

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
ADDITIONAL APPLIED SCIENCE A
Unit 3: Scientific Detection (Foundation Tier)

A325/01

Wednesday 16 June 2010
Morning

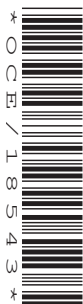
Duration: 45 minutes

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. Additional paper may be used if necessary but you must clearly show your Candidate Number, Centre Number and question number(s).

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.

Answer **all** the questions.

1 Collecting, storing and preparing scientific evidence is an important part of scientific detection.

(a) Which of the following is **not** a stage in this process?

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

- | | |
|--|--------------------------|
| collect representative samples | <input type="checkbox"/> |
| copy samples for multiple use | <input type="checkbox"/> |
| prevent change or deterioration of samples | <input type="checkbox"/> |
| avoid contamination of samples | <input type="checkbox"/> |
| avoid interfering with samples | <input type="checkbox"/> |

[1]

(b) Public laboratories that carry out tests have to be accredited by the United Kingdom Accreditation Service (UKAS).



The UKAS accreditation mark

(i) Which of the following is a reason for being accredited?

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

- | | |
|-----------------------------------|--------------------------|
| to ensure good working conditions | <input type="checkbox"/> |
| so everyone has equal pay | <input type="checkbox"/> |
| to maintain reliability | <input type="checkbox"/> |
| to save money | <input type="checkbox"/> |

[1]

(ii) Analysts carry out proficiency tests.

Which statement best explains why?

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

to ensure workers pass their cycling proficiency test

to check the quality of their work

to ensure that they make sufficient profit

to make sure the test is the same every time

[1]

(c) Good laboratory practice is important.

Which statements best describe what good laboratory practice depends upon?

Put ticks (✓) in the boxes next to the **three** best answers.

keeping to health and safety regulations

painting the laboratory every two years

having a good internal telephone system

updating the computers to the latest models every twelve months

paying for employees' lab-coats to be washed and replaced

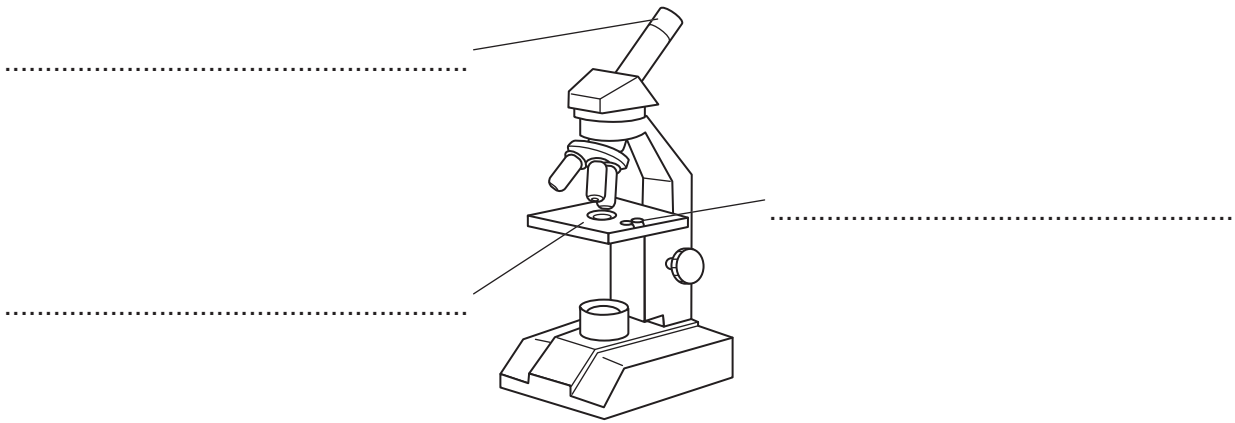
regular maintenance and checking of equipment

training and professional development of staff

[3]

[Total: 6]

2 Scientists sometimes use light microscopes when examining evidence.



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

Choose from the following parts of a microscope.

- eyepiece focussing-knob lamp objective-lens slide-clip stage**

[2]

(b) The microscope in the drawing is used with a $\times 20$ eyepiece and a $\times 40$ objective lens.

Calculate the magnifying power of the microscope.

Show your working.

answer [2]

(c) The microscope provides greater detail by increasing the magnification and the resolution of the image.

Draw straight lines linking together the **statement** with its correct **explanation**.

statement	explanation
magnification	separates out detail
resolution	shows things in colour
	makes the image larger

[2]

[Total: 6]

3 Police investigate a crime scene.

Surveillance cameras took photographs at regular intervals.

These are two photos of the crime scene.



photo 1 – before crime



photo 2 – after crime

scale of stolen picture in photo 1 $\text{H} = 10\text{cm}$

(a) The thieves stole three items including a picture.

Put rings around **two** other items in **photo 1** which were stolen.

[2]

(b) Use the scale to estimate the width of the stolen picture in **photo 1**.

answer [2]

(c) Describe **two other** ways, other than photographic images, that the police could record the images of the crime scene.

.....

..... [2]

[Total: 6]

4 Sometimes electron microscopes are used to examine evidence.

(a) Which of the statements about electron microscopes is true?

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

An electron microscope uses a beam of ...

... electrons only.

... light only.

... both electrons and light.

... neither electrons nor light.

[1]

(b) Which of the statements about atoms and electrons is true?

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

An atom consists of a tiny ...

... negative nucleus surrounded by positive electrons.

... positive nucleus surrounded by positive electrons.

... negative nucleus surrounded by negative electrons.

... positive nucleus surrounded by negative electrons.

[1]

(c) Electron microscopes can only be used with certain types of samples.

Which **two** statements are good examples of this limitation?

Put ticks (✓) in the boxes next to the correct answers.

Electron microscopes **cannot** be used to examine ...

... very thick specimens.

... living organisms.

... specimens that are opaque.

... moving objects.

... specimens that are very hard.

[2]

(d) Describe one **other** disadvantage and one advantage of using an electron microscope.

disadvantage

.....

advantage

..... [2]

[Total: 6]

5 Two-way paper chromatography can be used to separate the different food dyes in drinks.

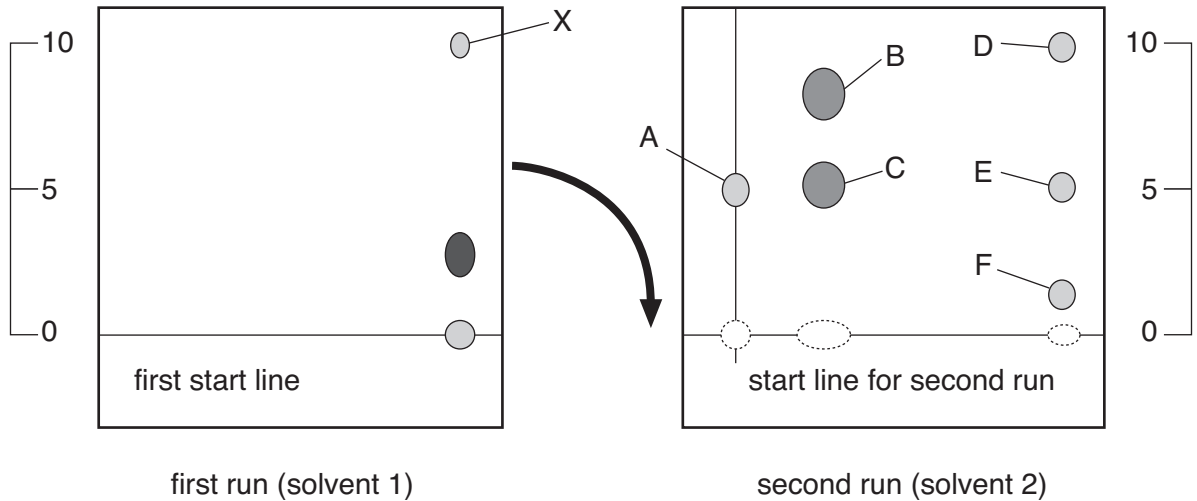
First a normal paper chromatogram is made and left to dry.

The paper is then turned through 90° and the process is repeated using a different solvent.

Food dyes have different solubilities in different solvents.

The diagrams show the results of each stage for a coloured drink.

(a) Use the information from these diagrams to answer these questions.



(i) In the left hand diagram, put a ring around the spot which is **insoluble** in solvent 1. [1]

(ii) For the second run, how many different colours have been separated from spot X?

answer [1]

(iii) In **total**, how many coloured spots have been separated by using this two-way method?

answer [1]

(iv) If only one-way chromatography had been used, using solvent 2 only, which dyes would **not** have been separated?

answer [1]

(b) Paper chromatograms have both stationary and mobile phases.

Draw a straight line linking the **phase** with its correct **description**.

phase	description
mobile phase	solvent
stationary phase	dyes
	paper

[2]

(c) Explain why forensic scientists use standard reference dyes in their chromatograms.

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

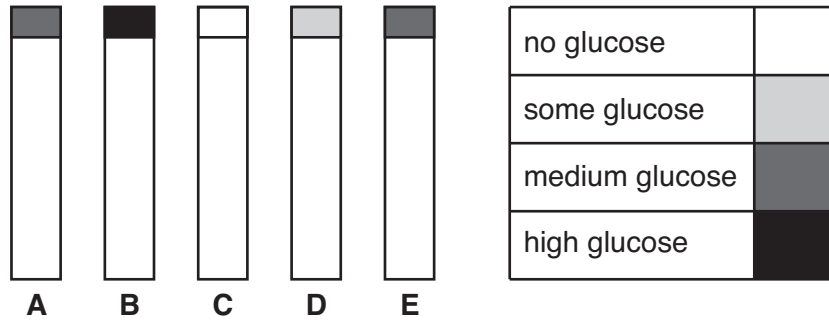
[Total: 7]

6 Diabetics excrete excess glucose in their urine.

The amount of glucose in the urine can be tested with clinisticks.

(a) Five different patients, **A**, **B**, **C**, **D** and **E**, had their urine tested for glucose.

Here are the results of the tests.



(i) Which patients, out of **A**, **B**, **C**, **D** and **E**, do **not** appear to be diabetic?

answer [1]

(ii) Which patient has the most glucose in their urine?

Choose from **A**, **B**, **C**, **D** and **E**.

answer [1]

(b) Litmus is another colour test that scientists sometimes use.

- (i) Draw a straight line to show what each **colour change** shows about the **pH range** of the solution.

colour change	pH range
red turns to blue	acidic
neither colour changes	neutral
blue turns to red	alkaline

[2]

- (ii) What is this type of test called?

Put a ring around the best answer.

proficiency **qualitative** **quantitative** **semi-quantitative** **thin-layer**

[1]

[Total: 5]

END OF QUESTION PAPER

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