

**GENERAL CERTIFICATE OF SECONDARY EDUCATION  
TWENTY FIRST CENTURY SCIENCE  
ADDITIONAL APPLIED SCIENCE A**

**F A325/01**

Scientific Detection  
FOUNDATION TIER

**THURSDAY 21 JUNE 2007**

Afternoon

Time: 45 minutes

Calculators may be used.

Additional materials: Pencil  
Ruler (cm/mm)



\* G C P / T 2 6 2 6 0 \*

Candidate  
Name

Centre  
Number

|  |  |  |  |  |
|--|--|--|--|--|
|  |  |  |  |  |
|--|--|--|--|--|

Candidate  
Number

|  |  |  |  |
|--|--|--|--|
|  |  |  |  |
|--|--|--|--|

**INSTRUCTIONS TO CANDIDATES**

- Write your name, Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.

**INFORMATION FOR CANDIDATES**

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The marks allocated and the spaces provided for your answers are a good indication of the length of answers required.

**FOR EXAMINER'S USE**

| Qu.          | Max.      | Mark |
|--------------|-----------|------|
| 1            | 4         |      |
| 2            | 6         |      |
| 3            | 7         |      |
| 4            | 8         |      |
| 5            | 5         |      |
| 6            | 6         |      |
| <b>TOTAL</b> | <b>36</b> |      |

This document consists of **10** printed pages and **2** blank pages.

Answer **all** the questions.

1 In order to make well informed decisions, accurate and reliable scientific data is essential.

The following organisations all need to gather scientific data.

(a) Draw straight lines to link each **agency** with the kind of **information it gathers**.

One has been done for you.



[3]

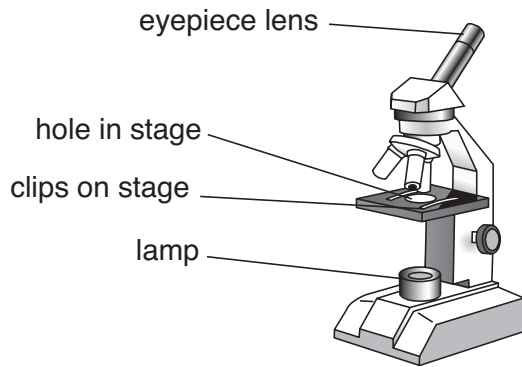
(b) Describe **one** example of the role of a person who works in the Forensic Science Service.

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

[Total: 4]

2 Microscopes are used to collect information.

(a) Look at the picture of a microscope.



Explain what each part does.

- (i) clips on stage ..... [1]
- (ii) lamp ..... [1]
- (iii) hole in stage ..... [1]
- (iv) eyepiece lens ..... [1]

(b) Soil samples can be studied using a microscope.

Look at the images of two soil samples, **A** and **B**.



Describe **two** features of the images that show they are the **same** type of soil.

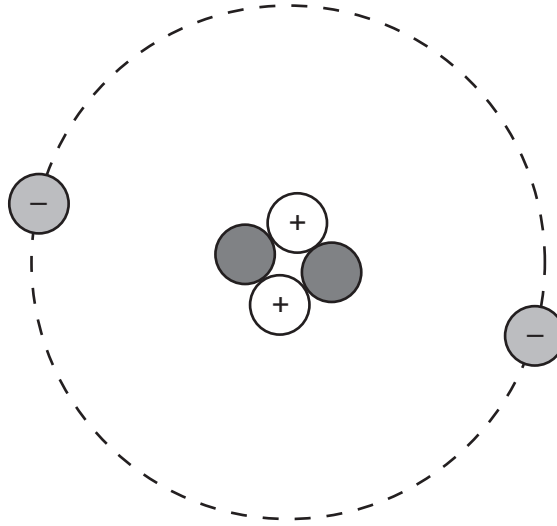
- 1 .....
- .....
- 2 .....
- ..... [2]

[Total: 6]

3 Jane is a forensic scientist.

She uses both an electron microscope and a light microscope in her work.

(a) Look at this diagram of a simple atom.



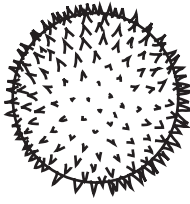
[1]

(i) Put a ring around a particle, in the atom, that is used in an electron microscope to produce images.

(ii) Name this particle.

..... [1]

(b) Look at the image of a pollen grain seen through a light microscope.



The pollen grain is **0.05 mm** in diameter.

(i) Measure the diameter of the image of the pollen grain with your ruler.

diameter = ..... mm [1]

(ii) Calculate the magnification of the image of the grain.

Show your working.

magnification =  $\times$  ..... [2]

(c) Jane uses both a light microscope and an electron microscope in her work.

Describe **two** differences between a light microscope and an electron microscope.

.....

.....

.....

..... [2]

[Total: 7]

4 Davina is a farmer. She wants to know whether her soil is acidic or alkaline.

She carries out a test on the soil using a chemical that changes colour (indicator).

(a) (i) Name a chemical (indicator) that she can use.

..... [1]

(ii) State the colour she would see if the soil was **acidic**.

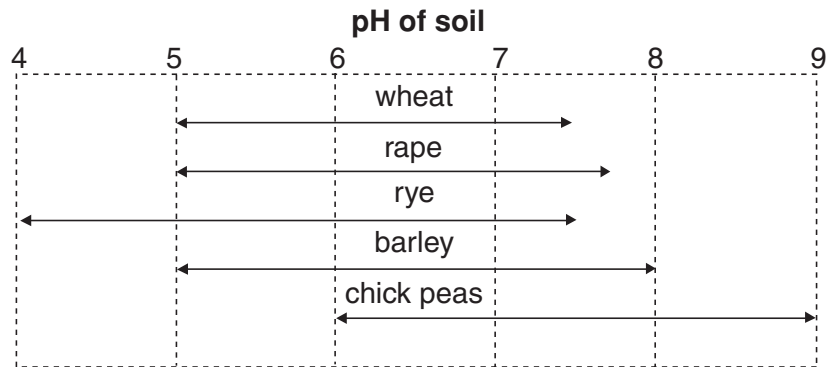
..... [1]

(iii) State the colour she would see if the soil was **alkaline**.

..... [1]

(b) Davina knows that acidity and alkalinity are measured using a pH scale.

The table shows the pH ranges in which different crops grow best.



Choose from the crops in the table to answer the questions.

Each crop may be used once, more than once or not at all.

(i) Which crop grows over the widest pH range?

..... [1]

(ii) Which crop has the narrowest pH range in which it will grow?

..... [1]

(iii) Which crop can grow in the most alkaline soil?

..... [1]

(iv) How many of the crops can grow in a neutral soil?

..... [1]

(v) Which crop can grow in the most acidic soil?

..... [1]

[Total: 8]

5 Jason works in a laboratory.

He uses this standard procedure to separate food colourings in a hard sweet.

|                |  |
|----------------|--|
| <b>stage 1</b> | Dissolve the sweet in distilled water.   |
| <b>stage 2</b> | Place drops of reference food colourings on chromatography paper.  |
| <b>stage 3</b> | Place a drop of the dissolved sweet on the chromatography paper.   |
| <b>stage 4</b> | Place the paper in a tank of solvent so that the drops of colourings are above the surface of the solvent. |
| <b>stage 5</b> | Cover the tank.  |
| <b>stage 6</b> | Leave until the solvent has soaked nearly up to the top of the paper.                                      |
| <b>stage 7</b> | Remove the paper and dry the chromatogram.   |

Choose from the following statements to help you answer the questions

- to stop the solvent evaporating off the paper
- to see what food colourings were in the sweet
- to get maximum separation of the food colourings
- to see into the tank
- food colourings only separate when dissolved
- so the food colourings did not go into the solvent.

(a) Why did Jason dissolve the sweet in water?

..... [1]

(b) Why did Jason place drops of reference colourings on the paper?

..... [1]

(c) Why did Jason make sure the drops of food colouring were above the surface of the solvent?

..... [1]

(d) Why did Jason cover the tank?

..... [1]

(e) Why did Jason leave the paper until the solvent had soaked nearly up to the top of the paper?

..... [1]

[Total: 5]

6 Data can be collected using a variety of instruments and measuring equipment.

Describe **one advantage** and **one limitation** of using the following instruments or methods.  
Do **not** include cost.

You **must not** give the same advantage or limitation more than once.

**(a) light microscope**

advantage .....

.....

limitation .....

..... [2]

**(b) electron microscope**

advantage .....

.....

limitation .....

..... [2]

**(c) chromatography**

advantage .....

.....

limitation .....

..... [2]

[Total: 6]

**END OF QUESTION PAPER**

**10**  
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