Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

A325/01

TWENTY FIRST CENTURY SCIENCE

ADDITIONAL APPLIED SCIENCE A

Scientific Detection
(Foundation Tier)

FRIDAY 19 JUNE 2009: 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:

None

OTHER MATERIALS REQUIRED:

Pencil
Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

DC (AC/JG) OV90904 13092/2

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, however additional paper may be used if necessary.**

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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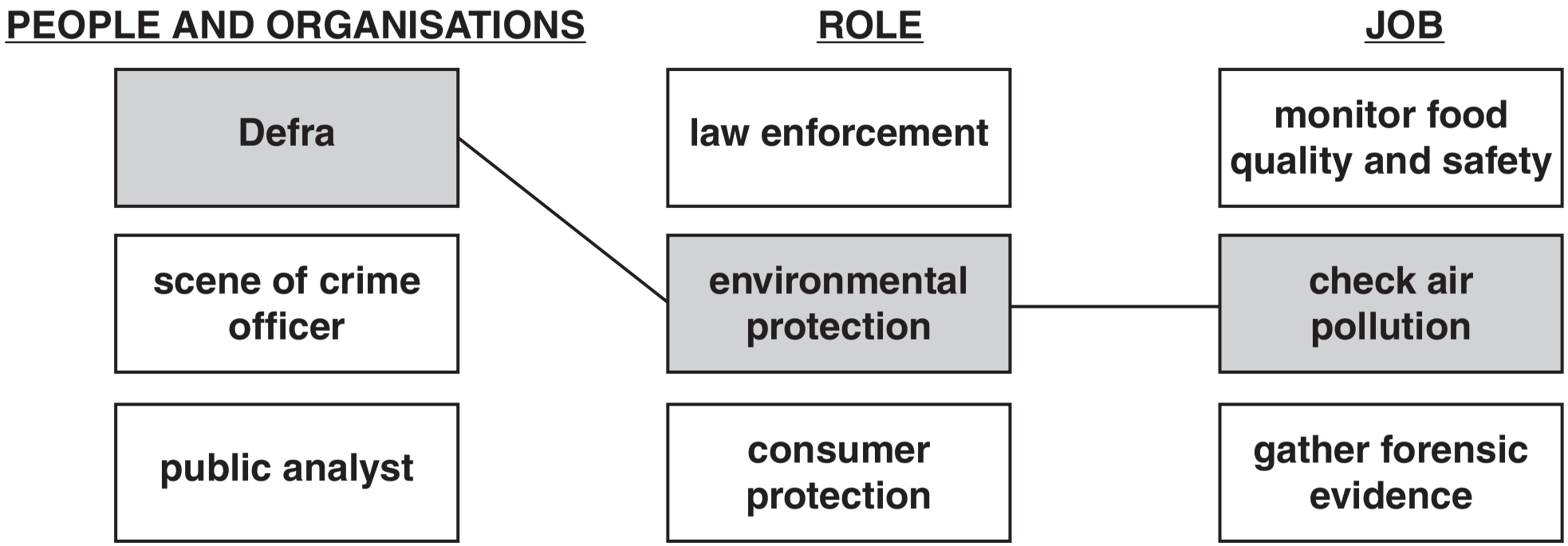
Answer ALL the questions.

1 Scientific detection is carried out in many different ways.

(a) On the page opposite, draw a straight line to link PEOPLE AND ORGANISATIONS with their correct ROLE. Draw a second straight line from the ROLE to the JOB they carry out.

One has been done for you. [2]


PEOPLE AND ORGANISATIONS
ROLE
JOB
Defra
law enforcement
monitor food quality and safety
scene of crime officer
environmental protection
check air pollution
public analyst
consumer protection
gather forensic evidence

(b) Good laboratory practice is very important.

Which of the following help with good laboratory practice?

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

car parking facilities for workers	
good health and safety procedures	
looking after and checking equipment	
making sure staff are well trained	
lots of staff to carry out all the procedures	

[3]

[Total: 5]

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2 A scene of crime officer attends a murder.

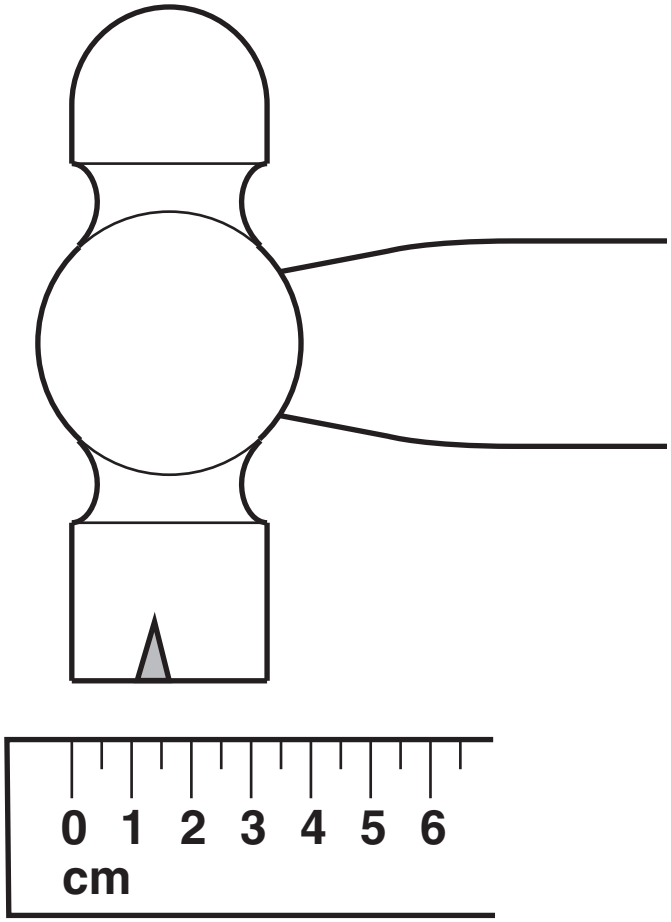
(a) State three different ways in which she can record <u>IMAGES</u>.

1 _____

2 _____

3 _____ **[3]**

(b) The murder weapon is a hammer.
The officer measures the size of the hammer head.



(i) Estimate the distance across the head of the hammer.

You <u>MUST</u> use the ruler in the picture.

_____ mm [2]

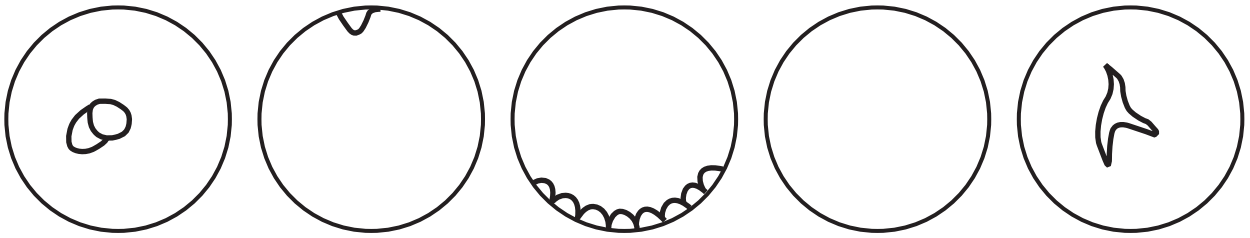
(ii) Identify one important feature that could be used to identify this particular hammer as the murder weapon.

_____

_____ [1]

(iii) The scientist used the hammer to make a plasticine mould.

Which of the following moulds, <u>A</u>, <u>B</u>, <u>C</u>, <u>D</u> or <u>E</u>, was made by the hammer?



A **B** **C** **D** **E**

answer _____ [1]

[Total: 7]

3 Steve makes a stained temporary slide of blood for microscopic examination.

(a) Explain how he carries out this procedure in four steps.

Use all the words provided in your explanation.

COVERSLIP

MICROSCOPE

SLIDE

SPECIMEN

STAIN

step 1_____

step 2_____

step 3_____

step 4_____ **[4]**

(b) Steve uses a ×20 objective lens and a ×10 eyepiece lens.

Calculate the magnifying power of the microscope.

Show your working.

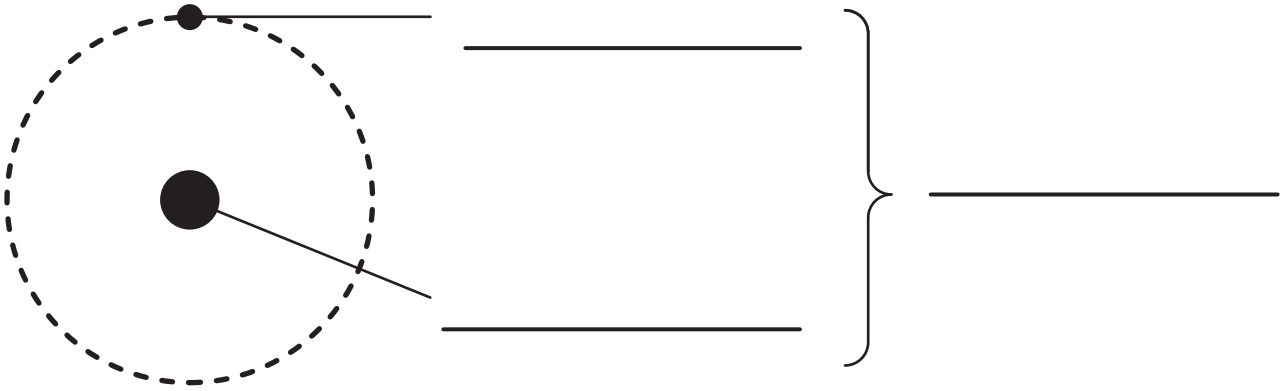
× _____ [1]

[Total: 5]

4 Electron microscopes use a beam of electrons to produce images of a specimen.

(a) Complete the diagram of an atom using these words.

ATOM **ELECTRON** **NUCLEUS**



[2]

(b) Electron microscopes show more detail than light microscopes.

Which of the statements explains why?

Put a tick (✓) in the box next to the <u>CORRECT</u> answer.

An electron microscope …

… is more expensive to buy.	
… has a more powerful eyepiece lens.	
… uses light instead of electrons.	
… has greater magnification.	
… is more difficult to use.	

[1]

(c) There are some cases where electron microscopes cannot be used.

Which of the statements best describe these LIMITATIONS?

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

Electron microscopes are limited because …

… images are produced on a TV screen.	
… living material cannot be viewed.	
… very thin samples can be viewed.	
… materials must be dried and fixed.	
… very high magnification can be used.	

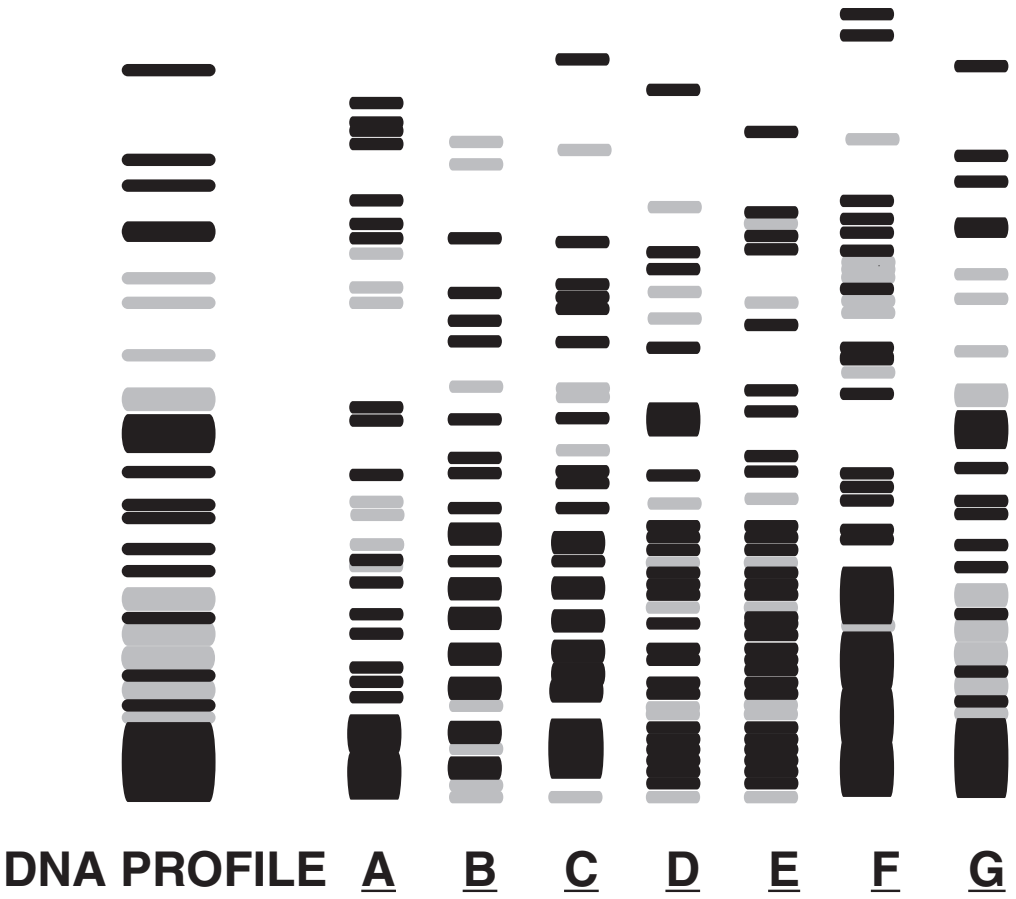
[2]

[Total: 5]

5 DNA profiling is used by forensic scientists.

A blood stain from a crime scene was used to produce a DNA profile.

This DNA profile was compared with DNA profiles from seven suspects (A to G).



(a) Which of the suspects, A, B, C, D, E, F or G, does the profile match?

_____ **[1]**

(b) Which of the statements about DNA profiling are correct?

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

uses electrophoresis	
produces an image of the suspect's face in profile	
can be used on small biological samples	
joins together strands of DNA	
separates the DNA into different colours	

[2]

(c) Give TWO different uses of DNA profiling.

1 _____

_____

2 _____

_____ **[2]**

[Total: 5]

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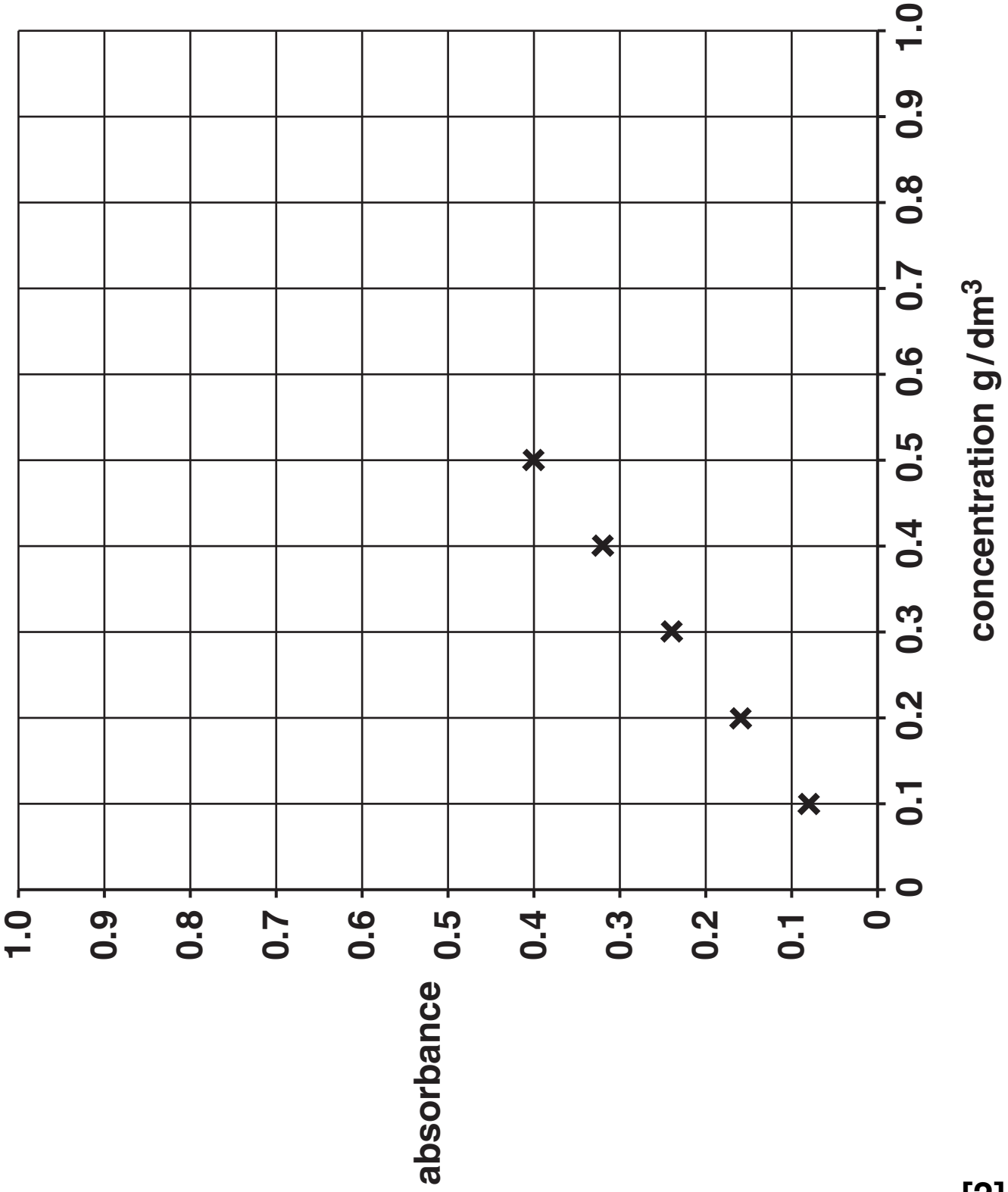
6 Colorimeters are used in analysis.

This data was collected for solutions of a coloured substance.

CONCENTRATION g/dm^3	ABSORBANCE
0.1	0.08
0.2	0.16
0.3	0.24
0.4	0.32
0.5	0.40
0.6	0.48
0.7	0.62
0.8	0.64
0.9	0.72
1.0	0.80

(a) **Use the data to plot the calibration graph. Some points have been done for you.**

Draw the line of best fit.



[2]

(b) On the graph on the previous page put a ring around the result which appears the least reliable (outlier). [1]

(c) An unknown concentration of the substance has an absorbance of 0.28.

What is the concentration of the dye in this solution?

_____ [2]

(d) Which of the following best describes what a colorimeter measures?

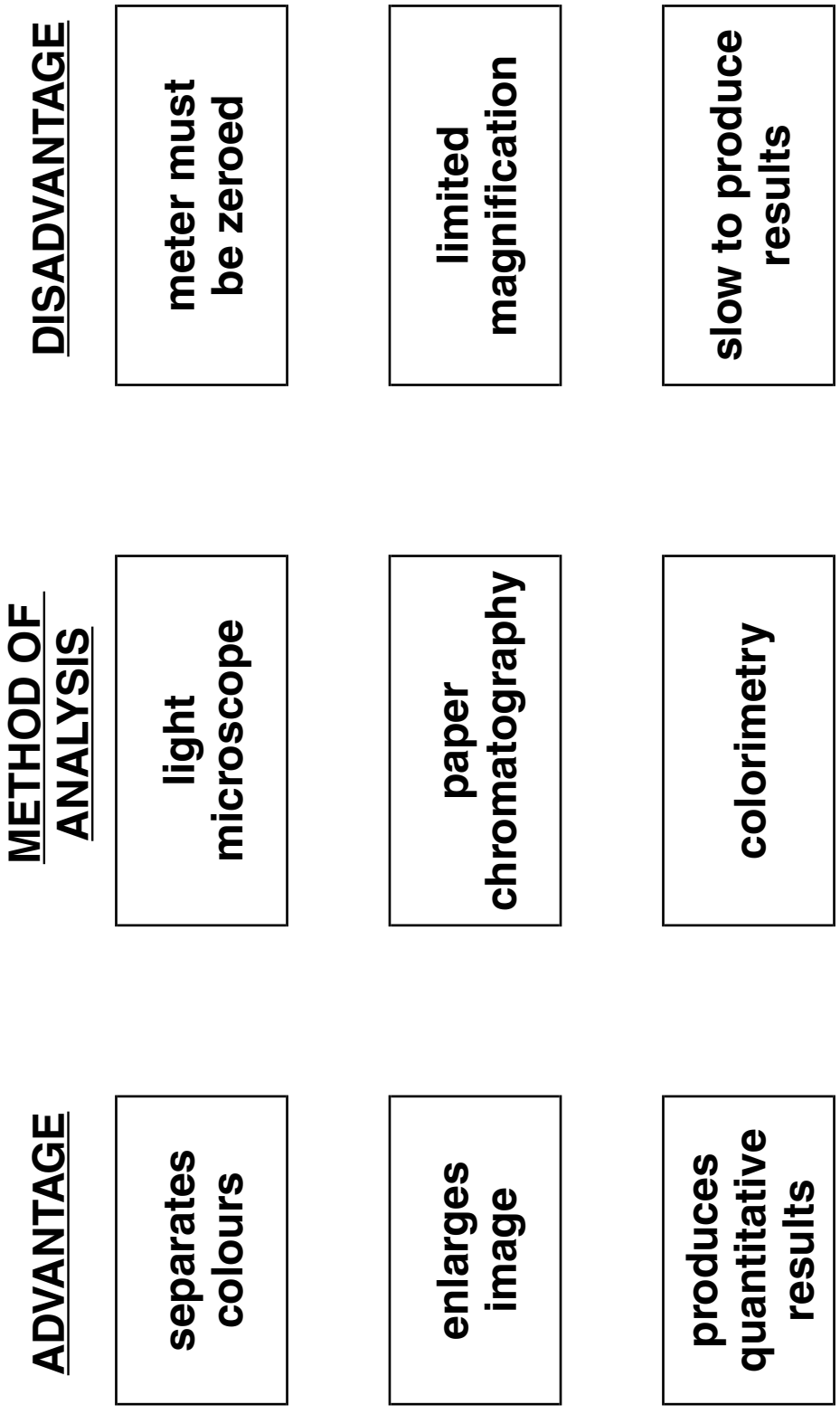
Put a tick (✓) in the box next to the CORRECT answer.

the shade of a colour	
the age of a substance	
the name of a substance	
the intensity of a colour	

[1]

(e) Each different method of analysis has advantages and disadvantages.

Draw a straight line to link the METHOD OF ANALYSIS, with its related ADVANTAGE, and its related DISADVANTAGE.



[3]

[Total: 9]

END OF QUESTION PAPER

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