

**Monday 30 January 2012 – Afternoon**

**GCSE TWENTY FIRST CENTURY SCIENCE  
ADDITIONAL APPLIED SCIENCE A**

**A325/01** Scientific Detection (Foundation Tier)

Candidates answer on the Question Paper.  
A calculator may be used for this paper.

**Duration:** 45 minutes

**OCR supplied materials:**  
None

**Other materials required:**

- Pencil
- Ruler (cm/mm)



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

**INFORMATION FOR CANDIDATES**

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **36**.
- This document consists of **16** pages. Any blank pages are indicated.

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Answer **all** the questions.

1 A volcano erupts in Iceland.

Volcanic ash in the atmosphere can cause jet engines in aircraft to fail.



It is important for our safety that jet aircraft are not allowed to fly through dense clouds of volcanic ash.

(a) The organisation that controls flights over the United Kingdom is called NATS (National Air Traffic Services).

(i) Name **one** other organisation employing scientists that works in consumer protection.

..... [1]

(ii) Give one example of a task carried out by scientists working for **this** organisation.

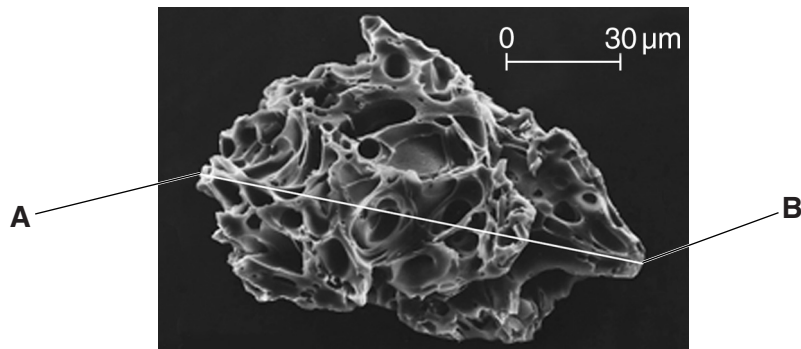
.....  
..... [1]

(b) A scientist looks at ash from the volcano using a scanning electron microscope.

Suggest why the scientist uses a scanning electron microscope rather than a light microscope.

.....  
..... [1]

(c) This is the microscope image of an ash particle.



(i) Use the scale on the image to calculate the actual length of the ash particle between **A** and **B**.

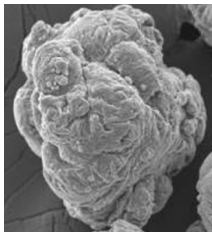
Show your working.

answer .....  $\mu\text{m}$  [2]

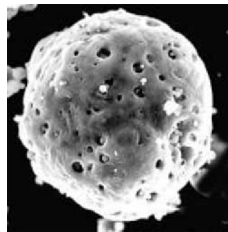
(ii) The scientist compares the ash particle with other types of ash particles.

Which of the following ash particles, **A**, **B**, **C**, **D**, or **E**, most closely matches the ash particle from the volcano?

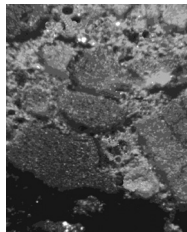
Give **two** reasons to explain your choice.



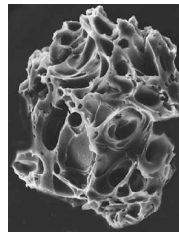
ash A



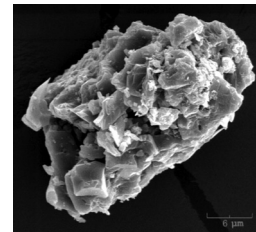
ash B



ash C



ash D



ash E

closest match .....

reason 1 .....

.....





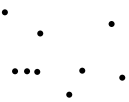
reason 2 .....

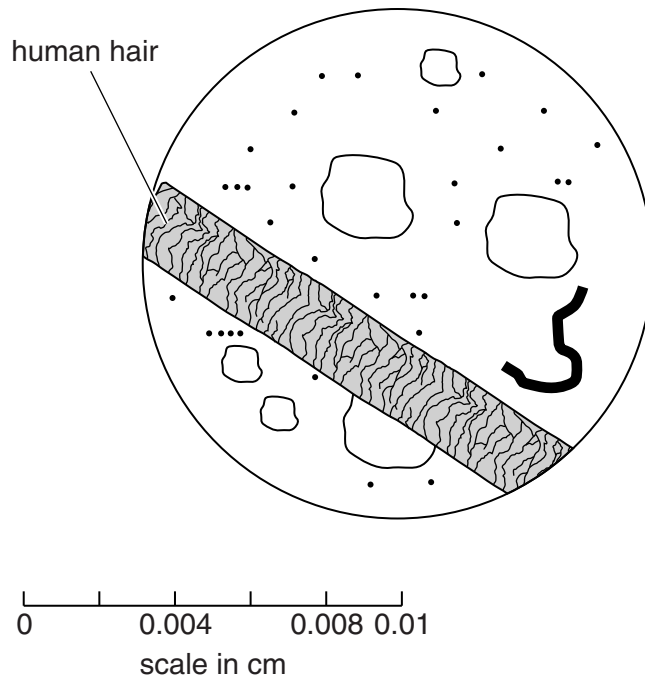
..... [3]

[Total: 8]



(b) The scientist views the dust through a light microscope.

reference samples	
	skin scale
	human hair
	fibres from clothing
	dust mite
	dust mite droppings



(i) Use the scale to estimate the thickness of the human hair in the image.

thickness of human hair ..... cm [1]

(ii) Write down **two** other different things shown in the image.

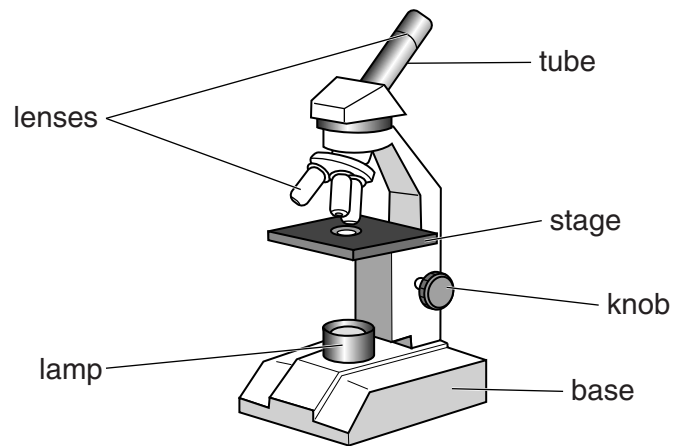
1 .....

2 ..... [2]

(iii) How many **types** of things can be seen in the image?

..... [1]

(c) Look at the picture of the light microscope.



Complete the table about what different parts of a microscope do.

Choose words from the diagram.

what it does	part of microscope
supports the slide	
illuminates the slide	
magnifies the object	
changes distance between the lens and the stage	

[2]

[Total: 9]

3 Rashid works in a hospital laboratory.

He uses this standard procedure to test for glucose in a sample of urine.

step 1	check that the sample bottle is sealed and labelled when it arrives in the laboratory
step 2	put on a clean pair of surgical gloves
step 3	get a new clinistick and check the colour of the stick against a colour chart
step 4	dip the stick into the urine solution
step 5	compare the stick with the colour chart once more
step 6	identify the matching colour and read off the result

(a) Choose from the following statements to help you answer the rest of the question.

- to make sure the clinistick is still in good condition
- to check for colour change indicating the presence of glucose in the urine
- to ensure the test is always carried out in the same way
- to check that the urine has been stored correctly
- to check that the sample could not have been contaminated
- so the patient can be identified

(i) Why did Rashid use a standard procedure?

..... [1]

(ii) Why did Rashid check that the sample bottle was sealed in step 1?

..... [1]

(iii) Why did Rashid check the colour of the clinistick before the test?

..... [1]

(iv) Why did Rashid check the colour of the clinistick after the test?

..... [1]



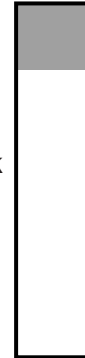
(b) Look at the result of Rashid's test.

amount of glucose  
in the urine  
g/litre

colour

0	
0.3	
1	
3	
20	

clinistick



(i) How much glucose is in the urine sample?

..... g/litre [1]

(ii) The clinistick test is an example of a semi-quantitative test.

Write down the name of one other semi-quantitative test.

..... [1]

(c) Give one other example of the use of a colour test kit for medical diagnosis which does **not** use clinisticks.

.....

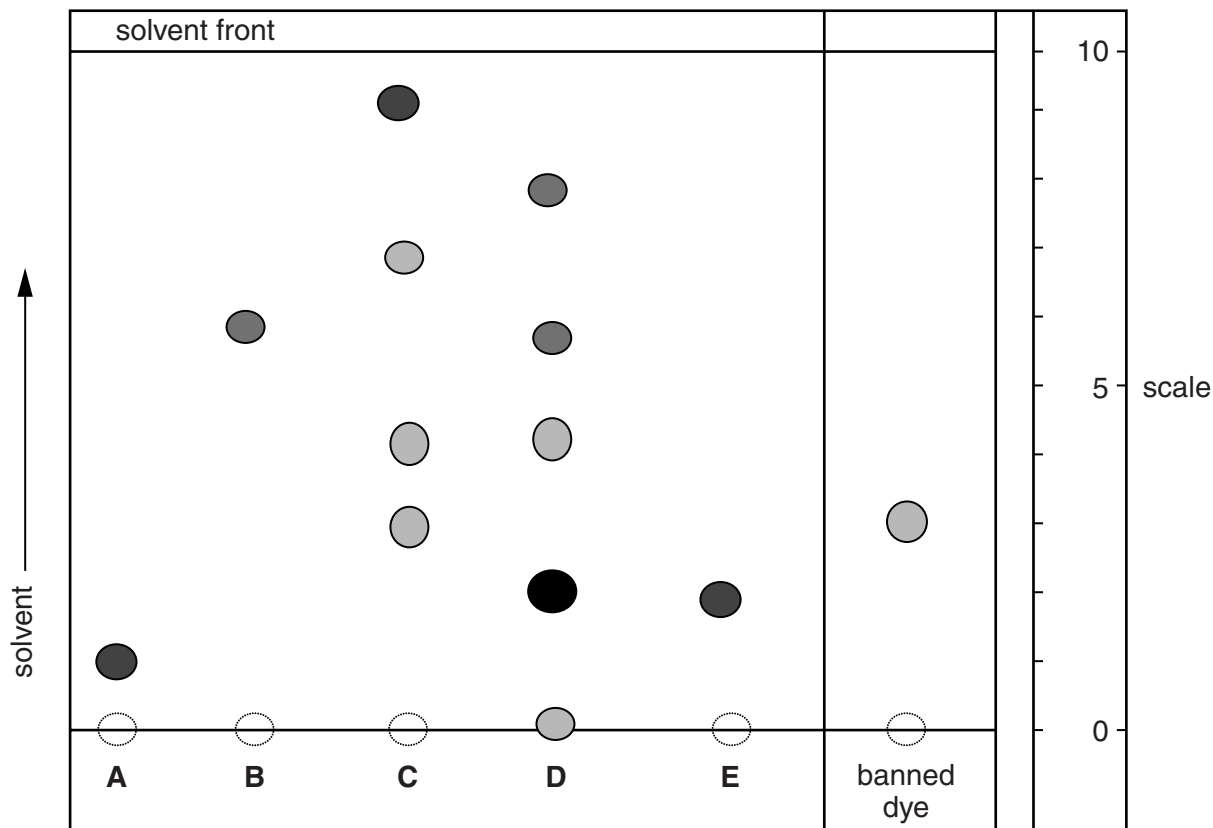
..... [1]

[Total: 7]

4 Scientists are concerned that some fizzy drinks may contain a banned food-dye.

They test five drinks, **A**, **B**, **C**, **D** and **E**, using paper chromatography.

This is the result of their tests.



(a) Which drink, **A**, **B**, **C**, **D** or **E**, may contain the banned food-dye?

answer ..... [1]

(b) From which drink has the largest number of food-dyes been separated?

Choose from **A**, **B**, **C**, **D** or **E**.

answer ..... [1]

(c) Drinks **A** and **E** are both the same colour.

Explain how you know that they each contain different dyes.

.....  
 ..... [1]

(d) The banned food-dye is used as a standard reference material in the chromatogram.

Explain what is meant by a standard reference material.

.....  
.....  
.....  
.....  
..... [2]

(e) Complete the sentences about chromatography.

Choose the best words from this list.

- mobile
- quantitative
- solution
- solvent
- stationary
- qualitative
- thin
- value

Water is used as the ..... to dissolve the banned food-dye.

Water moves up the paper and is called the ..... phase.

The paper is the medium and is called the ..... phase.

Other methods of chromatography include gas chromatography.

The advantage of gas chromatography is that it can produce

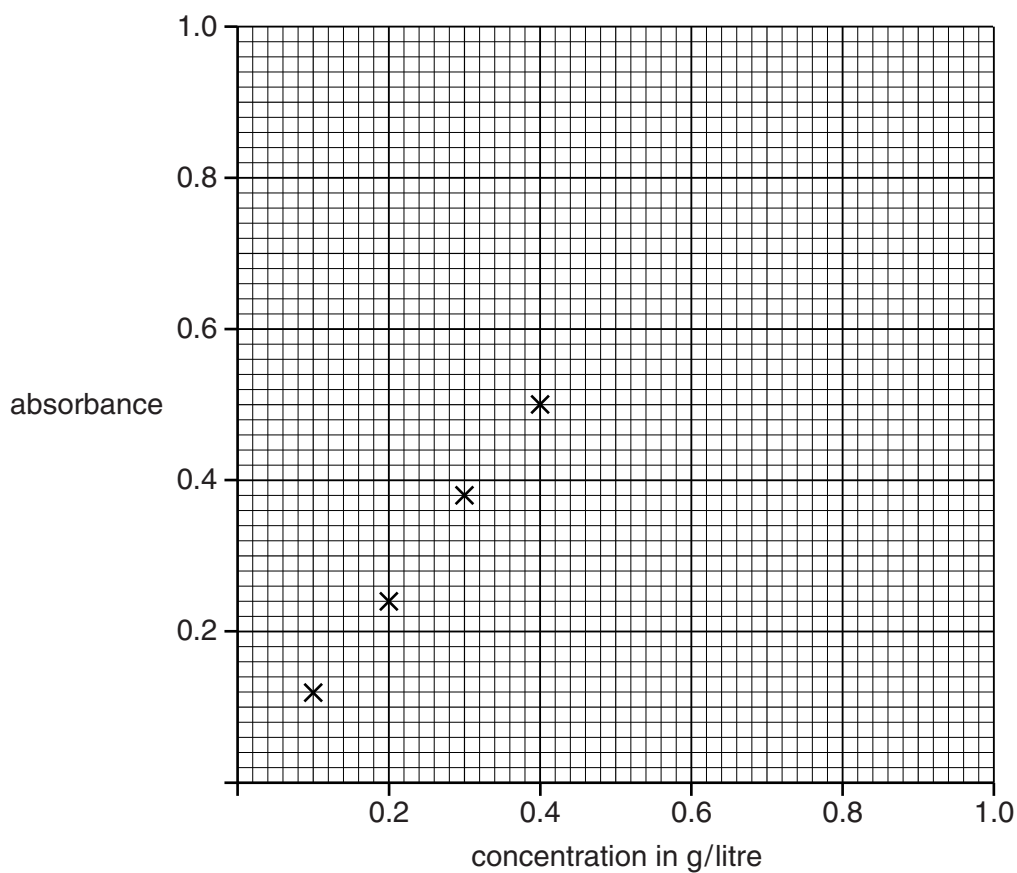
..... data. [2]

[Total: 7]

- 5 Colorimeters are used in analysis.  
This data was collected for solutions of a dye.

concentration of dye in g/litre	absorbance
0.0	0.00
0.1	0.12
0.2	0.24
0.3	0.38
0.4	0.50
0.5	0.63
0.6	0.85
0.7	0.87
0.8	1.00

- (a) Use the data to plot the calibration graph.  
Some points have been plotted for you.  
Draw a line of best fit.



[2]

- (b) Put a ring around the point on the graph which is an outlier.

[1]

(c) A solution of the dye was tested and had an absorbance of 0.3.

Use the graph to find the concentration of the dye in this solution.

concentration ..... g/litre [1]

(d) Which of the following best describes what a colorimeter measures?

Put a tick (✓) next to the **best** answer.

the shade of a colour

the age of a substance

the name of a substance

the intensity of a colour

[1]

[Total: 5]

**END OF QUESTION PAPER**

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