

**GENERAL CERTIFICATE OF SECONDARY EDUCATION  
TWENTY FIRST CENTURY SCIENCE  
ADDITIONAL APPLIED SCIENCE A**

**A325/01**

Scientific Detection  
(Foundation Tier)

**Friday 19 June 2009  
Morning**

**Duration: 45 minutes**

Candidates answer on the question paper  
A calculator may be used for this paper

**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 clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

**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.

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Answer **all** the questions.

1 Scientific detection is carried out in many different ways.

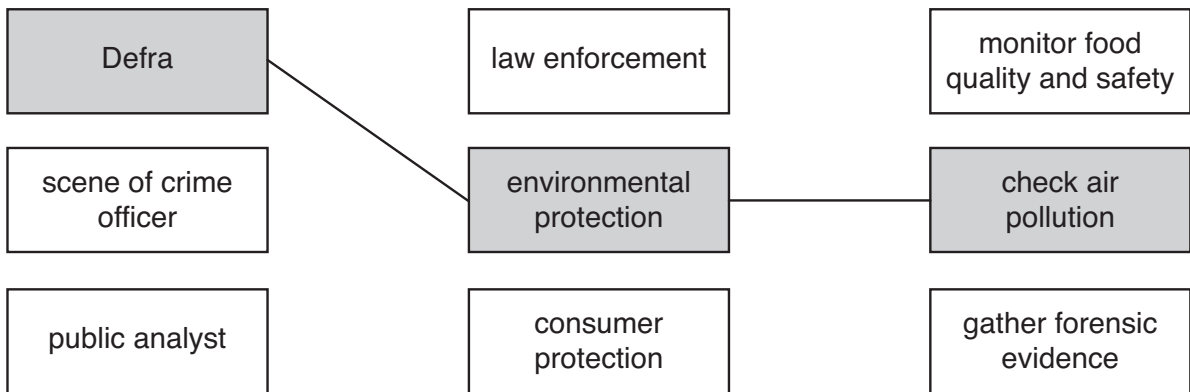
(a) Draw a straight line to link **people and organisations** with their correct **role**. Draw a second straight line from the **role** to the **job** they carry out.

One has been done for you.

**people and organisations**

**role**

**job**



[2]

(b) Good laboratory practice is very important.

Which of the following help with good laboratory practice?

Put ticks (✓) in the boxes next to the **three** best answers.

car parking facilities for workers	
good health and safety procedures	
looking after and checking equipment	
making sure staff are well trained	
lots of staff to carry out all the procedures	

[3]

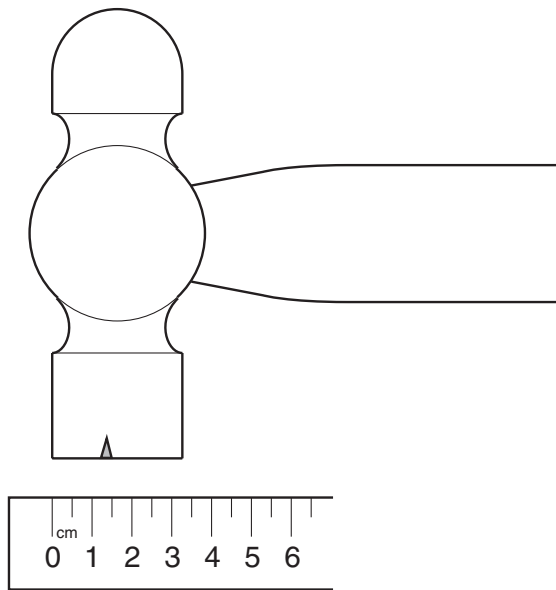
[Total: 5]

2 A scene of crime officer attends a murder.

(a) State three different ways in which she can record **images**.

- 1.....
- 2.....
- 3..... [3]

(b) The murder weapon is a hammer.  
The officer measures the size of the hammer head.



(i) Estimate the distance across the head of the hammer.

You **must** use the ruler in the picture.

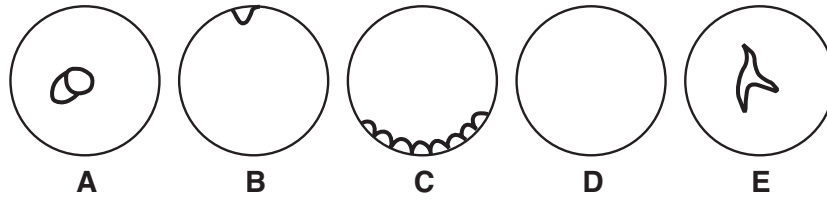
..... mm [2]

(ii) Identify one important feature that could be used to identify this particular hammer as the murder weapon.

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

(iii) The scientist used the hammer to make a plasticine mould.

Which of the following moulds, **A, B, C, D** or **E**, was made by the hammer?



answer ..... [1]

[Total: 7]

3 Steve makes a stained temporary slide of blood for microscopic examination.

(a) Explain how he carries out this procedure in four steps.

Use all the words provided in your explanation.

**coverslip      microscope      slide      specimen      stain**

step 1 .....

step 2 .....

step 3 .....

step 4 ..... [4]

(b) Steve uses a  $\times 20$  objective lens and a  $\times 10$  eyepiece lens.

Calculate the magnifying power of the microscope.

Show your working.

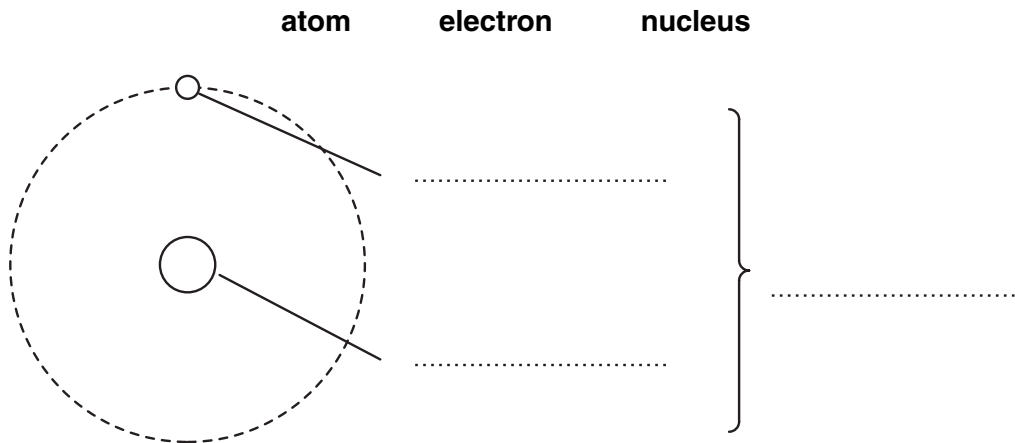
$\times$  ..... [1]

[Total: 5]

Turn over

4 Electron microscopes use a beam of electrons to produce images of a specimen.

(a) Complete the diagram of an atom using these words.



[2]

(b) Electron microscopes show more detail than light microscopes.

Which of the statements explains why?

Put a tick (✓) in the box next to the **correct** answer.

An electron microscope ...

... is more expensive to buy.	<input type="checkbox"/>
... has a more powerful eyepiece lens.	<input type="checkbox"/>
... uses light instead of electrons.	<input type="checkbox"/>
... has greater magnification.	<input type="checkbox"/>
... is more difficult to use.	<input type="checkbox"/>

[1]

(c) There are some cases where electron microscopes cannot be used.

Which of the statements best describe these **limitations**?

Put ticks (✓) in the boxes next to the **two** correct answers.

Electron microscopes are limited because ...

... images are produced on a TV screen.	<input type="checkbox"/>
... living material cannot be viewed.	<input type="checkbox"/>
... very thin samples can be viewed.	<input type="checkbox"/>
... materials must be dried and fixed.	<input type="checkbox"/>
... very high magnification can be used.	<input type="checkbox"/>

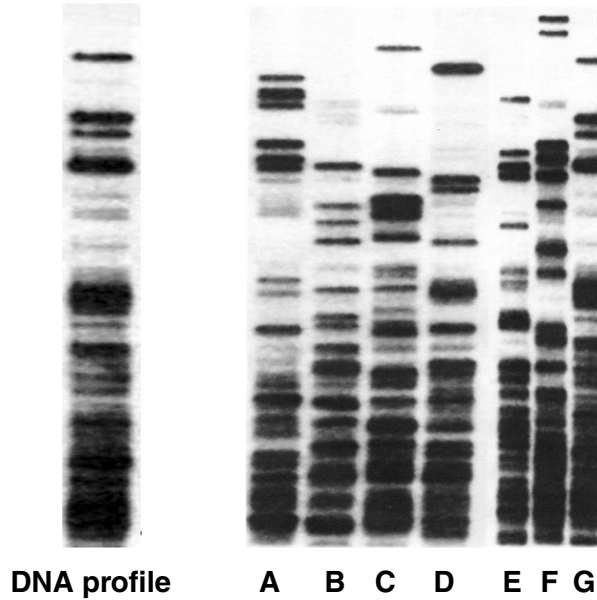
[2]

[Total: 5]

5 DNA profiling is used by forensic scientists.

A blood stain from a crime scene was used to produce a DNA profile.

This DNA profile was compared with DNA profiles from seven suspects (A to G).



(a) Which of the suspects, A, B, C, D, E, F or G, does the profile match?

.....

[1]

(b) Which of the statements about DNA profiling are correct?

Put ticks (✓) in the boxes next to the **two** correct answers.

uses electrophoresis	<input type="checkbox"/>
produces an image of the suspect's face in profile	<input type="checkbox"/>
can be used on small biological samples	<input type="checkbox"/>
joins together strands of DNA	<input type="checkbox"/>
separates the DNA into different colours	<input type="checkbox"/>

[2]

(c) Give **two** different uses of DNA profiling.

1.....  
.....

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

[Total: 5]  
Turn over

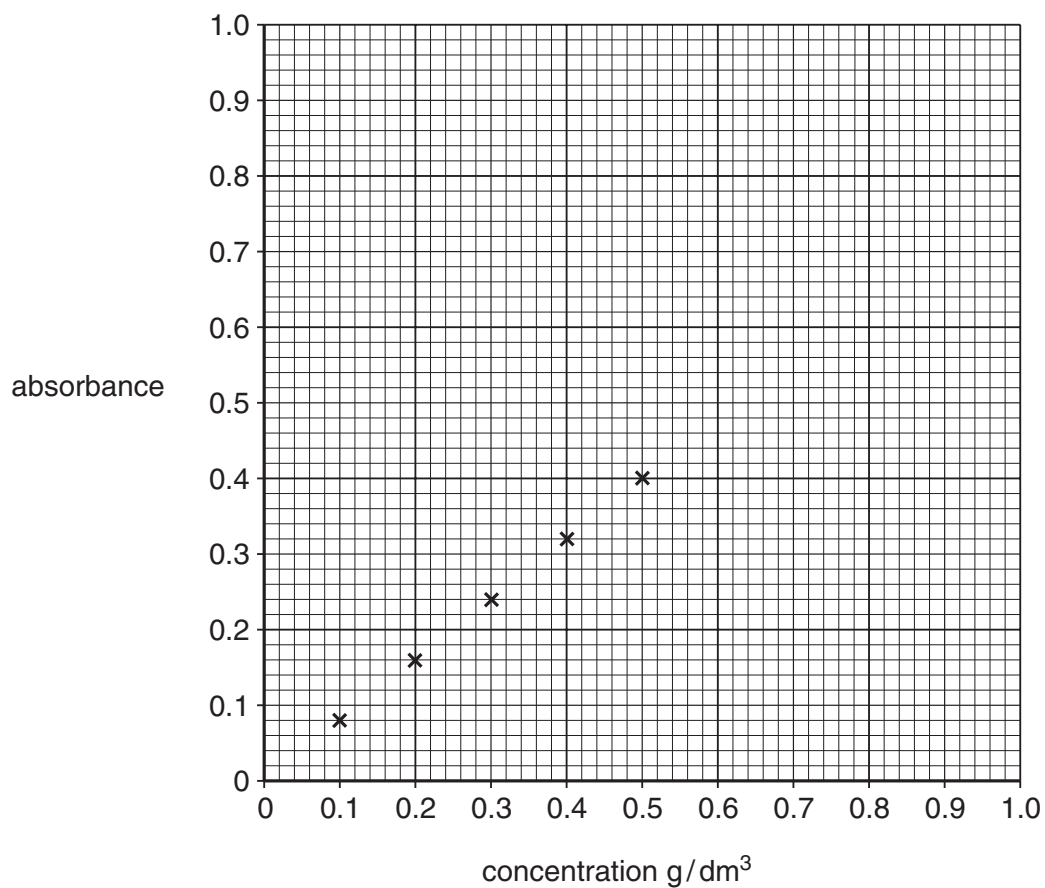
**6** Colorimeters are used in analysis.

This data was collected for solutions of a coloured substance.

concentration g/dm <sup>3</sup>	absorbance
0.1	0.08
0.2	0.16
0.3	0.24
0.4	0.32
0.5	0.40
0.6	0.48
0.7	0.62
0.8	0.64
0.9	0.72
1.0	0.80

**(a)** Use the data to plot the calibration graph. Some points have been done for you.

Draw the line of best fit.





- (b) Put a **ring** around the result which appears the least reliable (outlier). [1]
- (c) An unknown concentration of the substance has an absorbance of 0.28.

What is the concentration of the dye in this solution?

..... [2]

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

Put a tick (✓) in the box next to the **correct** answer.

the shade of a colour	<input type="checkbox"/>
the age of a substance	<input type="checkbox"/>
the name of a substance	<input type="checkbox"/>
the intensity of a colour	<input type="checkbox"/>

[1]

- (e) Each different method of analysis has advantages and disadvantages.

Draw a straight line to link the **method of analysis**, with its related **advantage**, and its related **disadvantage**.

advantage	method of analysis	disadvantage
separates colours	light microscope	meter must be zeroed
enlarges image	paper chromatography	limited magnification
produces quantitative results	colorimetry	slow to produce results

[3]

[Total: 9]

**END OF QUESTION PAPER**

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11  
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