Surname

Other Names

Candidate Signature

AQA

General Certificate of Secondary Education
Foundation Tier
January 2013

Additional Applied Science   AAS1FP

F

Unit 1   Science at Work

Written Paper

Tuesday 22 January 2013   9.00 am to 10.00 am

For this paper you must have:
- a ruler
- a calculator
- the Equations Sheet (enclosed).

Time allowed
- 1 hour

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 6(c) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

AAS1FP

Answer **all** questions in the spaces provided.

1 (a) Different types of fire need different fire extinguishers.

Use the correct answers from the box to complete the sentences.

carbon dioxide	**foam**	**water**	**oxygen**

A petrol fire is best extinguished using ....

A wood fire is best extinguished using ....

A fire in electrical equipment is best extinguished

using ....

(3 marks)

1 (b) Which **one** of the following hazard symbols would you see on a container of very flammable material?

Tick (✓) **one** box.
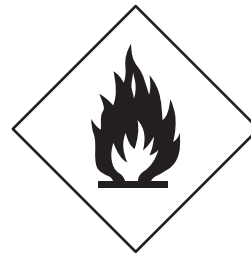
(1 mark)

4

2 (a) Sporting equipment is made from different materials.

Look at the following pieces of sporting equipment.

Draw **one** line from each piece of equipment to the properties of the material that the equipment is made from.

Equipment	**Properties of the material**
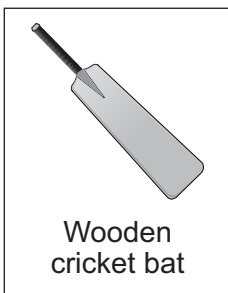
easy to work
natural
hard

Wooden
cricket bat

light
strong
hard

Polymer
climbing rope
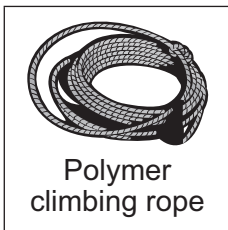
flexible
strong
water resistant

Metal alloy
tennis racquet

rigid
light
brittle

(3 marks)

Turn over ▶

2 (b) Metals are very useful materials. The table shows properties of some metals.

Metal	Density in g/cm³	Melting point in °C	Relative electrical conductivity	Cost per tonne in £
Aluminium	2·7	660	40	1 500
Copper	8·9	1083	64	4 900
Iron	7·9	1535	11	600
Silver	10·5	962	67	620 000
Zinc	7·1	420	18	1 100

Use the information in the table to answer the questions.

2 (b) (i) Aluminium is used to make overhead electricity cables.

Overhead electricity cable
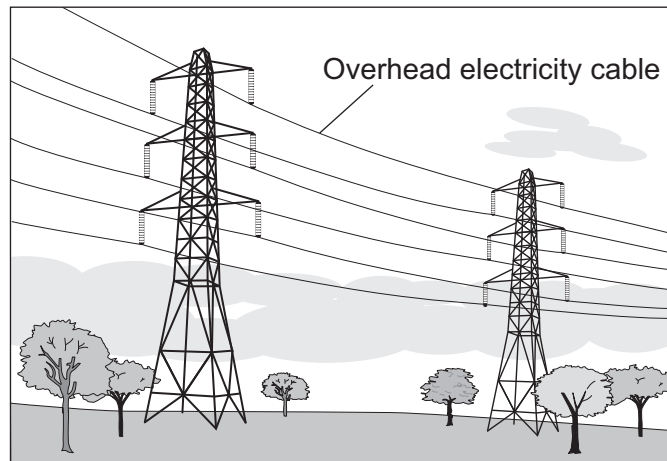
Copper is a better electrical conductor than aluminium.

Copper is **not** used to make overhead electricity cables.

Use the information in the table to explain why copper is **not** used to make overhead electricity cables.

....

....

....

....

(2 marks)

2 (b) (ii) The diagram shows a lightning conductor on a building. The lightning conductor is made of copper.

Copper lightning conductor

Copper plate buried underground
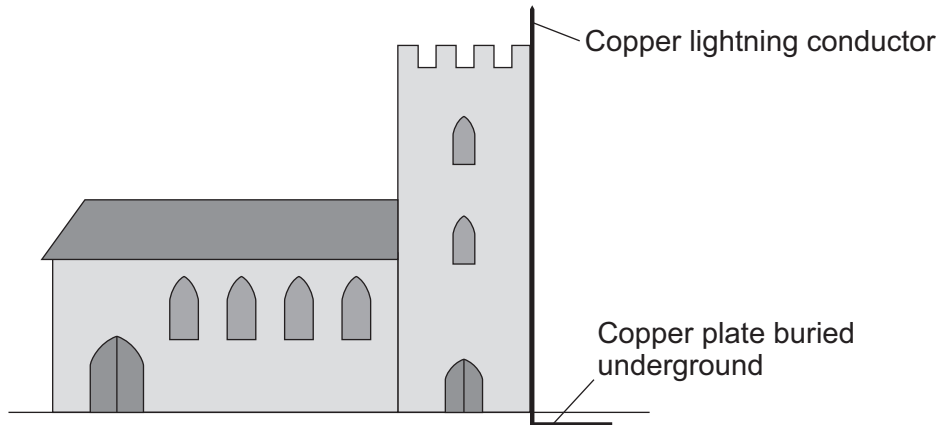
When lightning strikes a building it generates a lot of heat and electricity.

Use the information in the table on **page 4** to suggest **two** reasons why a lightning conductor is **not** made from zinc.

1 ....

....

2 ....

....

(2 marks)

7

Turn over for the next question

Turn over ▶

3 A woman had food poisoning after eating salad in a restaurant.

3 (a) (i) Name **one** type of bacteria that could have caused the food poisoning.

....

(1 mark)

3 (a) (ii) Give **two** symptoms of food poisoning.

1 ....

2 ....

(2 marks)

3 (b) Making sure food preparation areas have no bacteria can prevent food poisoning. The diagram shows part of the kitchen in the restaurant.
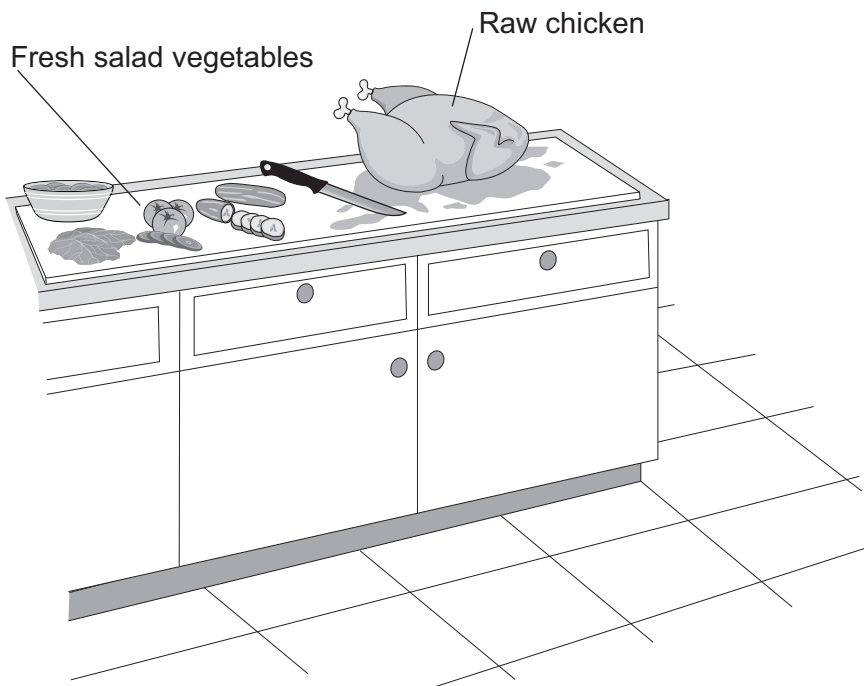
Use information in the diagram to suggest how the woman could have got food poisoning from eating salad.

....

....

....

....

....

(3 marks)

3 (c) A public health inspector took a swab from the knife used to prepare the food back to the laboratory for testing.

Complete the flow chart to show the stages used to identify bacteria, using an agar plate.

Prepare agar plate

↓

....
....

↓

....
....

↓

....
....

↓

Identify bacteria
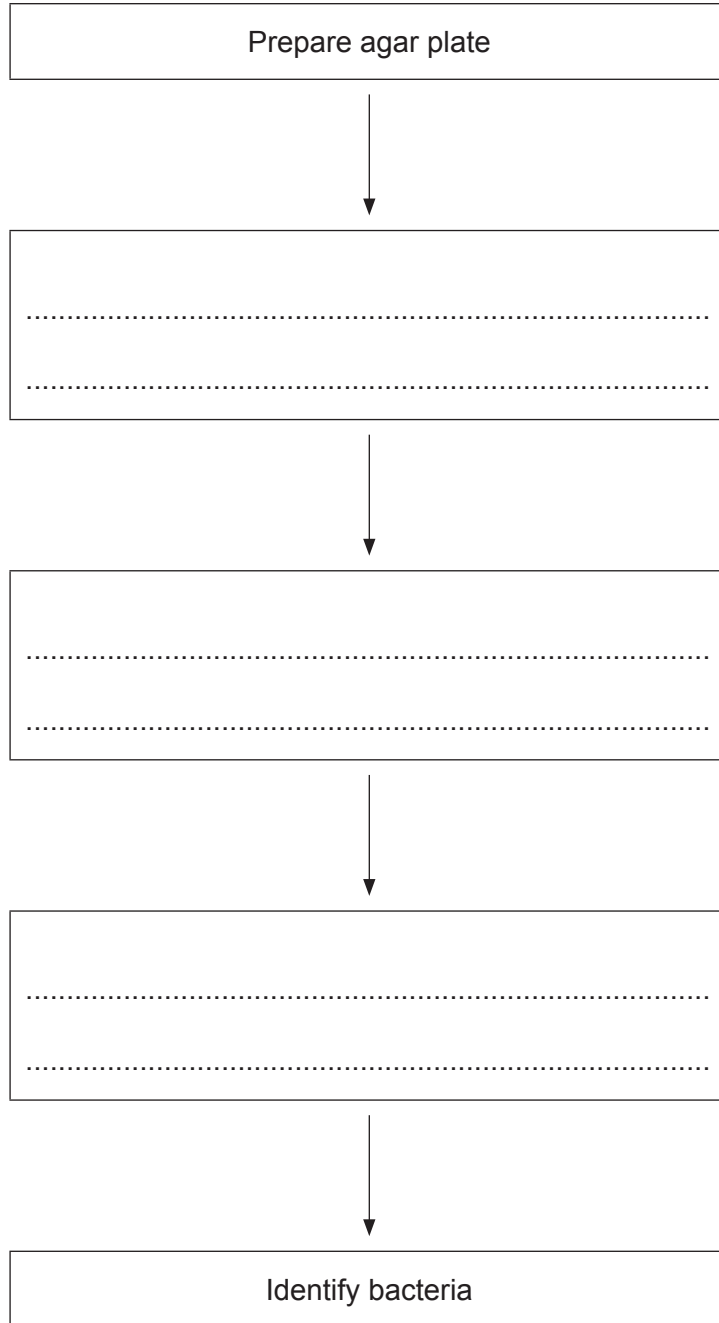
(3 marks)

9

Turn over ▶

4 A fitness trainer advises an athlete how to build up the muscles in his arms.

4 (a) The fitness trainer advised the athlete to change his diet and exercise routine.

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

The fitness trainer advised the athlete to eat more

| carbohydrate. |
| fat. |
| protein. |

The fitness trainer also advised the athlete to do more

| running. |
| cycling. |
| weight training. |

(2 marks)

4 (b) The table shows the energy provided by three different menus, **A**, **B** and **C**.

Meal	Menu A	Menu B	Menu C
Breakfast (kJ)	3570	2190	1248
Lunch (kJ)	4070	2496	1506
Dinner (kJ)	4160	3014	2744
Total energy (kJ)	11800	■	5498

4 (b) (i) Calculate the total energy given by Menu **B**.

....

Energy .... kJ
(1 mark)

4 (b) (ii) The athlete uses 25 kJ of energy each minute when he is training.

How much energy would he use when training for 30 minutes?

....

Energy .... kJ
(1 mark)

4 (b) (iii) An average person needs 8700 kJ of energy each day.

The athlete trains for 2 hours each day.

Which menu would you recommend for the athlete?

Use your answer from **(b)(ii)** to support your explanation.

Menu ....

Explanation ....

....

....

....

....

....

(4 marks)

Question 4 continues on the next page

Turn over ▶

4 (c) An athlete trains to increase his arm strength. He measures his arm strength every 2 months for 8 months.

The results are shown in the table.

Month	Arm strength in newtons
0	34
2	41
4	48
6	56
8	62

4 (c) (i) Plot the data from the table on the grid below. The first point has been done for you.

Draw a line of best fit.
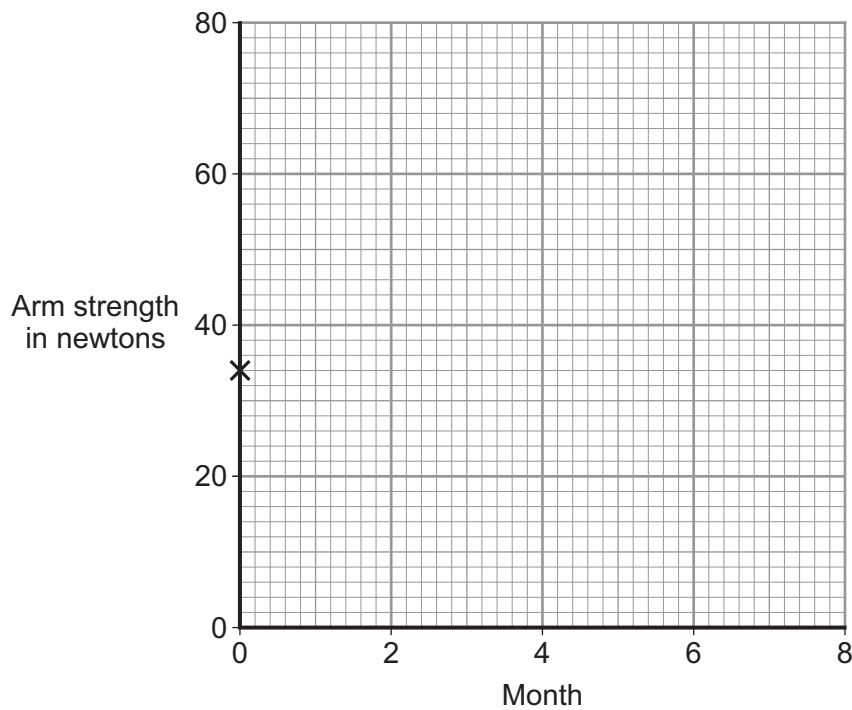
(3 marks)

4 (c) (ii) Use your graph to suggest what the athlete's arm strength will be after 7 months.

....

(1 mark)

4 (c) (iii) Describe the relationship between the length of training and the athlete's arm strength.

....

....

(1 mark)

13

Turn over for the next question

Turn over ▶

5 The police found a block of transparent material at the scene of an accident.

5 (a) (i) **Diagram 1** shows a ray of light entering the block.

Diagram 1

A ....

B ....

Block of material

C ....
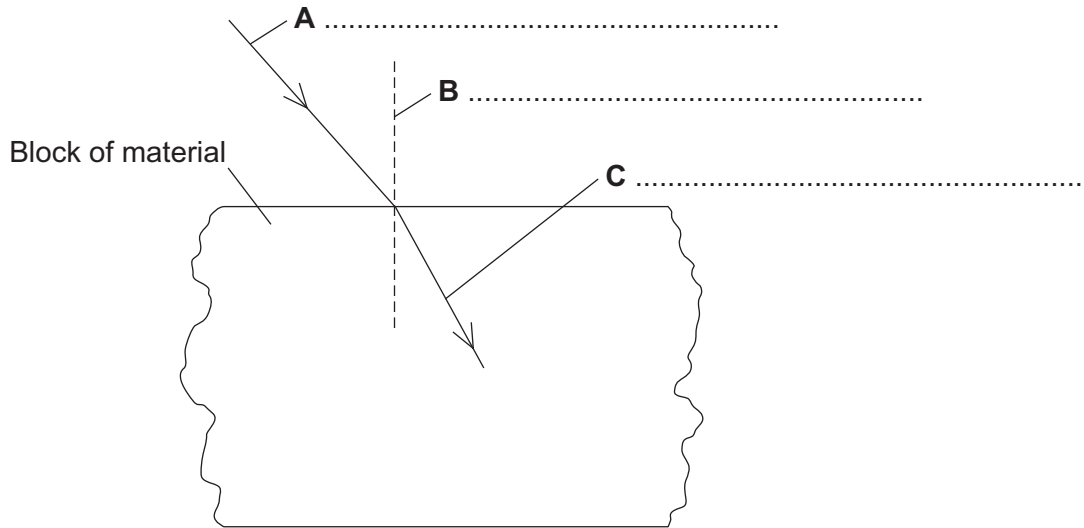
Use the correct words from the box to complete the labels for **A**, **B** and **C**.

incident ray	**reflected ray**	**refracted ray**	**normal**

(3 marks)

5 (a) (ii) On **Diagram 2** label the angle of incidence (*i*) and the angle of refraction (*r*).

Diagram 2

Air

Block of material
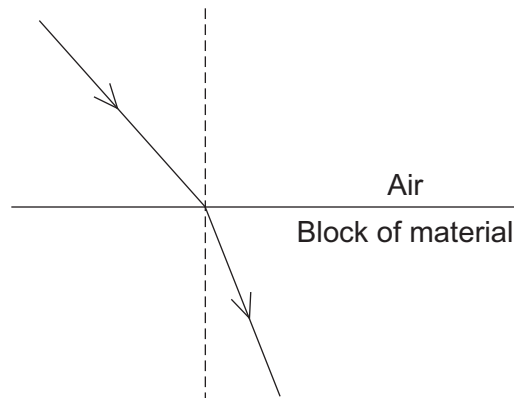
(2 marks)

5 (b) An accident investigator calculated the refractive index of the material.

The value he obtained for the refractive index was 1·488.

Suggest which of the materials in the table is the material the block was probably made from. Give a reason for your answer.

Material	Refractive index
Crown glass	1.518
Flint glass	1.578
Perspex	1.491
Polycarbonate	1.592

Material ....

Reason ....

....

....

(2 marks)

5 (c) How would the investigator make sure that his results were repeatable?

....

....

....

....

(2 marks)

9

Turn over for the next question

Turn over ▶

6   A farmer uses intensive farming methods. He adds fertiliser to the soil to increase the yield of his crops.

6 (a)   Name **one** other type of chemical the farmer could add to his crops. Explain why adding this chemical increases the yield.

....

....

....

(2 marks)

6 (b)   Fertilisers can be made when an acid is added to an alkali.

What is the name for the reaction between an acid and an alkali?

....

(1 mark)

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

A farmer wants to use a new source of water to water his crops. The farmer sends a sample of the water to an analyst to find out the acid content of the water.

The analyst does an acid–alkali titration to analyse the water. First she puts 25.0 cm^3 of alkali solution into a conical flask and does an approximate titration.

Conical flask

25 cm^3 alkali solution
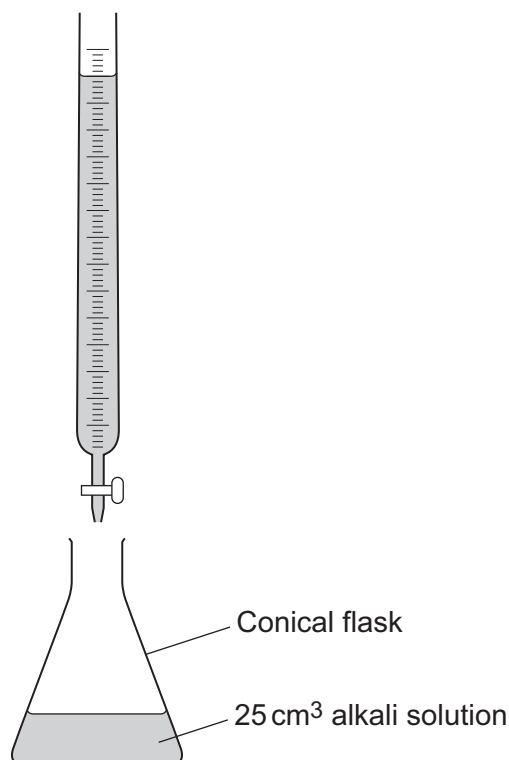
The analyst then does an accurate titration.

What are the main stages in doing an accurate titration?

Include any readings the analyst should take.

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....

....
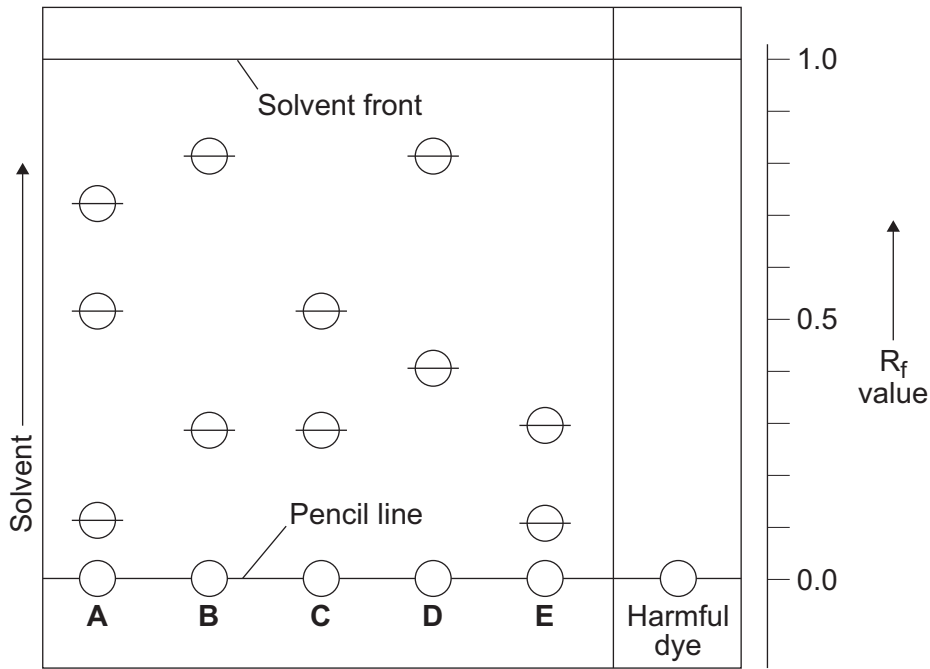
(6 marks)

9

7 A Trading Standards scientist tests some children's toys to make sure that the toys are not coloured with harmful dyes.

He tests the colours from five different toys, **A**, **B**, **C**, **D** and **E**, using paper chromatography.

The scientist also tests a harmful dye.

The diagram shows the chromatogram the scientist obtained.

7 (a) The solvent front moves 9 cm.

The single spot from the harmful dye moves 3.6 cm.

7 (a) (i) Calculate the R$_f$ value of the harmful dye.

Use the Equations Sheet to help you work out your answer.

....

....

....

R$_f$ value ....
(2 marks)

7 (a) (ii) Draw the spot from the harmful dye in the correct position on the chromatogram.
(1 mark)

7 (b) Use the chromatogram to decide which one of the toys, **A**, **B**, **C**, **D** or **E**, should **not** be sold to the public. Explain your answer.

....

....

....

....

....

....

(2 marks)

7 (c) The scientist tests the samples again using a different solvent.

Which **two** statements best explain why he used a different solvent?

Tick (✓) **two** boxes.

All dyes dissolve in lots of different solvents. ☐

Different solvents separate different dyes. ☐

More data can be collected about which dyes are on the toys. ☐

There is only one colour in the harmful dye. ☐

The scientist wanted to make the test a fair test. ☐

(2 marks)

Question 7 continues on the next page

Turn over ▶

7 (d) Chromatography separates samples using a mobile phase and a stationary phase.

Use the correct answers from the box to complete the sentences.

| beaker | dye | paper | pencil line | solvent |

The mobile phase is the ....

The stationary phase is the ....

(2 marks)

9

END OF QUESTIONS

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED