CCEA GCSE SCIENCE: SINGLE AWARD (MODULAR)

SCIENCE



EXAM QUESTION PACK

MODULE 4 FOUNDATION TIER GSC41 PAPERS

STEMUP

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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2012

Science: Single Award (Modular)

Materials and their Management
Module 4

Foundation Tier

[GSC41]

GSC41

TUESDAY 13 NOVEMBER 2012, MORNING

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.

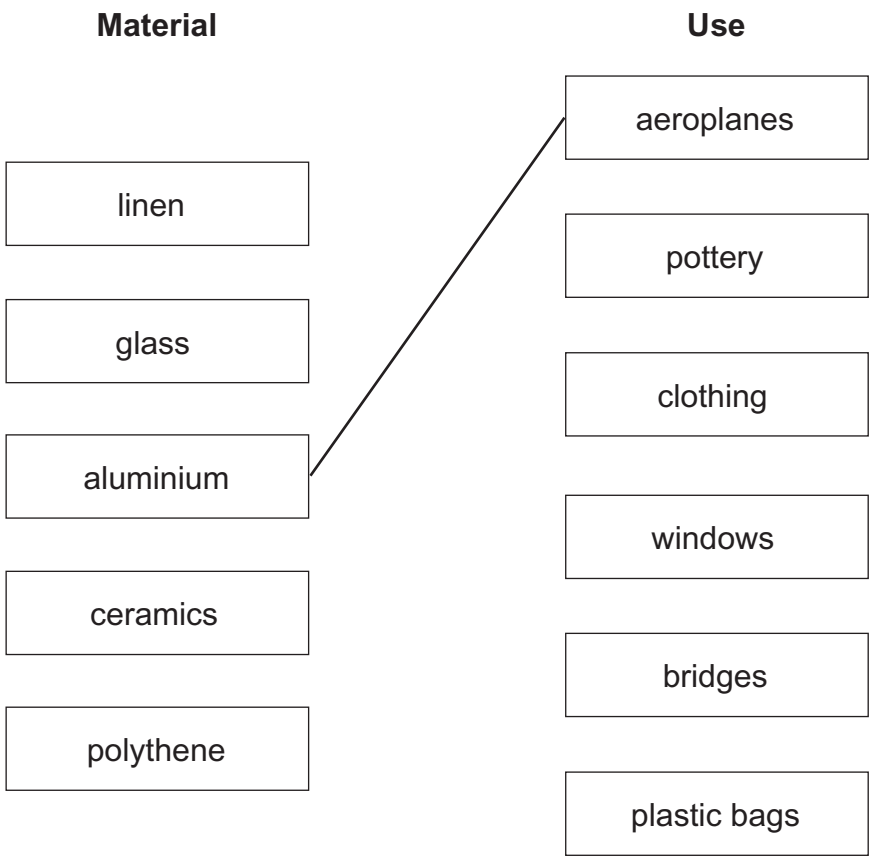
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Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
Total Marks	

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Examiner Only	
Marks	Remark

1 **(a)** Materials have many important uses.

Match each material, using lines, to **one** of its uses.
One has been done for you.



[4]

(b) Bottles can be made from glass or plastic. Give **two** advantages of using plastic to make bottles.

1. _____

_____

2. _____

_____ [2]

2 The table below gives the percentage of different types of waste found in a bin.

Type of waste	Percentage
paper	35
glass bottles	
cans	10
plastic packaging	29
fruit and vegetables	6
other waste	5

(a) Calculate the percentage of glass bottles in the bin.

(Show your working out.)

_____ % [2]

Putting one tonne of waste into landfill costs £84. However, it only costs £8 to recycle one tonne of waste from a recycling bin.

(b) Calculate how much money is saved when one tonne of waste is recycled instead of going to landfill.

£ _____ [1]

(c) Fruit and vegetables are examples of biodegradable materials. Explain fully the term **biodegradable**.

_____

_____ [2]

Examiner Only

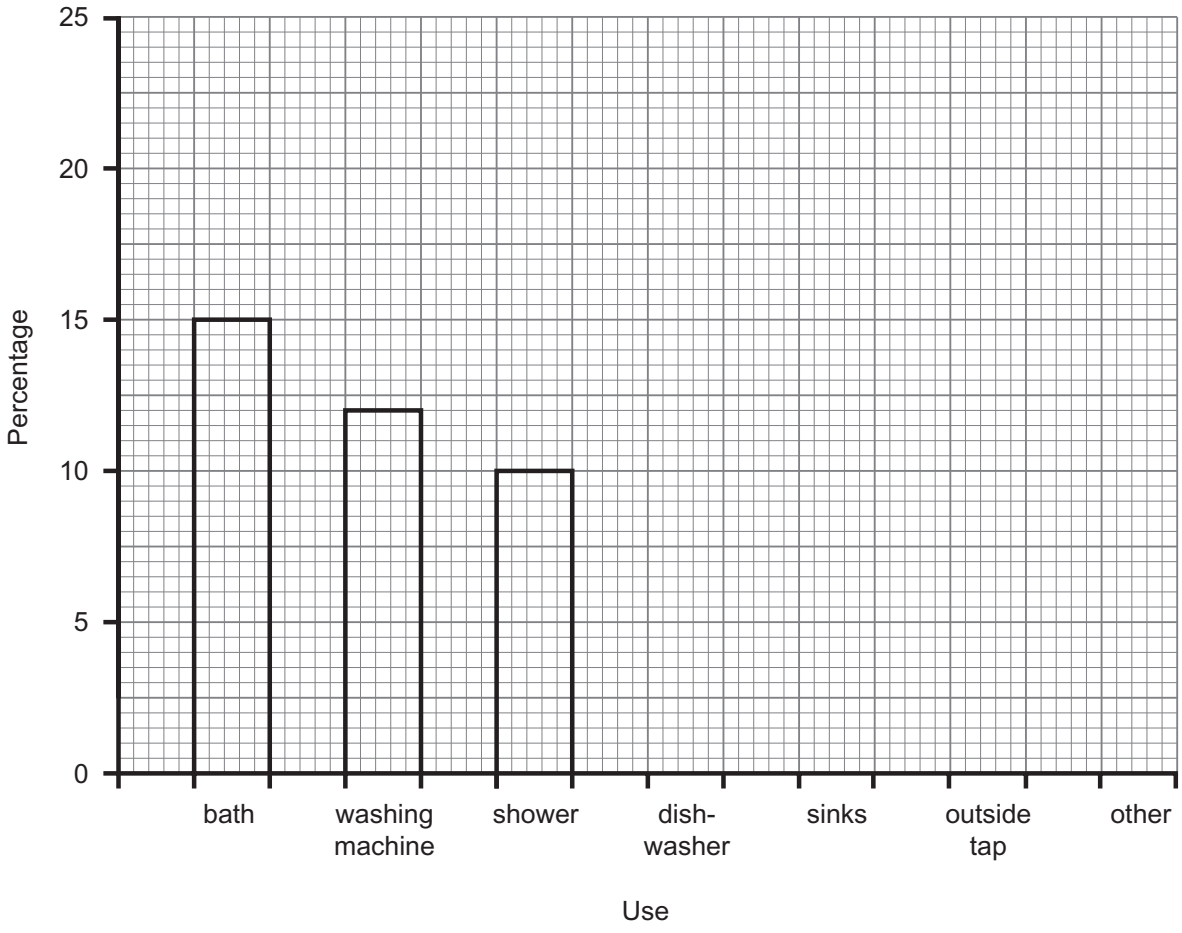
Marks	Remark

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3 Below is a table showing how the average household uses water.

Use	Percentage
bath	15
washing machine	12
shower	10
dishwasher	6
sinks	22
outside tap	10
other	25

(a) Complete the bar chart below for this information.



[2]

Examiner Only

Marks	Remark

(b) Use the information given to calculate the difference between the percentage of water used in a bath and the percentage of water used in a shower.

_____ % [1]

(c) Parts of Northern Ireland are described as hard water areas. What is meant by the term **hard water**?

_____

_____ [2]

(d) In the table below place a tick (✓) beside the **two** statements that are advantages of hard water.

tastes good	
gives kettle fur	
wastes soap	
good for strong teeth and bones	
stains clothes during washing	

[2]

Examiner Only

Marks	Remark

4 Complete the table below giving the processes involved.

Choose from:

recycling : combustion : ion exchange

polymerisation : IR spectroscopy

Use	Process
detecting alcohol	
creating heat energy by burning a fuel	
softening hard water	
producing long chain molecules such as polythene	

[4]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

5 Forensic scientists use the steps below to carry out a flame test. However, the steps are **not** in the correct order.

A Record the colour of the flame produced.

B Dip the flame test rod into acid and heat in a Bunsen flame.

C Dip the flame test rod into the test material and put into the flame.

D Repeat this until there is no colour change.

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

_____ _____ _____ _____ [2]

(b) Give **one** suitable safety precaution when carrying out flame tests.

_____ [1]

(c) Complete the table below.

Metal chloride	Flame colour
calcium	brick red
potassium	
sodium	
	blue/green
	pale blue

[4]

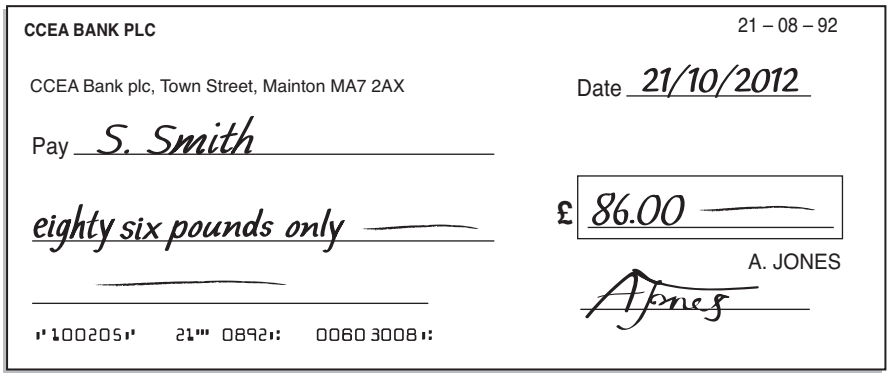
(d) A candle company wanted to make a Christmas candle that burnt with a brick red flame.

From the table, name a metal chloride that would be suitable to add to the candle wax mixture.

_____ [1]

Examiner Only	
Marks	Remark

6 **(a)** On the cheque below it is suspected that Mr. Smith has added eighty to the value of the cheque.



CCEA BANK PLC

21 – 08 – 92

CCEA Bank plc, Town Street, Mainton MA7 2AX

Date 21/10/2012

Pay S. Smith

eighty six pounds only

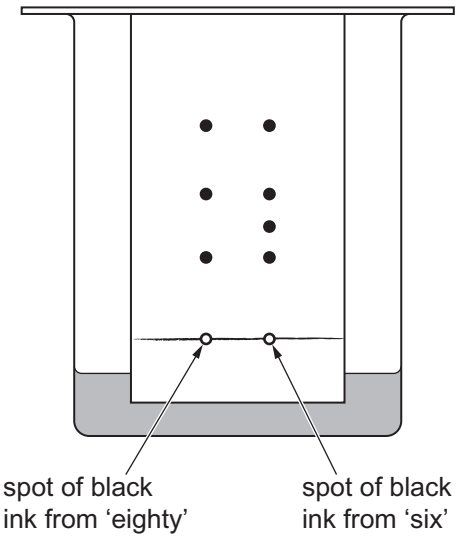
£ 86.00

A. JONES

A. Jones

⑈100205⑈ 21⑈ 0892⑆ 0060 3008⑆

The ink from words 'eighty' and 'six' were tested using chromatography. The results are shown below.



(i) How many dyes did the black ink from the 'eighty' contain?

_____ [1]

(ii) From the results decide if there was a forgery and give a reason for your answer.

_____

_____

_____ [1]

(iii) In chromatography, the first step is to draw a pencil line 3 cm from one end of a piece of chromatography paper. Describe fully what is then done to produce the results.

_____

_____

_____

_____

_____

_____

_____ [3]

(b) Forensic scientists can use fingerprints to help identify the person who has committed a crime.

(i) Name a powder that is used to dust for fingerprints on a white surface.

_____ [1]

(ii) Explain fully why fingerprints found at the scene of a crime are useful to convict the person who has committed the crime.

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

7 Some hydrocarbons can be used as fuels to heat our homes.

(a) Which element does **not** take part in the burning of a hydrocarbon?

Circle the correct answer.

hydrogen : oxygen : fluorine : carbon [1]

(b) Ethanol (C_2H_5OH) is an organic molecule which can also be used as a fuel.

(i) How many different elements are contained in ethanol?

_____ [1]

(ii) Explain fully why ethanol is not a hydrocarbon.

_____

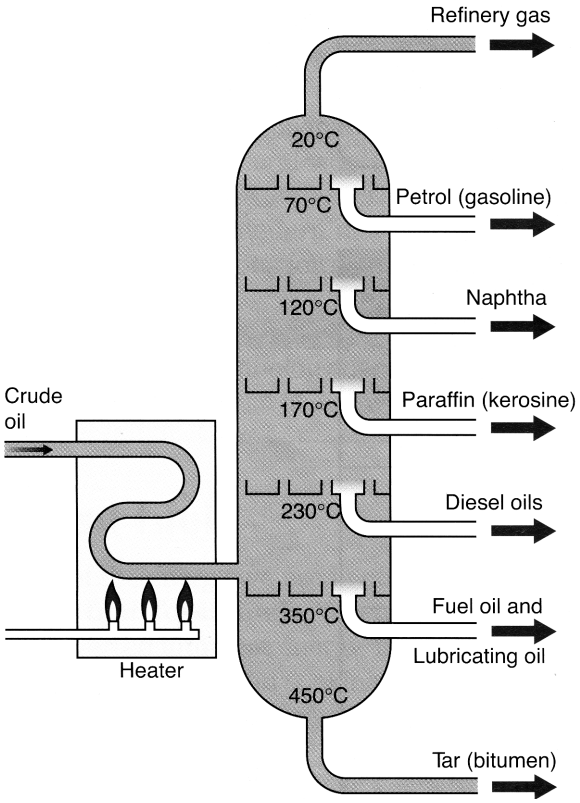
_____

_____ [2]

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Examiner Only	
Marks	Remark

(c) Crude oil contains many hundreds of different substances which can be separated by fractional distillation.



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Describe the separation of crude oil by fractional distillation.

_____

_____

_____

_____

_____

_____ [3]

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General Certificate of Secondary Education
2012

Science: Single Award (Modular)

Materials and their Management
Module 4
Foundation Tier

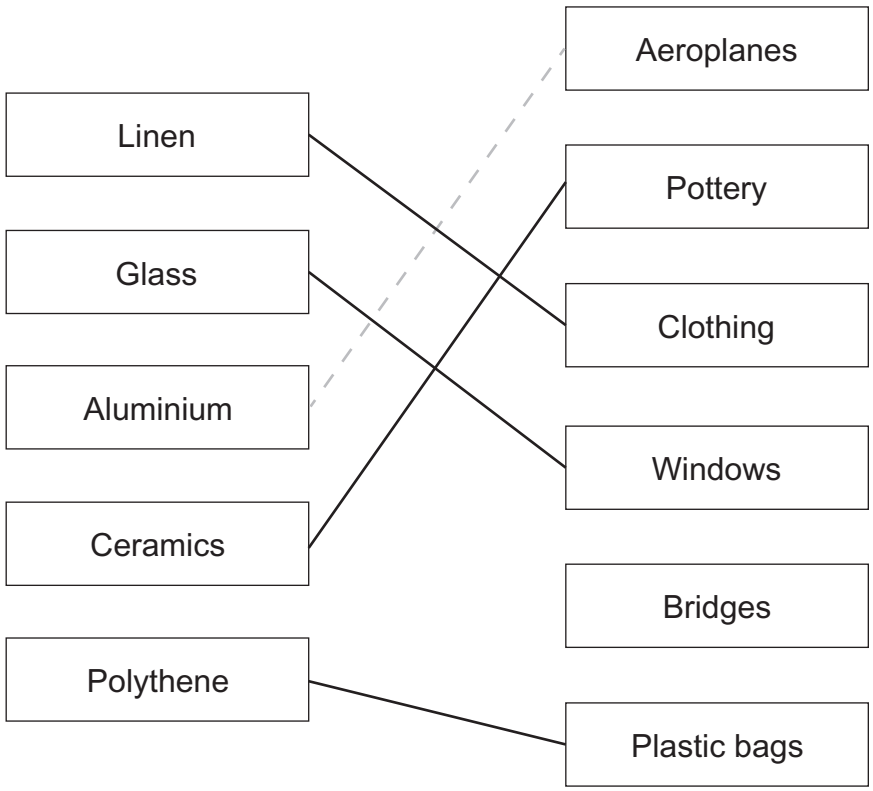
[GSC41]

TUESDAY 13 NOVEMBER 2012
10.15 am–11.00 am

MARK SCHEME

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				AVAILABLE MARKS
1	(a)	**Material**	**Use**	



[4]

(b) *Any **two***:

- Lighter [1]
- Does not break/shatter [1]
- Cheaper [1]
- Any other suitable property [1]

[2] 6

2 **(a)** 100 − (35 + 10 + 29 + 6 + 5) [1]
15% [1] [2]

(b) £76 [1]

(c) Breaks down/decays [1]
By microbes/decomposers/micro organism/bacteria/fungus [1] [2] 5

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3 **(a)** All bars drawn correctly [2], 3 bars [1] [2]

(b) 5% [1]

(c) Difficult to lather [1]
With soap [1]
(Leaves scum [1]) [2]

(d)

Tastes good	✓	[1]
Gives kettle fur		
Wastes soap		
Good for strong teeth and bones	✓	[1]
Stains clothes during washing		

[2]

AVAILABLE MARKS: 7

4

Use	Process
Detecting for alcohol and drugs	IR Spectroscopy [1]
Creating heat energy by burning a fuel	Combustion [1]
Softening hard water	Ion Exchange [1]
Producing long chain molecules such as polythene	Polymerisation [1]

[4]

AVAILABLE MARKS: 4

5 **(a)** B D C A [2]
(*Any **two*** in correct position [1]) [2]

(b) Wear safety goggles (or other suitable) [1]

(c)

Metal chloride	Flame colour
Calcium	Brick red
Potassium	Lilac [1]
Sodium	Orange/Yellow [1]
Copper [1]	Blue/green
Lead [1]	Pale blue

[4]

(d) Calcium chloride [1]

AVAILABLE MARKS: 8

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				AVAILABLE MARKS
6	**(a)**	**(i)**	3 [1]	
		(ii)	Different number of dyes in each ink sample/dyes do not match [1]	
		(iii)	*Any **three*** • Dissolve a small sample of each ink from the cheque in water [1] • Place a sample of each ink on the pencil line [1] • Place the paper in a tank with the bottom dipping into the solvent [1] • Wait for the solvent to travel up the paper and compare results [1] [3]	
	(b)	**(i)**	Carbon (black) [1]	
		(ii)	Fingerprints are unique [1] Compare suspect's fingerprints to those found at the scene of a crime [1] [2]	8
7	**(a)**		Fluorine [1]	
	(b)	**(i)**	3 [1]	
		(ii)	Hydrocarbons contain carbon and hydrogen [1] only/Ethanol contains oxygen as well [1] [2]	
	(c)		*Any **three*** • Heat the mixture • Each hydrocarbon/fraction has a different boiling point [1] • Each fraction contains hydrocarbons with similar number of carbon atoms/similar sized hydrocarbons [1] • Each fraction separates at a different level [1] • Fractions are condensed and collected [1] [3]	7
			Total	**45**

Rewarding Learning

General Certificate of Secondary Education
2011–2012

Science: Single Award (Modular)

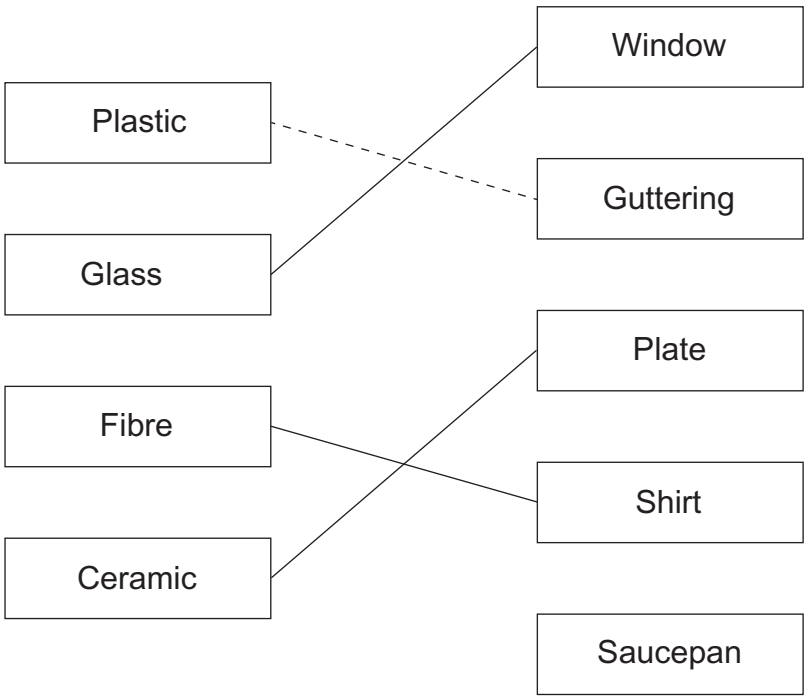
Materials and their Management
Module 4
Foundation Tier

[GSC41]

MONDAY 21 MAY 2012
9.15 am–10.00 am

MARK SCHEME

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			AVAILABLE MARKS
1	(a)		
		One mark for each correct line. [3]	
	(b) (i)	Strong Hard relatively cheap Any order, One mark for each correct response [3]	
	(ii)	Any **two** of: Plastic is lighter/less dense [1] Plastic does not rust/react with water [1] Plastic does not need to be painted [1] Plastic is cheaper [1] (must be comparison) **Accept** opposite argument for metal, e.g. metal is heavier [2]	8
2	(a)	Cancel newspaper delivery Close all gates Ask a neighbour to check the house regularly One mark for each correctly circled response [3]	
	(b)	Any **three** of: Quality of paper [1] Watermarks [1] Metal strip [1] Bar coding [1] Holograms [1] Fake note will fluoresce under UV light [1] [3]	
	(c)	Chromatography [1]	7

		AVAILABLE MARKS
3	**(a)** **(i)** 5 bars correctly plotted [2] 3/4 bars correctly plotted [1] [2]	
	(ii) The amount of waste being recycling has **increased** over the past 8 years. [1]	
	(b) **(i)** 2. Collection and Transport [1] 3. Reprocessing of Cullet/crushing of glass/making cullet [1] [2]	
	(ii) Any **one** of: ● Saves raw materials/saves resources ● Cuts down the number of quarries (to obtain raw materials) ● Cuts down the amount of energy/fossil fuels used ● Reduce landfill sites/glass is not biodegradable [1]	
	(c) Any **one** of: ● Destroys natural habitats ● Noise pollution/increase in traffic ● Dust pollution ● Eyesore (Accept other suitable) [1]	7
4	**(a)** **(i)** C [1]	
	(ii) A [1]	
	(iii) B [1]	
	(b) Any **two** of: ● Same volume of water ● Shaken with the same vigour/same person shaking ● Same size of test tube ● Same amount of boiling (not: same amount of soap/temperature/time) [2]	
	(c) Calcium/Magnesium only [1]	
	(d) Any **two** of: ● Caves ● Stalactites ● Stalagmites ● Limestone pavements [2]	8

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		AVAILABLE MARKS
5	**(a)** Thermoplastic/Thermosoftening [1] Thermosetting [1] [2]	
	(b) Non-Biodegradable materials will not decay [1] by the action of bacteria [1]	
	(c) **(i)** **Starch/Plant material** or any **named** starchy plant, e.g. potato, maize [1]	
	(ii) Any **two** of ● Other named recycling bin, e.g. glass, paper ● Providing recycling centres ● Recycling available at supermarkets, etc. ● Charging businesses for putting waste in landfill sites ● Advertising/Education [2]	7
6	**(a)** Any **three** of: ● Crude oil is heated/vaporized ● Each hydrocarbon/fraction has a different boiling point ● Each fraction contains hydrocarbons with similar number of carbon atoms/similar sized hydrocarbons ● Each fraction separates at a different level/section ● Fractions are condensed and collected [3]	
	(b) Fuel for gas ovens/LPG/Calor gas/heating homes [1]	
	(c) **(i)** Oxygen [1], Water [1] (accept correct symbols)	
	(ii) Global Warming/Greenhouse effect [1]	
	(d) Any **one** of: ● Setting carbon dioxide emission limits ● Climate change program ● Clean Air act ● Air Quality strategy ● encouraging giving grants for use of alternative fuels ● adverts encouraging less use of cars [1]	8
	Total	**45**

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Science: Single Award (Modular)

Materials and their Management
Module 4
Foundation Tier

[GSC41]

TUESDAY 28 FEBRUARY 2012
9.30 am–10.15 am

GSC41

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.

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Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
Total Marks	

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Examiner Only	
Marks	Remark

1 Below are four common materials.

wood : plastic : petrol : wool

(a) Place each material in the correct column of the table below.

Man-made	Natural

[2]

(b) The window panes shown below are made from glass.



© Eurocell Plc.

(i) Suggest **one** reason why glass is a suitable material to use.

_____ [1]

(ii) Window frames used to be made from wood but more recently plastic is usually used. Give **two** reasons why plastic is better than wood for making window frames.

1. _____

_____

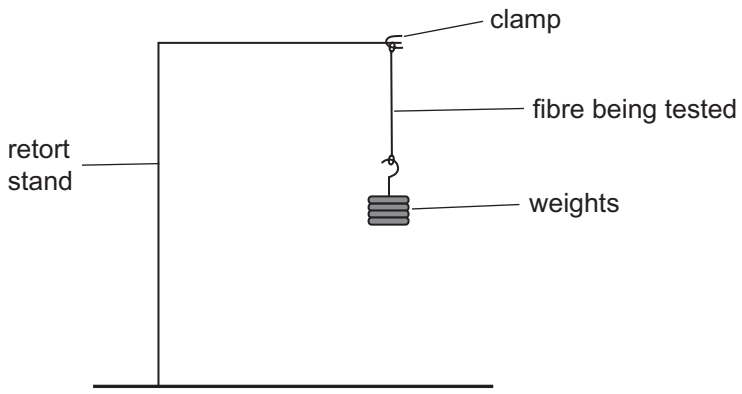
2. _____

_____ [2]

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Examiner Only	
Marks	Remark

2 Ronald did an investigation to test the strength of five different fibres using the apparatus shown below.



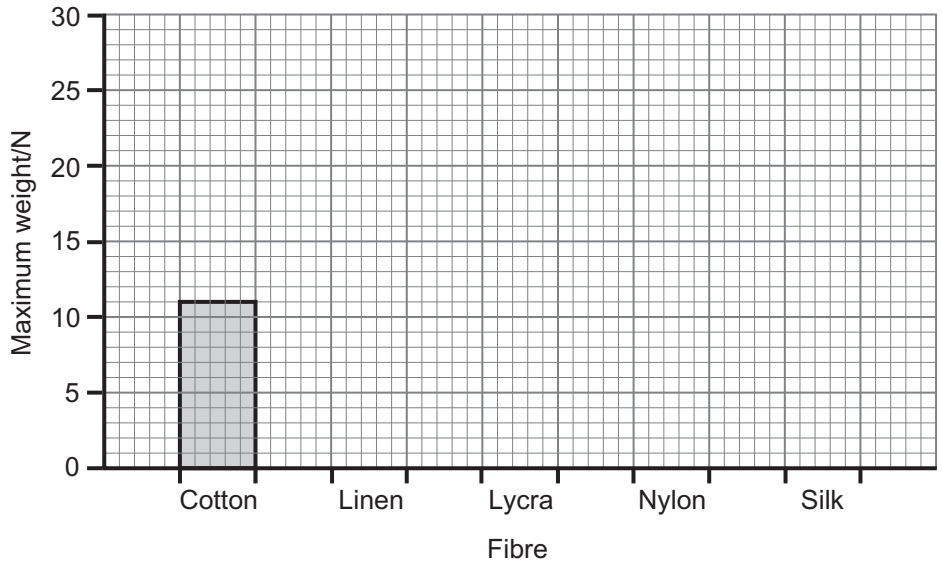
(a) State **one** thing that must be kept the same to make sure it is a fair test.

_____ [1]

(b) The maximum weight each fibre could hold before breaking was measured and recorded below.

Fibre	Maximum weight/N
Cotton	11
Linen	10
Lycra	25
Nylon	19
Silk	9

(i) Complete the bar chart below for the results of Ronald's investigation.



[2]

(ii) Name the weakest fibre.

_____ [1]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

3 **(a)** Given below are the results of some flame tests. Complete the table.

Choose from:

Lilac : Blue/Green : Red

Metal	Colour of Flame
Copper	
Sodium	Orange/Yellow
Potassium	
Lead	Blue/White

[2]

(b) This experiment can be dangerous. Identify **one** possible risk and describe how this can be avoided.

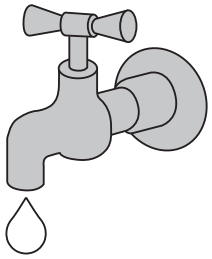
_____

_____ [2]

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Examiner Only	
Marks	Remark

4 Water can be described as being hard or soft.



(a) Complete the sentences below.

Choose from:

stalagmites : stalactites : dissolve : sodium : soft : calcium : lather : permanent

Hard water is water that does not _____ easily with soap.

There are two types of hard water, temporary and _____ .

The compounds that cause hard water contain magnesium or _____ .

Hard water areas can have caves where you might find _____ hanging from the roof. [4]

(b) (i) Give **two** advantages of hard water.

1. _____

2. _____ [2]

(ii) Give **one** disadvantage of hard water.

_____ [1]

(c) Temporary hard water can be softened by boiling. Give **two** methods of softening **permanent** hard water.

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

5 Coal, oil and natural gas are fossil fuels used to heat our homes.



© Tek Image / Science Photo Library

(a) The chemical formula for natural gas is $\mathbf{CH_4}$. Name the two **elements** it contains.

(You may find your Data Leaflet helpful.)

_____ and _____ [2]

(b) Why are fossil fuels described as **finite** energy resources?

_____ [1]

(c) Suggest **two** alternative energy sources that could be used **instead** of fossil fuels.

1. _____

2. _____ [2]

(d) In each statement below **circle** the correct word(s) to complete the sentences about natural gas.

(i) Natural gas is a **polymer** / **hydrocarbon** / **plastic**

(ii) When natural gas burns it produces carbon dioxide and

hydrogen / **water** / **oxygen**

(iii) One harmful effect of burning natural gas is

acid rain / **global warming** / **water pollution** [3]

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Examiner Only	
Marks	Remark

6 Bottles can be made from plastic or glass.



© 2012 Bill Lindsey

(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]

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Examiner Only	
Marks	Remark

7 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]

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Rewarding Learning

General Certificate of Secondary Education
2011–2012

Science: Single Award (Modular)

Materials and their Management
Module 4

Foundation Tier

[GSC41]

TUESDAY 28 FEBRUARY 2012
9.30 am–10.15 am

MARK SCHEME

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			AVAILABLE MARKS
1	**(a)**		

Man-made	Natural
Plastic	Wool
Petrol	Wood

$\frac{1}{2}$ mark for each correct answer, rounded down. [2]

(b) **(i)** glass is transparent/ see through/insulator/water proof [1]

(ii) Any **two** of:
No need to paint/less maintenance/longer lasting or durable/ doesn't rot [2] — 5

2 **(a)** Any **one** of: same length of fibre/same thickness of fibre/ other suitable [1]

(b) **(i)** 4 correct bars plotted [2]
2 or 3 bars plotted [1] [2]

(ii) Silk [1] — 4

3 **(a)**

Metal ion	Colour of Flame
Copper	**Blue/Green** [1]
Sodium	Orange/Yellow
Potassium	**Lilac** [1]
Lead	Blue/White

[2]

(b) Acid in eyes/hot apparatus/or suitable [1]
Wear Safety glasses/goggles/wear gloves/tie hair back appropriate explanation [1] [2] — 4

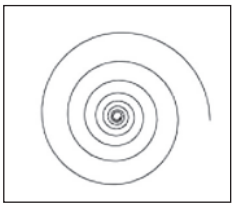
4 **(a)** Lather [1]
Permanent [1]
Calcium [1]
Stalactites [1] [4]

(b) **(i)** Any **two** of: better taste/good for brewing or making beer/good for teeth or bones/prevents heart disease/good for tanning or curing leather [2]

(ii) Any **one** of: wastes soap/leaves fur in kettle/blocks pipes with limescale/scum with soap/stains cloths **Not** more expensive unless linked to using a lot of soap [1]

(c) Any **two** of: Adding washing soda/using ion exchange column/ distillation [2] — 9

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			AVAILABLE MARKS
5	**(a)**	Carbon [1] Hydrogen [1] **either order** [2]	
	(b)	It will run out/there is a limited amount [1]	
	(c)	Any **two** of; Solar/wind/wave/tidal/nuclear/geothermal/HEP/biomass/ hydrogen/sun [2]	
	(d)	**(i)** Hydrocarbon [1]	
		(ii) Water [1]	
		(iii) Global Warming [1] [3]	8
6	**(a)**	any **one** of: lighter/doesn't break easily/cheaper/easily moulded/ safer qualified [1]	
	(b)	any **two** of: Bottle banks/household bins for recycling/advertising/ fines; rewards [2]	
	(c)	any **two** of: saves energy/money/saves raw materials/reduces/stops use of landfill [2]	
	(d)	**(i)** Breaks down/decays/rots [1] by microbes/decomposers/microorganism/bacteria/fungus [1] [2]	
		(ii) any named suitable **material** e.g. cotton, wool, paper/wood/food [1]	8
7	**(a)**	 Any spiral shape [1]	
	(b)	Gently press finger on tile/surface [1] Sprinkle some **carbon/black** powder on the paper [1] Use a (**paint) brush** to remove excess powder gently [1] Place a piece of (sticky) tape on the fingerprint and remove [1] [4]	
	(c)	**Any 2** from Hair [1] Blood [1] DNA/skin/saliva/sperm [1] Footprint [1] Fibres [1] Paint/metal [1] Or other suitable [2]	7
		Total	**45**

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Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2011–2012

Science: Single Award (Modular)

Materials and their Management
Module 4

Foundation Tier

[GSC41]

WEDNESDAY 9 NOVEMBER 2011
10.15 am–11.00 am

GSC41

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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Examiner Only	
Marks	Remark

1 **(a)** Picnic tables are often made from wood.



© *iStockphoto / Thinkstock*

Give three reasons why wood is a suitable material.

Choose from:

burns easily : attractive : strong : flexible : rots readily : comfortable

1. _____

2. _____

3. _____ [3]

(b) Suggest two reasons why some people buy plastic picnic tables and chairs instead of wooden ones.

1. _____

2. _____ [2]

2 **(a)** Below are four methods of crime detection. Using lines, link each method of detection to the evidence it can provide.

Method of detection	Evidence provided
	Metals in car paint at a hit and run accident
Microscope	
	Forged banknotes
Breathalyser	
	Driver over the drink-drive limit
Chromatography	
	Appearance of cotton at the scene of a robbery
Flame test	
	Different dyes in the ink of a forged cheque

[4]

(b) Shown below is a picture of a banknote.



© Bank of England

Give two features of a banknote that help prevent forgeries.

1. _____

2. _____ [2]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

3 **(a)** Complete the sentences below about hard water.

Choose from:

baking soda : sodium : basalt : magnesium : limestone : lather : washing soda

(i) Hard water is difficult to _____ with soap.

(ii) Compounds of calcium and _____ cause hardness in water.

(iii) Adding _____ removes permanent and temporary hardness.

(iv) Stalagmites and stalactites are formed from the reaction of rainwater and _____ .

[4]

(b) In the table below place a tick (✓) beside the **two** statements that are advantages of hard water.

Produces fur in kettles	
Good for teeth and bones	
Clogs up water pipes	
Tastes good	
Good for washing clothes	

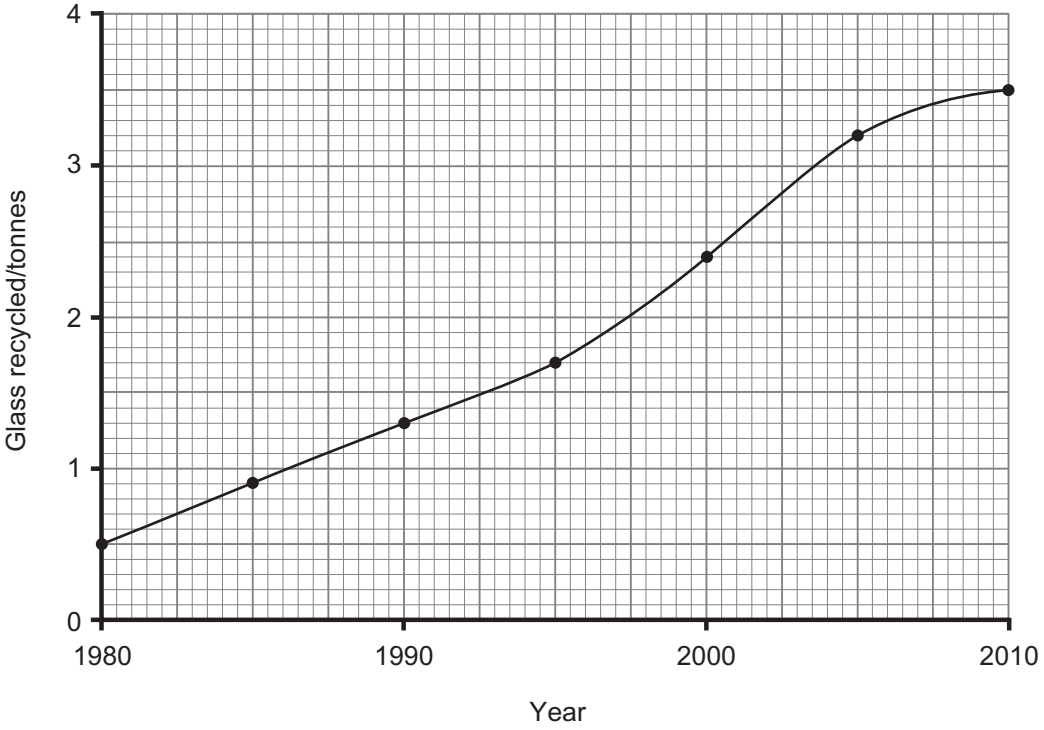
[2]

(c) Suggest how the Marble Arch Caves can be of benefit to the people of County Fermanagh.

_____ [1]

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4 The graph below shows information about the recycling of glass by a small company.



(a) Complete the following sentence giving a trend shown by the graph.

From 1980 to 2010 there has been _____

_____ [1]

(b) Use your graph to calculate the change in the amount of glass that the company recycled between 1980 and 2010.
Show your working.

_____ tonnes [2]

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

1. _____

2. _____ [2]

Examiner Only

Marks	Remark

(d) Glass is only one of many materials that can be recycled. Other common examples are aluminium, plastic and paper.

(i) Which of the above materials is an element?

_____ [1]

(ii) Give two ways that local councils are promoting the recycling of plastics.

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

5 In the United Kingdom it is illegal to drive if your blood alcohol level is more than 80 mg/100 ml.



© PA Wire / Press Association Images

(a) Explain fully why it is dangerous to drink alcohol and then drive.

_____

_____

_____ [2]

(b) Many countries would like to introduce a zero blood alcohol limit.

(i) Suggest what is meant by a zero blood alcohol limit.

_____

_____ [1]

(ii) Suggest **one** advantage and **one** disadvantage of a zero blood alcohol limit.

Advantage _____

_____

Disadvantage _____

_____ [2]

Examiner Only

Marks	Remark

6 The properties of some metals are given below.

Metal	Melting temperature/ºC	Electrical conductivity	Relative cost	Relative weight	Relative strength
Aluminium	660	Very good	7.3	1	1
Copper	1083	Excellent	9.2	3	2
Iron	1535	Good	1	2.3	3
Silver	962	Excellent	1923	2.6	1
Zinc	420	Good	5.8	2.3	1.5

Use the information and your knowledge to answer the following questions.

Examiner Only	
Marks	Remark

(a) Suggest which **one** of the properties is most important when using aluminium for aircraft construction.

_____ [1]

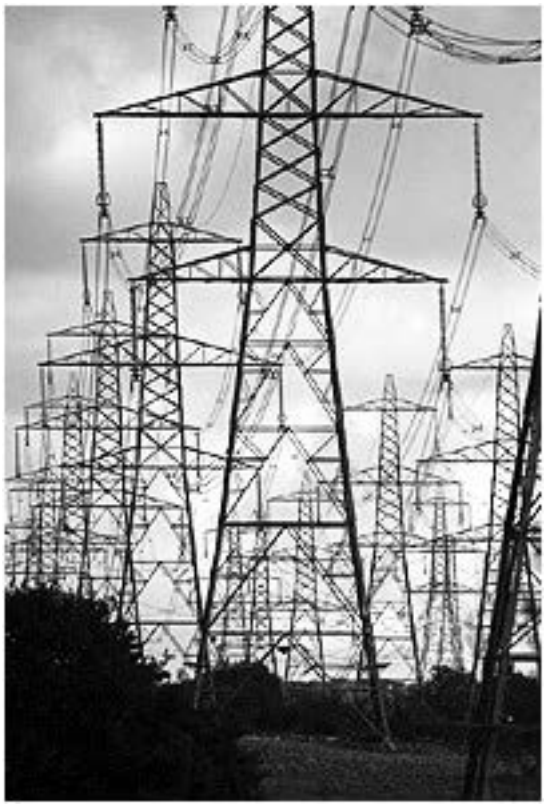
(b) Give two reasons why iron is used in the construction of buildings rather than zinc.

1. _____

2. _____ [2]

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(c) Below is a picture showing part of the national grid.



© PA Wire / Press Association Images

Explain fully why overhead electrical cables in the national grid are made of aluminium rather than copper.

_____

_____

_____

_____ [3]

Examiner Only

Marks	Remark

Examiner Only	
Marks	Remark

7 **(a)** The following hydrocarbons are obtained from crude oil.

paraffin : naphtha : petrol : bitumen : lubricating oil



© iStockphoto / Thinkstock

(i) Name the process that is used to obtain these hydrocarbons from crude oil.

_____ [2]

(ii) Which of the hydrocarbons in the list above has the highest boiling point?

_____ [1]

(iii) Give **one** important use of bitumen.

_____ [1]

(iv) Complete the word equation to show what products are produced when petrol burns.

petrol + oxygen ⟶ _____ + _____

[2]

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(b) Explain fully why scientists are always trying to find more effective ways of extracting crude oil.

_____

_____

_____ [2]

Examiner Only	
Marks	Remark

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Rewarding Learning

General Certificate of Secondary Education
2011–2012

Science: Single Award (Modular)

Materials and their Management
Module 4
Foundation Tier

[GSC41]

WEDNESDAY 9 NOVEMBER 2011
10.15 am–11.00 am

MARK SCHEME

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			AVAILABLE MARKS
1	**(a)** attractive [1], strong [1], comfortable [1]		
	(b) Any **two** from: lower cost, low maintenance, do not rot lightweight	[2]	5
2	**(a)** microscope/appearance of cotton [1], chromatography/dyes in ink [1], breathalyser/driver over limit of alcohol [1], flame test/metals in car paint [1]		
	(b) Any **two** from: quality of paper/watermarks/metal strip/bar coding/holograms/serial number	[2]	6
3	**(a)** **(i)** lather		
	(ii) magnesium		
	(iii) washing soda		
	(iv) limestone 4 × [1]	[4]	
	(b) good for teeth [1], tastes good [1]	[2]	
	(c) tourism	[1]	7
4	**(a)** an increase in the amount of glass recycled	[1]	
	(b) 1980 = 0.5, 2010 = 3.5 [1] 3.5 − 0.5 = 3 [1] for correct values (3.5, 0.5) [1]	[2]	
	(c) Any **two** from: saves money/energy/saves resources/reduces greenhouse gases/ saves landfill	[2]	
	(d) **(i)** aluminium	[1]	
	(ii) Any **two** from: recycling bank for (plastic) fines for not recycling councils provide households with different coloured recycling bins, adverts/rewards	[2]	8
5	**(a)** Any **two** from: affects people's judgement, causes accidents, slows down reaction times	[2]	
	(b) **(i)** (if driving) you cannot have any alcohol in the blood [1]		
	(ii) advantage – cut down on number of accidents/ no confusion about limit [1] disadvantage – common products have alcohol e.g. mouthwash [1]	[3]	5

				AVAILABLE MARKS
6	**(a)**	it is lightweight	[1]	
	(b)	iron is stronger [1] cheaper [1]	[2]	
	(c)	it is lighter than copper [1] and it is less likely to break [1] it is cheaper [1] not as good conductor but sufficient [1] not as strong but sufficient [1] very good conductor [1] [2] properties + [1] explained	[3]	6
7	**(a)**	**(i)** fractional [1], distillation [1]		
		(ii) bitumen [1]		
		(iii) roofing/roads/tar [1]		
		(iv) carbon dioxide [1], water [1]	[6]	
	(b)	Any **two** from: • extract as much as possible • crude oil running out/make last longer/lower cost • avoid water pollution	[2]	8
			Total	**45**

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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.
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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
Total Marks	

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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]

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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

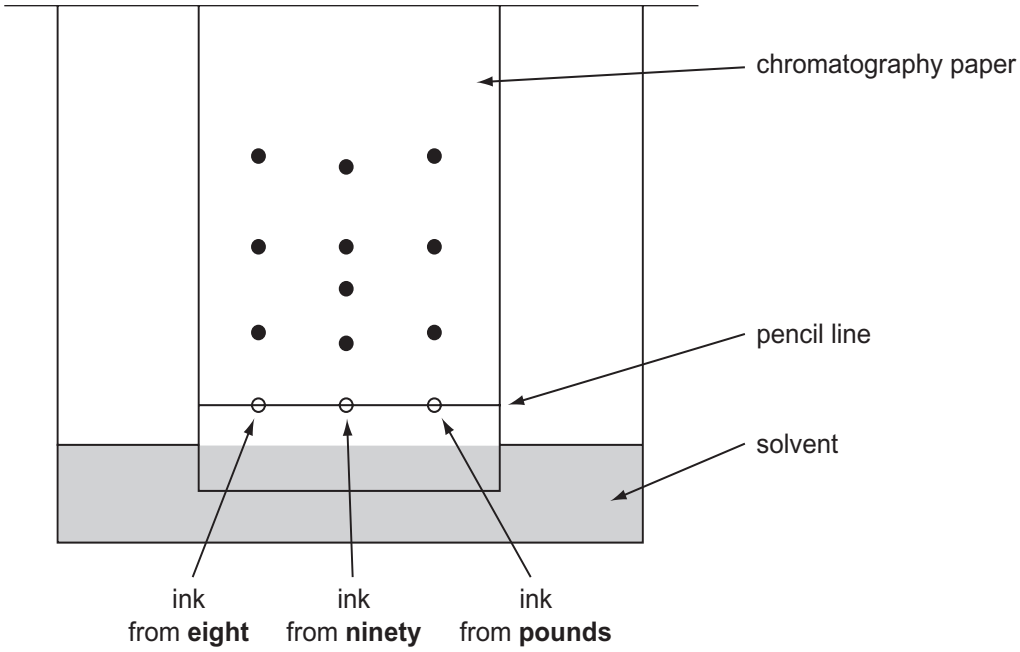
98.00

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]

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(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

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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.

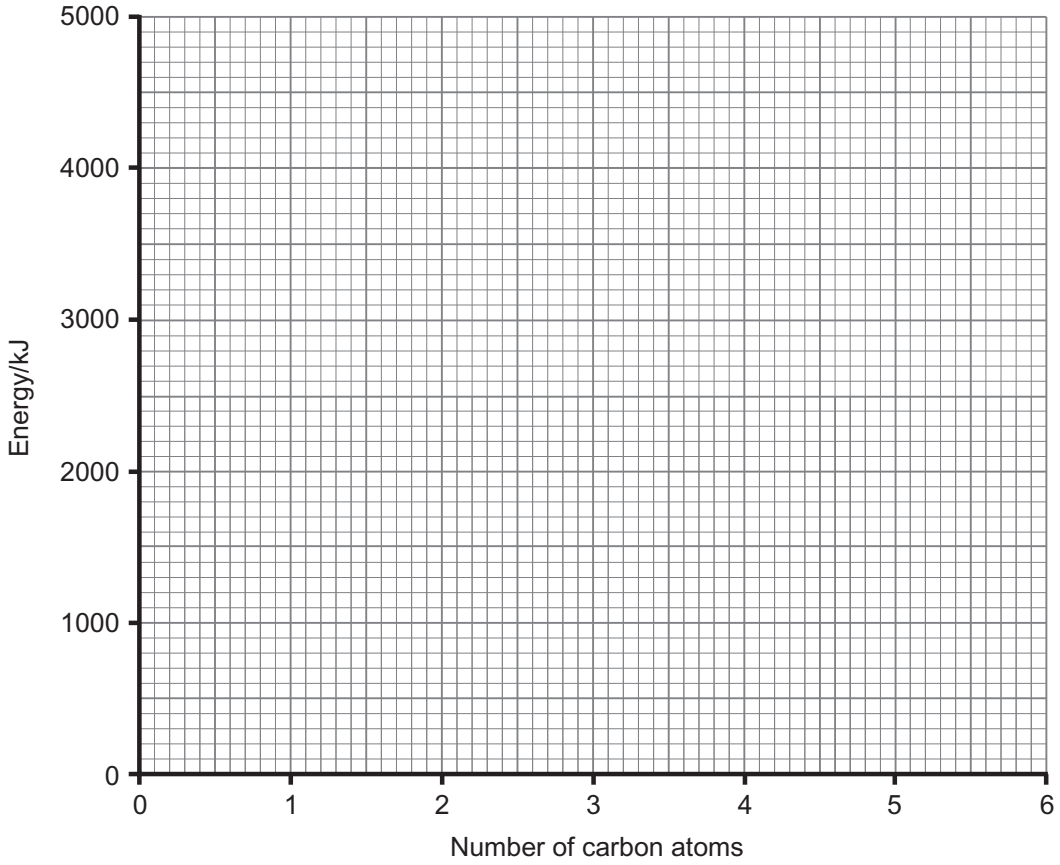
Calcium hydrogencarbonate → _____ + _____ + water [2]

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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]

Examiner Only

Marks	Remark

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(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]

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Marks	Remark

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Rewarding Learning

General Certificate of Secondary Education
2010–2011

Science: Single Award (Modular)

Materials and their Management
Module 4

Foundation Tier

[GSC41]

FRIDAY 20 MAY 2011, AFTERNOON

MARK SCHEME

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			AVAILABLE MARKS
1	**(a)**	relatively cheap [1], strong [1], easy to shape [1] [3]	
	(b)	less damage in accident/lightweight/long lasting/cheaper/appearance (any 2) [2]	5
2	**(a)**	bitumen/tar [1], naphtha/chemicals [1], diesel/fuel [1] [3]	
	(b) **(i)**	carbon [1], hydrogen [1] [2]	
	(ii)	carbon [1]	6
3	**(a)**	brightness [1]	
	(b)	thermochromic [1]	
	(c)	particles [1], size [1] [2]	4
4	**(a)**	visitors/bathers [1], wind [1], washed in [1] or other suitable [2]	
	(b)	charge for bags [1], promote reusing bags [1], biodegradable plastic bags (any 2) [2]	
	(c)	kills wildlife [1]	
	(d) **(i)**	have to be separated [1]	
	(ii)	thermoplastic [1], thermosetting [1] [2]	8
5	**(a)** **(i)**	solvent would dissolve inks [1], inks could not be separated [1] [2]	
	(ii)	will be able to compare dyes in all three words [1], result of comparison [1] [2]	
	(iii)	4 dyes [1]	
	(iv)	it contains 2 different black inks as shown by the different number of dyes [1], more dots/dyes in the ninety [1]	
	(b)	three from /cut out different words [1], add a few drops of water [1] use a small capillary dropping tube to spot chromatogram [1] use clean droppers/dry between spots [1] or other suitable e.g. damp cotton bud [2] [3]	9

				AVAILABLE MARKS
6	**(a)**	potassium chloride [1], magnesium sulphate [1]	[2]	
	(b)	two from magnesium sulphate/magnesium chloride/calcium nitrate	[2]	
	(c)	measuring cylinder/pipette/burette	[1]	
	(d)	calcium carbonate [1], carbon dioxide [1] accept *correct* formula	[2]	7
7	**(a)**	5 points correct [2], 4 points [1] line [1]	[3]	
	(b)	answer from graph	[1]	
	(c)	cut down on levels CO_2/greenhouse effect/global warming/ non-renewable or named effect	[1]	
	(d)	important in making polymers/polythene/plastic	[1]	6
			Total	**45**

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Centre Number

71	

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2010–2011

Science: Single Award (Modular)

Materials and their Management
Module 4

Foundation Tier

[GSC41]

GSC41

FRIDAY 25 FEBRUARY 2011, MORNING

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

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Question Number	Marks
1	
2	
3	
4	
5	
6	
Total Marks	

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Examiner Only	
Marks	Remark

1 **(a)** Below are four types of materials. Using lines match each material to one example.

The first one has been done for you.

Material	Example
Glass	iron
Plastic	tiles
Ceramic	window
Metal	packaging

[2]

(b) Complete the table below by giving a property which makes each material suitable for the use given.

Choose from:

easy to mould : very hard : electrical conductor : strong fibre

Material	Use	Property
copper wire	house wiring	
plastic	basin	
ceramic	bricks	
linen	curtains	

[3]

(c) Some shirts are made from a mixture of cotton, nylon and polyester.



© http://www.LateralLineCo.com

Which **one** of the three materials in the shirt is a natural material?

_____ [1]

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Examiner Only	
Marks	Remark

2 Each year many tourists visit the Marble Arch Caves in Fermanagh. The water in this area is described as hard water.



© Marble Arch Caves Global Geopark http://www.archhouse.com/sites/90/marblearch.jpg

(a) Given below are the steps needed to test for the hardness of water but not in the correct order.

A Continue adding soap solution one drop at a time
B Note the number of drops of soap solution used
C Measure out 50 cm^3 of the water sample
D Add one drop of soap solution and shake
E Stop adding soap solution when a permanent lather forms

(i) Using the letters **A**, **B**, **C**, **D** and **E**, complete the correct order of steps.

Order C ____ ____ ____ ____ [2]

(ii) Name a piece of apparatus which could be used to measure the 50 cm^3 of hard water.

Circle the correct answer.

beaker : measuring cylinder : conical flask [1]

(iii) How would you know when a permanent lather forms?

_____ [1]

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(b) Use ticks (✓) to show the advantages and disadvantages of hard water.

One example is done for you.

	Advantage	Disadvantage
Good for bones	✓	
Helps in brewing beer		
Leaves stains on clothes		
Forms boiler scale		
Strengthens teeth		
Forms kettle fur		

[3]

Examiner Only

Marks	Remark

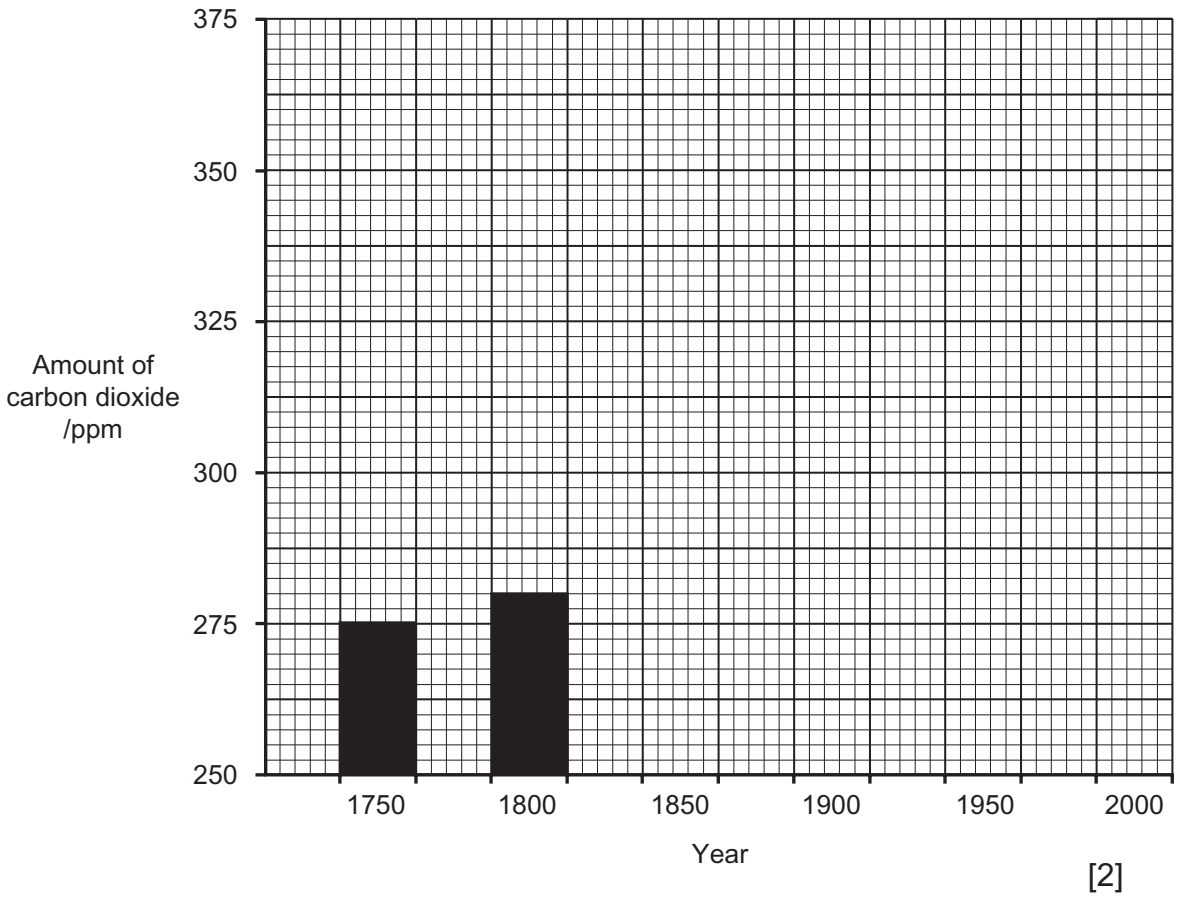
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Examiner Only	
Marks	Remark

3 The table below shows how the amount of carbon dioxide in the air has changed from 1750 to 2000.

Year	Amount of carbon dioxide/ppm
1750	275
1800	280
1850	285
1900	295
1950	320
2000	370

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



[2]

(ii) Complete the sentence below to give the trend shown by the information.

From 1750 to 2000 the amount of carbon dioxide has

_____ [1]

Examiner Only	
Marks	Remark

(b) Natural gas which is mainly methane, CH_4, produces carbon dioxide on burning.



© Getty Images/Jupiterimages/Photos.com

(i) Name the **two** elements present in methane gas.

(You may find your Data Leaflet useful).

_____ and _____ [1]

(ii) Name the gas in air which combines with methane when it burns.

_____ [1]

(iii) Name the other product formed when methane burns in air.

Circle the correct answer.

sulphur dioxide : water : nitrogen dioxide [1]

(iv) Give **one** harmful effect, to the environment, of burning methane.

_____ [1]

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Examiner Only	
Marks	Remark

4 **(a)** The table below contains information about five hydrocarbon molecules.

Molecule	Melting point/°C	Boiling point/°C	Energy produced per gram /kJ
Methane	–182	–161	56
Ethane	–183	–88	52
Propane	–188	–42	51
Butane	–138	–0.5	50
Pentane	–130	36	49

(i) Name the hydrocarbon with the highest **melting point**.

_____ [1]

(ii) Calculate the energy produced from 10 grams of methane.

Show your working.

_____ kJ [2]

(iii) Calculate the difference in **boiling point** between propane and methane.

_____ [1]

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Examiner Only	
Marks	Remark

(b) Complete the following sentences.

A cup painted with thermochromic paint changes colour when the _____ changes while a cup painted with photochromic paint will change colour when the _____ changes. [2]

(c) Shown below is a picture of a genuine £50 note.



© Bank of England

Banks use special paper which can be tested using UV light to avoid counterfeiting.

(i) Give three other ways that bank notes are protected against counterfeiting.

1. _____

2. _____

3. _____ [3]

(ii) Explain fully how shop owners use UV light to test for counterfeit notes.

_____

_____

_____ [2]

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Examiner Only	
Marks	Remark

5 Glass recycling has greatly increased over the last ten years.



© Chris Garner http://www.pettistree.suffolk.gov.uk/images/bottlebankcimg1687crg.jpg

(a) Describe the main steps in the recycling of glass.

_____

_____

_____

_____ [3]

(b) Waste glass is dangerous and causes litter problems because it is very unreactive and is non-biodegradable.

(i) Explain fully the meaning of the term **non-biodegradable**.

_____

_____ [2]

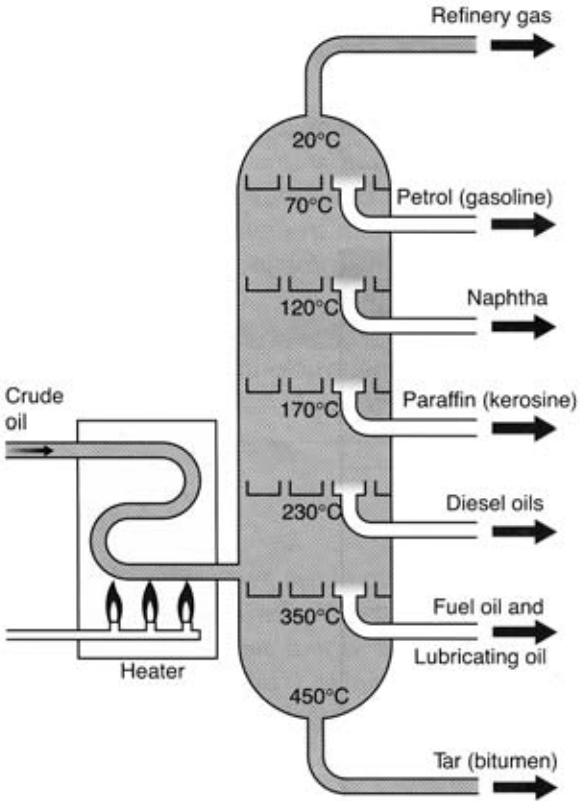
(ii) Give two ways in which local councils are promoting the recycling of glass.

1. _____

2. _____ [2]

Examiner Only	
Marks	Remark

6 Crude oil is made up of many hydrocarbons and these can be separated using fractional distillation.



(a) (i) Describe how fractional distillation separates the fractions in crude oil.

_____

_____

_____

_____ [3]

(ii) Give **one** use of the paraffin fraction.

_____ [1]

(b) Ethene is an important hydrocarbon which is used to make polythene.

Describe what happens to ethene molecules when they are polymerised to form polythene.

_____

_____ [2]

(c) The Clean Air Acts were introduced by government to help reduce the problems of air pollution.

Give one way of reducing the problems caused by burning hydrocarbon fuels.

_____ [1]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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111805

Rewarding Learning

General Certificate of Secondary Education
2010–2011

Science: Single Award (Modular)

Materials and their Management
Module 4

Foundation Tier

[GSC41]

FRIDAY 25 FEBRUARY 2011, MORNING

MARK SCHEME

STEMUP.CO.UK

					AVAILABLE MARKS
1	**(a)**	plastic/packaging, ceramic/tiles, metal/iron 3 correct [2], 1 correct [1]		[2]	
	(b)	copper/electrical conductor, plastic easy to mould, ceramic/very hard, linen/long strands of fibre 4 correct [3], 2 correct [2], 1 correct [1]		[3]	
	(c)	cotton		[1]	6
2	**(a)**	**(i)**	D, A, E, B any two in correct position [1]	[2]	
		(ii)	measuring cylinder	[1]	
		(iii)	lather which lasts a given time, e.g. 30 seconds	[1]	
	(b)	Advantages helps brewing beer strong teeth 5 correct [3], 3/4 [2], 1/2 [1]	Disadvantages leaves stains forms boiler scale forms kettle fur	[3]	7
3	**(a)**	**(i)**	4 correct [2], 3/2 correct [1]	[2]	
		(ii)	increased	[1]	
	(b)	**(i)**	carbon and hydrogen	[1]	
		(ii)	oxygen	[1]	
		(iii)	water	[1]	
		(iv)	causes global warming/greenhouse effect	[1]	7
4	**(a)**	**(i)**	pentane	[1]	
		(ii)	56×10 [1] $= 560$ (kJ)	[2]	
		(iii)	119 [1] ignore ($-$ sign)	[1]	
	(b)	temperature, **accept** heat [1], light [1]		[2]	
	(c)	**(i)**	watermarks [1], metal strip [1], hologram bar coding serial numbers [1]	[3]	
		(ii)	shine UV light on note [1], glows or idea of fluorescence [1]	[2]	11

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				AVAILABLE MARKS
5	**(a)**	1. bottle banks, door step collection and segregation [1] 2. collection and transport [1] 3. reprocessing of cullet [1] 4. furnace/remoulding [1] any **three**	[3]	
	(b)	**(i)** not broken down [1] by microbes [1]	[2]	
		(ii) advertising [1], bins for recycling [1]	[2]	7
6	**(a)**	**(i)** oil is heated [1], different fractions boil at different temperatures [1], vapours rise up column and separate [1], vapours are condensed [1]	[3]	
		(ii) heating oil	[1]	
	(b)	double-bond in ethene breaks [1] *many molecules* are (chemically) joined [1] into long chains [1] any **two**	[2]	
	(c)	use renewable fuels smokeless fuel/filters on chimneys/use public transport	[1]	7
		Total		**45**

STEMUP.CO.UK

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 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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1 Plastic is used to make garden hoses.

Examiner Only	
Marks	Remark

(a) Give three reasons why plastic is a suitable material for making garden hoses.

Choose from:

flexible : conductor : low melting point

long lasting : waterproof : insulator

1. _____

2. _____

3. _____ [3]

(b) Name the raw material used in making plastic.

Circle the correct answer.

sea water : oil : marble : carbon

[1]

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Examiner Only	
Marks	Remark

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	Evidence of a crime
	Driver over the drink-drive limit
UV light	
	Different dyes in the ink of a forged cheque
Breathalyser	
	Fingerprints on a window at a robbery
Chromatography	
	Fibres at the scene of a robbery
Microscope	
	Forged bank notes

[4]

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(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]

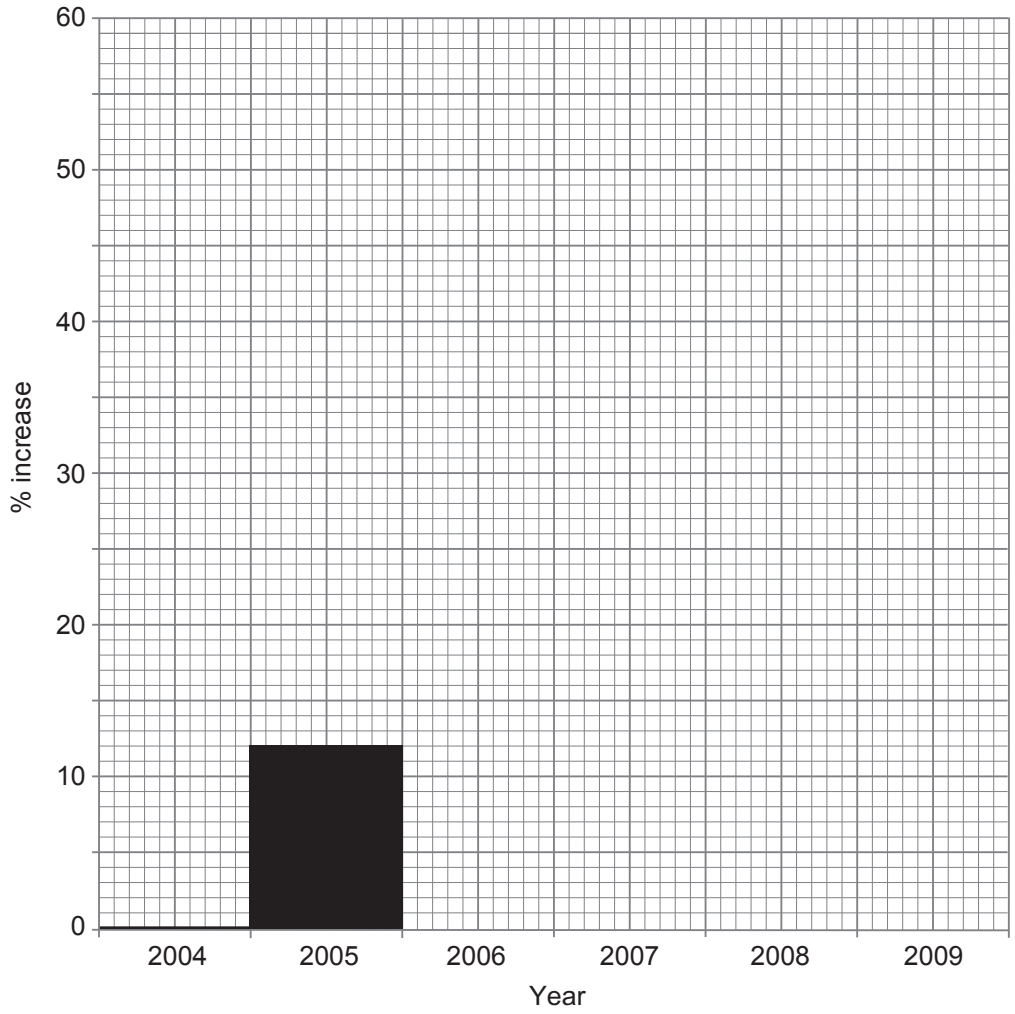
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Examiner Only	
Marks	Remark

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]

(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]

Examiner Only

Marks	Remark

STEMUP.CO.UK

Examiner Only	
Marks	Remark

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.

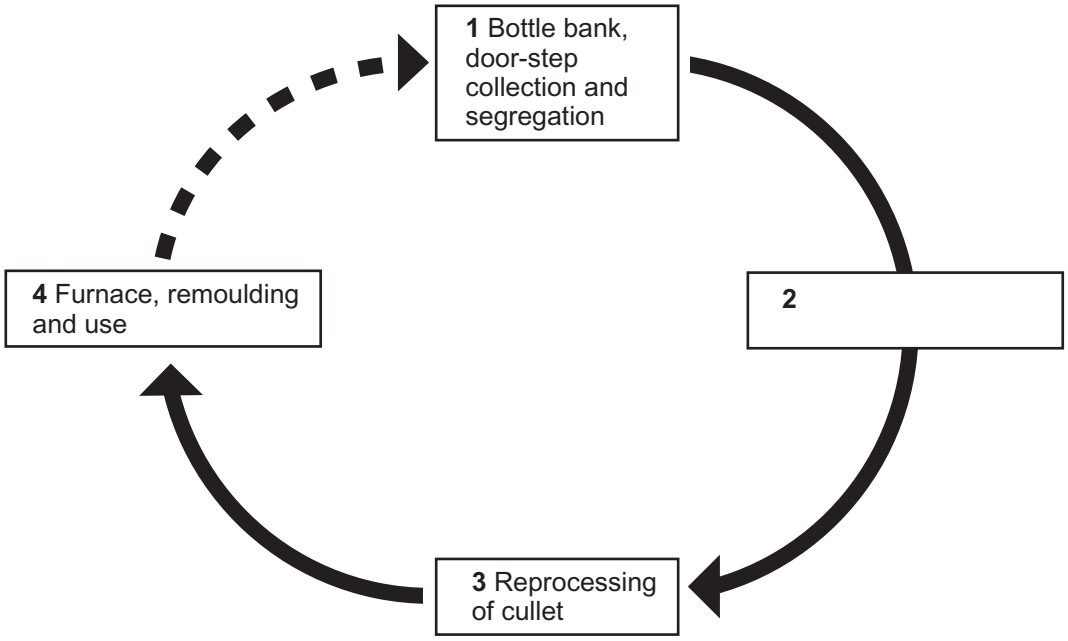
_____

_____ [2]

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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]

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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

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(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

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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 cm^3 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]

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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]

THIS IS THE END OF THE QUESTION PAPER

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Rewarding Learning

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

MARK SCHEME

STEMUP.CO.UK

				AVAILABLE MARKS
1	**(a)**	flexible [1], long lasting [1], waterproof [1]	[3]	
	(b)	oil	[1]	4
2	**(a)**	UV light/forged bank notes [1] breathalyser/drink driving [1] chromatography/forged cheque [1] microscope/fibres [1]	[4]	
	(b)	**(i)** D A C B 4 correct [2] any two in correct position [1]	[2]	
		(ii) carbon powder is black (**or** implied)	[1]	7
3	**(a)**	**(i)** 4 correct [2], 3 correct [1]	[2]	
		(ii) 2007 and 2008	[1]	
		(iii) wound dressings/plasters/sterilising spray	[1]	
		(iv) smaller	[1]	
	(b)	**(i)** smart	[1]	
		(ii) change in intensity of light (**or** implied)	[1]	7
4	**(a)**	**biodegradable** / **non-biodegradable** cardboard / copper grass / polythene bricks aluminium 6 × $[\frac{1}{2}]$ (round down)	[3]	
	(b)	rot/decay/broken down [1] by microbes [1]	[2]	
	(c)	running out of landfill sites [1] idea it doesn't rot [1] **or** different types/have to be sorted [1] difficult to recycle [1] (must have cause → effect)	[2]	7
5	**(a)**	**(i)** transport (**or** implied)	[1]	
		(ii) crushed/smashed up/broken up	[1]	
		(iii) saves resources/saves energy/saves landfill sites/not biodegradable	[1]	
	(b)	cost less to produce/saves energy/idea of safer/lighter/easier to mould Any **two**	[2]	5

					AVAILABLE MARKS
6	**(a)**	**(i)**	tar	[1]	
		(ii)	the boiling point of the fraction increases/gets higher	[1]	
		(iii)	heating oil/used as fuel/in lamps	[1]	
	(b)	**(i)**	made up of carbon and hydrogen [1] only [1]	[2]	
		(ii)	carbon dioxide/CO_2	[1]	
		(iii)	leads to global warming/produces greenhouse gases	[1]	7
7	**(a)**	**(i)**	C	[1]	
		(ii)	B	[1]	
		(iii)	B	[1]	
		(iv)	same volume of water/soap solution/boiled for 2 minutes	[1]	
	(b)	**(i)**	calcium sulphate/magnesium sulphate/ calcium chloride/magnesium chloride or correct formulae	[1]	
		(ii)	calcium carbonate [1], water [1] (**or** correct symbols)	[2]	
		(iii)	add washing soda/ion exchange/distillation/sodium carbonate	[1]	8
				Total	**45**

STEMUP.CO.UK

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2009–2010

Science: Single Award (Modular)

Materials and their Management
Module 4

Foundation Tier

[GSC41]

FRIDAY 21 MAY 2010, MORNING

GSC41

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 you.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
Total Marks	

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Examiner Only	
Marks	Remark

1 **(a)** The following words describe some important uses of materials.

electrical wire : bridges : bags :

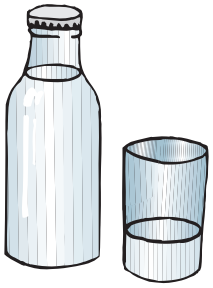
wall insulation : floor tiles : shirts

Choose words from the list above to complete the table below. The first one has been done for you.

Material	Use
plastic	bags
ceramic	
copper	
fibre	
iron	

[4]

(b) Many containers for liquids are made from glass.



What makes glass a good container for storing liquids?
Tick (✓) **three** correct boxes.

Glass is brittle	
Glass is strong	
Glass is lightweight	
Glass is unreactive	
Glass is transparent	
Glass has a low melting point	

[3]

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(c) Many bottles are now made of plastic.

Give two reasons why plastic has replaced glass to make bottles.

1. _____

2. _____ [2]

2 **(a)** Below are four fractions obtained from crude oil. Match each fraction to **one** use.
One is already done.

Fraction	Use
Naphtha	Chemicals
Refinery gas	
Paraffin	
Tar	

Lubricants

Roads

Gas cookers

Liquid fuel for heating [3]

(b) Name the process used to separate the different hydrocarbons in crude oil.
Circle the correct answer.

filtration : chromatography : fractional distillation

[1]

(c) Methane (CH_4) is one of the gases present in refinery gas.

(i) Name the **two** elements present in methane. You may find your Data Leaflet useful.

_____ and _____ [1]

(ii) Give **one** harmful environmental effect of burning methane gas.

_____ [1]

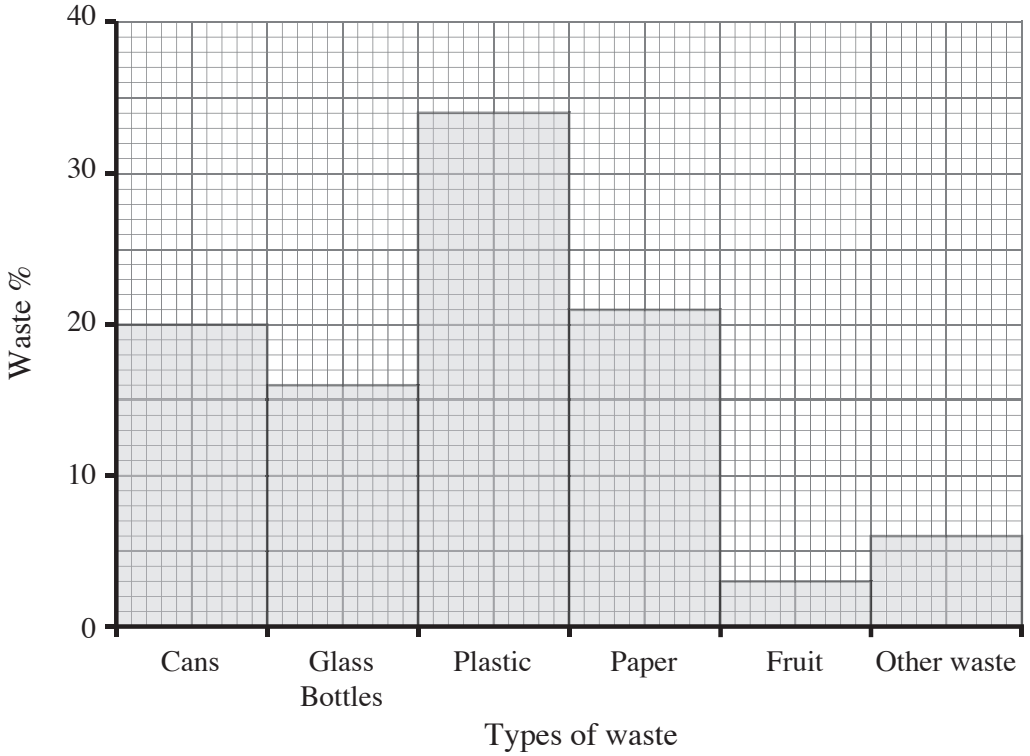
Examiner Only

Marks	Remark

STEMUP.CO.UK

Examiner Only	
Marks	Remark

3 The bar chart below gives the percentage of different types of waste found in a town park.



(a) (i) What percentage of waste is glass bottles?

_____% [1]

(ii) Suggest a material which you would expect to find included in 'other waste'.

_____ [1]

(b) Paper bags are an example of a biodegradable material.

(i) Explain fully the term **biodegradable**.

_____

_____ [2]

(ii) Give two environmental reasons why it is important that supermarkets use fewer plastic bags.

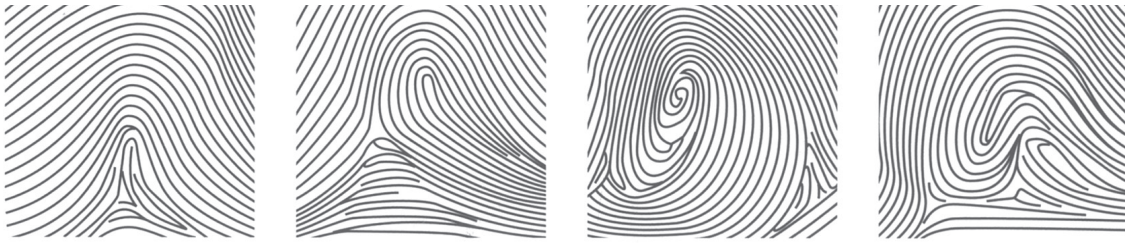
1._____

2._____ [2]

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Examiner Only	
Marks	Remark

4 Below are the four types of fingerprints.



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A B C D

(a) From the fingerprints above (A, B, C or D) identify the:

(i) Loop _____

(ii) Whorl _____ [2]

(b) Describe how you could obtain your fingerprint on black glossy paper. Your description should include:

- how the fingerprint is put on the paper
- the powder used
- how to remove excess powder
- how to remove the fingerprint from the black surface.

_____

_____

_____

_____

[4]

(c) Fingerprinting is used to help solve crime. Name another scientific technique used to help police solve crime.

_____ [1]

(d) It is important to protect valuables in the home. Give two ways that jewellery in the home can be protected from theft.

1. _____

2. _____ [2]

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Examiner Only	
Marks	Remark

5 **(a)** Photochromic and thermochromic paints are smart materials which alter with a change in the surrounding environmental conditions.

(i) What environmental condition causes photochromic paint to change?

_____ [1]

(ii) Shown below is a baby's feeding bottle.



The bottle is made from thermochromic plastic which changes colour as temperature changes.
Suggest how this may make the bottle safer to use.

_____

_____

_____ [2]

(b) Nanotechnology involves the use of nano-sized particles.

(i) Explain fully the meaning of **nanotechnology**.

_____

_____ [2]

(ii) Give one use of nanotechnology.

_____ [1]

(iii) How many nanometres are in one metre?
Circle the correct answer.

10^{-9} 10^{9} 10^{3} 10^{-3} [1]

Examiner Only	
Marks	Remark

6 Many areas in Northern Ireland have hard water. Hardness is caused by certain salts of calcium and magnesium.



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(a) (i) Explain fully what is meant by the term **hard water**.

_____

_____ [2]

(ii) Name a compound that forms permanent hard water.

_____ [1]

(b) Four samples of water (A, B, C and D) were tested for hardness. The results are shown below.

Sample	A	B	C	D
Volume of soap solution required **before** boiling/cm^3	21	26	24	18
Volume of soap solution required **after** boiling/cm^3	11	12	24	13

From the results which sample (A, B, C or D) has:

(i) the hardest water? _____

(ii) permanent hard water only? _____

(iii) the greatest problem with kettle 'fur'? _____ [3]

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(c) Temporary hardness in water is caused by calcium hydrogencarbonate. Complete the word equation to show how temporary hardness is removed by boiling.

Calcium hydrogencarbonate → water + _____ + _____

[2]

Examiner Only	
Marks	Remark

THIS IS THE END OF THE QUESTION PAPER

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GCSE

Science: Single Award (Modular)

End of Module Tests

May 2010

Mark Schemes

Issued: October 2010

Rewarding Learning

General Certificate of Secondary Education
2010

Science: Single Award (Modular)

Materials and their Management
Module 4
Foundation Tier

[GSC41]

FRIDAY 21 MAY 2010, MORNING

MARK SCHEME

STEMUP.CO.UK

					AVAILABLE MARKS
1	**(a)**	ceramic/floor tiles [1], copper/electrical wire [1], fibre/shirts [1], iron/bridges [1]	[4]		
	(b)	strong [1], unreactive [1], transparent [1]	[3]		
	(c)	lighter/safer/ flexible/easy to dye/low cost/easy to mould, any **two**	[2]		9
2	**(a)**	refinery gas/gas cookers [1], paraffin/liquid fuel [1], tar/roads [1]	[3]		
	(b)	fractional distillation [1]	[1]		
	(c)	**(i)** carbon and hydrogen [1]	[1]		
		(ii) global warming or effect/greenhouse effect [1] (**not** air pollution/produces CO_2)	[1]		6
3	**(a)**	**(i)** 16%	[1]		
		(ii) cloth (any valid) (**not** metal/food on own)	[1]		
	(b)	**(i)** can be broken down/decompose/rot [1] by microbes/bacteria/fungi [1]	[2]		
		(ii) saves resources [1], saves energy [1] accept reduces landfill sites litter/don't rot/safer for wildlife (do **not** accept saves money)	[2]		6
4	**(a)**	Loop/B [1], Whorl/C [1]	[2]		
	(b)	Gently press finger on paper [1], sprinkle some talcum/aluminium powder on the paper [1], use a **paintbrush to rub off**/blow off/tap off excess powder [1], place a piece of (stick) tape on the fingerprint and remove [1]	[4]		
	(c)	flame test/ chromatography/ DNA/ fibres [1]	[1]		
	(d)	safe or idea of locking away/ lock doors (windows)/ out of sight [1] alarm system/ security mark [1]	[2]		9

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					AVAILABLE MARKS
5	**(a)**	**(i)**	light [1]	[1]	
		(ii)	show if bottle **food** is warm [1] won't burn the baby [1]	[2]	
	(b)	**(i)**	smaller **particle** size [1] new material properties [1]	[2]	
		(ii)	wound dressing/sun creams/bandages/plasters/clear oil spills or other example [1]	[1]	
		(iii)	10^9 [1]	[1]	7
6	**(a)**	**(i)**	does not lather [1] with soap [1]	[2]	
		(ii)	calcium sulphate or chloride/magnesium sulphate or magnesium chloride	[1]	
	(b)	**(i)**	B [1]		
		(ii)	C [1]		
		(iii)	B [1]		[3]
	(c)		calcium carbonate [1], carbon dioxide [1]	[2]	8
				Total	**45**

STEMUP.CO.UK

Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2009–2010

Science: Single Award (Modular)

Materials and their Management
Module 4

Foundation Tier

[GSC41]

GSC41

THURSDAY 25 FEBRUARY 2010, MORNING

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

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Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
A Data Leaflet is provided for use with this paper.

For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
Total Marks	

STEMUP.CO.UK

Examiner Only	
Marks	Remark

1 **(a)** Electric kettles are often made of plastic.

Image of Kettle removed due to copyright issues.

Give three reasons why plastic is a suitable material for making kettles. Choose from:

flexible : strong : conductor : brittle

insulator : easy to mould

1. _____

2. _____

3. _____ [3]

(b) Give two reasons why the heating elements in kettles are made from stainless steel.

Images of heating elements removed due to copyright issues.

1. _____

2. _____ [2]

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(c) Linen is a natural material made from flax while nylon is a man-made material made from oil. The picture below shows a linen tablecloth.

Examiner Only	
Marks	Remark

Image of linen tablecloth removed due to copyright issues.

(i) Linen is also used to make clothes. Name another natural material which could be used to make clothes.

_____[1]

(ii) Suggest two reasons why a traditional material like linen has been replaced with man-made materials like nylon.

1. _____

2. _____[2]

(d) Give **one** problem associated with many man-made plastics.

_____

_____[1]

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Marks	Remark

2 **(a)** Flame tests were carried out on five metal chlorides and the colour of the flames were recorded in the table below. Complete the table.

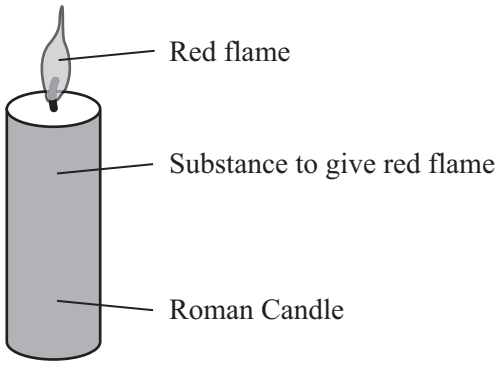
Choose from:

yellow : blue : lilac

Metal chloride	Flame colour
Potassium	
Calcium	Brick red
Sodium	
Lithium	Crimson
Lead	Blue-white

[2]

(b) A fireworks company wanted to make a Roman Candle firework to give a brick red flame.



From the table, name a metal chloride that would be suitable.

_____ [1]

(c) It is important that the flame test rod is clean. Name a liquid that is used in the cleaning process.

Circle the correct answer.

acid : water : alkali [1]

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(d) The compound copper sulphate contains the elements, **copper**, **sulphur** and **oxygen** and produces a green flame in a flame test. Which of the elements in copper sulphate causes the flame to be green?

_____[1]

(e) Give **one** suitable safety precaution when carrying out flame tests.

_____[1]

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Marks	Remark

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Marks	Remark

3 This question is about hard and soft water.

(a) Choose words from the list to complete the sentences below.

salt : lather : magnesium chloride : soap

stalactites : stalagmites : calcium carbonate

Water is hard if it does not _____ with

_____ solution.

In hard water areas _____ form on the roof of caves.

Deposits of _____ are formed in kettles in hard water areas. [4]

(b) In the table below, tick the statements which show the **advantages** of hard water. One has been done for you.

Statement	Place a tick
Good for teeth and bones	✓
Tastes good	
Stains clothes	
Good for making beer	
Gives kettle fur	

[2]

(c) Temporary hard water can be softened by boiling. Give **two** other suitable ways of softening temporary hard water.
Circle your answers.

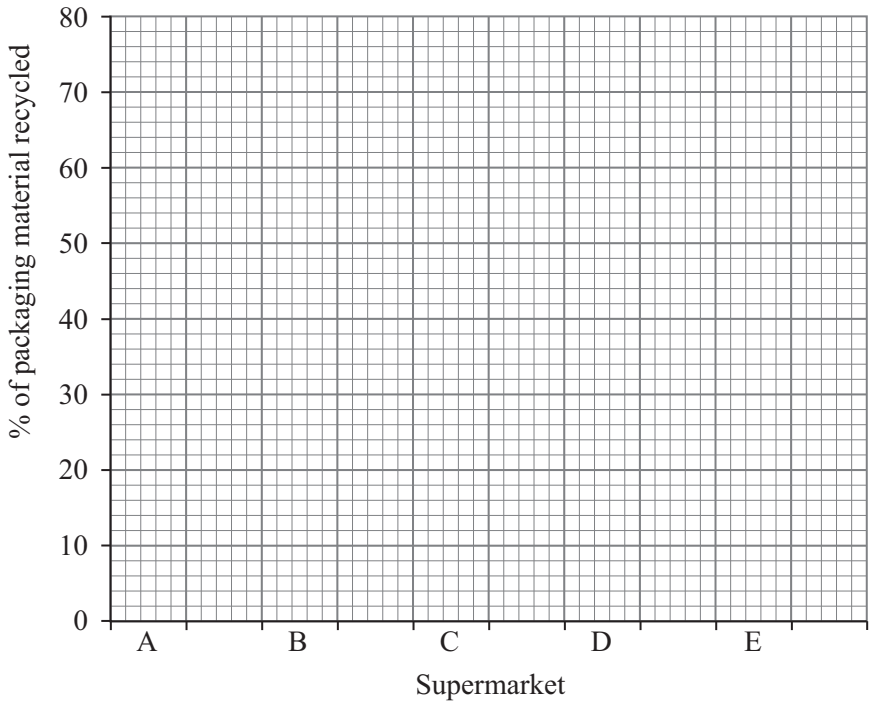
filtering : distillation : chromatography : evaporating : ion exchange [2]

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4 A group of students investigated the amount of packaging material which five supermarkets (A, B, C, D and E) recycle. The table below shows their results.

Supermarket	% of packaging material recycled
A	28
B	70
C	58
D	38
E	66

(a) On the grid below, draw a **bar chart** using the information in the table.



[2]

(b) Calculate the percentage difference between the supermarket which recycles most and the one which recycles least.
Show your calculation.

Percentage difference _____ % [2]

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Marks	Remark

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(c) Name **one** packaging material that is commonly used in supermarkets.

_____[1]

(d) Give two reasons why supermarkets must improve the amount of packaging material they recycle.

1. _____

_____

2. _____

_____[2]

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Marks	Remark

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Examiner Only	
Marks	Remark

5 The diagram below shows two alcoholic drinks, each containing one unit of alcohol.



Half pint of beer
= 1 unit



Glass of wine
= 1 unit

(a) A person drinks **two** half pints of beer and **three** glasses of wine. Calculate the number of units of alcohol consumed and the increase in blood alcohol this produces if 1 unit of alcohol = 20 mg alcohol per 100 cm^3 of blood.

_____ units

_____ mg alcohol per 100 cm^3 of blood [2]

(b) A man has a blood alcohol level of 160 mg per 100 cm^3 of blood. Calculate his blood alcohol level after two hours if his body removes one unit of alcohol per hour.

(i) _____ mg alcohol per 100 cm^3 of blood. [1]

(ii) The legal limit to drive is 80 mg alcohol per 100 cm^3 of blood. Explain fully why it would still be dangerous for him to drive even after waiting two hours.

_____

_____

_____ [2]

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6 **(a)** In an investigation to find how much energy is released, the same amount of four hydrocarbon fuels were burnt and the following results were obtained.

Hydrocarbon fuel	Formula	Energy released/kJ
Methane	CH_4	890
Ethane	C_2H_6	1560
Propane	C_3H_8	2220
Butane	C_4H_{10}	2880

(i) What was done in the investigation to make it a fair test?

_____ [1]

(ii) Use the information to give one trend, shown by the results, when the fuels are burnt.

_____

_____ [1]

(iii) Use the information in the table to suggest the value for the energy produced when pentane, C_5H_{12}, is burnt.
Circle your answer.

2900 kJ : 5100 kJ : 2400 kJ : 3510 kJ [1]

(b) Ethanol, C_2H_5OH, is an organic molecule which can also be used as a fuel.

(i) How many different elements are contained in ethanol?

_____ [1]

(ii) Explain fully why ethanol is not a hydrocarbon.

_____

_____

_____ [2]

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(iii) Complete the word equation to show what happens when ethane burns in excess oxygen.

ethane + oxygen → _____ + _____ [2]

(c) (i) Name the hydrocarbon molecule that is used to make polythene.

_____ [1]

(ii) Give **one** environmental problem caused by polythene.

_____

_____ [1]

THIS IS THE END OF THE QUESTION PAPER

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Marks	Remark

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GCSE

Science: Single Award (Modular)

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Mark Schemes

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Rewarding Learning

General Certificate of Secondary Education
2009 – 2010

Science: Single Award (Modular)

Materials and their Management
Module 4
Foundation Tier

[GSC41]

THURSDAY 25 FEBRUARY 2010, MORNING

MARK SCHEME

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				AVAILABLE MARKS
1	**(a)**	strong [1], insulator [1] and easy to mould [1]	[3]	
	(b)	Any **two** from: good conductor [1] and does not rust [1] idea of unreactive [1] or high melting point [1]	[2]	
	(c)	**(i)** silk/wool/cotton/fur/leather [1]		
		(ii) superior properties [1] cost [1] doesn't crease (synthetic)	[3]	
	(d)	disposal/non-biodegradable/fills landfill sites/uses up resources/ uses up energy	[1]	9
2	**(a)**	sodium; yellow [1] potassium; lilac/purple/violet [1]	[2]	
	(b)	calcium chloride	[1]	
	(c)	acid	[1]	
	(d)	copper	[1]	
	(e)	wear safety goggles/wear gloves/fumecupboard/tie hair back/ no spillage of acid	[1]	6
3	**(a)**	lather [1], soap [1], stalactites [1], calcium carbonate [1]	[4]	
	(b)	tastes good [1] and good for making beer [1]	[2]	
	(c)	distillation [1] ion exchange [1]	[2]	8
4	**(a)**	5 correct [2], 3/4 [1]	[2]	
	(b)	70 – 28 [1] = 42 [1]	[2]	
	(c)	plastic [1]/paper [1]/glass [1]/aluminium foil [1] or other suitable	[1]	
	(d)	to save resources [1]/to save energy [1]/saves money [1]/ saves landfill sites [1]	[2]	7
5	**(a)**	5 units [1], 5 × 20 = 100 [1]	[2]	
	(b)	**(i)** 160 – 40 = 120	[1]	
		(ii) could be over the legal limit [1], over 80 idea of slow reaction time [1] (judgement/concentration) cause accidents or death [1] Max 2	[2]	5

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					AVAILABLE MARKS
6	**(a)**	**(i)**	same amount [1]	[1]	
		(ii)	as the number of carbon increases the amount of energy released increases or as the number of hydrogen increases the amount of energy released increases	[1]	
		(iii)	3510	[1]	
	(b)	**(i)**	3	[1]	
		(ii)	a hydrocarbon is a molecule that contains H and C only [1], ethanol contains H, H, C and O [1]	[2]	
		(iii)	carbon dioxide [1] and water [1]	[2]	
	(c)	**(i)**	ethene	[1]	
		(ii)	non-biodegradable	[1]	10
				Total	**45**

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