OCR
RECOGNISING ACHIEVEMENT

H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE ADDITIONAL APPLIED SCIENCE A

A325/02

Scientific Detection (Higher Tier)

11LMP06054

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)

Tuesday 7 June 2011
Afternoon

Duration: 45 minutes

A325 02

Candidate forename		Candidate surname	

Centre number						Candidate number				

MODIFIED LANGUAGE

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Answer **all** the questions.
- Do **not** write in the bar codes.

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 Good laboratory practice is essential to produce reliable evidence.

(a) Describe **two** ways in which all public laboratories make sure their (evidence) data is reliable.

.....

.....

.....

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

(b) Describe the three main things that are important to (maintain) good laboratory practice.

1 .....

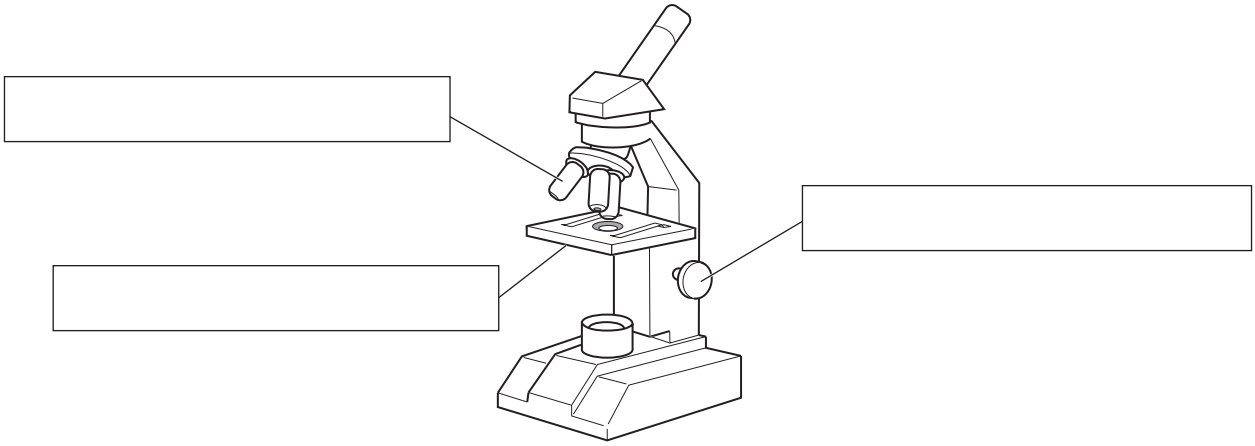
2 .....

3 ..... **[3]**

[Total: 5]

2 Scientists sometimes use light microscopes when examining evidence.

(a) Complete the labels on this diagram of a microscope.



[3]

(b) A forensic scientist looks at a fingerprint through a microscope.

She takes three different photographs of the fingerprint.

A **B** **C**

Photograph **B** has the greatest resolution.

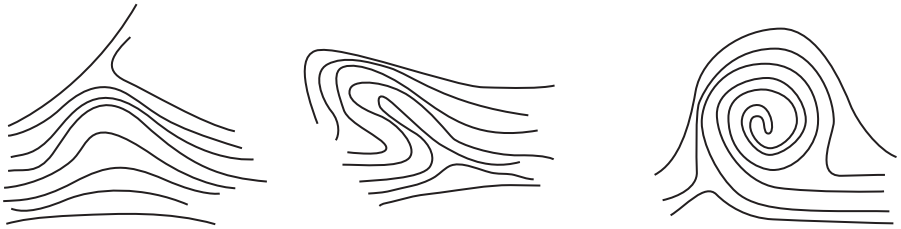
Explain what is meant by resolving power. Explain the limitations of resolving power to light microscopy.

.....

.....

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

(c) Look at the drawings of three different patterns found in fingerprints.



arch loop whorl

Which **two** of these patterns are found in fingerprint **B**?

..... and ..... **[1]**

(d) The scientist wants to know how many times the image of the fingerprint has been magnified.

Which two facts does she need to know about her microscope, to be able to work out the magnification of the fingerprint?

1 .....

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

[Total: 8]

3 Materials can be tested in different ways.

Different tests give different levels of detail in the results.

(a) A scientist tests a drink with litmus paper.

(i) Which of these words **best** describes the litmus test?

Put a (ring) around the correct answer.

qualitative **quantitative** **semi quantitative**

[1]

(ii) Explain how a **quantitative** test is different from a **qualitative** test.

.....

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

(iii) What colour will the litmus paper change to if the drink is alkaline?

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

(b) The scientist tests the drink with a different indicator.

pH scale	indicator colour
pH 2	
pH 4	
pH 7	
pH 10	
pH 13	

results of the test on the drink

What is the pH of the drink?

pH = ...

How can you tell the pH of the drink?

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

(c) Colour testing kits are used in medical diagnosis.
Pregnancy testing kits and indicators (like the litmus test) to identify acids and alkalis are examples of colour tests.
Name one other example of a colour testing kit used in medical diagnosis.

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

[Total: 5]

4 A scientist prepares material to be viewed using an electron microscope.

He uses a standard procedure.

The table shows the steps the scientist follows.
The steps are in the correct order.

step	what is done to the material	reason (A to F)
step 1	A very thin slice is cut from the material.	
step 2	The slice is dried and fixed.	
step 3	The slice is placed in the electron microscope.	
step 4	Air is sucked out of the electron microscope.	
step 5	The image of the slice is viewed on a screen.	

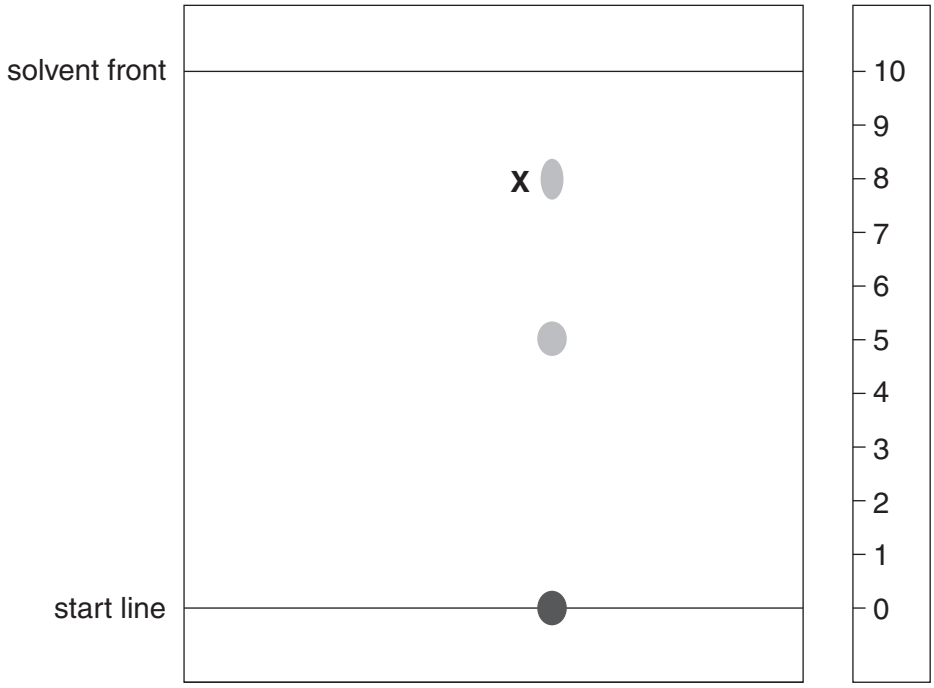
The sentences **A**, **B**, **C**, **D**, **E**, and **F** give possible reasons for each step in the standard procedure.

A to prevent the material changing during the sample preparation
B the eye cannot see electrons
C to kill any living specimens
D air would stop electrons passing through
E to allow electrons to pass through the specimen
F air oxidises the inside of the microscope

Write a letter, **A**, **B**, **C**, **D**, **E** or **F**, inside each empty box to show the correct reason for the step. **[4]**

[Total: 4]

5 A forensic scientist makes a paper chromatogram of amino acids in a protein sample.



(a) The scientist has to develop the chromatogram before analysing the results.

Explain why.

.....

.....

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

(b) Use the following equation to calculate the R_f value of substance **X**.

$$R_f = \frac{\text{distance travelled by substance}}{\text{distance travelled by solvent}}$$

Show your working.

R_f = ... **[3]**

(c) In paper chromatography, a moving solvent washes each sample across the medium (paper).

The distance a sample moves depends on the relative attractions between different types of molecules.

Put ticks (✓) in the boxes next to the **two** statements about the forces that determine how far the sample moves.

The attraction between …

… sample molecules and solvent molecules.	
… solvent molecules and other solvent molecules.	
… sample molecules and the molecules of the medium.	
… molecules of the medium and other molecules of the medium.	
… solute molecules and other solute molecules.	

[2]

(d) Scientists often need to separate mixtures.

Here are some ways that mixtures can be separated.

A distillation
B gas chromatography
C paper chromatography
D electrophoresis
E filtration through a filter paper

For each of the following examples, choose from **A**, **B**, **C**, **D** or **E** to show the best method of separating the mixture.

(i) A cheap way of separating colours of felt tip pens in a school laboratory.

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

(ii) Separating very small samples of gases or liquids.

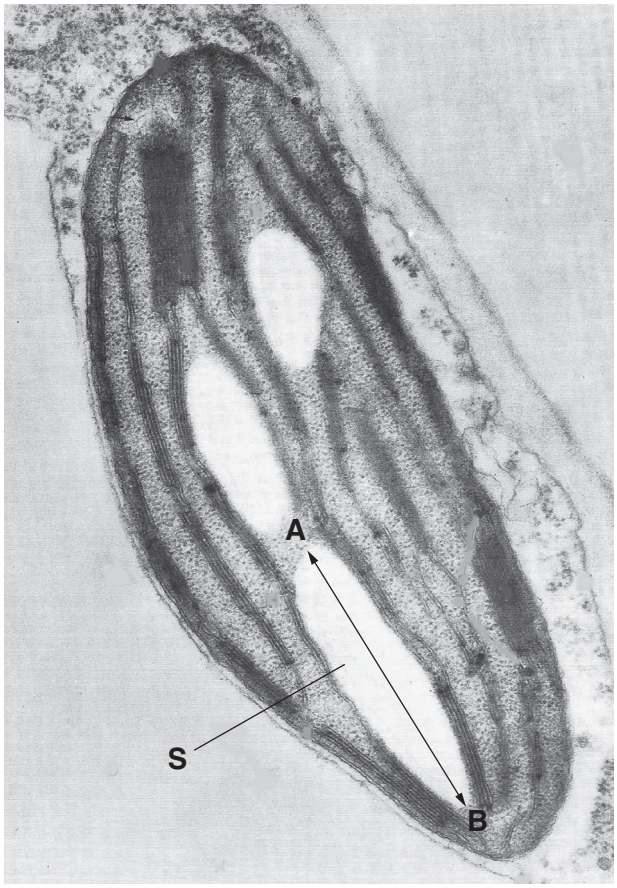
..... **[1]**

(iii) Separating biological molecules such as DNA fragments.

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

[Total: 9]

6 A scientist made an electron micrograph of part of a plant cell.



(a) Structure **S** is a starch grain.

(i) Measure the length of the image of the starch grain between points **A** and **B**.

length = ... mm **[1]**

(ii) The magnification of the image is × 10 000.

Work out the **actual** length of the starch grain.

Show your working.

actual length of starch grain = ... mm **[2]**

(b) Scientists often use the term 'depth of field' when talking about images from a scanning electron microscope.

Explain what is meant by 'depth of field'.

.....

.....

.....

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

[Total: 5]

END OF QUESTION PAPER

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