Rewarding Learning

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]

GSC41

FRIDAY 20 MAY 2011, 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	

Examiner Only	
Marks	Remark

1 Most car bodies are made from steel.

© *Hemera / Thinkstock*

(a) Give **three** reasons why steel is a suitable material for making car bodies.

Choose from:

lightweight : flexible : relatively cheap

soft : easy to shape : strong

1. _____

2. _____

3. _____ [3]

(b) Suggest **two** reasons why car bumpers are now made of plastic rather than metal.

1. _____

_____

2. _____

_____ [2]

Examiner Only	
Marks	Remark

2 **(a)** Below are three fractions obtained from crude oil. Using lines, match each fraction to **one** use.

Fraction	Use
diesel	lubricants
bitumen	making chemicals
naphtha	fuel for vehicles
	tar

[3]

(b) **(i)** Name the **two** elements that make up methane, CH_4.

Choose from:

helium **hydrogen** **calcium** **nitrogen** **carbon**

_____ and _____ [2]

(ii) Name the main element contained in coal.

_____ [1]

Examiner Only	
Marks	Remark

3 Complete the parts **(a)**, **(b)** and **(c)** below.

Choose from:

biochromic **size** **colour** **brightness**

atoms **particles** **thermochromic** **density**

(a) Photochromic dyes in T-shirts allows them to change colour when the _____ of light changes.

(b) Some toys change colour when the temperature changes because they contain _____ paint.

(c) Nanotechnology is about very small _____ which have very different properties due to their _____ . [4]

4 In the last 15 years the amount of plastic waste littering our beaches has doubled. Some of the 13 billion free plastic carrier bags handed out each year end up in the sea. Scientists say that the plastic stays in the environment and never fully breaks down.

© Seacology

(a) Give two ways that plastic litter can end up on beaches.

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

(b) Suggest **two** ways that supermarkets can help to reduce the number of plastic bags found on our beaches.

_____

_____ [2]

(c) Suggest **one** danger to wildlife which results from plastic litter on beaches.

_____ [1]

(d) There are many different plastics each with its own properties.

© Ingram Publishing / Thinkstock

© iStockphoto / Thinkstock

(i) Explain why this makes recycling of plastic difficult.

_____ [1]

(ii) There are two main types of plastic. Name the type of plastic in each of the following descriptions.

Choose from:

thermosetting thermochromic thermostatic thermoplastic

1. A plastic that can be melted and reshaped over and over again

is called _____ .

2. A plastic that can be melted and shaped only once is called

_____ . [2]

Examiner Only	
Marks	Remark

5 Forensic scientists often test for forgery in cheque transactions using chromatography. On the cheque below it is suspected that Mr Black has added ninety to the value of the cheque.

Date *10/06/10*

Pay *Mr J. Black*

ninety eight pounds only

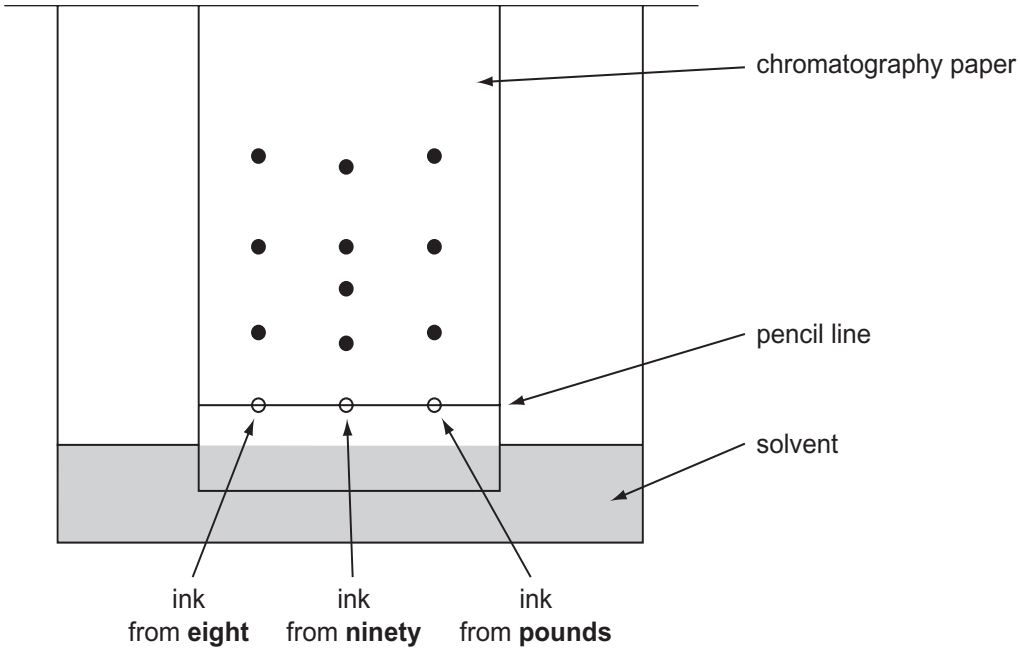
98.00

T. JONES

T. Jones

100203 : 110892 : 00723001

(a) The inks from the words **ninety**, **eight** and **pounds** were tested using chromatography. The results are shown below.



(i) Explain fully why it is important that the spots of ink are placed above the solvent.

_____

_____

_____ [2]

(ii) Why did the forensic scientist test inks from **ninety**, **eight** and **pounds** rather than just **ninety** and **eight**?

_____

_____

_____ [2]

(iii) How many dyes did the ink from the **ninety** contain?

_____ . [1]

(iv) What evidence is there that a forgery has taken place?

_____

_____ [1]

(b) Describe how you would obtain samples of the ink from the wording on the cheque and how you would place the samples on the chromatography paper.

_____

_____

_____

_____ [3]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

6 Soap solution was used to find out which of the compounds in the table cause hardness in water. The same amount of each compound was dissolved in 50 cm^3 distilled water. 2 cm^3 of soap solution was then added to 20 cm^3 of each solution. After shaking each sample, the height of the lather was measured and recorded in the table.

Solution used	Formula of compound	Height of lather/mm
Sodium sulphate	Na_2SO_4	20
Calcium nitrate	$Ca(NO_3)_2$	2
	KCl	19
Magnesium chloride	$MgCl_2$	1
Sodium nitrate	$NaNO_3$	19
	$MgSO_4$	1

(a) Complete the table above by filling in the names of the missing solutions.

Your Data Leaflet will be helpful. [2]

(b) From the above results name **two** compounds that cause permanent hard water.

_____ and _____ [2]

(c) Name a piece of apparatus that could be used to measure the volume of soap solution in each test.

_____ [1]

(d) Complete the word equation to show how temporary hardness is removed by boiling.

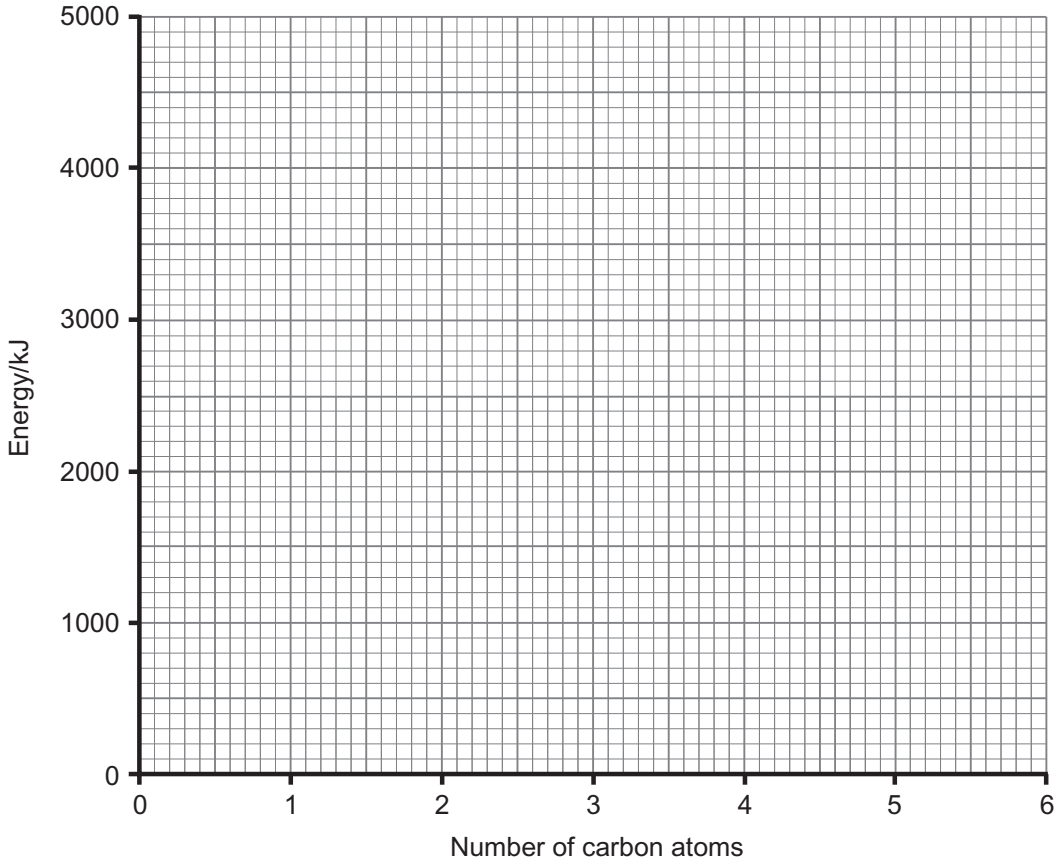
Calcium hydrogencarbonate → _____ + _____ + water [2]

Examiner Only	
Marks	Remark

7 Alkanes are important hydrocarbons that are used as fuels. The table below gives information about the energy produced by burning equal amounts of the first six alkanes.
The energy value has not been included for pentane.

Alkane	Formula	Number of carbon atoms	Energy/kJ
Methane	CH_4	1	900
Ethane	C_2H_6	2	1550
Propane	C_3H_8	3	2200
Butane	C_4H_{10}	4	2900
Pentane	C_5H_{12}	5	
Hexane	C_6H_{14}	6	4200

(a) On the grid below plot and draw a line graph of energy against number of carbon atoms.



[3]

(b) Use your graph to find the energy produced when pentane is burnt.

_____ kJ [1]

(c) Give **one** reason why we should reduce the amount of hydrocarbon fuels we burn.

_____

_____ [1]

(d) Ethene is another hydrocarbon. Give one important use of ethene.

_____ [1]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

111911