CCEA GCSE SCIENCE: SINGLE AWARD (MODULAR)

SCIENCE



EXAM QUESTION PACK

MODULE 4 HIGHER TIER GSC42 PAPERS

STEMUP

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Rewarding Learning

General Certificate of Secondary Education
2011–2012

Science: Single Award (Modular)

Materials and their Management
Module 4
Higher Tier

[GSC42]

MONDAY 21 MAY 2012
9.15 am–10.00 am

MARK SCHEME

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			AVAILABLE MARKS
1	**(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
2	**(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 or giving grants for use of alternative fuels ● adverts encouraging less use of cars [1]	8
3	**(a)**	It combines the **properties** of two or more materials [1] to form a better/more useful material [1]	
	(b)	Any **one** of ● light ● long-lasting/durable ● unreactive ● non-rusting ● flexible [1]	
	(c)	Cost: Expensive/not cheap [1]	4

AVAILABLE MARKS

4 **(a)** Any **two** of: Blood, hair, skin, semen, saliva [2]

(b) **(i)** unique [1] reference to cutting crime faster/solve crime faster [1]

(ii) human rights/cost/big brother state/information may be lost [1] — 5

5 **(a)** 5 points plotted correctly [2] or if 3–4 points plotted correctly [1]
smooth curve [1]

(b) The number/percentage of road accidents due to drink driving is **decreasing** over time [1]

(c) Better education/more aware/more arrests/more likely to be caught/ more advertising [1] — 5

6 **(a)** A material whose properties change [1]
when there is a change in surroundings/change in temp, pH or light [1]

(b) **(i)** Many **small molecules/monomers** [1]
joined together/in long chains [1]

(ii)

Monomer (alkene)	Polymer	Property	Common Use
Ethene	**Polyethene** [1] or Polythene	Light and flexible	**Plastic bags, cling film (other suitable)** [1]
Propene [1]	Polypropene	Light and Durable	Ropes

7

		AVAILABLE MARKS
7 **(a)** **(i)** C [1]		
(ii) A [1]		
(iii) B [1]		
(iv) D [1]		
(b) Any **two** from: ● Measure a given volume of water and add **soap** solution ● Measure the amount of **lather** after shaking ● **boil** and redo experiment [2] **Must have:** **One named apparatus,** e.g. measuring cylinder, test tube, ruler [1] **One fair test** reference, e.g. same volume of water, same size test tube etc. [1] **Result expected**: comparison/boiled sample would have more lather [1]		9
Total		**45**

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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	

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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.

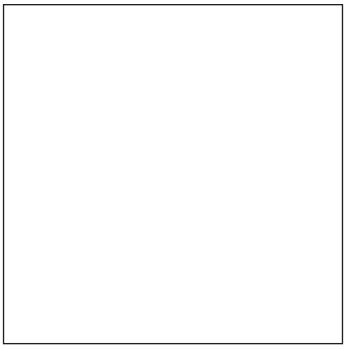
_____ [1]

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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]

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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]

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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]

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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]

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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]

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Examiner Only	
Marks	Remark

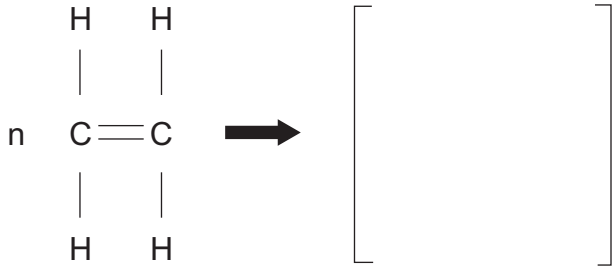
(c) Ethene can be used to make the polymer polythene, which can be used to make plastic bags.

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

_____

_____ [2]

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



[2]

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General Certificate of Secondary Education
2011–2012

Science: Single Award (Modular)

Materials and their Management
Module 4

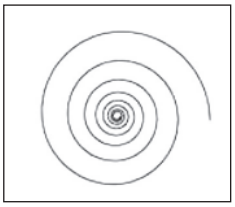
Higher Tier

[GSC42]

TUESDAY 28 FEBRUARY 2012
9.30 am–10.15 am

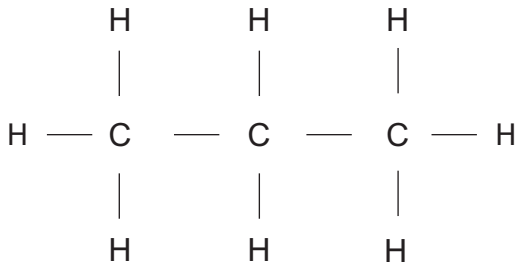
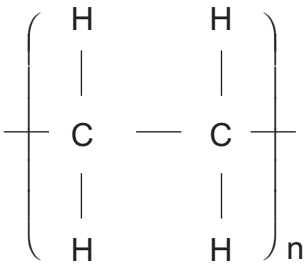
MARK SCHEME

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			AVAILABLE MARKS
1	(a)	any **one** of: lighter/doesn't break easily/cheaper/easier to shape **not** safer/flexible [1]	
	(b)	any **two** of: bottle banks/household bins for recycling/advertising/ fines/rewards [2]	
	(c)	any **two** of: saves money/energy/saves raw materials/reduces 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, food, wood [1]	8
2	(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 tap [1] Place a piece of (sticky) tape on the fingerprint and remove [1] [4]	
	(c)	**Any 2** from Hair [1] Blood [1] DNA/saliva/skin/sperm [1] Footprint [1] Clothes/fibres [1] Paint/bits of metal [1] Or other suitable [2]	7
3	(a) (i)	7 [1]	
	(ii)	140 [CM allowed **(i)** × 20] [1]	
	(b)	Any **two** of: Affects nervous system/slows down reactions/affects concentration/ judgement or similar [1] Can cause accident/death [1] [2]	
	(c)	Any **one** of: LSD/Marijuana/ecstasy or other suitable [1] Scientific names only.	5

					AVAILABLE MARKS
4	**(a)**	**(i)**	1 000 000 000	[1]	
		(ii)	Any **one** of: Sterilising sprays/wound dressings/cleaning operating theatres	[1]	
	(b)	**(i)**	They change (properties) depending on their surroundings [1] Heat [1] causes the paint to change colour [1] (Changes colour as temperature changes = [2])	[3]	
		(ii)	When the metal frame is damaged it can easily return to its original shape/easily reshaped **not:** easily fixed/repaired	[1]	
	(c)		Lilac [1] Lead [1]	[2]	8
5	**(a)**	**(i)**	Sample C	[1]	
		(ii)	Take each sample, shake with soap solution and (measure the height of the lather) [1] Test tube/Measuring Cylinder or Ruler [1] Same volume of water/same volume of soap or other suitable [1] Do not accept repeat experiment		
	(b)		$CaCO_3$ [1] Ca $(HCO_3)_2$ [1]		
	(c)		Calcium chloride + Carbon Dioxide (either order) accept symbols	[2]	8

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			AVAILABLE MARKS
6	**(a)**	 [1]	
	(b) **(i)**	$C_2H_4 + C_8H_{18}$ either order [2]	
	(ii)	using a catalyst [1]	
	(iii)	Higher demand for smaller hydrocarbons/petrol/smaller hydrocarbons more useful [1]	
	(c) **(i)**	Many small molecules/monomers [1] joined together/in long chains [1] Total [2]	
	(ii)	 No double bond [1] n [1] Total [2]	9
		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

Higher Tier

[GSC42]

WEDNESDAY 9 NOVEMBER 2011
10.15 am–11.00 am

GSC42

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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1 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.

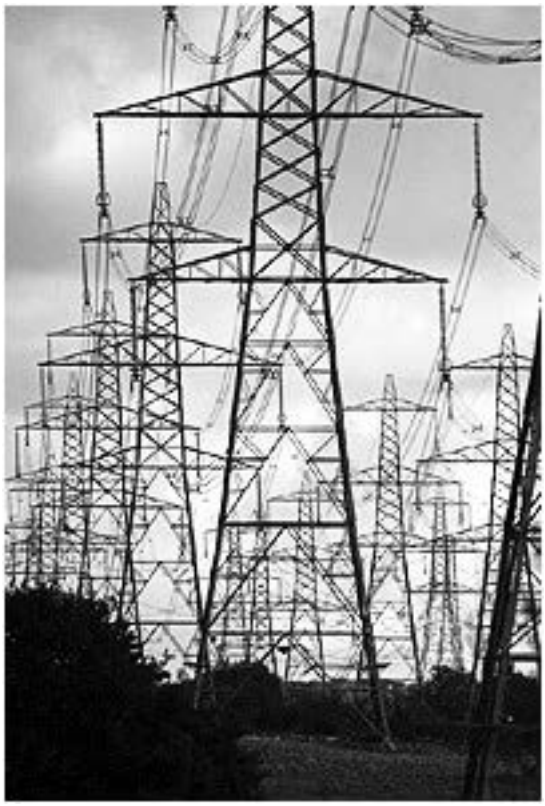
_____ [1]

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

1. _____

2. _____ [2]

(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

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

paraffin : naphtha : petrol : bitumen : lubricating oil



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(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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Examiner Only	
Marks	Remark

3 Most plastics are non-biodegradable and this leads to many problems in our environment.



© Courtesy Algalita.org

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

_____

_____ [2]

(b) Explain fully why it can be difficult to recycle plastic.

_____

_____ [2]

(c) Name a natural organic compound that can be used to make a biodegradable plastic.

_____ [1]

Examiner Only	
Marks	Remark

4 In forensic science flame tests are used to show the presence of certain metal ions in paint from the scene of a crime.



© Andrew Lambert Photography / Science Photo Library

(a) Describe in detail how a flame test could be carried out in the laboratory. Include a safety procedure you would use.

_____

_____

_____

_____

_____ [4]

(b) Complete the table about the flame colours of different metal ions.

Metal ion	Flame test colour
Sodium	
	Lilac
	Brick red

[3]

(c) Give the type of spectroscopy used in flame tests.

Circle the correct answer.

infra-red : ultraviolet : emission : visible

[1]

Examiner Only	
Marks	Remark

5 A student conducted the following investigation into the cause of hardness in water. He dissolved the same amount of each of six different chemicals in separate flasks each containing 20 cm^3 of distilled (pure) water. He added soap solution to each flask and shook until a lather was formed. The results are shown below.

Solution used	Positive ion	Negative ion	Height of lather/mm
Sodium sulphate	Na^+	SO_4^{2-}	20
Calcium nitrate	Ca^{2+}	NO_3^-	2
Potassium chloride	K^+	Cl^-	19
Magnesium chloride	Mg^{2+}	Cl^-	1
Sodium nitrate	Na^+	NO_3^-	19
Magnesium sulphate	Mg^{2+}	SO_4^{2-}	1

(a) (i) Suggest why it was important to use distilled (pure) water.

_____ [1]

(ii) The student was careful to conduct a 'fair' investigation. Apart from the same amount of chemicals and distilled water used, give **two** other ways the student made the test fair.

1. _____

2. _____ [2]

(iii) What information in the table is used as a measure of the hardness of water?

_____ [1]

(iv) From the results state which two ions cause hardness in water.

_____ and _____ [2]

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(b) Fermanagh is a limestone region in Northern Ireland famous for its Marble Arch Caves.

(i) Describe how stalactites and stalagmites are formed in limestone caves.

_____

_____

_____

_____ [3]

(ii) Give **one** method of removing permanent hardness from water.

_____ [1]

Examiner Only	
Marks	Remark

Examiner Only	
Marks	Remark

6 Ethene and propane are two important organic chemicals.

(a) Complete the table below to show the molecular and structural formulae of ethene and propane.

Hydrocarbon	Molecular formula	Structural formula
Ethene		
Propane		

[4]

(b) Polythene is a useful plastic made from ethene molecules.

(i) Name the type of reaction that is used to produce polythene from ethene.

_____ [1]

(ii) What is the physical state of polythene at room temperature?

_____ [1]

(c) Propane is used as a fuel.

Balance the symbol equation to show the complete combustion of propane.

$$C_3H_8 \quad + \quad O_2 \quad \longrightarrow \quad CO_2 \quad + \quad H_2O$$ [2]

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2011–2012

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Materials and their Management
Module 4
Higher Tier

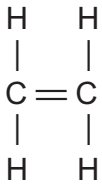
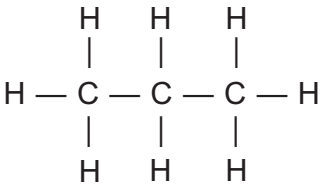
[GSC42]

WEDNESDAY 9 NOVEMBER 2011
10.15 am–11.00 am

MARK SCHEME

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				AVAILABLE MARKS
1	**(a)**	it is lightweight	[1]	
	(b)	iron is stronger [1] is 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
2	**(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
3	**(a)**	not broken down [1] by microbes [1]		
	(b)	different types of plastic difficult to separate	[1] [1]	
	(c)	starch	[1]	5
4	**(a)**	Any **four** from: clean test rod in (conc HCl) acid test rod does not impart colour to flame put test rod in sample note colour of flame when sample is placed in it use a roaring/very hot flame wear safety goggles	[4]	
	(b)	orange/yellow [1], potassium [1], calcium [1]		
	(c)	emission	[1]	8
5	**(a)**	**(i)** no other ions present/nothing else in it	[1]	
		(ii) Any **two** from: • same size of flask • shake for same time • same amount/type of soap	[2]	
		(iii) height of lather	[1]	
		(iv) Mg^{2+} and Ca^{2+} (names ok)	[2]	

				AVAILABLE MARKS
(b)	**(i)**	Any **three** from: rainwater/($H_2O + CO_2$) runs over limestone and reacts with it calcium hydrogencarbonate solution forms drips from roof of cave to floor stalactites form from roof/stalagmites from floor	[3]	
	(ii)	add washing soda/ion exchange/distillation	[1]	10
6	**(a)**	C_2H_4 [1] 	[1]	
		C_3H_8 [1] 	[1]	
	(b)	**(i)** polymerisation	[1]	
		(ii) solid	[1]	
	(c)	$C_3H_8 + 5O_2 \longrightarrow 3CO_2 + 4H_2O$ LHS [1] RHS [1]		8
			Total	**45**

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Module 4

Higher Tier

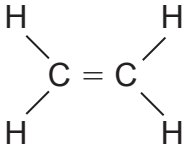
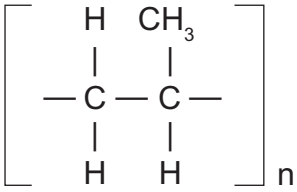
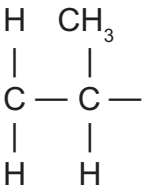
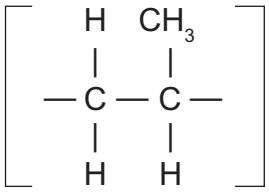
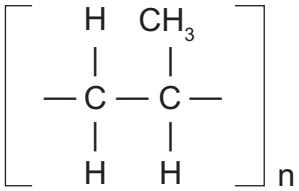
[GSC42]

FRIDAY 20 MAY 2011, AFTERNOON

MARK SCHEME

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				AVAILABLE MARKS
1	**(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
2	**(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	[1]	
	(d)	important in making polymers/polythene/plastics	[1]	6
3	**(a)**	it is convenient to use	[1]	
	(b)	saves landfill sites or other suitable	[1]	
	(c)	fines/charges for dumping	[1]	
	(d)	broken down [1] by microbes [1] saves separations from waste in plant [1]	[3]	
	(e)	for gardens	[1]	7
4	**(a)**	composite	[1]	
	(b)	use carbon powder [1], dust gently [1] brush off gently with brush [1] use sellotape to obtain fingerprint [1] any 3	[3]	
	(c)	invasion of privacy [1] lost/stolen [1]/identity theft [1] idea of mistake [1] any 2	[2]	
	(d)	lilac [1], sodium [1], brick red [1]	[3]	9

			AVAILABLE MARKS
5	**(a)**	gas syringe/inverted measuring cylinder [1]	
	(b)	16.6 – 9.6 = 7 9.6 + 3.5 = 13.1 [1]	
	(c)	**(i)** no more bubbles CO_2/total volume of gas remained constant [1]	
		(ii) $5\frac{1}{2} \rightarrow 6$ minutes (accept $13 \rightarrow 13.2$) [1]	
	(d)	repeat results/take more readings [1]	
	(e)	$CaCO_3$ [1], $CaCl_2$ [1] [2]	
	(f)	calcium ethanoate [1]	8
6	**(a)**	carbon [1], hydrogen [1] [1]	
	(b)	 all C – H bonds correct [1] C = C bond correct [1] [2]	
	(c)	small molecules joint [1] to form a long chain molecule [1] [2]	
	(d)	 = breaking [1]	
		[1] for   [1]	
		[1] for   [1]	
		[3]	8
		Total	**45**

Rewarding Learning

Centre Number

71	

Candidate Number

General Certificate of Secondary Education
2010–2011

Science: Single Award (Modular)

Materials and their Management
Module 4

Higher Tier

[GSC42]

GSC42

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

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 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.

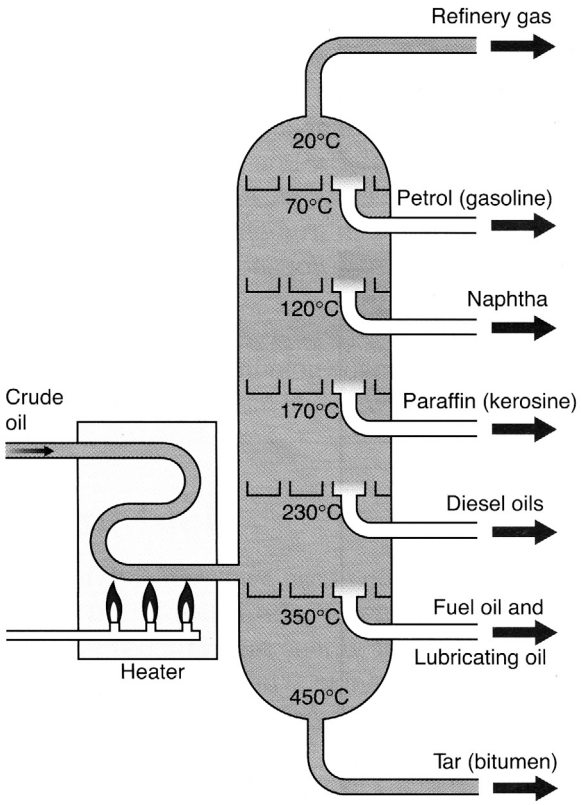
1. _____

2. _____ [2]

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Examiner Only	
Marks	Remark

2 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]

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(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.

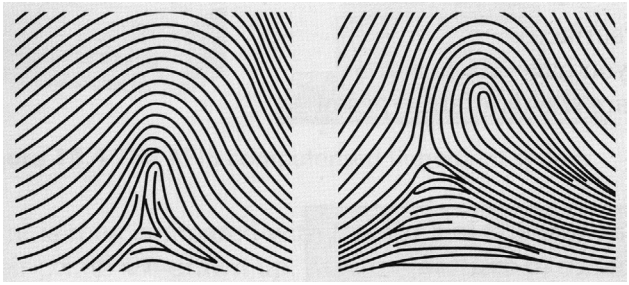
_____ [1]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

3 **(a)** The following two fingerprints were found on the window of a stolen car.



A B

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(i) Name the two types of fingerprint patterns found on the stolen car.

A _____

B _____ [2]

(ii) Name a suitable powder for obtaining fingerprints on the window of the car.

_____ [1]

(iii) How can forensic scientists use the fingerprints found at the scene of the crime to convict the person who has committed the crime?

_____

_____

_____ [2]

(b) The government has discussed the possibility of having a national database of fingerprints.

(i) Suggest what the national database would contain.

_____

_____ [1]

(ii) Suggest one advantage of a national database.

_____

_____ [1]

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Examiner Only	
Marks	Remark

4 Soap solution was used to test the hardness of four water samples (A, B, C and D). Each sample was tested by shaking 10 cm^3 with 20 drops of soap solution. The tests were then repeated with samples which had been boiled for one minute and then with samples which had equal amounts of washing soda added. The results are shown in the table below.

Sample	**Test 1 Before boiling**	**Test 2 After boiling**	**Test 3 Washing soda added**
A	Lather	Lather	Lather
B	No lather	Lather	Lather
C	No lather	Lather	Lather
D	No lather	No lather	Lather

(a) From the table which result (A, B, C or D):

(i) shows a soft water area only? _____ [1]

(ii) shows an area of permanent hard water only? Explain your answer.

_____

_____

_____ [2]

(b) Give two things that were done in the investigation to make the results valid (fair test).

1. _____

2. _____ [2]

(c) The investigation tested two methods of softening hardwater. Give one other method.

_____ [1]

(d) Temporary hardness in water is caused by calcium hydrogen carbonate.

(i) Give the chemical formula for calcium hydrogen carbonate.

(You may find your Data Leaflet helpful.)

_____ [1]

(ii) Give **one** advantage of hardwater.

_____ [1]

(iii) Complete the word equation to show how kettle fur forms.

Calcium hydrogen carbonate $\rightarrow$ calcium carbonate + _____ + _____ [2]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

5 Many organic chemicals from oil have important uses.

(a) Give the molecular formula for ethene.

_____ [1]

(b) Draw the structural formula of propane (C_3H_8) showing all the chemical bonds.

[2]

(c) Give two reasons why polypropene is a suitable material for making nets for fishing.

1. _____

2. _____ [2]

(d) Ethene is obtained by the thermal cracking of decane. Explain fully the meaning of the term **thermal cracking**.

_____

_____

_____ [2]

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Examiner Only	
Marks	Remark

6 **(a)** Each of the balanced symbol equations has one incorrect formula. Put a circle round the incorrect formula.

One has been done for you.

A $2H_2 + O_2 \rightarrow (2HO)$

B $C_2H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

C $C_{10}H_{22} \rightarrow C_7H_{18} + C_2H_4$

D $CaCO_3 + 2HCl_2 \rightarrow CaCl_2 + H_2O + CO_2$ [3]

(b) From the equations above (**A**, **B**, **C** and **D**) identify the reaction which represents:

(i) the removal of fur from an element in a kettle.

_____ [1]

(ii) the cracking of a hydrocarbon in an oil refinery.

_____ [1]

(iii) the burning of a fuel obtained from oil.

_____ [1]

(c) Give the formula of the chloride ion in calcium chloride.

_____ [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

Higher Tier

[GSC42]

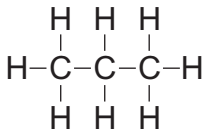
FRIDAY 25 FEBRUARY 2011, MORNING

MARK SCHEME

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					AVAILABLE MARKS
1	**(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
2	**(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)		many molecules are chemically joined [1] into long chains [1]	[2]	
	(c)		use renewable fuels	[1]	7
3	**(a)**	**(i)**	arch [1], loop [1]	[2]	
		(ii)	carbon	[1]	
		(iii)	get fingerprints of suspect [1] and compare with those at the scene of the crime [1] idea of unique fingerprint/compare to data base	[2]	
	(b)	**(i)**	everyone's finger print	[1]	
		(ii)	solves more crime **or** solves crime faster	[1]	7
4	**(a)**	**(i)**	A	[1]	
		(ii)	D [1] as no lather after boiling and a lather after addition of washing soda [1] (both points needed for 2nd part)	[2]	
	(b)		any **two**: same volume water/same volume washing soda/same number of drops of soap solution/same time for boiling	[2]	
	(c)		ion exchange/distillation	[1]	

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				AVAILABLE MARKS
	(d)	**(i)** $Ca(HCO_3)_2$	[1]	
		(ii) good for teeth and bones **or** tastes better good for brewing beer good for tanning leather reduced risk of heart disease	[1]	
		(iii) water [1], carbon dioxide [1]	[2]	10
5	**(i)**	C_2H_4	[1]	
	(ii)	 [1] for all correct C–H [1] for all correct C–C	[2]	
	(iii)	strong [1] and waterproof [1] flexible/durable	[2]	
	(iv)	breaking large hydrocarbon molecules into smaller molecules [1] using heat [1]	[2]	7
6	**(a)**	C_2H_8 [1], C_7H_{18} [1], $2HCl_2$ [1]	[3]	
	(b)	**(i)** D	[1]	
		(ii) C	[1]	
		(iii) B	[1]	
	(c)	Cl^-	[1]	7
			Total	**45**

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Rewarding Learning

General Certificate of Secondary Education
2010–2011

Science: Single Award (Modular)

Materials and their Management

Module 4

Higher Tier

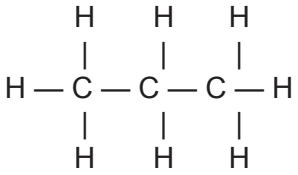
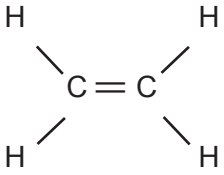
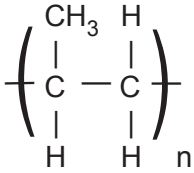
[GSC42]

FRIDAY 12 NOVEMBER 2010, AFTERNOON

MARK SCHEME

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					AVAILABLE MARKS
1	**(a)**	**(i)**	tar	[1]	
		(ii)	the boiling point of the fraction increases/gets higher	[1]	
		(iii)	heating oil/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
2	**(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 symbol	[2]	
		(iii)	add washing soda/ion exchange/distillation/sodium carbonate	[1]	8
3	**(a)**		combines the properties of 2 or more materials [1] to give a more useful material [1]	[2]	
	(b)		plastic	[1]	
	(c)	**(i)**	610 – 420 = 190	[1]	
		(ii)	very strong/light/flexible Any **two**	[2]	6
4	**(a)**	**(i)**	light [1] temperature/heat [1]	[2]	
	(b)	**(i)**	use of very **small** particles [1] to produce new beneficial properties in materials [1]	[2]	
		(ii)	cost/health worries	[1]	5
5	**(a)**		MgCl [1], $2HO_2$ [1]	[2]	
	(b)		$CaCO_3$ [1] + H_2O [1]	[2]	4

				AVAILABLE MARKS
6	**(a)**	cleaned using (hydrochloric) acid [1] imparts no colour to the flame/heat in flame [1] put flame test rod in acid then metal salt/powder [1] one safety procedure [1]	[4]	
	(b)	that the paint contained a sodium salt [1] and not a calcium salt [1]	[2]	
	(c)	Emission	[1]	7
7	**(a)**	**(i)**  propane  ethene	[2]	
		(ii) fuel/heating	[1]	
	(b)	**(i)** starch	[1]	
		(ii) less problems in landfill sites	[1]	
	(c)	 [1] for n (in correct place) [1] for C — C [1] for ( )	[3]	8
			Total	**45**

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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2009–2010

Science: Single Award (Modular)

Materials and their Management
Module 4

Higher Tier

[GSC42]

GSC42

FRIDAY 21 MAY 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 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 you.

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)** 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]

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Examiner Only	
Marks	Remark

2 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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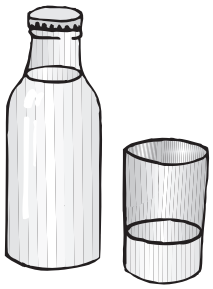
(c) Temporary hardness in water is caused by calcium hydrogencarbonate. Complete the word equation to show how temporary hardness is removed by boiling.

Calcium hydrogencarbonate → water + _____ + _____

[2]

Examiner Only	
Marks	Remark

3 Glass is a non-biodegradable material. Each year thousands of tonnes of glass are recycled.



(a) Describe fully the main stages in recycling glass.

_____

_____

_____

_____

_____ [4]

(b) Apart from being non-biodegradable, give **two** other environmental reasons why it is important to recycle glass.

_____

_____ [2]

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Examiner Only	
Marks	Remark

4 **(a)** For each set of equations below, **(i)**, **(ii)**, **(iii)**, only one of the three equations is correct. Put a circle around the correct equation.
The first is done for you.

(i) $2C + O_2 \rightarrow 2CO_2$

$C + 2O_2 \rightarrow CO_2$

(circled) $C + O_2 \rightarrow CO_2$

(ii) $NaCO_3 + MgCl_2 \rightarrow MgCO_3 + 2NaCl$

$Na_2CO_3 + MgCl_2 \rightarrow MgCO_3 + 2NaCl$

$Na_2CO_3 + 2MgCl_2 \rightarrow 2MgCO_3 + 2NaCl$

(iii) $CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$

$CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + 2H_2O$

$2CaCO_3 + HCl \rightarrow CaCl + CO_2 + H_2O$

[2]

(b) Each of the three sets of equations, **(i)**, **(ii)**, **(iii)**, shown above can be classified as one of neutralisation, displacement, combustion or precipitation.
Complete the reaction type for:

Equation set **(i)** _____

Equation set **(ii)** _____

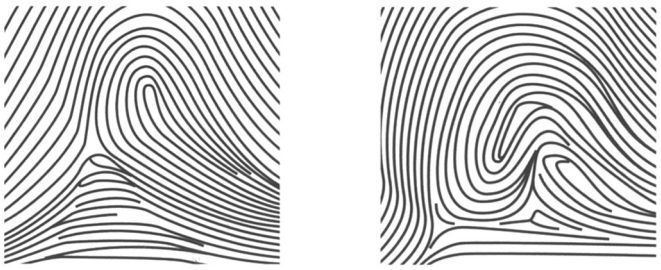
Equation set **(iii)** _____

[3]

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Examiner Only	
Marks	Remark

5 Two common types of fingerprints are shown below.



A B

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(a) Name the two types of fingerprints A and B.

A _____

B _____ [2]

(b) Describe and explain why many people support the idea of having a national database of fingerprints.

_____

_____

_____ [2]

6 The table below gives information about four materials.

Material	Relative heaviness	Relative strength	Relative stiffness	Relative cost
Nylon	1100	8	3	medium
Kevlar	1500	300	190	very high
Polythene	960	2.0	0.6	low
Carbon-reinforced plastic	1600	180	200	high

(a) Using the values in the table and your knowledge of materials, describe and explain one reason for using polythene in packaging.

_____

_____

_____ [2]

(b) A company won a contract to make bulletproof vests. Using the information provided, suggest which material they should use. Explain your answer.

_____

_____

_____

_____ [3]

(c) Carbon-reinforced plastic is a composite material. What is meant by the term composite material?

_____

_____

_____ [2]

Examiner Only

Marks	Remark

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Examiner Only	
Marks	Remark

7 **(a)** Ethene is an important chemical used to make polythene. It can be obtained by the thermal cracking of alkanes as shown in the equation below.

$$C_{10}H_{22} \rightarrow C_8H_{18} + C_2H_4$$

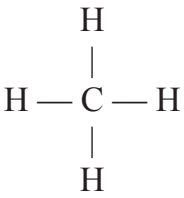
Explain fully the meaning of the term thermal cracking.

_____

_____

_____ [2]

(b) Complete the table below.

Name	Molecular Formula	Structural Formula
Methane		
Ethene	C_2H_4	
Butane	C_4H_{10}	

[3]

(c) Propane is a fuel used in gas barbecues. Complete the **balanced** equation below to show the combustion of propane.

$C_3H_8 + 5O_2 \rightarrow$ _____ + _____

[2]

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(d) The combustion of hydrogen produces water as shown in the equation below.

$$2H_2 + O_2 \rightarrow 2H_2O$$

Suggest why hydrogen is termed a clean fuel.

_____

_____ [1]

Examiner Only	
Marks	Remark

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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
2009 – 2010

Science: Single Award (Modular)

Materials and their Management
Module 4
Higher Tier

[GSC42]

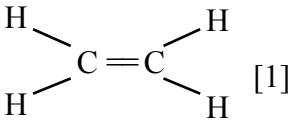
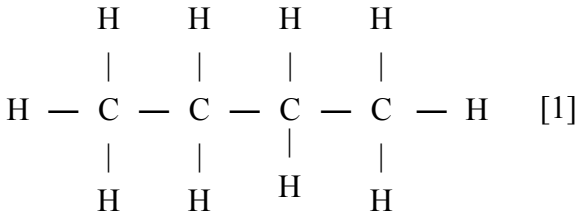
FRIDAY 21 MAY 2010, MORNING

MARK SCHEME

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					AVAILABLE MARKS
1	**(a)**	**(i)**	light [1]	[1]	
		(ii)	show if bottle food is warm [1], won't burn baby [1]	[2]	
	(b)	**(i)**	smaller **particle** size [1], new materials / properties [1]	[2]	
		(ii)	wound dressing/plaster/bandages/sun cream/tennis ball hydrogel/clear oil spills/or other example [1]	[1]	
		(iii)	10^9 [1]	[1]	7
2	**(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
3	**(a)**		1 (**bottle** bank and **doorstep** collection) 2 transport of glass to reprocessing facility 3 reprocessing of cullet / cullet produced / glass broken - crushed 4 furnace, heat/melt, remoulding and use Not in correct order – max [3]	[1] [1] [1] [1]	
	(b)		Saves resources [1] and energy [1] Reduce landfill sites Reduce CO_2 emissions	[2]	6
4	**(a)**	**(ii)**	circle around 2nd equation [1]		
		(iii)	circle around the first equation [1]	[2]	
	(b)		combustion [1] precipitation [1] neutralisation [1]	[3]	5
5	**(a)**		A = loop [1] and B = composite [1]	[2]	
	(b)		unique [1] reference to cutting crime faster / solve crime faster [1]	[2]	4

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				AVAILABLE MARKS
6	**(a)**	low cost/flexible/lightness [1] explanation related to property given [1]	[2]	
	(b)	high strength [1] and not as stiff [1] kevlar [1]	[3]	
	(c)	Composite material as it combines the **properties** of more than one material [1]; to give a more useful material [1]	[2]	7
7	**(a)**	using heat [1] to break large hydrocarbons into smaller (more useful hydrocarbon) molecules [1]	[2]	
	(b)	CH_4 [1]		
		 [1]		
		 [1]	[3]	
	(c)	$3CO_2 + 4H_2O$ [1] for products [1] for correct balancing	[2]	
	(d)	does not produce polluting gases/ does not produce greenhouse gases/ **only** produces water	[1]	8
			Total	**45**

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Rewarding Learning

Centre Number	
71	

Candidate Number

General Certificate of Secondary Education
2009–2010

Science: Single Award (Modular)

Materials and their Management
Module 4

Higher Tier

[GSC42]

GSC42

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

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 is provided for use with this paper.

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 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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Examiner Only	
Marks	Remark

2 **(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]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

3 In Northern Ireland, there are many areas where the water is hard. While many physical features associated with hard water areas attract tourists, hard water also has several disadvantages. One major disadvantage is the limescale which builds up in kettles.



© Djorde Korovljevic/iStockphoto.com

(a) (i) Explain the meaning of the term **hard water**.

_____ [1]

(ii) $Ca(HCO_3)_2$ is the formula of the compound which causes temporary hardness. Name the two ions present in this compound. (You may find your Data Leaflet useful.)

_____ ion and _____ ion [1]

(iii) Name the rock that is responsible for the formation of temporary hard water.

_____ [1]

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(b) (i) Describe fully an experiment you could carry out in the laboratory to show that a sample of water only has temporary hardness.

_____

_____

_____

_____

_____ [3]

(ii) Calcium sulphate and magnesium chloride are two compounds that cause permanent hardness. Give the formula for each of these two compounds.
(You may find your Data Leaflet useful.)

Calcium sulphate _____

Magnesium chloride _____ [2]

(c) Give **one** physical feature found in a hard water area.

_____ [1]

Examiner Only	
Marks	Remark

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Examiner Only	
Marks	Remark

4 **(a)** Each equation below has one mistake; either a formula or a balancing number is incorrect, but not both. Put a circle round the incorrect part. The first has been done for you.

A $\textcircled{2C} + O_2 \rightarrow CO_2$

B $CaCl + Na_2CO_3 \rightarrow 2NaCl + CaCO_3$

C $CH_4 + O_2 \rightarrow CO_2 + 2H_2O$

D $Mg(HCO_3)_2 \rightarrow Mg_2CO_3 + H_2O + CO_2$ [3]

(b) From the above reactions (**B**, **C** and **D**) select the reaction which is:

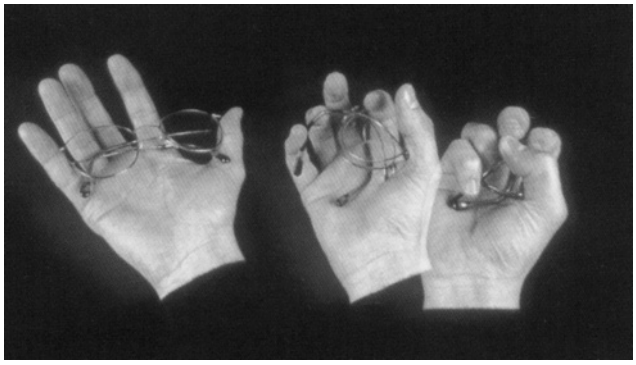
(i) combustion _____

(ii) thermal decomposition _____ [2]

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Examiner Only	
Marks	Remark

5 **(a)** Spectacles made from shape memory metal can be easily crushed, as shown below, but they will quickly return to their original shape form with the warmth of the hand. Shape memory metal is described as a smart material.



© Pascal Goetgheluck/Science Photo Library

(i) Explain fully the meaning of the term **smart material**.

_____

_____

_____ [2]

(ii) Explain what happens when the following two paints behave as smart materials.

1. Photochromic paint _____

_____

2. Thermochromic paint _____

_____ [3]

(b) Complete the table below about flame colours.

Metal chloride	Flame colour
Potassium	Lilac
	Yellow
Calcium	
	Green

[3]

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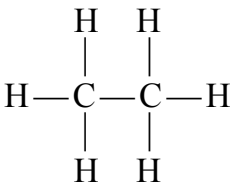
Examiner Only	
Marks	Remark

6 Ethane is a hydrocarbon with a molecular formula C_2H_6 and is obtained from crude oil.

(a) (i) Name the process that is used to obtain liquids and gases from crude oil.

_____ [2]

(ii) Complete the table below to show the structural formula of propane.

Name	Molecular formula	Structural formula
Ethane	C_2H_6	
Propane	C_3H_8	

[2]

(b) Alkenes are hydrocarbons that are used to make important commercial polymers.

(i) Name the type of reaction that is used to make polymers.

_____ [1]

(ii) In terms of bonds, describe how polythene is made from ethene.

_____

_____

_____

_____ [3]

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GCSE

Science: Single Award (Modular)

March 2010

Mark Schemes

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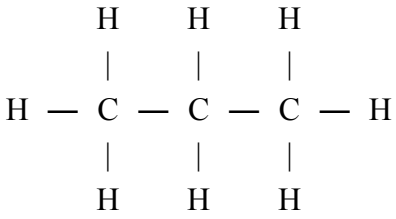
THURSDAY 25 FEBRUARY 2010, MORNING

MARK SCHEME

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					AVAILABLE MARKS
1	**(a)**		5 units [1], $5 \times 20 = 100$ [1]	[2]	
	(b)	**(i)**	$160 - 40 = 120$	[1]	
		(ii)	could be over the legal limit [1], idea of slow reaction time [1], cause accidents or death [1] Max 2	[2]	5
2	**(a)**	**(i)**	crude oil	[1]	
		(ii)	as the number of carbon 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
3	**(a)**	**(i)**	water which does not lather readily with soap solution	[1]	
		(ii)	calcium ion, hydrogencarbonate ion	[1]	
		(iii)	limestone / magnesium carbonate	[1]	
	(b)	**(i)**	take a given volume of water [1] test with soap solution for (a permanent lather) [1] boil and repeat [1] comparison [1] Any **three** but must have comparison	[3]	
		(ii)	$CaSO_4$ [1], $MgC1_2$ [1]	[2]	
	(c)		caves [1] or other suitable	[1]	9
4	**(a)**		CaC1 [1], O_2 [1], Mg_2CO_3 [1]	[3]	
	(b)	**(i)**	C	[1]	
		(ii)	D	[1]	5

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					AVAILABLE MARKS
5	**(a)**	**(i)**	properties change [1] change in surroundings [1]	[2]	
		(ii)	1. change colour [1] according to light intensity [1] 2. change colour [1] according to temperature [1] Any **three**	[3]	
	(b)		sodium [1], brick-red [1] and copper [1]	[3]	8
6	**(a)**	**(i)**	fractional [1] distillation [1]	[2]	
		(ii)			
			1 mark for correct Carbons 1 mark for correct Hydrogens	[2]	
	(b)	**(i)**	polymerisation	[1]	
		(ii)	double bond breaks [1] long chain [1] of repeating units [1] (Full marks for correct equation)	[3]	8
				Total	**45**

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