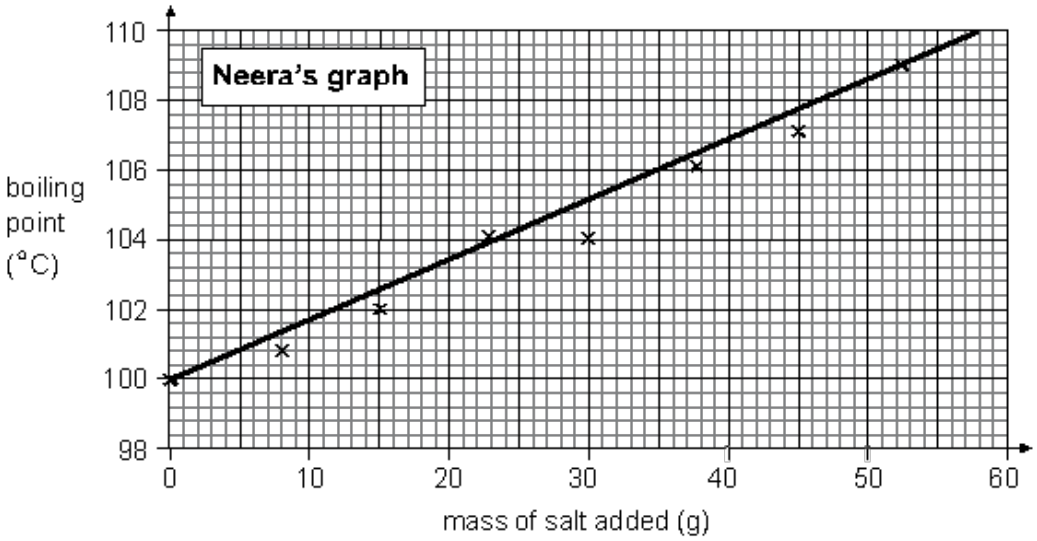
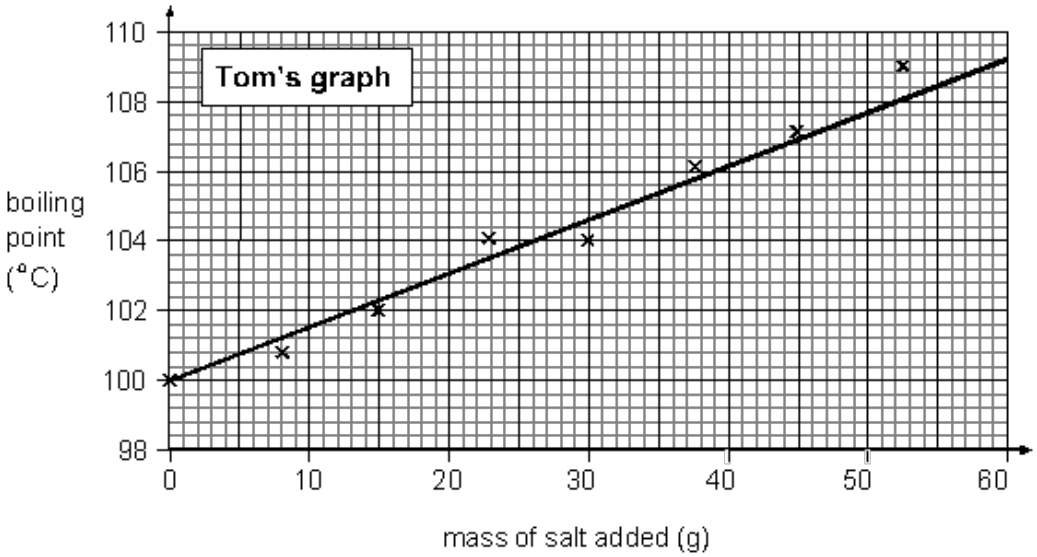
1 mark

(b) Neera and Tom plotted their results and drew the graphs shown below.





(i) How can you tell from the graphs that Neera and Tom started with pure water?

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1 mark

(ii) Why is Tom's line of best fit better than Neera's line of best fit?

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1 mark
maximum 5 marks