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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**

Unit 3: Scientific Detection (Foundation Tier)

WEDNESDAY 16 JUNE 2010: Morning

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:

Two loose photosheets for question 3.

OTHER MATERIALS REQUIRED:

Pencil

Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **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.**
- **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.**

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Question 1 begins on page 4

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

copy samples for multiple use

prevent change or deterioration of samples

avoid contamination of samples

avoid interfering with samples

[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

so everyone has equal pay

to maintain reliability

to save money

[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

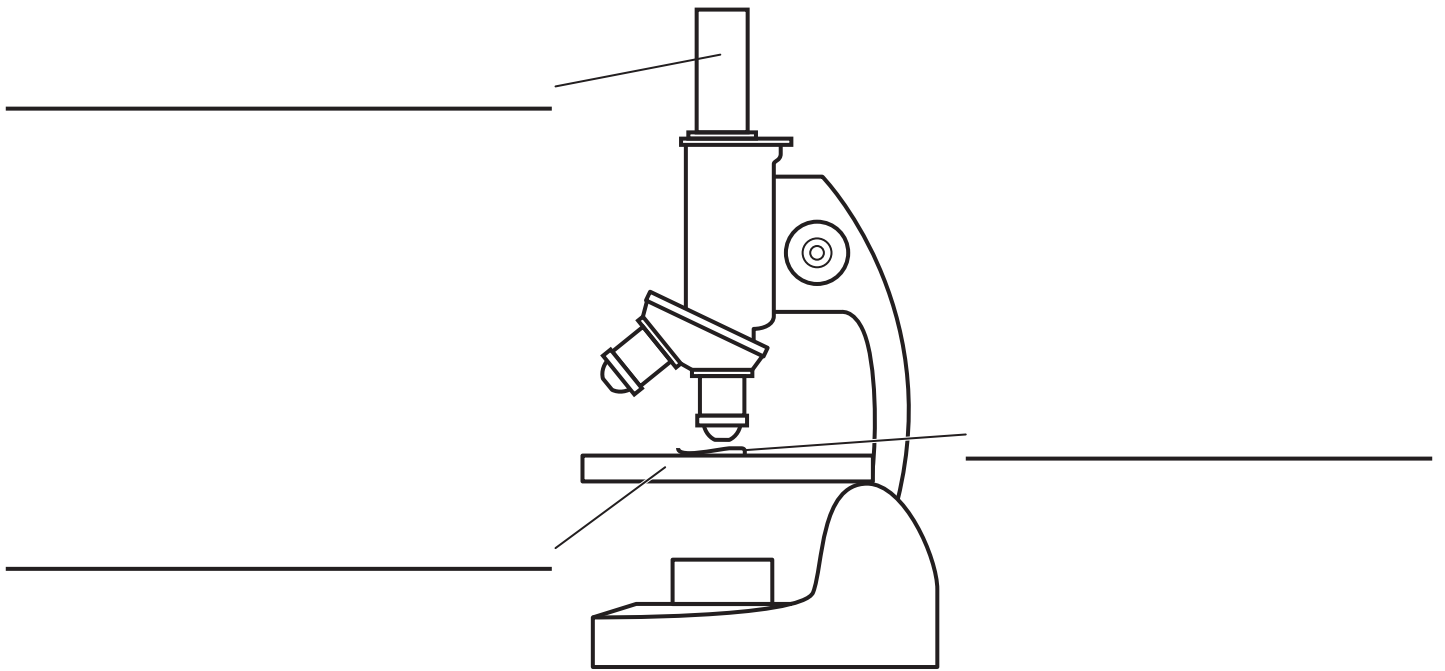
regular maintenance and checking of equipment

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]

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3 Police investigate a crime scene.

Surveillance cameras took photographs at regular intervals.

Look at the two photos on the inserts.

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

Put ring around TWO other items in PHOTO 1 (on the insert) which were stolen.

[2]

(b) scale of stolen picture in photo 1

┆──┆ = 10 cm

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.

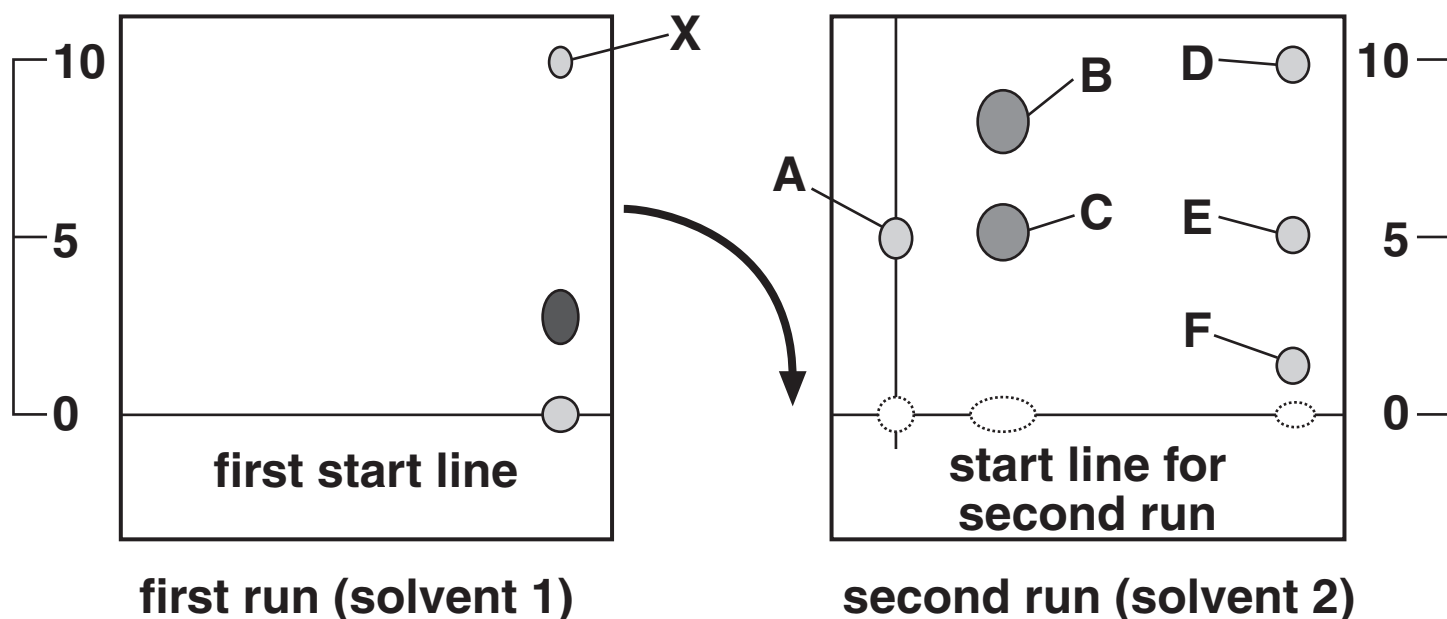
First a normal paper chromatogram is made and left to dry.

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

stationary phase

solvent

dyes

paper

[2]

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

_____ [1]

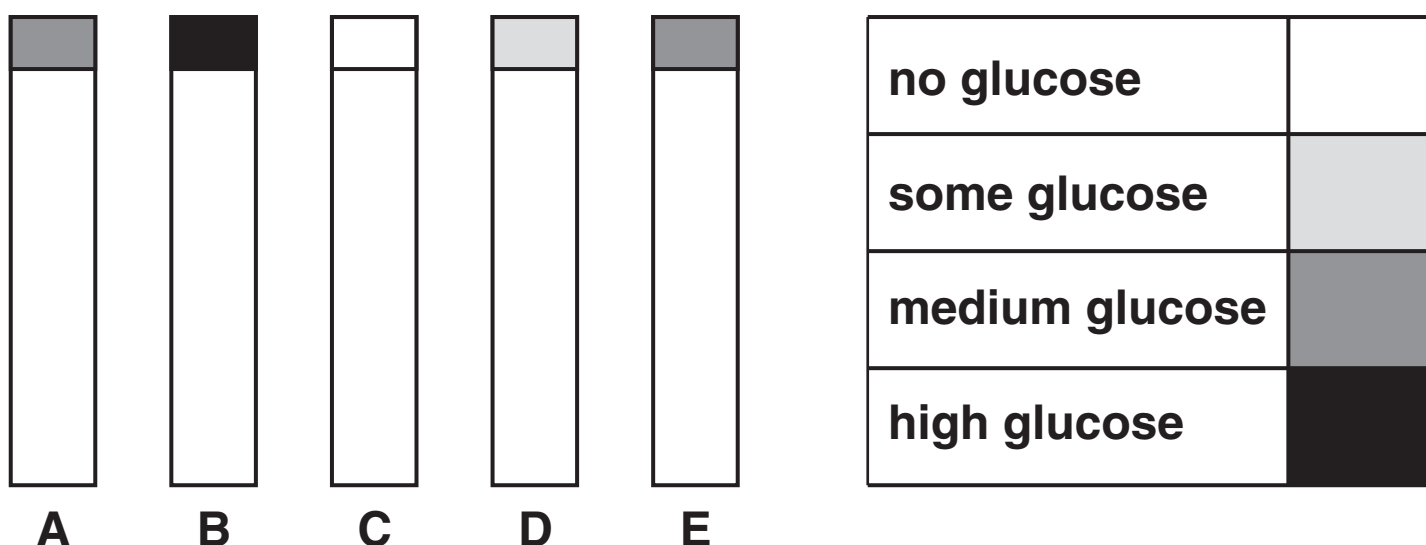
[Total: 7]

6 Diabetics excrete excess glucose in their urine.

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

(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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