

Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION**

A325/01

**TWENTY FIRST CENTURY SCIENCE
ADDITIONAL APPLIED SCIENCE A**

Scientific Detection (Foundation Tier)

TUESDAY 7 JUNE 2011: Afternoon

DURATION: 45 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

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)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. 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.**

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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Please turn over for question 1.

Answer ALL the questions.

1 Forensic laboratories need to ensure good laboratory practice.

One of the key features of this is the regular checking of equipment.

(a) Name one piece of laboratory equipment.

Describe how scientists could make sure that it is giving correct results.

name of equipment _____

how to ensure correct results _____

_____ **[3]**

**(b) Many jobs require use of scientific expertise.
For each of the following areas of employment,
give one example of a job which uses scientific
expertise.**

(i) law enforcement

_____ **[1]**

(ii) consumer protection

_____ **[1]**

[Total: 5]

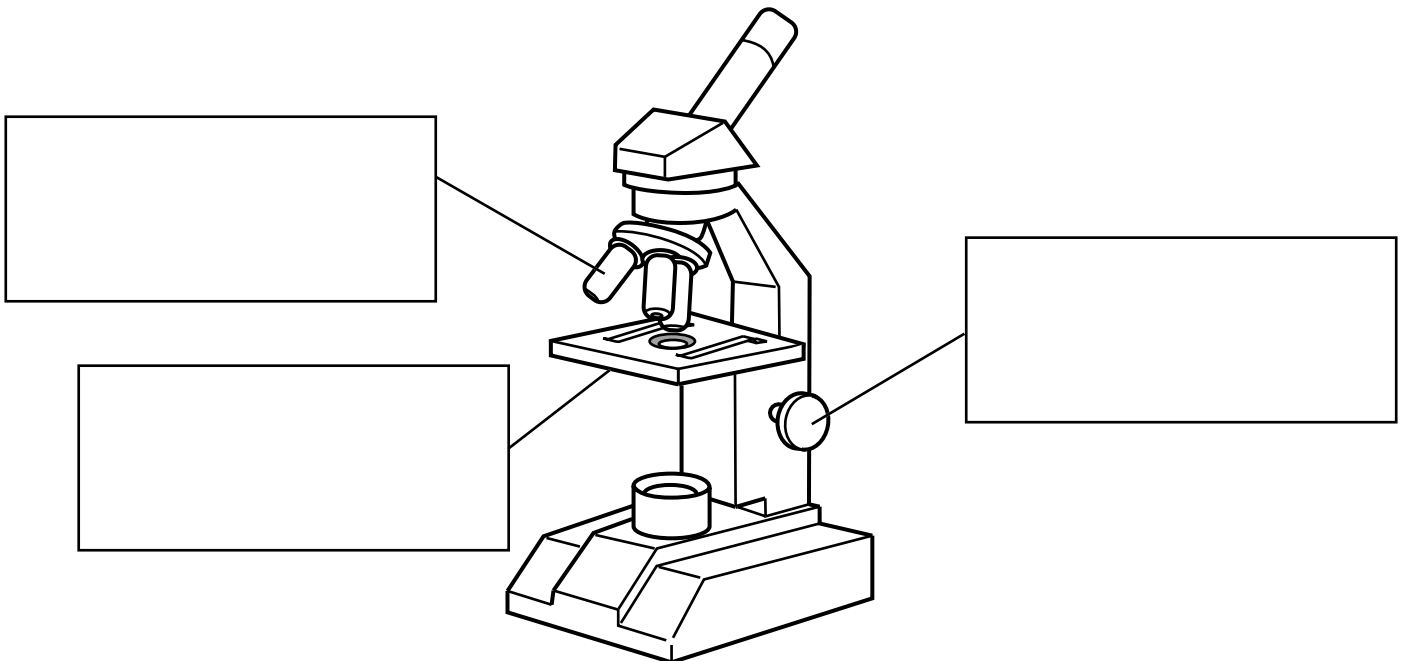
2 Scientists sometimes use light microscopes when examining evidence.

**(a) Complete the labels on this diagram of a microscope.
Choose from this list.**

BASE EYEPIECE LENS LAMP

CLIP FOCUSING ADJUSTER CONDENSER

OBJECTIVE LENS STAGE DIAPHRAGM



[3]

- (b) The microscope affects both the magnification and the resolution of the image.
Which of the following changes helps the scientist to see most detail?

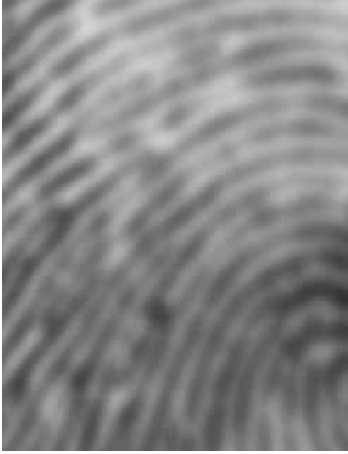
Put a tick (✓) next to the BEST answer.

MAGNIFICATION	RESOLUTION	
decreases	increases	<input type="checkbox"/>
increases	no change	<input type="checkbox"/>
decreases	decreases	<input type="checkbox"/>
increases	increases	<input type="checkbox"/>
no change	increases	<input type="checkbox"/>
increases	decreases	<input type="checkbox"/>

[1]

**(c) A forensic scientist looks at a fingerprint through a microscope.
She takes three different photographs of the print.**

A



B



C



(i) Which photograph, A, B or C, has the greatest magnification?

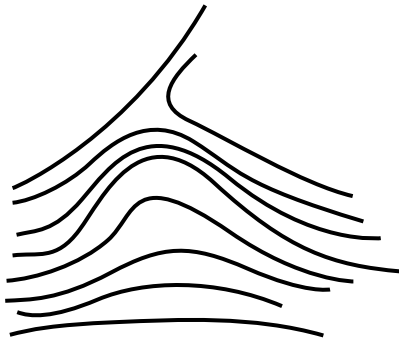
answer _____ [1]

(ii) Which photograph, A, B or C, has the greatest resolution?

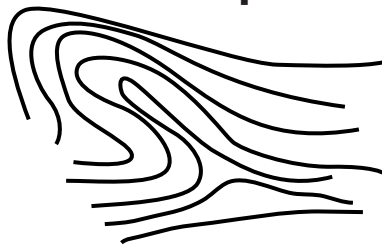
answer _____ [1]

(d) Look at the drawings of three different types of fingerprint.

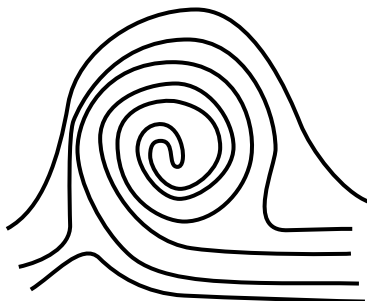
arch



loop



whorl



Use the drawings to identify the type of fingerprint the scientist saw in photograph B.

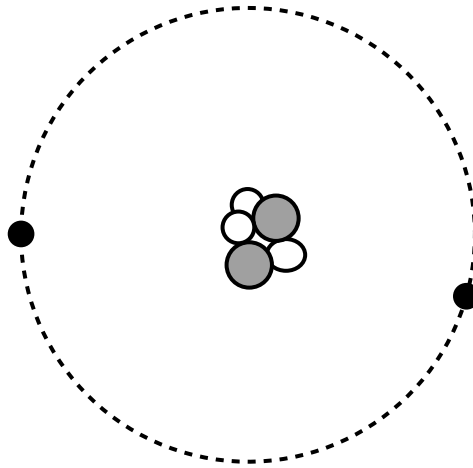
answer _____ [1]

- (e) For photograph A, the scientist uses an eyepiece lens of $\times 5$ and an objective lens of $\times 10$. Calculate the magnification of the image. Show your working.

magnification = \times _____ [2]

- (f) Even greater detail can be obtained using an electron microscope.

Look at the diagram of an atom.



- (i) Put a **ring** around ONE electron. [1]
- (ii) Put a **box** around ONE negatively charged particle. [1]
- (iii) Explain why it is called an electron microscope.

[1]

[Total: 12]

3 Materials can be tested in different ways. Different tests give different levels of details 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.


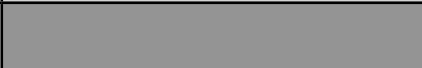
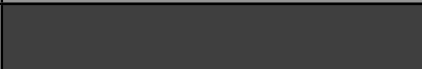
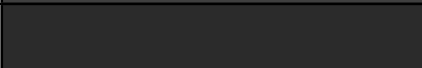

_____ **[1]**

(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]

- 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]

5 A forensic scientist collects a sample of blood from a crime scene.

(a) There are several stages in the collection, storage and preparation of blood samples for analysis. For each STAGE, the scientist takes a different ACTION.

Draw a straight line to join EACH STAGE with the correct ACTION taken.

Then for EACH ACTION, draw a straight line to join it to the REASON why it is done.

STAGE

ACTION

REASON

collect representative samples

ensures the freezer is locked

to see if all the blood is from the same person

avoid contamination of samples

collects blood from various places

unwanted material in the sample could ruin the evidence

prevent change or deterioration to samples

places blood samples in freezer

so that the blood can be analysed at a later time

avoid tampering of samples

places blood in a sealed tube

so the evidence remains secure

[4]

(b) When the blood has been analysed the data tells the scientist

- **the blood group**
- **the proportion of red cells, white cells and platelets**
- **the DNA profile.**

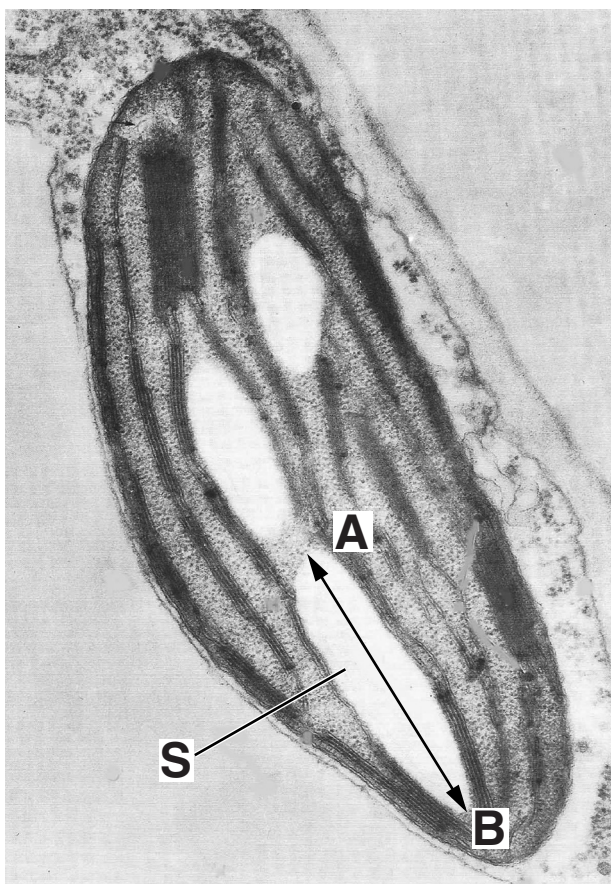
Suggest two ways that the scientist could present this data.

1 _____

2 _____ **[2]**

[Total: 6]

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



- (a) Structure S is a starch grain.
How many starch grains are visible in the electron micrograph?

answer _____ [1]

- (b) Measure the length of the image of the starch grain between points A and B.

length = _____ mm [1]

- (c) The magnification of the image is $\times 10\,000$.
Calculate the **ACTUAL** length of the starch grain.
Show your working.

actual length
of starch grain = _____ mm [2]

[Total: 4]

END OF QUESTION PAPER

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