OCR
RECOGNISING ACHIEVEMENT

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A325/02

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE

ADDITIONAL APPLIED SCIENCE A

Scientific Detection (Higher Tier)

WEDNESDAY 18 JUNE 2008

Afternoon

Time: 45 minutes

Candidates answer on the question paper.
Additional materials (enclosed):
None

Calculators may be used.
Additional materials: Pencil
Ruler (cm/mm)

CUP/T43743

Candidate Forename		Candidate Surname	
Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **36**.

FOR EXAMINER'S USE		
Qu.	**Max**	**Mark**
1	**8**	
2	**6**	
3	**3**	
4	**6**	
5	**13**	
TOTAL	**36**	

This document consists of **11** printed pages and **1** blank page.

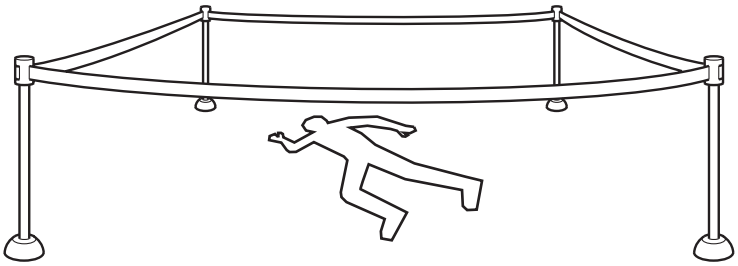
[Turn over

Answer **all** the questions.

1 Steve is a forensic scientist.

He attends the crime scene of a murder.

Detectives have cordoned off the scene of crime area.



(a) The area measures 10.5 metres by 8.6 metres.

(i) Calculate the size of the cordoned off area in square metres.

Show your working.

answer ..... m^2 [1]

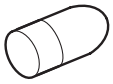
(ii) Explain why the calculated area has a greater uncertainty than the measured lengths.

.....

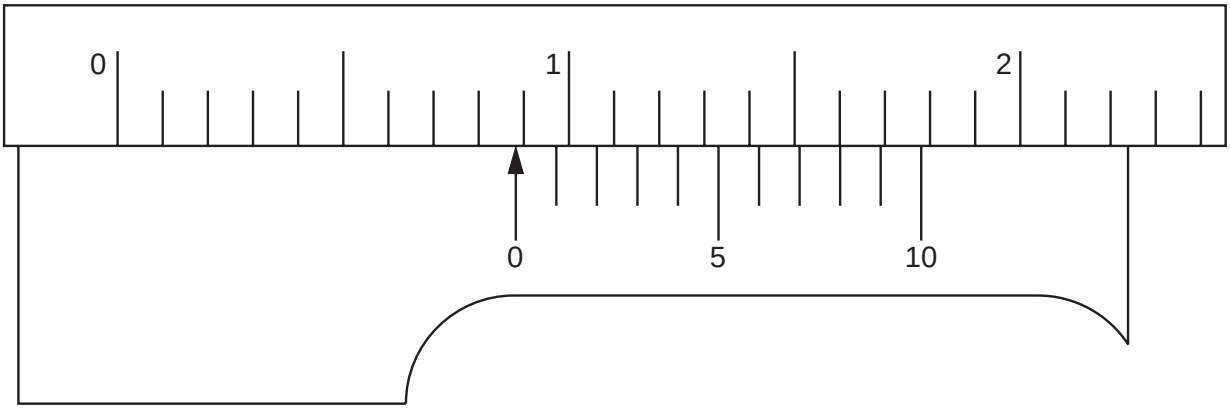
.....

.....[2]

(b) Steve measures the diameter of the bullet found in the body.



He uses a Vernier scale to measure the diameter of the bullet.



(i) Record the reading from the Vernier scale.

answer ..... cm [2]

(ii) Steve uses the following standard procedure for using the Vernier scale.

The steps are in the wrong order.

A Note the reading from the bottom scale.
B Adjust the jaws so that they are both touching each side of the bullet.
C Read the top main scale including the first decimal place.
D Place the bullet in the jaws of the Vernier scale.
E Look for the two graduations that line up.

Fill in the boxes to show the right order. The first one has been done for you.

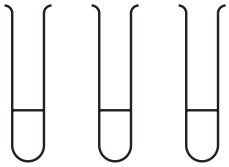
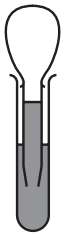
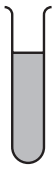
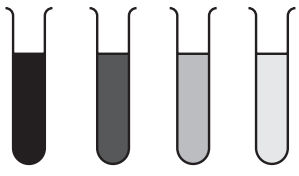
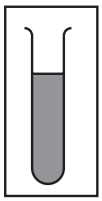
D				

[3]

[Total: 8]

2 Freya works in a laboratory.

She uses this standard procedure to estimate the concentration of an unknown solution by colour matching.

step 1  160 ppm	Prepare a reference solution of the coloured compound at a concentration of 160 parts per million (ppm).
step 2 	Pipette 5 cm^3 of distilled water into each of three test tubes.
step 3  80 ppm	Pipette 5 cm^3 of the reference solution into the first test tube and label it 80 ppm.
step 4 	Then, suck the liquid into and squeeze the liquid out of the pipette several times.
step 5  40 ppm	Pipette 5 cm^3 of the mixture in the first test tube into the second test tube. Label the second test tube 40 ppm. Repeat step 4.
step 6  20 ppm	Pipette 5 cm^3 of the mixture in the second test tube into the third test tube. Label the third test tube 20 ppm. Repeat step 4.
step 7  160 80 40 20  unknown	Compare the colour intensity of the unknown solution with the four prepared reference solutions.

(a) Choose from the following statements to help you answer the questions.

- So there is always the same volume of liquid in each test tube.
- To mix up the solution.
- So the pipette does not contaminate all the other test tubes.
- To get a closer match.
- Because the unknown solution is unlikely to exactly match one of the reference solutions.
- So it is the same every time.

(i) Why did Freya produce four reference solutions, rather than just one?

.....

..... [1]

(ii) Why did Freya perform **step 4**?

.....

..... [1]

(iii) Why is this method unlikely to give Freya an exact result?

.....

..... [1]

(iv) Why does Freya use a standard procedure for this activity?

.....

..... [1]

(b) Freya then uses a colorimeter to check her results.

(i) Suggest why Freya does this.

Use **one** of the following words in your answer.

accreditation **accurate** **chromatography** **microscope**

.....

..... [1]

(ii) Which of the following words best describes the results obtained by using a colorimeter?

Choose from the following list.

Put a (ring) around the best answer.

qualitative **quantitative** **semi-quantitative** [1]

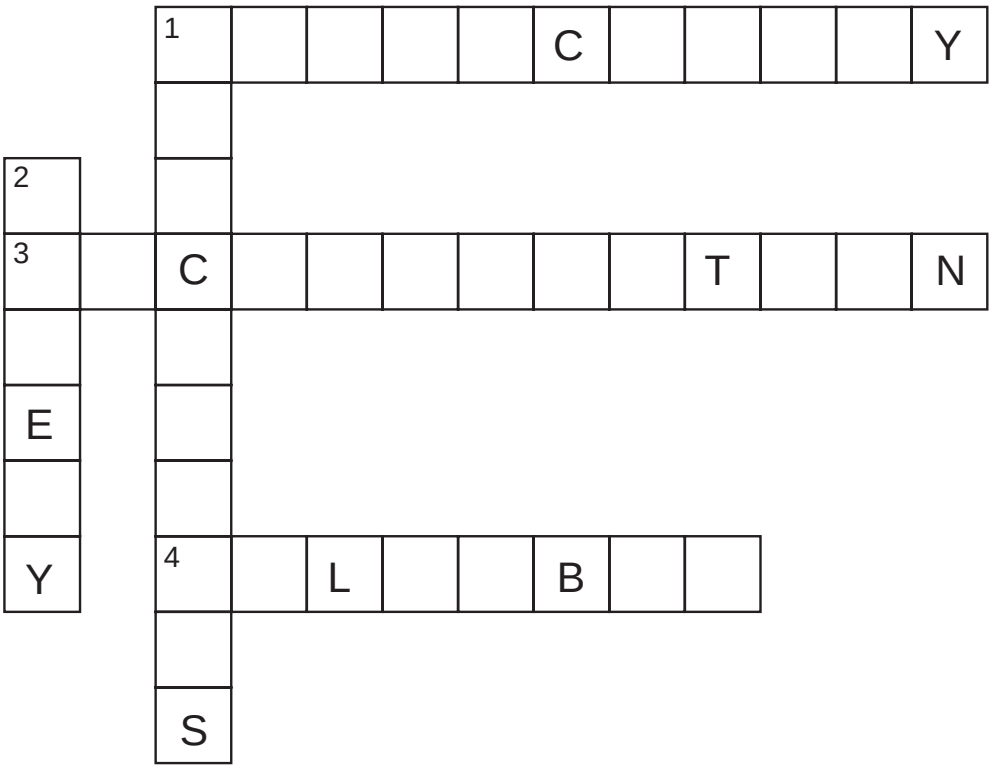
[Total: 6]

3 Good laboratory practice is essential to produce reliable evidence.

Complete the crossword.

All the clues are about good laboratory practice.

Some of the letters have been completed for you.



Across

1 A type of test used to check a laboratory.
3 What laboratories get when they pass the test.
4 Good laboratory practice produces …… evidence.

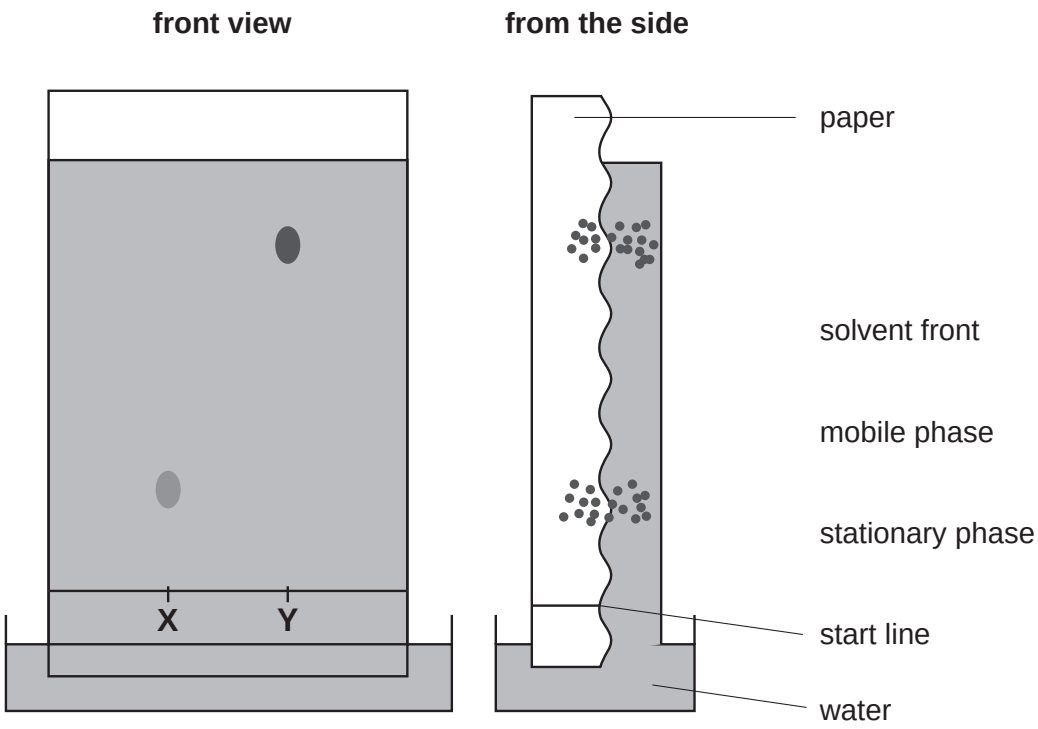
Down

1 Reliability is increased by using common practice and …… .
2 Complete the following phrase. 'Health and ……' [3]

[Total: 3]

4 Neil uses chromatography to analyse an unknown solution **X**.

Look at the diagram of Neil's chromatogram.



(a) Label the side-view of Neil's chromatogram.

Use the words next to the diagram. [3]

(b) Draw an arrow on Neil's side-view diagram to show the movement of substances between the mobile phase and the stationary phase. [1]

(c) Neil uses **Y** as a standard reference solution.

What conclusion can Neil make about **X** and **Y**?

Explain your answer.

.....

.....

..... [2]

[Total: 6]

5 Suniel uses a colorimeter to measure the concentration of a coloured food dye in a soft drink.

(a) The flow diagram shows the sequence of events that occurs in the colorimeter.

Complete the flow diagram.

Choose words from the following list.

continuous phase **filter** **light-sensitive cell**

meter **paper strip** **test solution**

[3]

(b) Suniel first calibrates the machine by using pure water.

Give **two** reasons why.

.....

.....

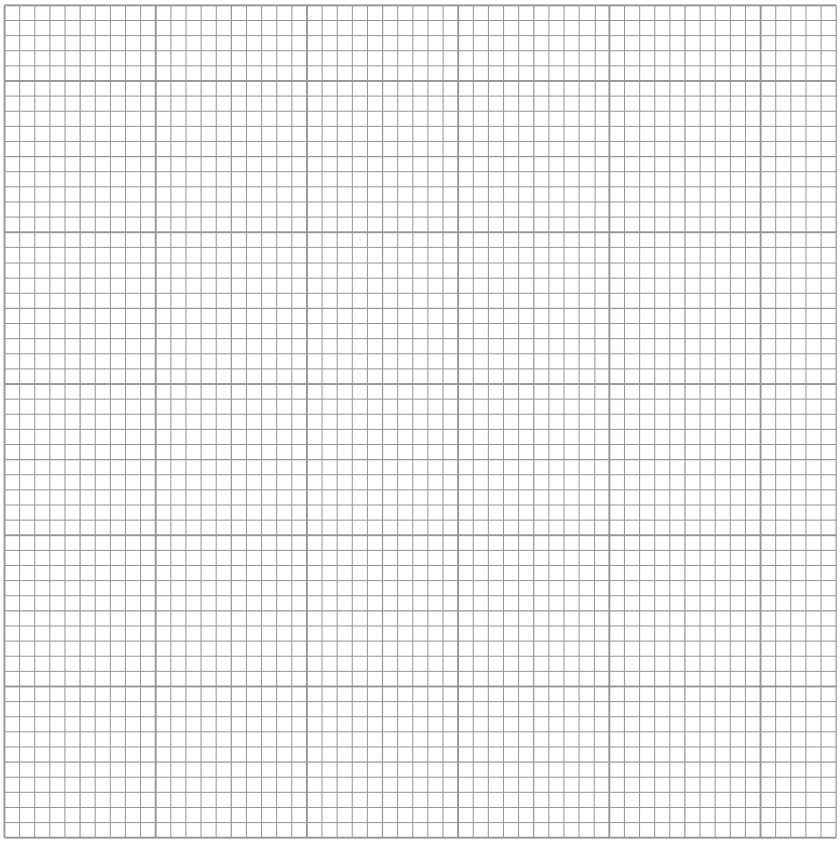
..... [2]

(c) Calibration readings were taken for a series of standard reference solutions.

concentration (g/dm^3)	absorbance
0.2	0.15
0.4	0.32
0.6	0.47
0.8	0.58
1.0	0.75

(i) Use Suniel's data to plot a calibration graph.

absorbance



concentration
in g/dm^3

[3]

(ii) Suniel's soft drink had an absorbance of 0.24.

Use the graph to work out the concentration of the food dye in the soft drink.

Draw straight lines on your graph to show how you worked out your answer.

concentration = ... g/dm^3 [2]

(d) Draw straight lines from each **description** of what a colorimeter does to the correct **missing word**.

description	missing word
Colorimeters measure the …… of a colour.	colour
	concentration
This can be used to find out the …… of a coloured chemical in solution.	intensity
	qualitative
A colorimeter provides …….. data about a coloured solution.	quantitative
	frequency

[3]

[Total: 13]

END OF QUESTION PAPER

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