Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Science: Single Award (Modular)

Materials and their Management
Module 4
Higher Tier

[GSC42]

GSC42

TUESDAY 28 FEBRUARY 2012
9.30 am–10.15 am

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 six** 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	
Total Marks	

Examiner Only	
Marks	Remark

1 Bottles can be made from plastic or glass.

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(a) Give **one** advantage of using plastic instead of glass to make bottles.

_____ [1]

(b) Glass can be recycled. Give **two** ways that local councils are encouraging the recycling of glass.

1. _____

_____

2. _____

_____ [2]

(c) Give **two** reasons why it is important to recycle materials.

1. _____

2. _____ [2]

(d) Some companies are using biodegradable plastics to make their bottles.

(i) Explain fully what is meant by the term **biodegradable**.

_____

_____ [2]

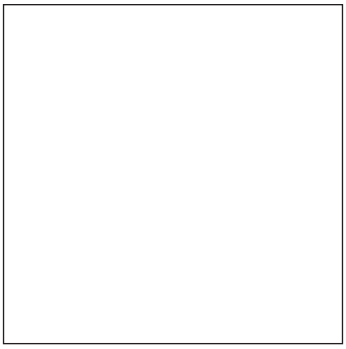
(ii) Give **one** other example of a biodegradable material.

_____ [1]

Examiner Only	
Marks	Remark

2 Fingerprints can be used to help solve crimes. There are four types of fingerprint patterns; arch, loop, whorl and composite.

(a) In the box below draw the pattern for a **whorl** fingerprint.



[1]

(b) Describe how you would obtain your fingerprint from a white surface such as a tile.

Your description must include:

- how the fingerprint is put onto the tile
- the powder used
- how you would remove excess powder
- how to remove the fingerprint from the tile

_____

_____

_____

_____

_____

_____

_____ [4]

(c) Apart from fingerprints, give **two** other types of forensic evidence which scientists collect at the scene of a crime.

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

3 The alcohol content of a drink is counted in units. For example a half pint of beer or one glass of wine each contains one unit of alcohol.

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(a) (i) Calculate the number of units of alcohol consumed by a person who drinks **three** pints of beer and **one** glass of wine.

_____ units [1]

(ii) Calculate the increase in blood alcohol this produces if:

1 unit of alcohol = 20 mg alcohol per 100 cm^3 of blood.

_____ mg alcohol per 100 cm^3 of blood [1]

(b) Explain fully why it would be dangerous to drive after consuming alcohol.

_____

_____ [2]

(c) Suggest **one** other drug that could affect a person's driving.

_____ [1]

Examiner Only	
Marks	Remark

4 **(a)** Nanotechnology is now being used to develop many new materials to replace older products. These new materials contain nano-sized particles.

(i) How many nanometres are in one metre?

Circle the correct answer.

100 : 1000 : 1 000 000 : 1 000 000 000 [1]

(ii) Scientists have found that nano-sized particles of silver have important uses. Give **one** use of silver nanoparticles.

_____ [1]

(b) **(i)** Thermochromic paint is a smart material.

Explain the meaning of the term 'smart material' and describe how thermochromic paint behaves as a smart material.

_____

_____

_____

_____ [3]

(ii) Shape memory metal is another example of a smart material; it can be used to make 'super-elastic' spectacle frames. Explain how this is useful if the spectacles' frame is damaged.

_____

_____ [1]

(c) Given below are some flame test results. Complete the table.

Metal Chloride	Flame Colour
Sodium	Yellow/orange
Potassium	
	Blue/white

[2]

Examiner Only	
Marks	Remark

5 Water that lathers easily with soap is described as **soft** water. Water that does not lather easily with soap is described as **hard** water.

(a) Sarah carried out an investigation to test the hardness of five samples of water. She recorded the results in the table below.

Sample	A	B	C	D	E
Height of lather/cm	10.5	12.0	1.0	2.0	13.5

(i) Which sample (**A**, **B**, **C**, **D** or **E**) was the hardest water?

Answer _____ [1]

(ii) Describe the experiment that Sarah carried out to obtain these results.

Your answer should include:

- how she would have used at least one piece of apparatus.
- how she would have made it a fair test.

_____

_____

_____

_____

_____

_____

_____ [3]

Examiner Only	
Marks	Remark

(b) **Calcium carbonate and calcium hydrogencarbonate** are two chemicals that can cause hard water. Give the **formula** of each of these compounds.

You may find your Data Leaflet useful.

Calcium carbonate _____

Calcium hydrogencarbonate _____ [2]

(c) Complete the following word equation for the reaction between calcium carbonate and hydrochloric acid.

calcium carbonate	+	hydrochloric acid	→		+		+	water

[2]

Examiner Only	
Marks	Remark

6 Propane and decane are examples of **alkanes** which are obtained from crude oil.

(a) Draw the structural formula for propane (C_3H_8).

[1]

(b) **(i)** Ethene is obtained by the cracking of decane. Complete the symbol equation below for the cracking of decane ($C_{10}H_{22}$).

$C_{10}H_{22} \rightarrow$ _____ + _____

[2]

(ii) There are two ways cracking can be carried out industrially. One of these uses heat. Name the other way.

_____ [1]

(iii) Explain why the cracking of large alkanes into smaller alkanes is important.

_____

_____ [1]

Examiner Only	
Marks	Remark

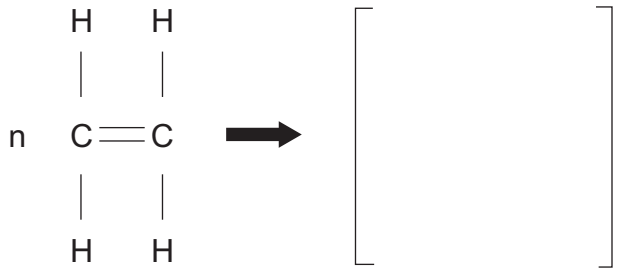
(c) Ethene can be used to make the polymer polythene, which can be used to make plastic bags.

(i) Explain what is meant by the term ‘polymer’.

_____

_____ [2]

(ii) Complete the equation for the polymerisation of ethene.



[2]

THIS IS THE END OF THE QUESTION PAPER

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