OCR
RECOGNISING ACHIEVEMENT

H

GENERAL CERTIFICATE OF SECONDARY EDUCATION

TWENTY FIRST CENTURY SCIENCE ADDITIONAL APPLIED SCIENCE A

A325/02

Scientific Detection (Higher Tier)

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

A325020

OCE/26520

Candidate forename		Candidate surname	

Centre number						Candidate number				

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.

© OCR 2011 [M/103/3781]
OCR is an exempt Charity

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

© OCR 2011

Answer **all** the questions.

1 Good laboratory practice is essential to produce reliable evidence.

(a) Describe **two** ways in which all public laboratories ensure reliability of their data.

.....

.....

.....

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

(b) State the three main things that good laboratory practice depends upon.

1 .....

2 .....

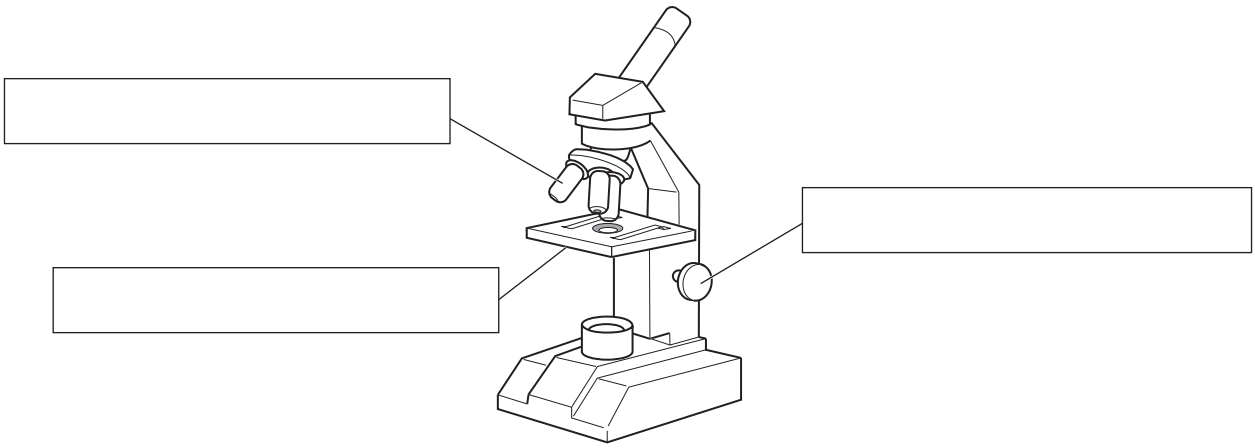
3 ..... **[3]**

[Total: 5]

© OCR 2011

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 and the limitations of resolving power to light microscopy.

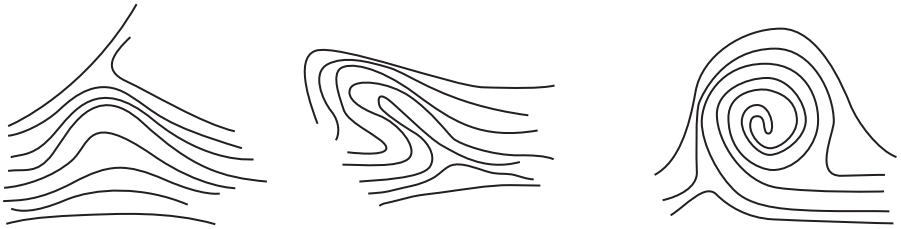
.....

.....

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

© OCR 2011

(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 calculate its magnification?

1 .....

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

[Total: 8]

© OCR 2011

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 differs from a **qualitative** test.

.....

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

(iii) What colour will the litmus paper turn 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?

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

(c) Indicators to identify acids or alkalis, and pregnancy testing kits, are examples of colour tests used in medical diagnosis.
Name one other example of a colour testing kit used in medical diagnosis.

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

[Total: 5]

© OCR 2011

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.
They 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 steps in the standard procedure.

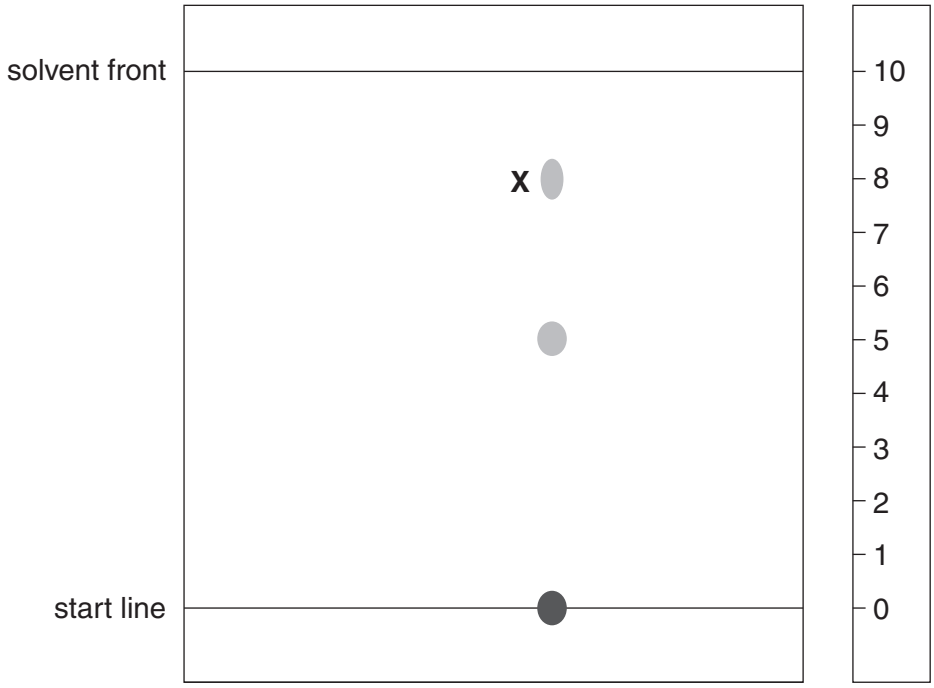
A to prevent the material changing during the sample preparation
B the eye cannot see electrons
C to kill any living specimens
D air would stop electrons passing through
E to allow electrons to pass through the specimen
F air oxidises the inside of the microscope

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]

© OCR 2011

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]**

© OCR 2011

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

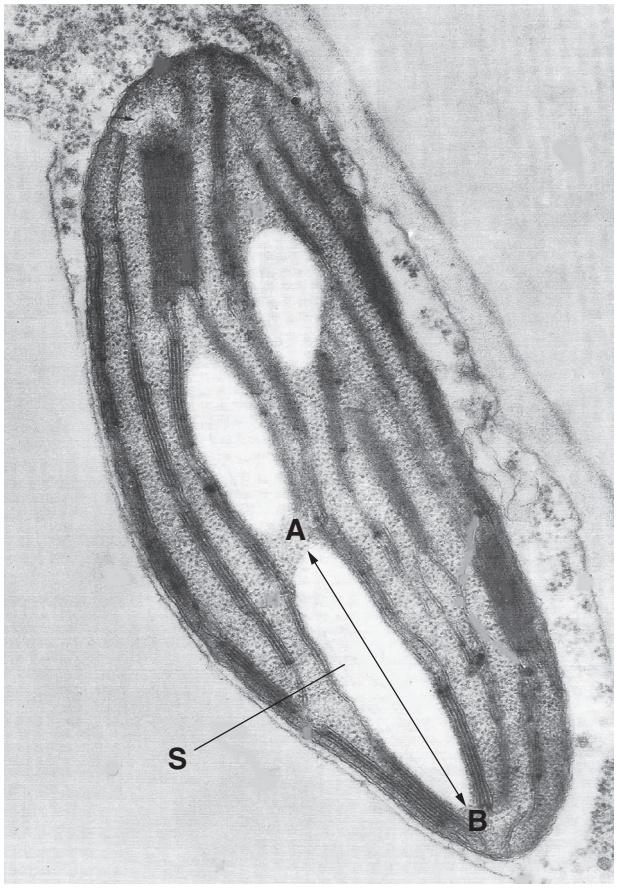
(iii) Separating biological molecules such as DNA fragments.

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

[Total: 9]

© OCR 2011

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.
Calculate the **actual** length of the starch grain.
Show your working.

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

© OCR 2011

(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

© OCR 2011

PLEASE DO NOT WRITE ON THIS PAGE

RECOGNISING ACHIEVEMENT

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© OCR 2011