



Centre Number

71

Candidate Number

General Certificate of Secondary Education
2010–2011

Science: Single Award (Modular)

Materials and their Management Module 4

Foundation Tier

[GSC41]



FRIDAY 12 NOVEMBER 2010, AFTERNOON

TIME

45 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.
Answer **all seven** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 45.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

A Data Leaflet, which includes a Periodic Table of the elements, is provided for your use.

For Examiner's
use only

Question Number	Marks
1	
2	
3	
4	
5	
6	
7	

Total
Marks

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2 (a) Below are **four** methods of crime detection used in forensic science. Using lines, link each method of detection to the evidence of a crime.

Method of detection

UV light

Breathalyser

Chromatography

Microscope

Evidence of a crime

Driver over the drink-drive limit

Different dyes in the ink of a forged cheque

Fingerprints on a window at a robbery

Fibres at the scene of a robbery

Forged bank notes

[4]

Examiner Only	
Marks	Remark

(b) A fingerprint was found on the door of a stolen white BMW car.

Examiner Only	
Marks	Remark

Forensic scientists used the stages below to make a copy of the fingerprint. The stages are not in the correct order.

- A Use a brush to dust off the excess powder
- B Gently lift off the sellotape
- C Place some sellotape over the fingerprint
- D Gently spread some carbon powder over the fingerprint

(i) Using the letters A,B,C and D, give the correct order.

Order _____ [2]

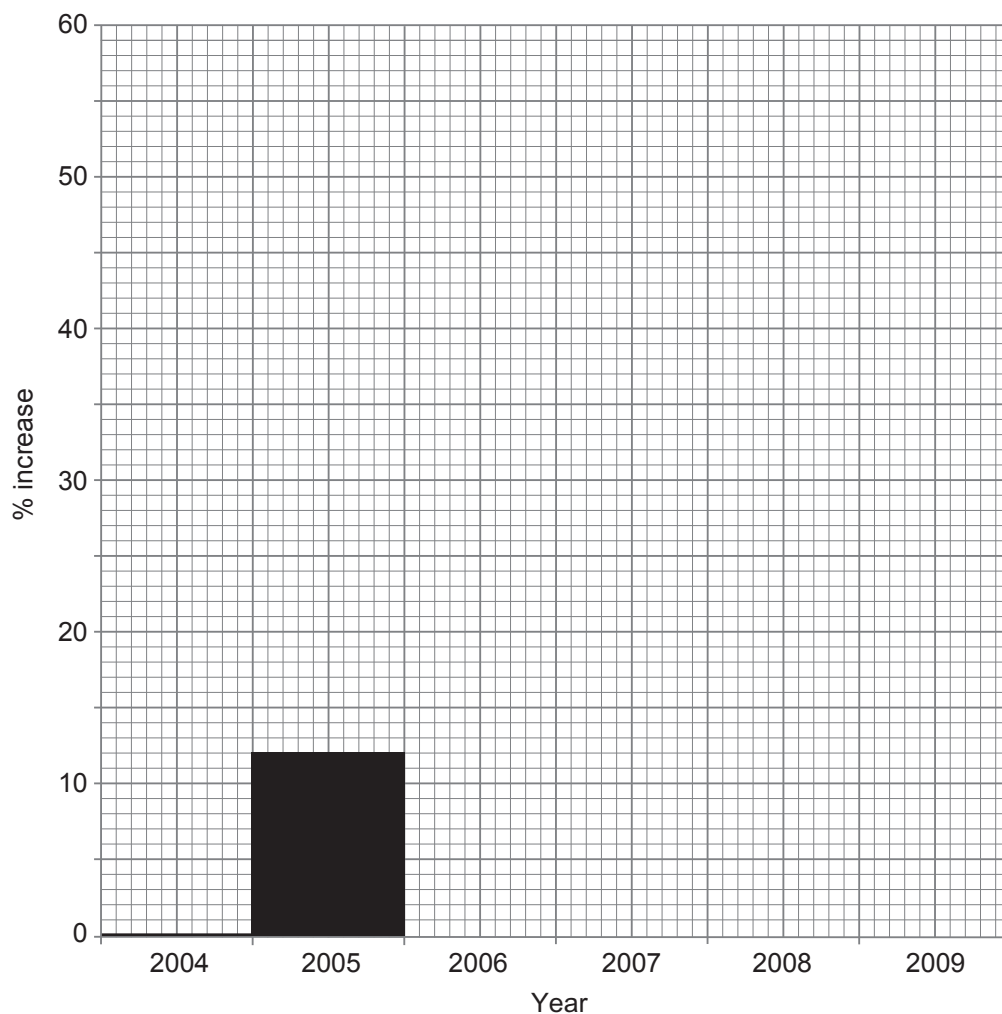
(ii) Why was carbon powder used to obtain the fingerprint from the white BMW car?

_____ [1]

- 3 The table below shows the yearly percentage increase in the amount of nano-silver produced by a chemical company from 2004 to 2009.

Year	% increase in nano-silver produced
2004	0
2005	12
2006	21
2007	34
2008	48
2009	59

- (a) (i) Complete **bar chart** using the information in the table.



[2]

Examiner Only

Marks Remark

Examiner Only	
Marks	Remark

(ii) Between which two years was there the greatest percentage increase in the production of nano-silver?

_____ and _____ [1]

(iii) Give one use of nano-silver.

_____ [1]

(iv) Complete the following sentence.

Nano-silver particles are _____ in **size** compared to normal silver particles. [1]

(b) The photochromic dye in the T-shirt below changes from blue to green in bright sunlight.



© Q Gifts Inc.

(i) What type of material is photochromic dye?

Choose from:

nano : smart : composite

_____ [1]

(ii) Why does the dye in the T-shirt change colour?

_____ [1]

4 (a) Classify the following materials into those which are biodegradable and those that are non-biodegradable.

copper : cardboard : polythene
bricks : grass : aluminium

Biodegradable	Non-biodegradable

[3]

(b) Explain fully why paper is described as a **biodegradable** material.

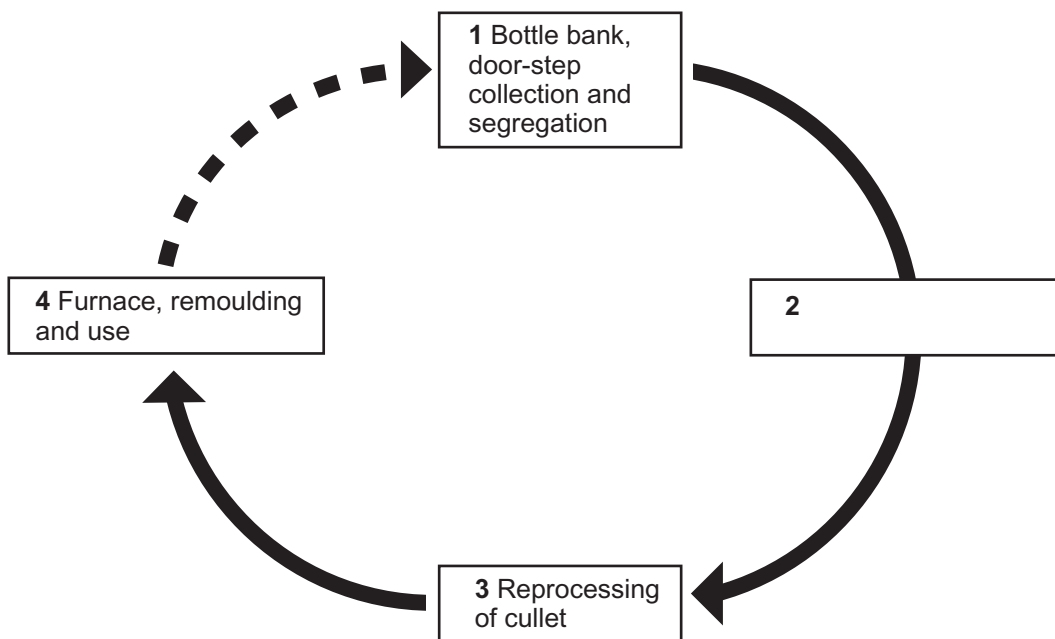
[2]

(c) Explain fully one problem that local councils have with plastic waste.

[2]

Examiner Only	
Marks	Remark

5 (a) The following block diagram shows the process for recycling glass.



(i) Explain what happens at stage 2 of the process.

_____ [1]

(ii) How is the glass from the bottle banks converted into cullet?

_____ [1]

(iii) Give one reason why it is important to recycle glass.

_____ [1]

(b) Suggest two reasons why many bottles are now made out of plastic rather than glass.

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

- 6 The table below gives information about the boiling range of some of the hydrocarbon fractions obtained from crude oil.

Fraction	Boiling range/°C	Number of carbon atoms in molecules
petrol	20–70	5 to 9
paraffin	120–170	10 to 14
diesel	170–230	15 to 20
tar	above 350	21 to 70

- (a) (i) Which fraction has molecules with the greatest number of carbon atoms?

_____ [1]

- (ii) Complete the following sentence to give a trend shown by the information.

As the number of carbon atoms in the molecules increases the

_____ [1]

- (iii) Give one use of the paraffin fraction.

_____ [1]

Examiner Only

Marks Remark

(b) One of the hydrocarbon fuels in the petrol fraction is octane.

(i) Explain fully why octane is a **hydrocarbon**.

_____ [2]

(ii) Complete the word equation for octane completely burning in oxygen.

octane + oxygen → water + _____ [1]

(iii) Give one reason why there is serious worldwide concern about the burning of octane.

_____ [1]

Examiner Only	
Marks	Remark

- 7 The hardness of four water samples (A, B, C and D) was investigated. Each sample was tested by shaking 25 cm³ with 25 drops of soap solution. The tests were then repeated with samples which had been boiled for two minutes. The results are shown in the table below.

Sample	Before boiling	After boiling
A	Lather	Lather
B	No lather	Lather
C	No lather	No lather
D	Lather	Lather

- (a) (i) Which sample (A, B, C or D) is permanent hard water?

_____ [1]

- (ii) Which sample (A, B, C or D) is temporary hard water?

_____ [1]

- (iii) Which sample (A, B, C or D) would give the greatest problem with kettle scale?

_____ [1]

- (iv) Give one thing that was done to make the above experiment a fair test.

_____ [1]

Examiner Only

Marks Remark

(b) (i) Name a chemical compound which is responsible for permanent hardness in water.

[1]

(ii) Complete the word equation to show how temporary hardness is removed.

Calcium hydrogen carbonate → _____ + carbon dioxide + _____

[2]

(iii) Give one method of removing permanent hardness.

[1]

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Marks	Remark

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