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Wednesday 30 May 2012 – Afternoon

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

A325/01 Scientific Detection (Foundation Tier)

Candidates answer on the Question Paper.
A calculator may be used for this paper.

Duration: 45 minutes

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, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB 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.

Answer **all** the questions.

- 1 Scientific detection is used in law enforcement (Forensic Science Service), environmental protection (Environment Agency) and consumer protection (Food Standards Agency).

- (a) Insert the **code letter** of each organisation to show which is responsible for each **type of scientific detection**.

For Forensic Science Service insert code **A**.

For Environment Agency insert code **B**.

For Food Standards Agency insert code **C**.

type of scientific detection	code letter
match and identify finger prints	
monitor river water samples	
check air quality	
investigate outbreaks of food poisoning	
check the safety of food packaging	
analyse samples from a crime scene	

[2]

- (b) **Collecting** and **storing** scientific evidence is an important part of scientific detection.

Which of the following are stages in this process?

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

collect representative samples	
copy samples for multiple use	
dispose of samples within a six week period	
avoid contamination of samples	
avoid interfering with samples	

[2]

- (c) Good laboratory practice is important to produce reliable results. Good laboratory practice depends upon
- keeping to health & safety regulations
 - maintenance and checking of equipment
 - staff training.

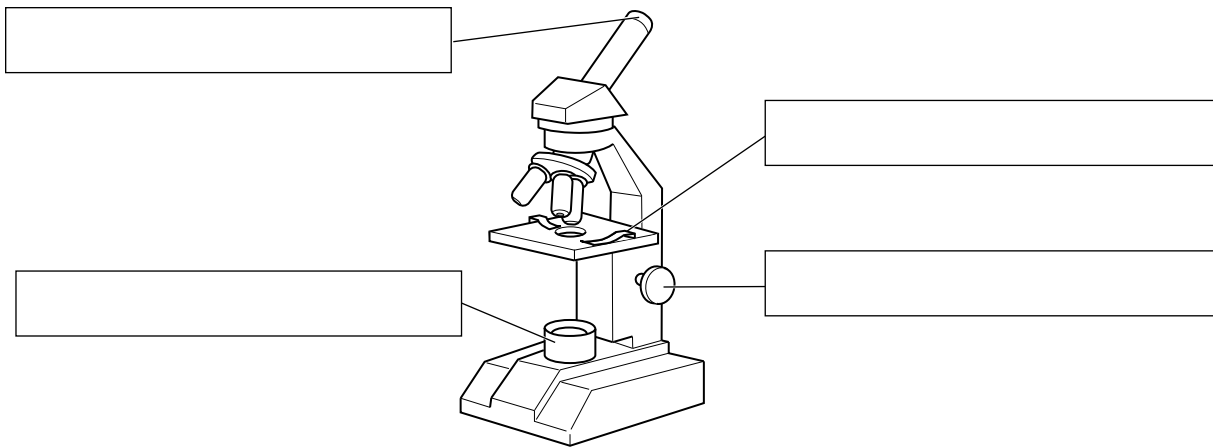
Complete the table about good laboratory practice.
Put a tick (✓) in the correct box for each **row**.

task	health & safety	checking equipment	staff training
clearing the work surface after completing an investigation			
showing a colleague how to operate new equipment			
calibrating a colorimeter			
attending courses on new techniques and methods			
having a first aider's telephone number on the wall			

[2]

[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 $\times 15$ eyepiece and a $\times 50$ objective lens. Calculate the magnifying power of the microscope. Show your working.

answer = [2]

(c) Light microscopes have some advantages and some disadvantages compared to electron microscopes.

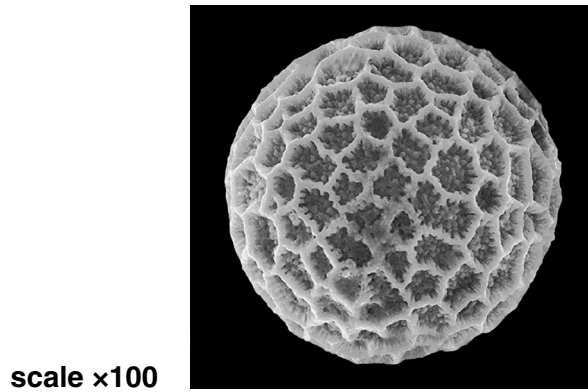
Complete the table by putting a tick (\checkmark) in the box next to each **advantage** of a light microscope compared to an electron microscope.

electron microscopes have greater magnification	
light microscopes are quicker to set up	
electron microscopes are more expensive	
light microscopes can examine living material	
electron microscopes have greater resolution	

[2]

[Total: 6]

3 A forensic scientist examines a pollen grain found on a suspect's clothing.



(a) Describe two of the main features of the **pollen grain**.

feature 1

.....

feature 2

.....

[2]

(b) Calculate the actual size of the pollen grain.

(i) Use your ruler to measure the width of the pollen grain image.

answer = mm [1]

(ii) Use the **scale** to calculate the actual size of the pollen grain.
Show your working.

answer = mm [2]

[Total: 5]

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 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) Other ways of collecting information include colour matching and colorimetry.

Which of these statements describe what colorimetry can be used for?
Put ticks (✓) in the boxes next to the **two** correct answers.

Colorimetry can be used to ...

... find the pH of different substances.	
... produce quantitative results.	
... discriminate between different colours.	
... identify different substances.	
... measure the intensity of a colour.	

[2]

(d) Explain why using cards of different colours is not a very accurate way of matching the colour of a sample during analysis.

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.....

..... [2]

[Total: 6]

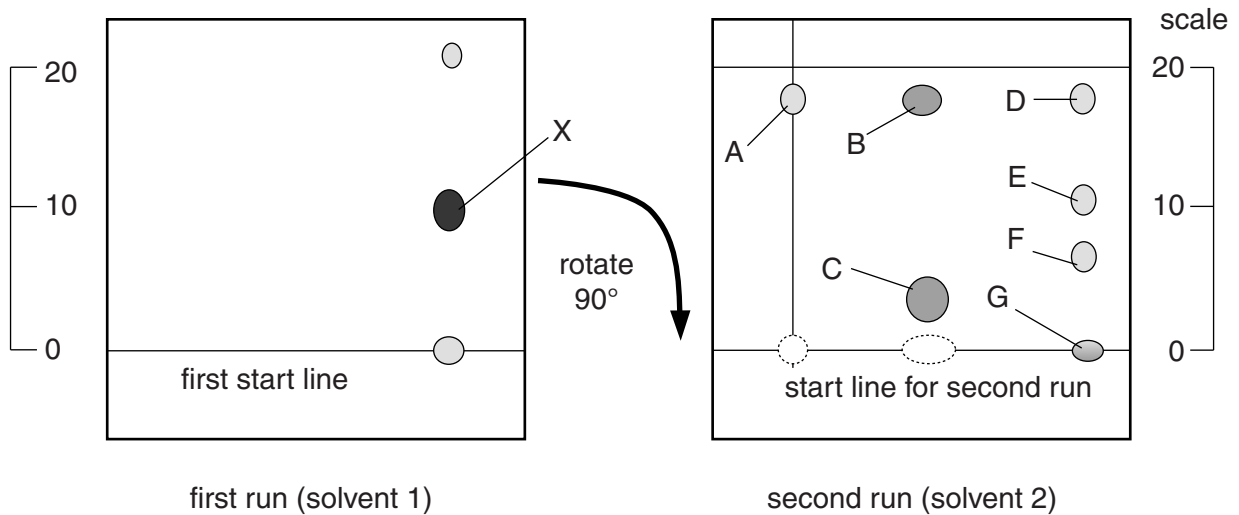
- 5 Two-way paper chromatography can be used to separate the different food dyes in drinks.

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 solubility 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) Write down the letter of the dye which is **insoluble** in solvent 2.
 [1]
- (ii) For the second run, how many different colours have been separated from spot **X**?
 [1]
- (iii) In **total**, how many colours have been separated by using this two-way method?
 [1]
- (iv) If only solvent 2 had been used to make a one-way chromatogram from the drink, which dyes would **not** have been separated?
 [1]

- (b) Paper chromatograms have both stationary and mobile phases. Draw a straight line linking the **phase** with its correct **description**.

phase	description
stationary phase	dyes
mobile phase	solvent
	paper

[1]

- (c) Explain the advantages of using gas chromatography (GC) over paper chromatography when separating complex mixtures.

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.....

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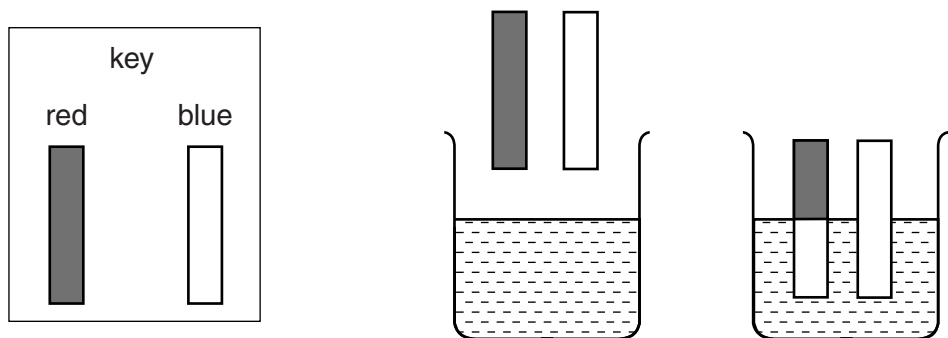
..... [2]

[Total: 7]

6 William tests an unknown solution with both red and blue litmus paper.

(a) The bottom part of each strip of litmus paper is dipped into the solution.

Here are the results of the tests.



(i) What does the result tell William about the solution?

..... [1]

(ii) Explain why this is an example of a qualitative test.

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

(b) Write down an example of a semi-quantitative test used in colour analysis.

..... [1]

(c) Write down two medical conditions for which colour testing kits are used for diagnosis.

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

[Total: 6]

END OF QUESTION PAPER

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