

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

A325/01

Scientific Detection
(Foundation Tier)

**Monday 19 January 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.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	5	
2	6	
3	5	
4	5	
5	9	
6	6	
TOTAL	36	

Answer **all** the questions.

1 The collection of scientific evidence is carried out by the following groups of people.

(a) Draw a straight line from each **group of people** to the correct **name of the agency** they work for and the **role carried out**.

name of agency	group of people	role carried out
Food Standards Agency	public analysts	law enforcement
Environment Agency	environmental protection officers	environmental protection
Forensic Science Service	crime scene investigators	consumer protection

[4]

(b) It is important that evidence is reliable.

Which of the following increases reliability?

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

- use different staff each time
- correct Health & Safety
- use the same procedures
- use up-to-date equipment

[1]

[Total: 5]

2 Evidence must be collected before it can be analysed.

(a) Which **two** of the following are **not** stages in the collection, storage and preparation of samples for analysis?

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

- collect representative samples
- estimate cost of collecting samples
- prevent deterioration of samples
- avoid contamination of samples
- avoid tampering of samples
- dispose of samples

[2]

(b) Standard procedures are used for analysing and testing the samples of evidence.

Which **two** of the following statements would **not** form part of a standard procedure?

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

- use standard reference materials to calibrate equipment
- buy new equipment at the end of each test
- make sure the equipment is from the same manufacturer
- use graphs to calibrate data
- record the standard procedure used
- record the outcomes achieved

[2]

(c) State **two** ways in which data from analysis can be presented.

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

[Total: 6]

3 Some tests use colour to show results.

Look at the pH colour charts for litmus and universal indicator.

litmus

4	5	6	7	8	9	10
red			purple	blue		

universal indicator

4	5	6	7	8	9	10
red	orange	yellow	green	green-blue	blue	blue-black

(a) Universal indicator gives the more precise measure of acidity.

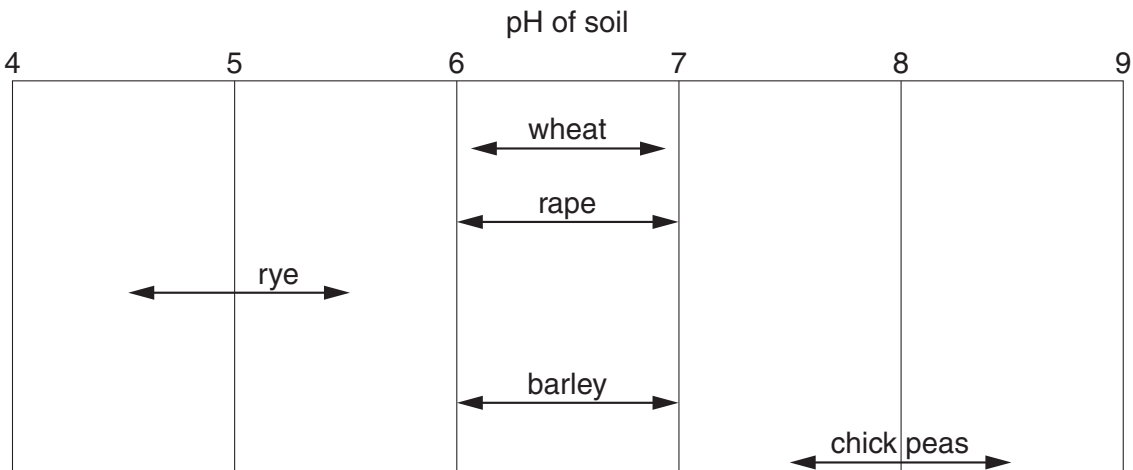
Explain why.

.....

.....

..... [1]

(b) Look at the data about the soil pH in which crops grow best.



Give the colour which universal indicator would turn if the following soils were tested.

(i) Soil in which rye grows best [1]

(ii) Soil in which chick peas grow best [1]

(c) Which of the following best describes the litmus test?

Put a (ring) around the correct answer.

qualitative

semi quantitative

quantitative

[1]

(d) Which of the following best describes the universal indicator test?

Put a (ring) around the correct answer.

qualitative

semi quantitative

quantitative

[1]

[Total: 5]

- 4 Neil uses a colorimeter and this standard procedure to measure the concentration of a test sample.

stage 1	place a sample of pure colourless solvent in the colorimeter
stage 2	set the meter to zero
stage 3	place solution of known concentration in the colorimeter
stage 4	plot data from known concentrations to produce a calibration graph
stage 5	place a test sample in the colorimeter
stage 6	use the calibration graph to work out the concentration of the test sample

Choose from the following statements to answer the questions.

- so the readings from the meter were accurate
- to be able to work out the concentration of the unknown sample
- to read the concentration at the point where the known absorbency crosses the line of the graph
- so the light absorbed by the solvent did not affect the results
- to obtain accurate data to plot the calibration graph

(a) Why did Neil place a sample of pure colourless solvent in the colorimeter?

.....
 [1]

(b) Why did Neil set the meter to zero?

.....
 [1]

(c) Why did Neil place samples of known concentration in the colorimeter?

.....
 [1]

(d) Why did Neil produce a calibration graph?

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

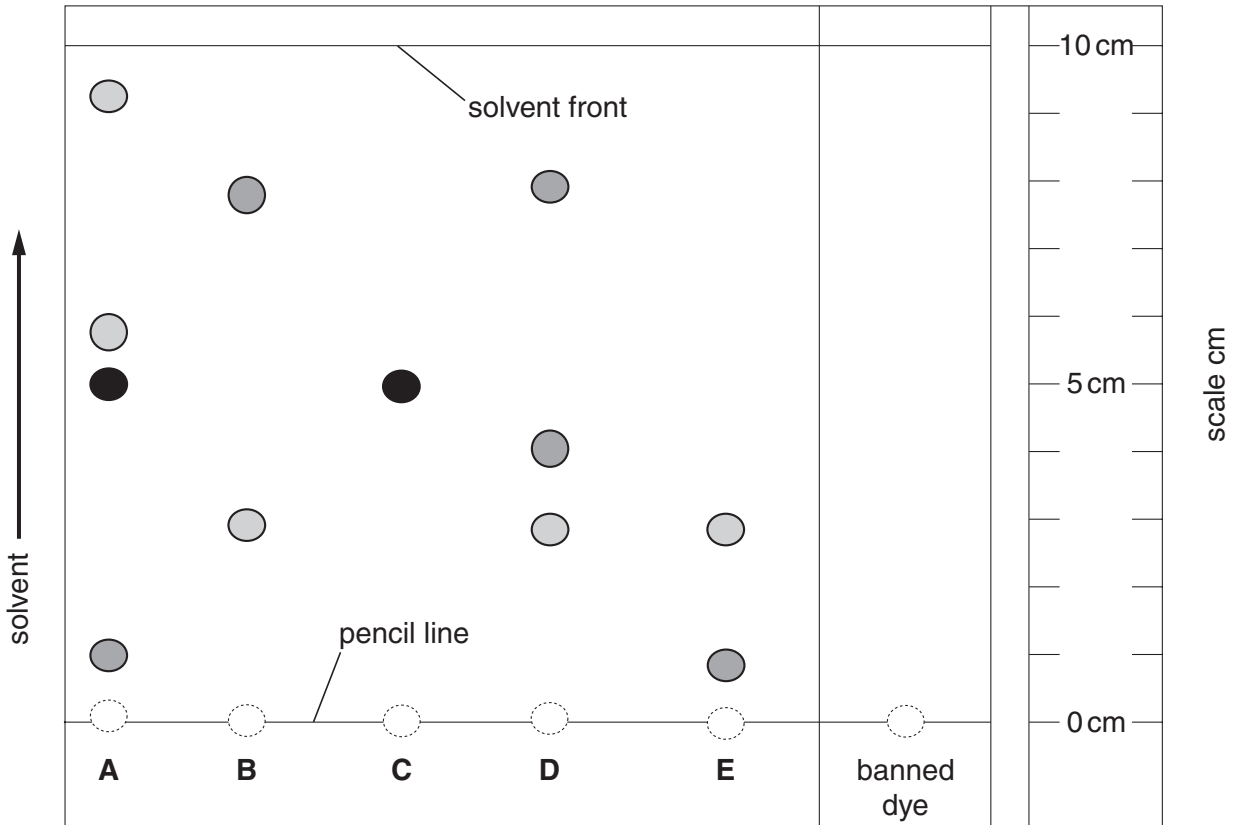
(e) How did Neil use the graph to work out the concentration of the test sample?

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

[Total: 5]

5 A Trading Standards scientist tests children's toys to make sure that they are not coloured with banned dyes.

She tests the colours from five different coloured toys, **A**, **B**, **C**, **D** and **E**, using thin layer chromatography.



She also tests a banned dye.

banned dye	Rf value
●	0.5

(a) Draw the spot from the **banned dye** in the correct position on the chromatogram. [2]

(b) Which **two** of the children's toys **A**, **B**, **C**, **D** or **E** contain the banned dye?

..... and [2]

(c) Chromatography tests **samples** using a **mobile phase** and a **stationary phase**.

(i) Which of the following is a **sample**?

Put a **ring** around the correct answer.

beaker

dye

paper

pencil line

solvent

[1]

(ii) Which of the following is the **mobile phase**?

Put a **ring** around the correct answer.

beaker

dye

paper

pencil line

solvent

[1]

(iii) Which of the following is the **stationary phase**?

Put a **ring** around the correct answer.

beaker

dye

paper

pencil line

solvent

[1]

(d) The scientist tests the samples again using a different solvent.

Put a tick (✓) against the **two** best statements that explain why.

all dyes dissolve in lots of different solvents

different solvents separate different dyes

more data can be collected about which dyes are present

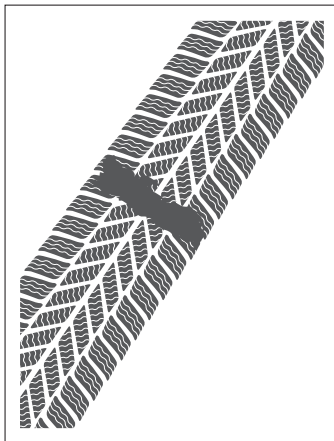
there is only one colour present in the dye

the scientist wanted to make it a fair test

[2]

[Total: 9]

6 Forensic scientists find the following tyre print at the scene of a hit and run accident.

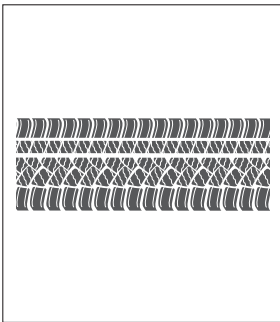


magnification = x0.1

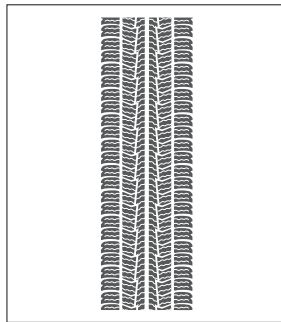
(a) How many times bigger than the image shown above, is the real tyre print?

..... [1]

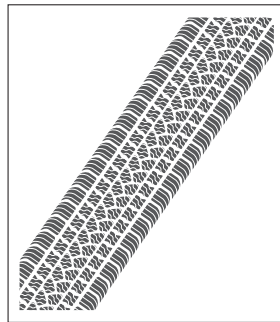
(b) The scientists compare the print with prints taken from four suspect's cars.



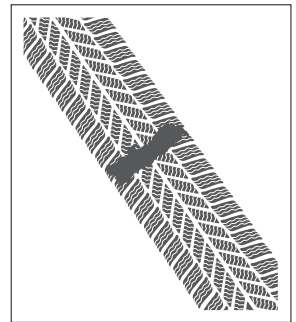
A



B



C



D

(i) Which print, A, B, C or D matches the crime scene print?

..... [1]

(ii) Describe **two** features that are found on both matching prints.

.....

 [2]

(c) Mud from the tyre was examined using a microscope.

The eyepiece was x10.

The objective lens was x25.

Calculate how many times the mud was magnified by.

Show your working.

X [2]

[Total: 6]

END OF QUESTION PAPER

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