

**GCSE**

**ADDITIONAL APPLIED SCIENCE A**

AP3 Scientific Detection

**Specimen Paper**

Candidates answer on the question paper:

Additional materials: ruler (cm/mm), calculator

**F** **A325/01**

45 mins

Candidate  
Name

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Centre  
Number

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Candidate  
Number

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**TIME** 45 mins

**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers on the dotted lines unless the question says otherwise.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- There is a space after most questions. Use it to do your working. In many questions marks will be given for a correct method even if the answer is incorrect.
- Do not write in the bar code. Do not write in the grey area between the pages.
- **DO NOT WRITE IN THE AREA OUTSIDE THE BOX BORDERING EACH PAGE. ANY WRITING IN THIS AREA WILL NOT BE MARKED.**

**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**.

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**This specimen paper consists of 19 printed pages.**

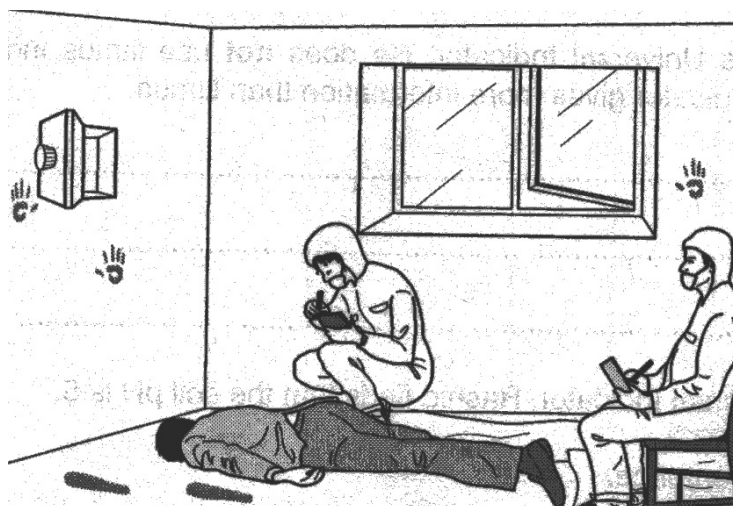
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### Answer all questions

- 1 Different methods can be used to analyse scientific evidence.

Draw a straight line from each **piece of evidence** to the **correct method used**.

The first one has been done for you.



#### Piece of evidence

#### Correct method used

finding the level of nitrogen in a soil sample

a microscope

finding how many food colourings are in a sweet

a semi-quantitative testing kit

finding out the level of glucose in urine

chromatography

finding the layers of paint on a bicycle

Clinistix

[2]

2. Forensic scientists go to a crime scene.

They record details of the crime scene.

(a) Write down two ways that they could record crime scene details.

1 .....

2 ..... [2]

(b) Look at the picture.

Write down two pieces of evidence that the forensic scientists could analyse to help solve the crime.

.....

..... [2]

(c) Suggest why it is important to record the details of a crime scene.

You should give at least **two** reasons in your answer.

.....

.....

..... [2]

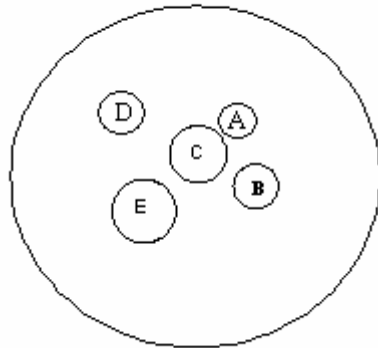
3 Neil is a forensic scientist.  
He tests some soil taken from a suspect's shoe.

(a) Neil uses Universal Indicator to find the pH of the soil.

(i) Explain why Neil uses Universal Indicator rather litmus indicator to test the soil.

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

(ii) Neil finds that the soil is pH 8.



What colour is Universal Indicator at pH 8?

.....[1]

(iii) What does this tell Neil about the soil?

Use words from this list to help you.

**acidic**

**alkaline**

**neutral**

.....[1]

(b) Neil examines the soil sample with a microscope.

The diagram shows the microscope that Neil uses.

(i) Label the diagram.

Use words from the list.

**objective lens**

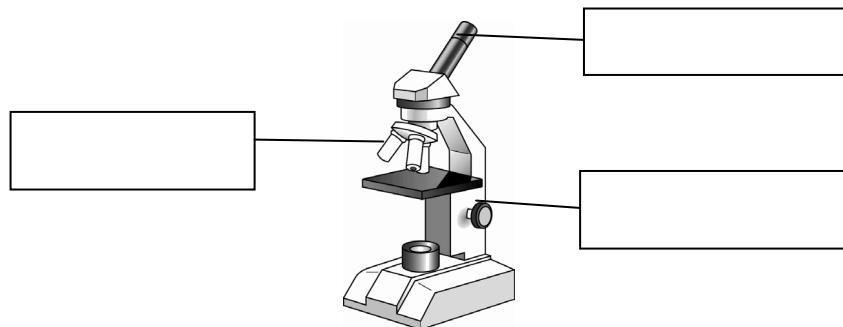
**focusing knob**

**eyepiece lens**

**light source**

[3]

(ii) The picture shows what Neil saw through the microscope.



1 mm ———

Look at the scale.

Determine the diameter of soil particle **E**.

Write your answer in the table.

soil particle	diameter in mm
A	0.8
B	0.7
C	0.9
D	0.6
E	

[1]

(iii) Work out the average diameter of the soil particles.

Show your working.

Average diameter = .....[2]

(iv) Neil looks at a table of information about particle size.

It shows the particle size of different types of soil.

<b>type of soil</b>	<b>particle size in mm</b>
clay	less than 0.002
silt	0.002 to 0.2
sand	0.2 to 2.0
gravel	more than 2.0

What type of soil was Neil looking at?

.....[1]

[Total: 11]



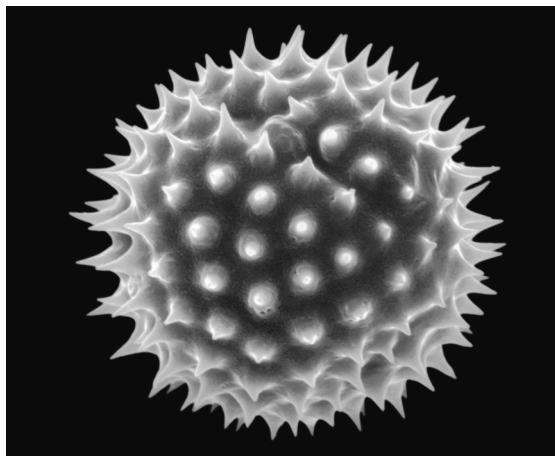
4. Scientists want to know how old the ice is at the South Pole.

They know the age of different pollen grains.

They often use pollen grains found in the ice, to determine the age of the ice.

(a) One of the pollen grains is shown below.

Look at its shape and texture.



DAVID MCCARTHY / SCIENCE PHOTO LIBRARY

Suggest **one** feature that could be used to identify this type of pollen grain.

.....[1]

(b) The scientists look at the pollen grain with an electron microscope.

Explain why the scientist sees more detail than with a light microscope.

.....[1]

(c) The following statements describe how samples are prepared for viewing through an electron microscope.

**Two** of them are wrong.

Put **two** crosses (**X**) next to the wrong statements.

- The sample is cut into a very thin section.
- The sample is stained with iodine solution.
- The sample is placed on a glass slide with a cover slip.
- The sample is coated with a metal.
- The sample is placed in a vacuum.

[2]

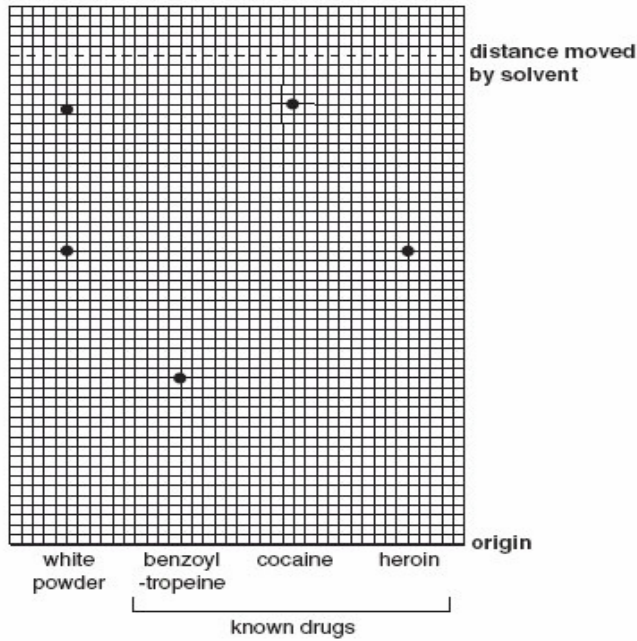
[Total: 4]

5. Police seize a bag of white powder from the home of a drug dealer.

A forensic scientist analyses the white powder using chromatography.

They also use three other known drugs.

The results are shown below.



(a) Suggest and explain why the scientist also tested three known drugs.

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

(b) Name **one** drug found in the white powder.

.....[1]

- (c) Put a **ring** around **one** spot on the chromatogram of the drug found in the white powder.

[1]

(d) Work out the Rf value of this spot.

Use the formula below to help you.

distance travelled by spot from origin

Rf value = -----

distance travelled by solvent from origin

Show your working.

Rf value = .....

[2]

[Total: marks]

6. Jamie needs to know the concentration of protein in a solution.

He mixes the solution with a dye that turns the protein solution blue.

He knows that the darker the blue colour, the more protein is in the solution.

He decides to test the solution in a colorimeter.

(a) Jamie first tests some pure water in the colorimeter.

Explain why.

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

(b) He then tests a range of protein solutions with known concentrations.

His results are shown below.

protein concentration in $\text{mg / cm}^3$	absorbance
0	0.05
0.2	0.17
0.4	0.29
0.6	0.42
0.8	0.54
1.0	0.66

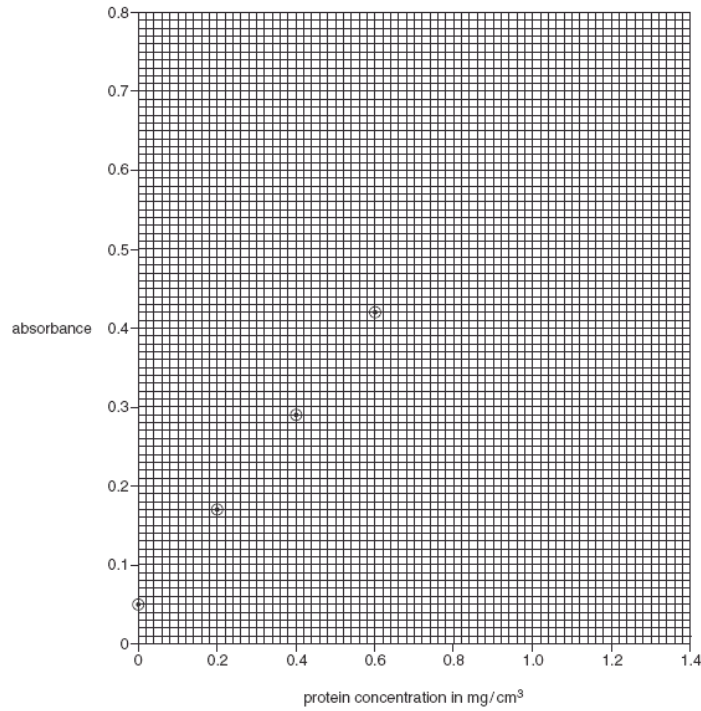
(i) Plot the points on the grid.

The first four have been done for you.

[2]

(ii) Complete the graph by drawing a line of best fit.

[1]



(c) Jamie now tests the solution with the unknown concentration of protein.

It has an absorbance of 0.48

Use the graph to determine its concentration.

Draw **two** lines on the graph to show how you worked out your answer.

concentration of unknown protein solution ..... mg/cm<sup>3</sup>[3]

[Total: 7]

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**GCSE**

**ADDITIONAL APPLIED SCIENCE A**

AP3 Scientific Detection

**Specimen Mark Scheme**

Maximum mark for this paper is [36]

**F** **A325/01**

45 mins

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**This specimen mark scheme consists of 3 printed pages.**

Question Number	Answer	Max Mark
1	Food colourings-chromatography Glucose level-Clinistix Paint layers-chromatography <b>(all correct = 2, 1/2 correct = 1)</b>	[2] [2] <b>Total marks</b>
2[a]	Written Drawings Photographs <b>(Any two. Accept other good answers)</b>	[2]
2[b]	Handprints Footprints	[2]
2[c]	To continue to work in the lab Can be used in court Idea of permanent record <b>(Any two)</b>	[2] <b>Total marks</b> [6]
3(a)i	Litmus does not give pH / strength of acid/alkali Universal indicator has more colours Each colour gives pH / strength <b>(Any two)</b>	[2]
3(a)ii	Green / blue green	[1]
3(a)iii	Alkali	[1]
3(b)i	Eyepiece lens Objective lens Focusing knob	[3]
3(b)ii	1 mm	[1]
3(b)iii	Method ie 4.0 / 5 0.8 mm	[2]
3(b)iv	Sand	[1] <b>Total marks</b> [11]
4(a)i	Round Spikey <b>(Any one)</b>	[1]
4(a)ii	Greater magnification	[1]
4(a)iii	The sampled is stained... The sample is placed on a glass slide...	[2] <b>Total marks</b> [4]

Question Number	Answer	Max Mark
5(a)i	Idea of comparison To identify unknown powder	[2]
5(a)ii	Heroin	[1]
5(a)iii	Ring round one of both correct dots	[1]
5(a)iv	Substitute correct 0.89 or 0.9	[2]
	<b>Total marks</b>	<b>[6]</b>
6(a)	A standard / to zero	[1]
6(b)i	Points correct = 2	[2]
6(b)ii	Line correct	[1]
6(c)	Lines correct = 2 0.7	[3]
	<b>Total marks</b>	<b>[7]</b>