

**GCSE**

**ADDITIONAL APPLIED SCIENCE A**

AP3 Scientific Detection

**Specimen Paper**

Candidates answer on the question paper:

Additional materials: ruler (cm/mm), calculator

**H** **A325/02**

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 14 printed pages.**

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**Answer all questions**

1. 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 than litmus indicator to test the soil.

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

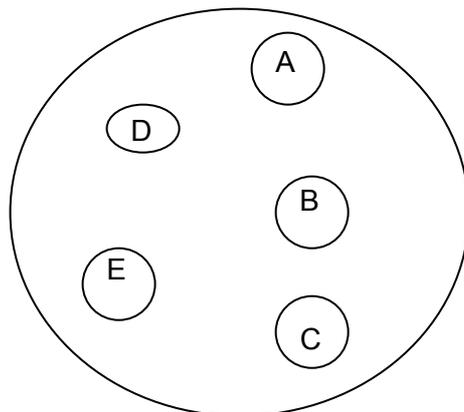
(ii) Neil finds that the Universal Indicator turns dark blue/green.

What does this tell Neil about the pH of the soil?

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

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

(i) 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	

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

Show your working.

Average diameter = .....

[3]

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

It shows the particle size of different types of soil.

type of soil	particle size in mm
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]

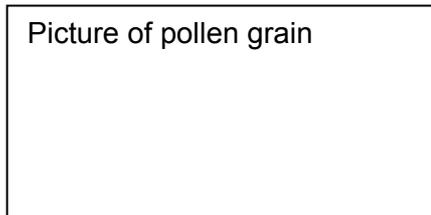
[Total: 8]

2. 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.

One of the pollen grains is shown below.



(a) 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 into a vacuum.

[2]

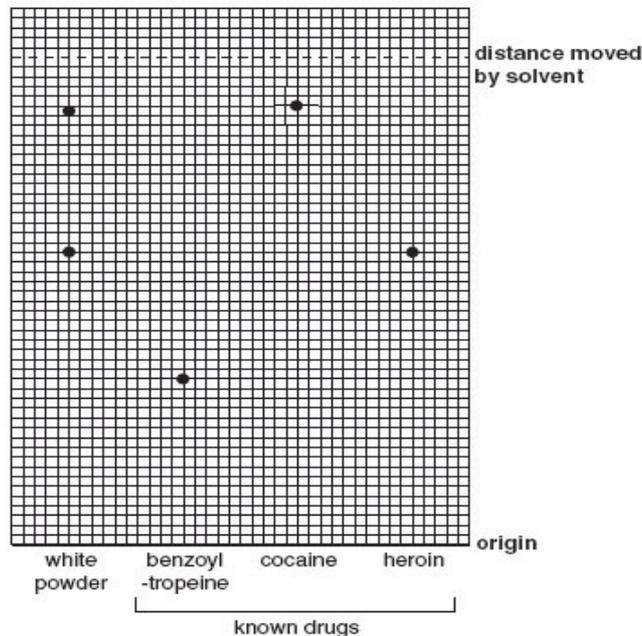
[Total: 4]

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

A forensic scientist analyses the white powder using chromatography.

The scientists also tests 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 round one spot on the chromatogram of the drug found in the white powder.[1]

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

Show your working.

Rf value = ..... [2]

[Total: 6]

4. 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

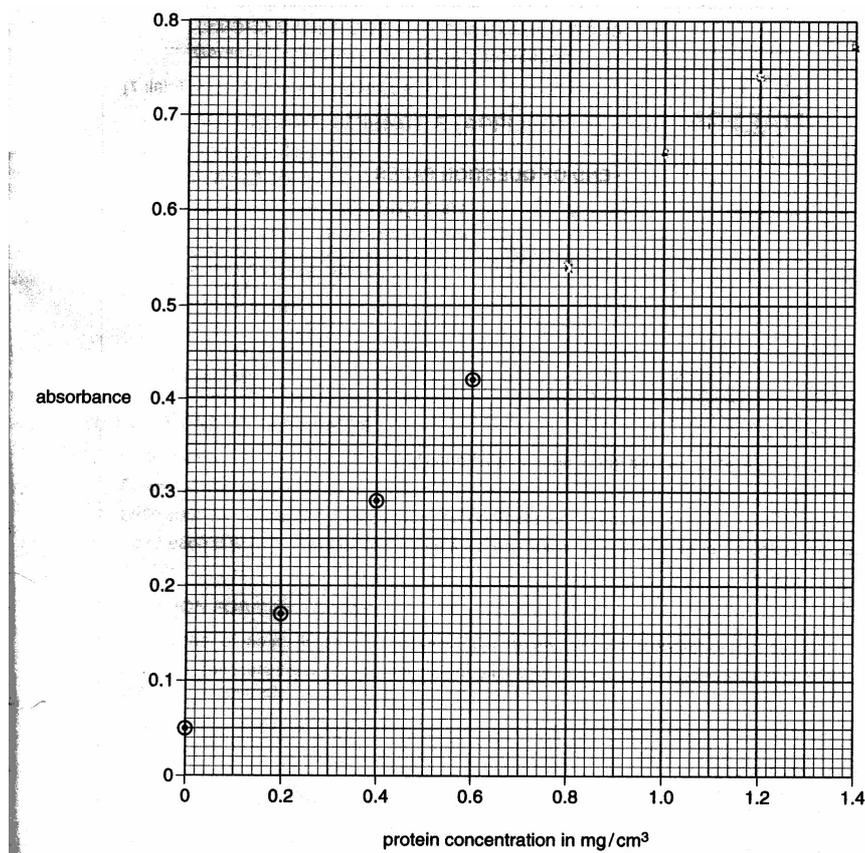
(i) Plot the points on the grid.

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.

concentration of unknown protein solution ..... [3]

(d) Jamie does the analysis again.

This time he uses a spectrophotometer.

Write down **three** advantages of using a spectrophotometer.

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

5. Trading Standards Officers are called to a meat factory.

They think that sausages labelled 'pork' may contain other types of meat.

(a) They test the DNA in the sausages using electrophoresis.

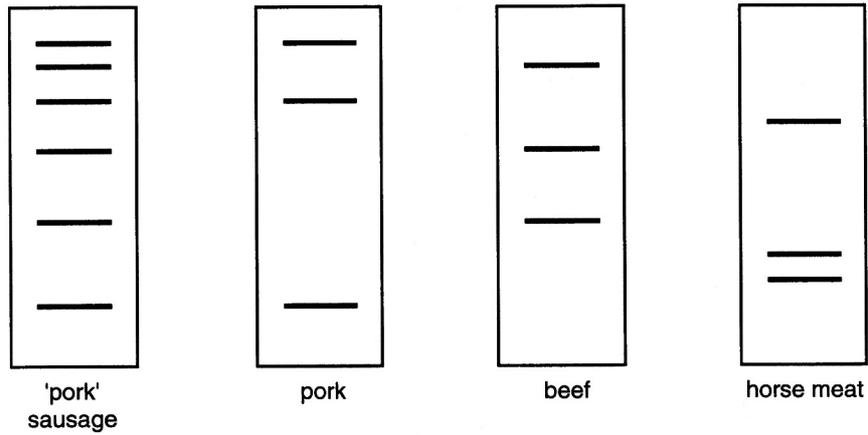
(i) Explain how electrophoresis works.

You may use the following words to help you.

**charge DNA faster fragments mass negative positive slower**

.....  
.....  
.....  
.....  
.....  
.....[4]

(ii) The results of the DNA analysis are shown below.



Explain whether the trading standards officers were correct in thinking that the pork sausage contained other types of meat.

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

(b) Laboratories that analyse food have to undergo a 'proficiency test'.

(i) Explain **why** this test has to be carried out.

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

(ii) Describe **how** this test is carried out.

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

[Total: 9]

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**GCSE**

**ADDITIONAL APPLIED SCIENCE A**

AP3 Scientific Detection

**Specimen Mark Scheme**

Maximum mark for this paper is [36]

**H**

**A325/02**

45 mins

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

Question Number	Answers	Max Mark
<p><b>1(a)i</b></p> <p><b>1(a)ii</b></p> <p><b>1(b)i</b></p> <p><b>1(b)ii</b></p> <p><b>1(b)iii</b></p>	<p>Litmus does not give pH / strength of acid/alkali; Universal indicator has more colours; <b>Each colour gives ph / strength</b></p> <p>pH 8 / 9 <b>alkali</b></p> <p>1 mm</p> <p>Method ie 4.0 / 5; 0.8 mm</p> <p>Sand</p> <p style="text-align: right;"><b>Total marks</b></p>	<p><b>[2]</b></p> <p><b>[1]</b></p> <p><b>[1]</b></p> <p><b>[1]</b></p> <p><b>[1]</b></p> <p><b>[1]</b></p> <p><b>[8]</b></p>
<p><b>2(a)</b></p> <p><b>2(b)</b></p> <p><b>2(c)</b></p>	<p>Round; Spikey;</p> <p>Greater magnification;</p> <p>The sample is stained.....;</p> <p>The sample is placed on a glass slide;</p> <p style="text-align: right;"><b>Total marks</b></p>	<p><b>[1]</b></p> <p><b>[1]</b></p> <p><b>[1]</b></p> <p><b>[1]</b></p> <p><b>[4]</b></p>
<p><b>3(a)i</b></p> <p><b>3(b)</b></p> <p><b>3(c)</b></p> <p><b>3(d)</b></p>	<p>Idea of comparison; To identify unknown powder;</p> <p>Heroin;</p> <p>Ring round correct dot Substitution correct;</p> <p>0.59 or 0.6</p> <p style="text-align: right;"><b>Total marks</b></p>	<p><b>[1]</b></p> <p><b>[1]</b></p> <p><b>[1]</b></p> <p><b>[1]</b></p> <p><b>[1]</b></p> <p><b>[6]</b></p>

Question Number	Answers	Max Mark
4(a)	A standard / to zero;	[1]
4(b)i	Points correct =2	[2]
4(b)ii	Line correct	[1]
4(c)	0.7; units	[1] [1]
4(d)	<b>evidence of using graph (correct answer and units scores 3)</b> More accurate; More sensitive OWTTE; Faster;	[1]   [2]   <b>Total marks</b> [9]
5(a)i	One mark for each word used in the correct context	[4]
5(a)ii	Comparison used; Contains beef	[1] [1]
5(b)i	Idea of safety	[1]
5(b)ii	Idea of same test; At different laboratory; To check accuracy;	[2]   <b>Total marks</b> [9]