

**Monday 30 January 2012 – Afternoon**

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

**A325/02** Scientific Detection (Higher 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**

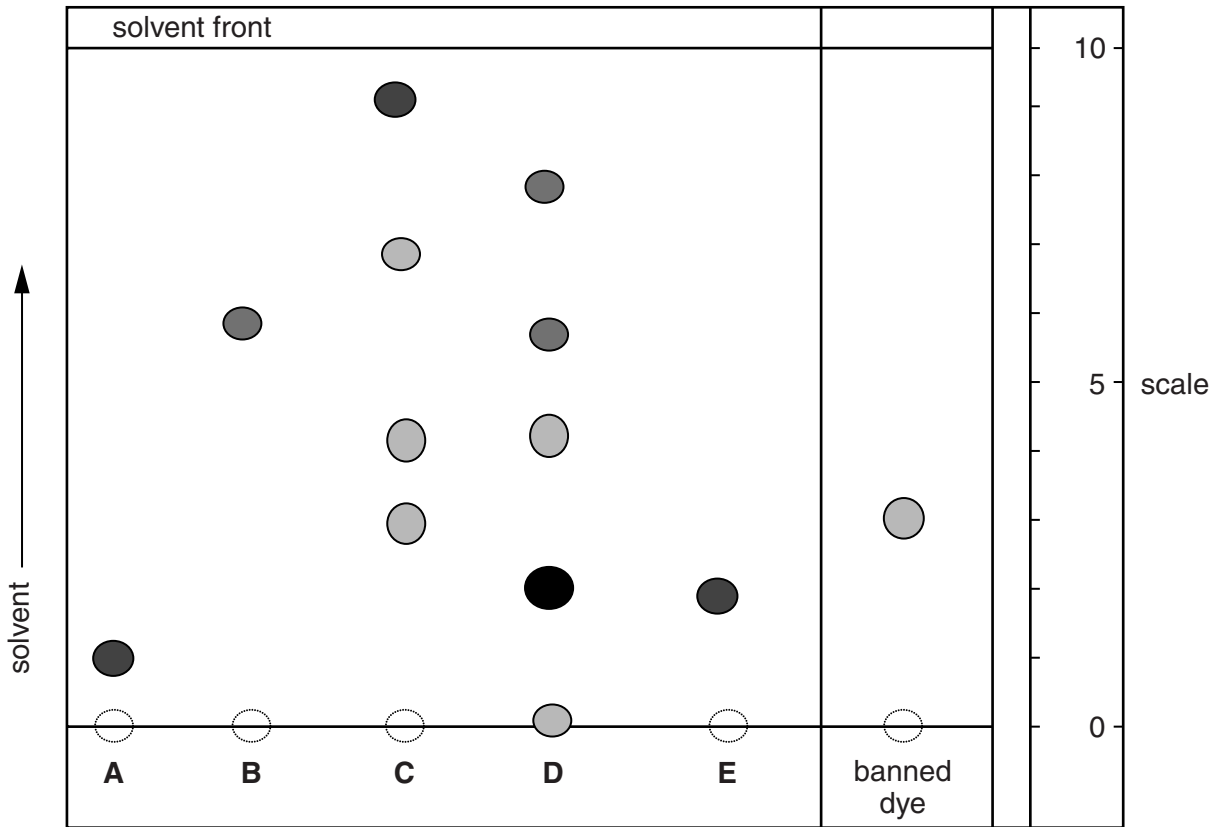
- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **36**.
- This document consists of **12** pages. Any blank pages are indicated.

Answer **all** the questions.

1 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) Calculate the R<sub>f</sub> value for the banned food-dye.

$$R_f \text{ value} = \frac{\text{distance travelled by substance}}{\text{distance travelled by solvent}}$$

R<sub>f</sub> value ..... [1]

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

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

answer ..... [1]

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

Explain how you know that they each contain different dyes.

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

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

Explain what is meant by a standard reference material.

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

(f) 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

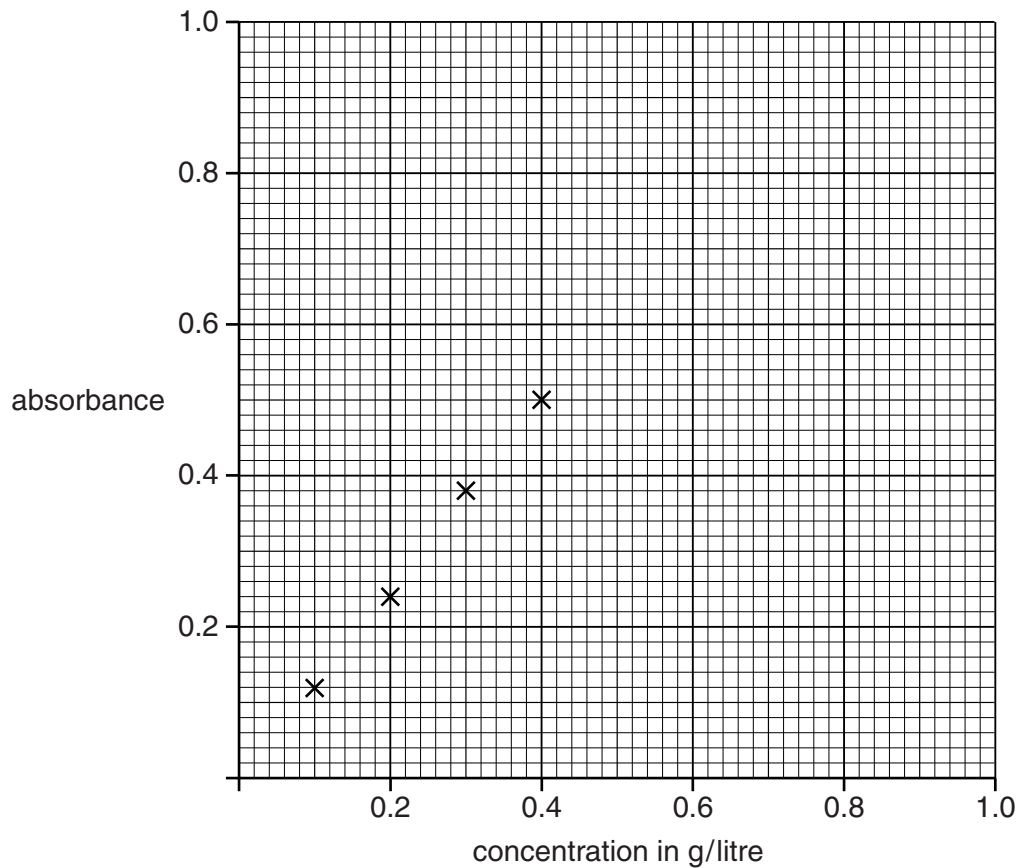
..... data. [2]

[Total: 8]

- 2 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]

5

(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]

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

Answer these questions about the standard procedure.

(a) Why did Rashid use a standard procedure?

..... [1]

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

..... [1]

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

..... [1]

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

..... [1]

[Total: 4]

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4 A volcano erupts in Iceland.

A scientist collects samples of the ash.

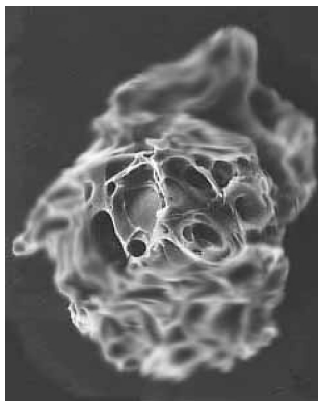


(a) The scientist looks at the ash using a scanning electron microscope.

He obtains four images.



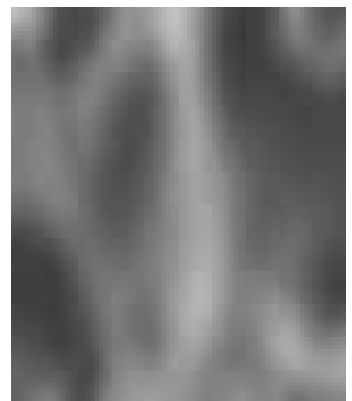
A



B



C



D

(i) Which image, **A**, **B**, **C** or **D**, has the greatest **magnification**?

Explain your answer.

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

(ii) Which image, **A**, **B**, **C** or **D**, has the greatest **resolution**?

Explain your answer.

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



(iii) Which image, **A**, **B**, **C** or **D**, has the greatest **depth of field**?

Explain your answer.

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

(b) A student uses a light microscope to look at volcanic ash.

Other than magnification, suggest why using a light microscope is **not** as good as using a scanning electron microscope.

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

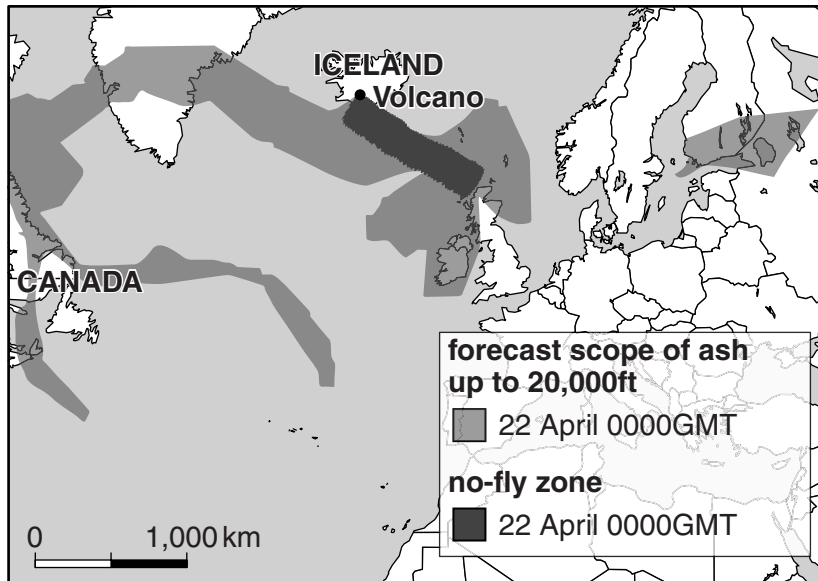
(c) There are also limitations to using a scanning electron microscope.

Describe **three** limitations to using an electron microscope.

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

(d) Jet aircraft are not allowed to fly through dense clouds of ash.

The map shows the extent of the volcanic ash cloud, including the denser no-fly zone area.



(i) Use the scale to calculate the approximate area of the no-fly zone.  
Show your working.

area of no-fly zone ..... [3]

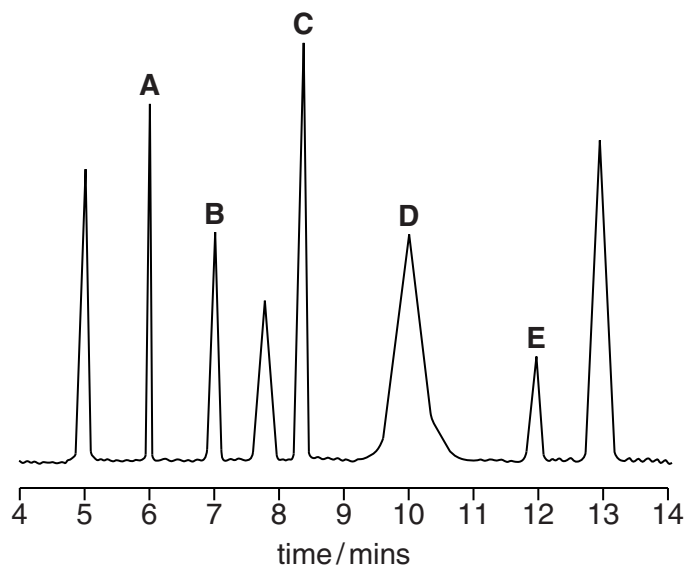
(ii) Suggest why the area you have calculated may not be a true value of the area of the no-fly zone.

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

[Total: 11]

5 Lynne monitors air pollution for carbon monoxide.

She uses gas chromatography to test a sample of air.



(a) The chart shows part of the gas chromatogram of the air sample.

(i) The chart is only part of the full gas chromatogram.

Explain how you can tell.

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

(ii) Carbon monoxide has a relative retention time of 8 minutes and 20 seconds.

Which component of the air sample, **A**, **B**, **C**, **D** or **E**, is carbon monoxide?

..... [1]

(iii) Which component, **A**, **B**, **C**, **D** or **E**, is present in the greatest quantity?

Explain your answer.

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

(b) Lynne also uses electrophoresis to separate different particles.

(i) Electrophoresis can be used for DNA profiling.

Write down and describe **two** different uses of DNA profiling.

example 1 .....

example 2 ..... [2]

(ii) Describe **two** factors that affect how particles separate during electrophoresis.

..... [2]

[Total: 8]

**END OF QUESTION PAPER**



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