WJEC GCSE CHEMISTRY

CHEMISTRY



EXAM QUESTION PACK

UNIT C1 HIGHER TIER 0236 PAPERS

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Surname	Centre Number	Candidate Number
Other Names		0

WJEC CBAC

GCSE

0236/02

SCIENCE
HIGHER TIER
CHEMISTRY 1

A.M. TUESDAY, 29 January 2013

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**6**	
3.	**3**	
4.	**12**	
5.	**5**	
6.	**4**	
7.	**6**	
8.	**8**	
Total	**50**	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

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Answer **all** *questions.*

1. The electronic structure of five elements, **A**, **B**, **C**, **D** and **E**, are given in the following table.

These letters are **not** chemical symbols.

Element	Electronic structure
A	2
B	2,1
C	2,8,3
D	2,8,8
E	2,8,8,2

Choose letters from the table to answer parts *(a)* and *(b)*.

Each letter may be used once, more than once or not at all.

(a) Give the **letters** of the **two** elements which belong to the **same** period of the Periodic Table. Give a reason for your answer. [2]

Elements ..... and .....

Reason .....

.....

(b) Give the **letter** of the element which is found in Group 2 of the Periodic Table. Give a reason for your answer. [2]

Element .....

Reason .....

.....

(c) The Periodic Table shown on the back cover of this examination paper may be of use in answering part (i).

(i) From the table above, give the **letter** of the element which represents argon. [1]

.....

(ii) Give **one** use of argon. [1]

.....

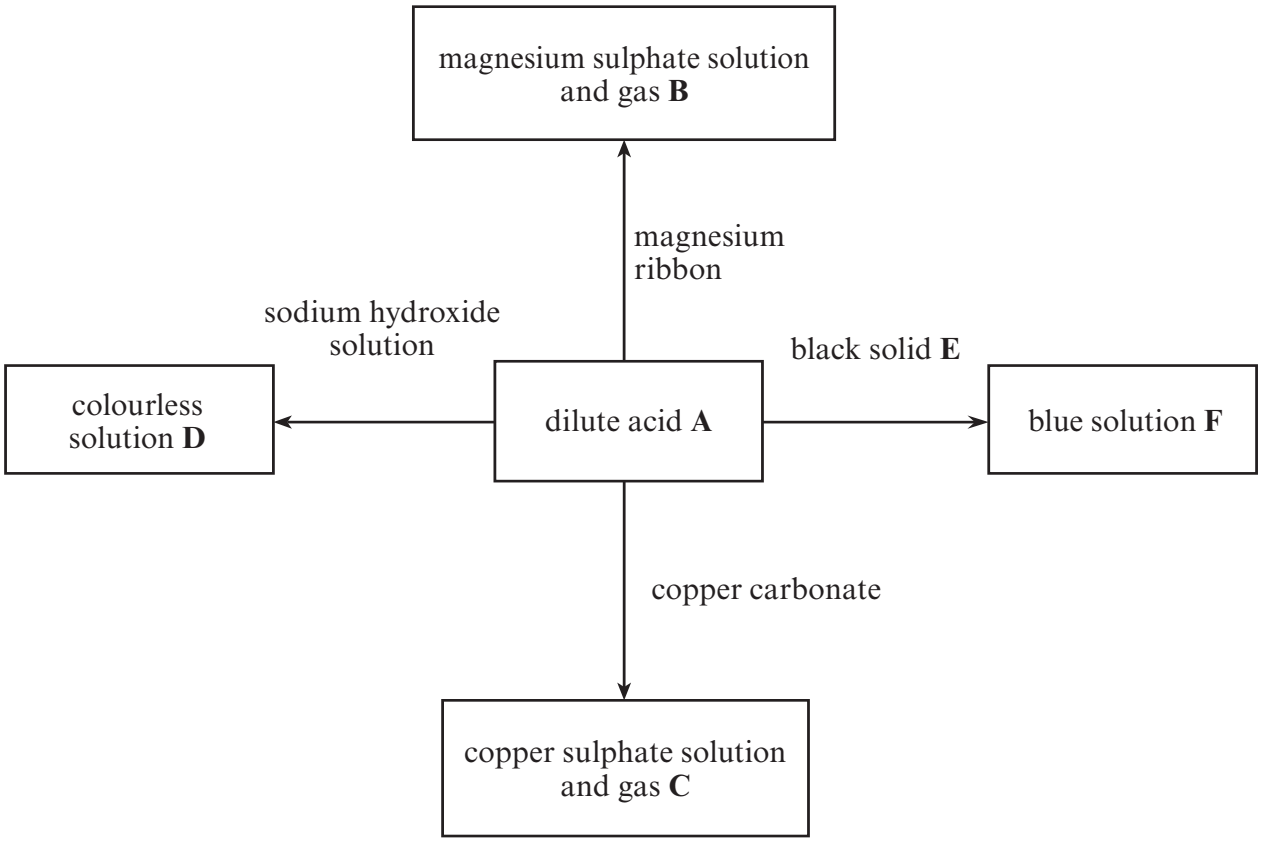
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2. The diagram below shows some reactions of a common acid.



Give the name of

(a) acid **A**, ... [1]

(b) gas **B**, ... [1]

(c) gas **C**, ... [1]

(d) colourless solution **D**, ... [1]

(e) black solid **E**, ... [1]

(f) blue solution **F**. ..... [1]

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3. Briefly describe what happens at a boundary where two tectonic plates are moving apart. [3]

.....

.....

.....

.....

3

4. This question is about Group 1 elements.

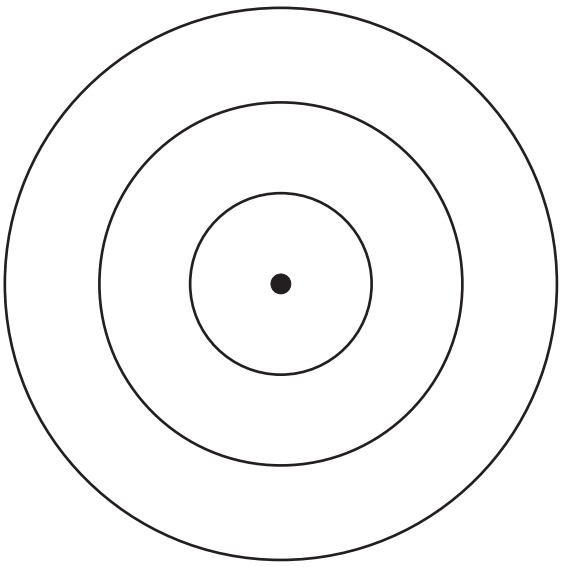
(a) Complete the following sentences using the Periodic Table shown on the back page of this examination paper.

(i) The symbol for caesium is ..... . [1]

(ii) The element with the atomic number of 37 is ..... . [1]

(iii) The Group 1 element in Period 4 is ..... . [1]

(b) Using **X** to represent an electron, complete the following diagram to show the electronic structure of an atom of sodium. [1]



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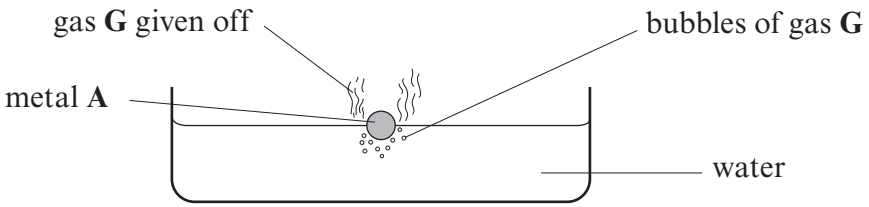
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(c) (i) Give a reason why Group 1 metals are usually stored in oil. [1]

.....

(ii) The following diagram shows the reaction between a Group 1 metal and water. Although the metal reacts vigorously with the water, gas **G** does not ignite spontaneously.



I Name metal **A**. ..... [1]

II Give the formula of gas **G**. ..... [1]

(iii) State **one** precaution a teacher should take in order to carry out this reaction safely. [1]

.....

.....

(d) Potassium burns readily in air.

(i) What flame colour is seen when potassium burns? [1]

.....

(ii) Give the balanced **symbol** equation for this reaction. [3]

..... + ... ⟶ .....

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5. *(a)* Describe how the composition of the atmosphere is affected by

(i) photosynthesis, [2]

.....

.....

.....

(ii) respiration. [2]

.....

.....

.....

(b) 4000 million years ago the percentage of carbon dioxide in the atmosphere was about 40% whereas the present atmosphere has only 0.035%. Give **one** reason why the percentage of carbon dioxide has decreased so much over geological time. [1]

.....

5

6. Nanoscience involves the study of particles that have sizes in the range 1-100 nm.

(a) How many nanometres make up 1 millimetre? [1]

.....

(b) Give a reason why nano-sized particles are used to clean operating theatres in hospitals. [1]

.....

.....

(c) Explain why some people are concerned about the presence of free nanoparticles in the atmosphere. [2]

.....

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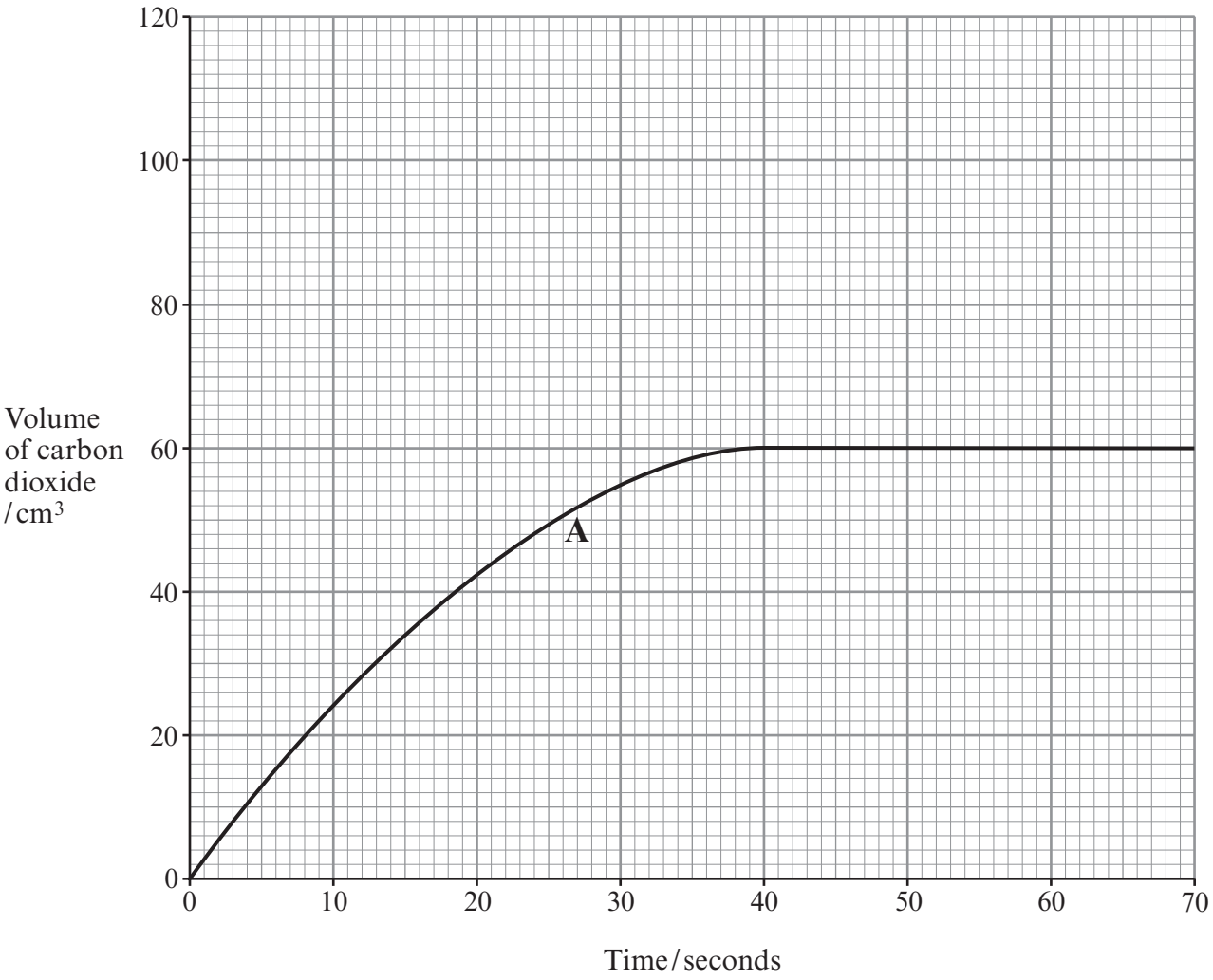
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7. Graph **A** below shows the volume of carbon dioxide formed during a reaction between **excess** marble chips (calcium carbonate) and dilute hydrochloric acid.



(a) On the same grid sketch carefully the graph that would be obtained if the acid was replaced with an equal volume of hydrochloric acid of **double** the concentration with the marble chips still in excess. Label this graph **B**. [2]

(b) (i) On the same grid sketch carefully the graph that would be obtained if the marble chips were ground to a powder and reacted with the same volume and concentration of acid used to produce graph **A**. Label this graph **C**. [2]

(ii) Explain your answer to part (i) using the particle theory. [2]

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6

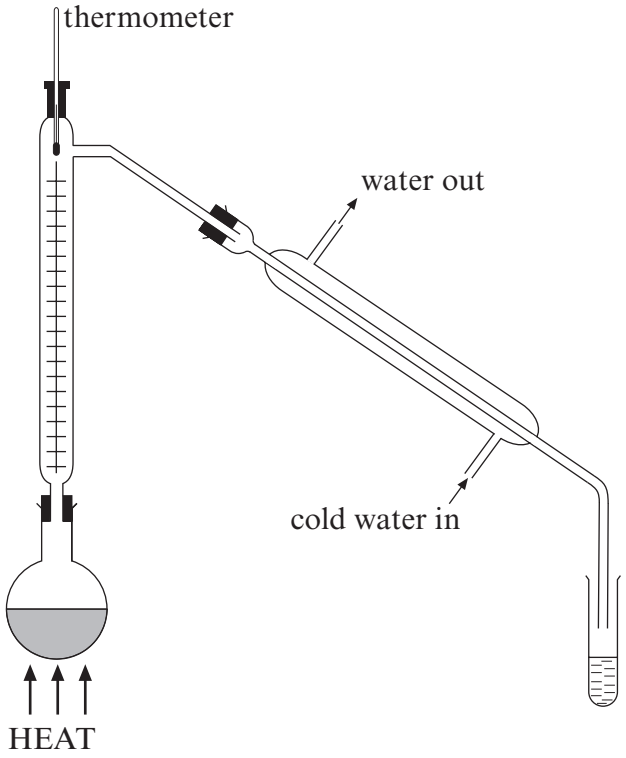
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8. *(a)* Crude oil is a mixture of compounds called hydrocarbons. The following equipment can be used in a school laboratory to separate crude oil into its fractions.



(i) Give the name of the process which separates crude oil into fractions. [1]

.....

(ii) Briefly explain how this process works. [3]

.....

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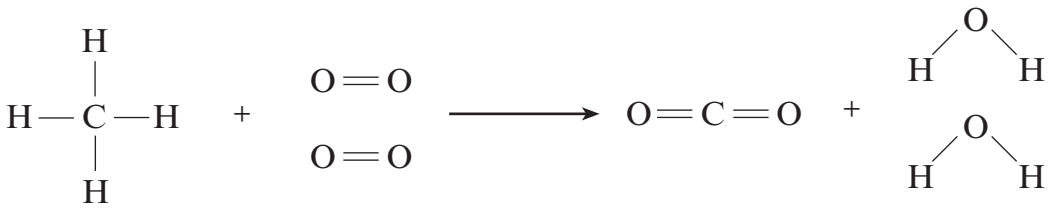
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(b) Methane, CH_4, burns in air to give carbon dioxide and water. The reaction can be represented as follows.



The relative amounts of energy needed to break the bonds in the above diagram are shown in the table.

Bond	Amount of energy needed to break the bond / kJ
C = O	805
O = O	?
O — H	464
C — H	413

Note: The amount of energy released in making a bond is equal and opposite to that needed to break the bond.

The overall relative energy change during the reaction is –818 kJ, showing that the reaction is exothermic.

Calculate the energy needed to break the O = O bond. [4]

.....

.....

.....

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.....

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.....

Energy needed to break the O = O *bond* = ... kJ

8

END OF PAPER

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FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	**Formula**	**Name**	**Formula**
Aluminium	Al^{3+}	Bromide	Br^{-}
Ammonium	NH_4^{+}	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^{-}
Calcium	Ca^{2+}	Fluoride	F^{-}
Copper(II)	Cu^{2+}	Hydroxide	OH^{-}
Hydrogen	H^{+}	Iodide	I^{-}
Iron(II)	Fe^{2+}	Nitrate	NO_3^{-}
Iron(III)	Fe^{3+}	Oxide	O^{2-}
Lithium	Li^{+}	Sulphate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^{+}		
Silver	Ag^{+}		
Sodium	Na^{+}		
Zinc	Zn^{2+}		

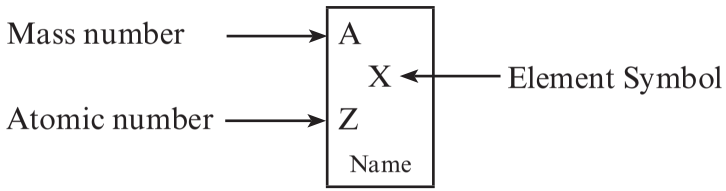
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PERIODIC TABLE OF ELEMENTS

1	2	Group										3	4	5	6	7	0
								$^{1}_{1}$H Hydrogen									$^{4}_{2}$He Helium
$^{7}_{3}$Li Lithium	$^{9}_{4}$Be Beryllium											$^{11}_{5}$B Boron	$^{12}_{6}$C Carbon	$^{14}_{7}$N Nitrogen	$^{16}_{8}$O Oxygen	$^{19}_{9}$F Fluorine	$^{20}_{10}$Ne Neon
$^{23}_{11}$Na Sodium	$^{24}_{12}$Mg Magnesium											$^{27}_{13}$Al Aluminium	$^{28}_{14}$Si Silicon	$^{31}_{15}$P Phosphorus	$^{32}_{16}$S Sulphur	$^{35}_{17}$Cl Chlorine	$^{40}_{18}$Ar Argon
$^{39}_{19}$K Potassium	$^{40}_{20}$Ca Calcium	$^{45}_{21}$Sc Scandium	$^{48}_{22}$Ti Titanium	$^{51}_{23}$V Vanadium	$^{52}_{24}$Cr Chromium	$^{55}_{25}$Mn Manganese	$^{56}_{26}$Fe Iron	$^{59}_{27}$Co Cobalt	$^{59}_{28}$Ni Nickel	$^{64}_{29}$Cu Copper	$^{65}_{30}$Zn Zinc	$^{70}_{31}$Ga Gallium	$^{73}_{32}$Ge Germanium	$^{75}_{33}$As Arsenic	$^{79}_{34}$Se Selenium	$^{80}_{35}$Br Bromine	$^{84}_{36}$Kr Krypton
$^{86}_{37}$Rb Rubidium	$^{88}_{38}$Sr Strontium	$^{89}_{39}$Y Yttrium	$^{91}_{40}$Zr Zirconium	$^{93}_{41}$Nb Niobium	$^{96}_{42}$Mo Molybdenum	$^{99}_{43}$Tc Technetium	$^{101}_{44}$Ru Ruthenium	$^{103}_{45}$Rh Rhodium	$^{106}_{46}$Pd Palladium	$^{108}_{47}$Ag Silver	$^{112}_{48}$Cd Cadmium	$^{115}_{49}$In Indium	$^{119}_{50}$Sn Tin	$^{122}_{51}$Sb Antimony	$^{128}_{52}$Te Tellurium	$^{127}_{53}$I Iodine	$^{131}_{54}$Xe Xenon
$^{133}_{55}$Cs Caesium	$^{137}_{56}$Ba Barium	$^{139}_{57}$La Lanthanum	$^{179}_{72}$Hf Hafnium	$^{181}_{73}$Ta Tantalum	$^{184}_{74}$W Tungsten	$^{186}_{75}$Re Rhenium	$^{190}_{76}$Os Osmium	$^{192}_{77}$Ir Iridium	$^{195}_{78}$Pt Platinum	$^{197}_{79}$Au Gold	$^{201}_{80}$Hg Mercury	$^{204}_{81}$Tl Thallium	$^{207}_{82}$Pb Lead	$^{209}_{83}$Bi Bismuth	$^{210}_{84}$Po Polonium	$^{210}_{85}$At Astatine	$^{222}_{86}$Rn Radon
$^{223}_{87}$Fr Francium	$^{226}_{88}$Ra Radium	$^{227}_{89}$Ac Actinium															

Key:



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GCSE MARKING SCHEME

CHEMISTRY (LEGACY)

JANUARY 2013

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2013 examination in GCSE CHEMISTRY (LEGACY). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

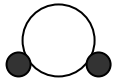
Unit	Page
C1 (LEGACY)	1
C2 (LEGACY)	17
C3 (LEGACY)	31

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GCSE CHEMISTRY (LEGACY)

C1 Mark Scheme - January 2013

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
1		(a)			1				
		(b)			2	CO_2 (1) carbon dioxide (1)	O_2C		

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
2		(a)			2	A – combustion B – respiration C – photosynthesis all three correct for (2) one correct for (1)			
		(b)			1	increase			

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
3		(a)	(i)		1	naphtha			
			(ii)		1	heated / boiled	vaporised evaporated		
			(iii)		1	condensation	condensed		
		(b)	(i)		1	21			
			(ii)		1	diesel oil			

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Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
4		(a)	(i)		1	length of a protein molecule 40nm			
			(ii)		1	million			
		(b)			1	kills germs			

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
5		(a)			1	sulphur	S		
		(b)			1	melting point is high boiling point is high density is high any one for (1)		numerical values e.g. mp = 1540	highest mp
		(c)			2	chlorine (1) boiling point < room temperature / 20 °C (1)	Cl_2	Cl	
		(d)			1	poor conductor / brittle / dull			

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
6		(a)	(i)		1	21.5 ± 0.1			
			(ii)		1	2.5			
		(b)			2	sodium hydroxide + hydrochloric acid (1) sodium chloride + water (1)	NaOH + HCl $NaCl + H_2O$		
		(c)			1	exothermic – temperature increases both needed for (1)	heat given out		

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
7		(a)			3	all points plotted correctly (2) any six points plotted correctly (1) suitable curve of best fit (1)	 consequential curve		
		(b)			1	37 ± 0.5			
		(c)			2	24 (1) volume of gas depends on the amount of calcium carbonate / since half the amount of calcium carbonate was used, half the volume of gas was produced (1)			

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
8	1	(a)	(i)		1	water		H_2O	
			(ii)		1	hydrogen and chlorine both needed for (1)		H and Cl	
			(iii)		1	sulphuric acid		H_2SO_4	
		(b)	(i)		1	NH_4Cl	$NH_4^+Cl^-$		
			(ii)		1	Na_2O	$Na^+{}_2O^{2-}$ / $(Na^{+)}{}_2O^{2-}$		

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
9	1	(a)			2	C and D - both needed (1) both have the same number of (occupied) shells / both have three (occupied) electron shells (1)	aluminium and argon / Al and Ar		
		(b)			2	E (1) two electrons in the outer shell (1) (accept when A given above)	calcium		A / He
		(c)	(i)		1	D			
			(ii)		1	light bulbs / welding			

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
10	2	(a)			1	sulphuric	H_2SO_4		
		(b)			1	hydrogen	H_2		H
		(c)			1	carbon dioxide	CO_2		
		(d)			1	sodium sulphate	Na_2SO_4		
		(e)			1	copper oxide	CuO		
		(f)			1	copper sulphate	$CuSO_4$		

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
11	3				3	• gap formed • magma rises or pushes (through the mantle) • magma cools or solidifies / forms new rock / forms igneous rock / forms a crust • forms (oceanic) ridges or volcanoes any three for (1) each	lava	earthquakes	

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	4	(a)	(i)		1	Cs			
			(ii)		1	rubidium / Rb			
			(iii)		1	potassium / K			
		(b)			1	2,8,1			
		(c)	(i)		1	to prevent the metal reacting with air / moisture / water vapour			
			(ii)	I	1	lithium / sodium	Li / Na		
				II	1	H_2			
			(iii)		1	goggles / safety screen / small piece of metal / tweezers / gloves / large volume of water			
		(d)	(i)		1	lilac	purple / pink		
			(ii)		3	$K + O_2$ (1) K_2O (1) $4 + 1 \rightarrow 2$ balancing (1)			

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Question Number									
FT	HT	Sub-section			Mark	Answer		Accept	Neutral answer	Do not accept
	5	(a)	(i)		2	amount of carbon dioxide decreases amount of oxygen increases	(1) (1)	plants take in carbon dioxide (1) and release oxygen (1)		
			(ii)		2	amount of carbon dioxide increases amount of oxygen decreases	(1) (1)	humans breathe in oxygen (1) and breathe out carbon dioxide (1)		
		(b)			1	(carbon dioxide removed) by plants / photosynthesis / dissolved in oceans / absorbed by rocks				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	6	(a)			1	1000000 / million			
		(b)			1	toxic to bacteria / antibacterial / antiviral / antifungal	sterilising		
		(c)			2	long term effects not known (1) may cause cancer / may be hazardous to health (1)		may cause harm	will cause cancer

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	7	(a)			2	curve from the origin to 120 cm^3 (1) curve drawn to the left of curve A (1)			
		(b)	(i)		2	curve from the origin to 60 cm^3 (1) curve drawn to the left of curve A (1)			
			(ii)		2	bigger surface area greater chance of collision faster reaction any two for (1) each			

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	8	(a)	(i)		1	fractional distillation			
			(ii)		3	• crude oil heated / enters as vapour • column is hot at the bottom / cool at the top • larger molecules / higher bp molecules liquid at the bottom • different fractions condense at different levels any three for (1) each			
		(b)			4	energy needed to break reactant bonds $= 4(413) + 2x / 1652 + 2x$ (1) energy released in the formation of products $= 2(805) + 4(464)/1610 + 1856/3466$ (1) $1652 + 2x - 3466 = -818$ (1) $2x = 3466 - 818 - 1652 = 996$ $x = \frac{996}{2} = 498$ (1) correct answer only (4)			

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0236/02

SCIENCE
HIGHER TIER
CHEMISTRY 1

A.M. TUESDAY, 12 June 2012

45 minutes

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Question	**Maximum Mark**	**Mark Awarded**
1.	**7**	
2.	**8**	
3.	**6**	
4.	**4**	
5.	**4**	
6.	**5**	
7.	**7**	
8.	**6**	
9.	**3**	
Total	**50**	

0236
020001

ADDITIONAL MATERIALS

In addition to this paper you will need a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

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Do not use gel pen or correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

If you run out of space, use the continuation page at the back of the booklet, taking care to number the question(s) correctly.

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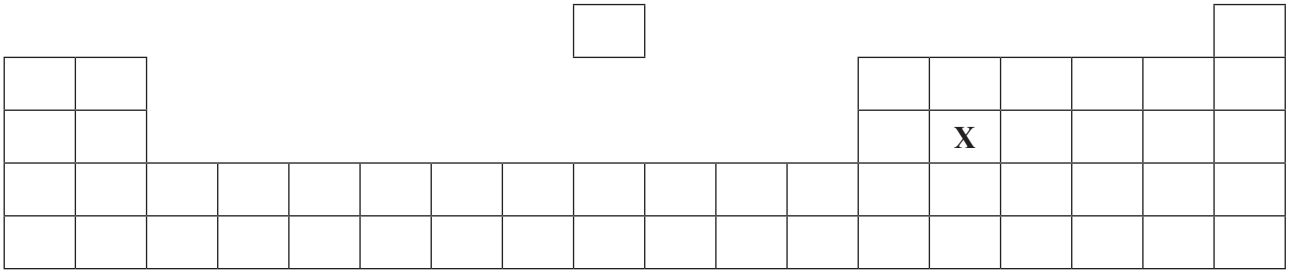
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Answer **all** *questions.*

1. The following diagram shows an outline of the Periodic Table of Elements.

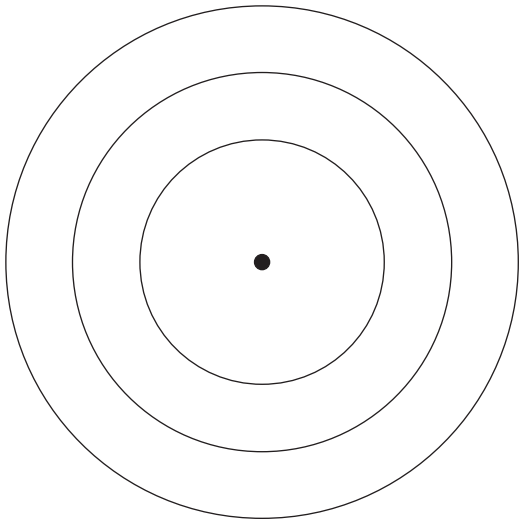
You may find the Periodic Table shown on the back page of this examination paper useful in answering this question.



(a) Using the letters **A-E**, show the position of the following elements on the diagram above. [5]

A – the most reactive alkali metal
B – the least reactive halogen
C – the gas used to fill weather balloons
D – the element that reacts with sodium to produce sodium chloride
E – the element with electronic structure 2,8,2

(b) Complete the diagram below to show the electronic structure of the element shown in position **X** in the table above. [1]



(c) State how the electronic structure can be used to determine an element's atomic number. [1]

.....

.....

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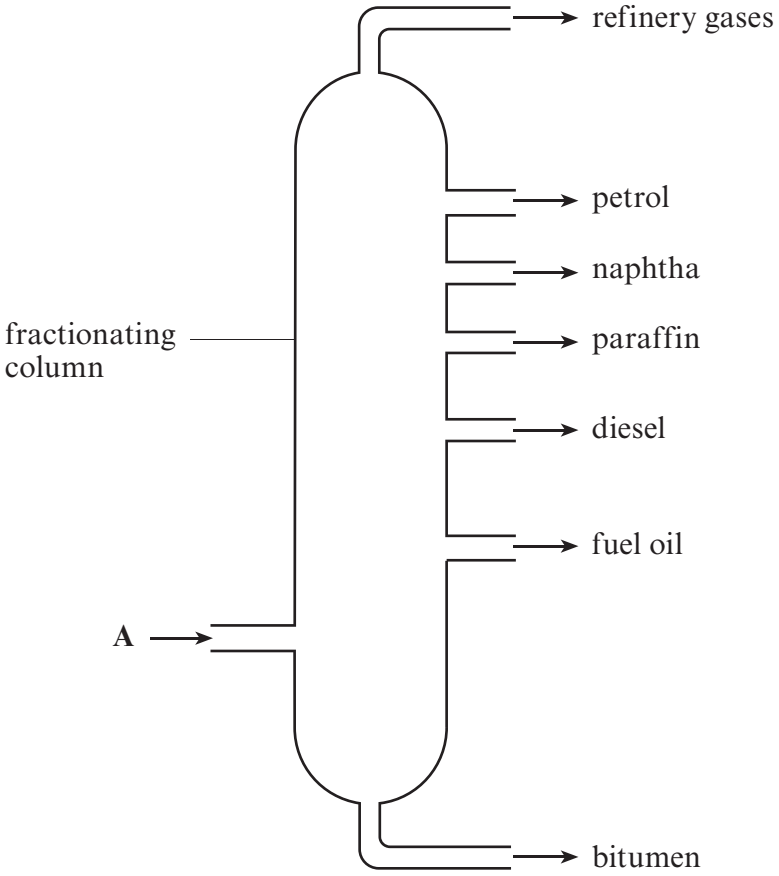
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2. *(a)* Crude oil is a mixture of compounds called hydrocarbons which can be separated into fractions in a fractionating column as shown below.



(i) Name the elements present in all hydrocarbons. [1]

..... and .....

(ii) State what must happen

I. to the crude oil before it enters the column at point **A**, [1]

.....

II. in order to collect the fractions as liquids. [1]

.....

(iii) Give the name of this process. [1]

.....

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(iv) Explain why petrol is collected above diesel in the fractionating column. [2]

.....

.....

(b) The following graph shows how the average price of crude oil changed between 1998 and 2008.



(i) State the trend in oil price over this period. [1]

.....

(ii) Suggest a reason for this trend. [1]

.....

.....

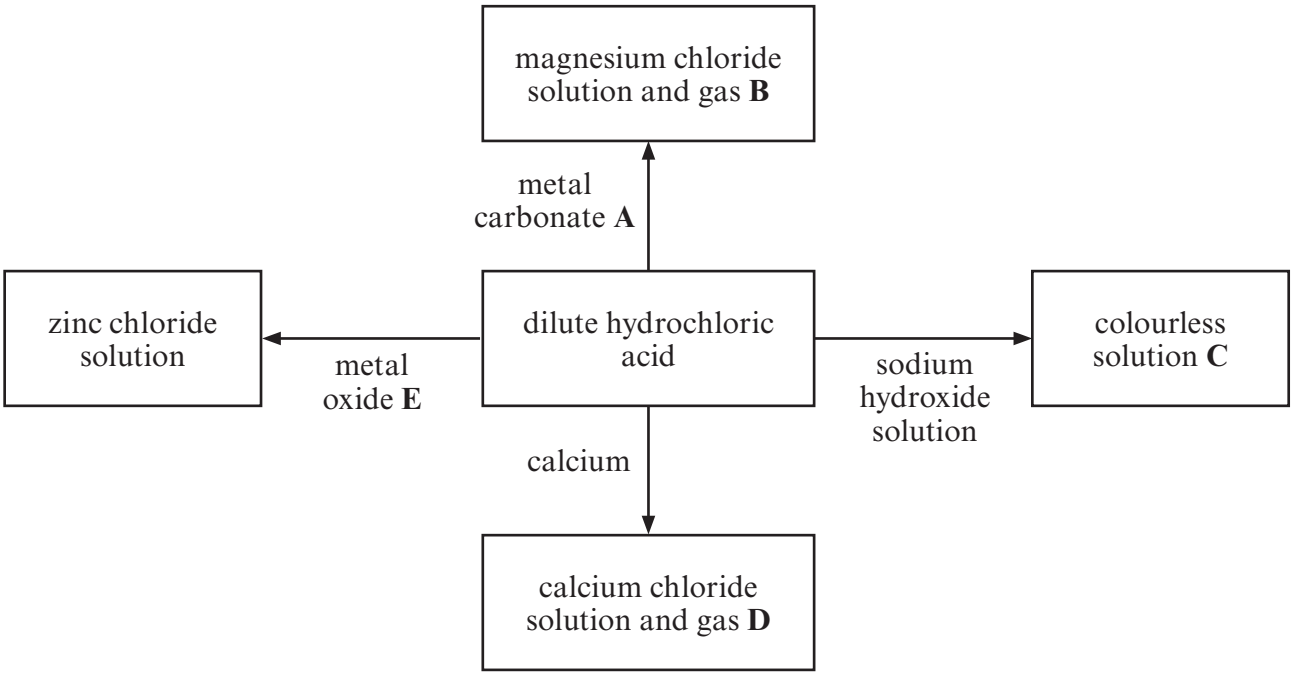
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3. *(a)* The diagram below shows some reactions of dilute hydrochloric acid.



Give the chemical name for

(i) metal carbonate **A**, ... [1]

(ii) gas **B**, ... [1]

(iii) colourless solution **C**, ... [1]

(iv) gas **D**, ... [1]

(v) metal oxide **E**. ..... [1]

(b) When magnesium chloride reacts with sodium hydroxide, a white precipitate of magnesium hydroxide is formed.

Use the **table of common ions** on the **inside of the back cover of this examination paper** to give the chemical formula of magnesium hydroxide. [1]

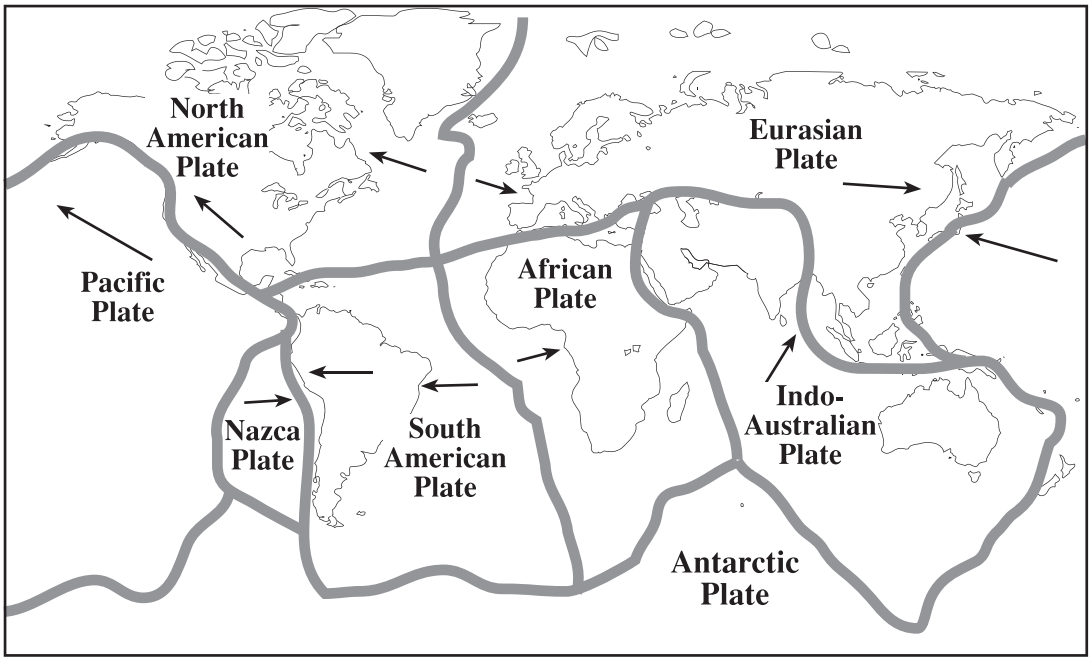
Formula of magnesium hydroxide .....

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4. The following diagram shows some of the tectonic plates which make up the Earth's crust.



Use the diagram above to answer parts *(a)* and *(b)*.

(a) Name **two** plates that are moving towards each other. [1]

..... and .....

(b) Describe how new rock is formed at the boundary between the Eurasian and the North American plates and name the type of rock formed. [3]

.....

.....

.....

Type of rock formed .....

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5. *(a)* State what is meant by *nanoscience*. [1]

.....

.....

(b) One example of the application of nanoscience is the use of nano-silver particles to coat the inner surfaces of refrigerators. Give the property of nano-silver that explains why it can be used in this way and give another use that depends on this property. [2]

Property .....

Other use .....

(c) Give **one** reason why some people are concerned about the use of nano-particles such as nano-silver. [1]

.....

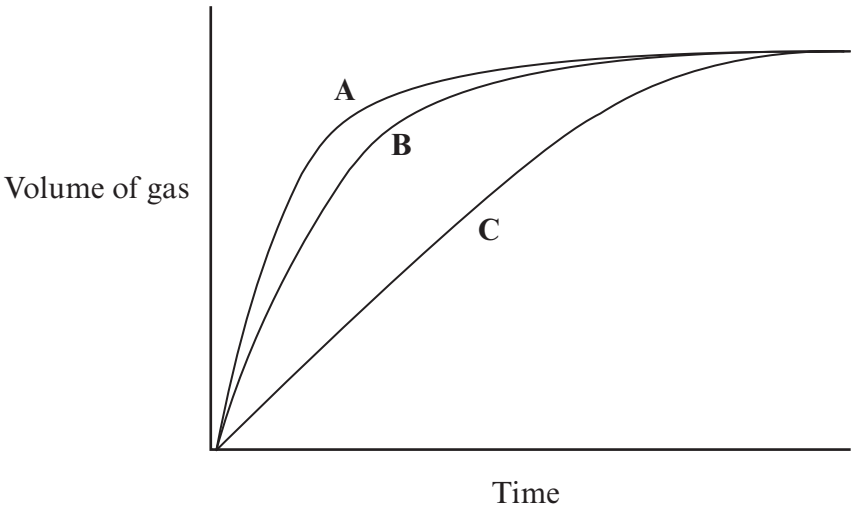
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6. Jane studied the rate of the reaction between hydrochloric acid and calcium carbonate. Three different experiments, **A**, **B** and **C**, were carried out using the same mass of calcium carbonate and with the acid in *excess* each time. The volume of gas produced was measured over time. The results of these experiments are shown in the graphs below.



State and explain, using particle theory, **two** factors that may be responsible for the different rates seen above. [5]

.....

.....

.....

.....

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.....

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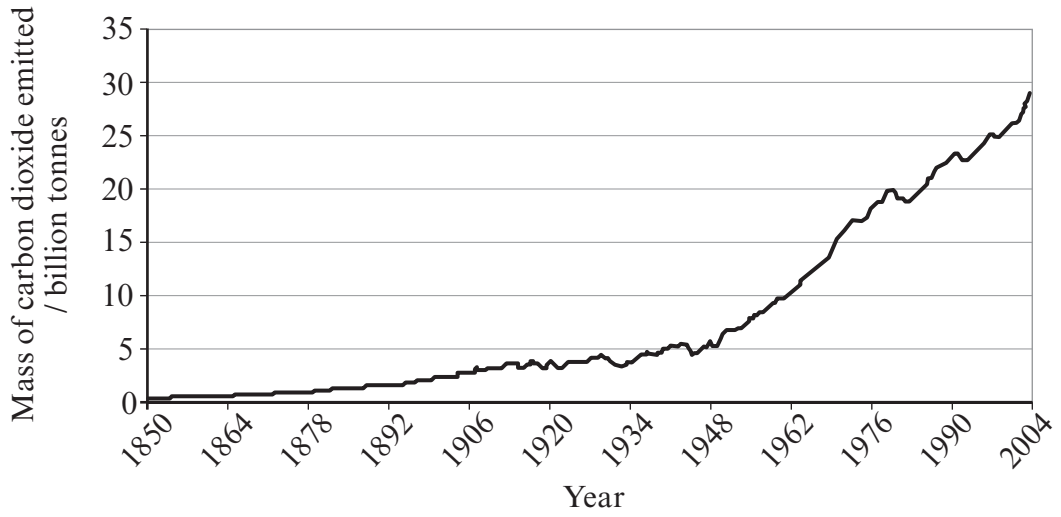
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7. *(a)* The following graph shows global carbon dioxide emissions between 1850 and 2004.



(i) Describe the trend in carbon dioxide emissions between 1850 and 2004. [2]

.....

.....

(ii) State what effect this change is likely to have on the average temperature of the Earth's atmosphere. [1]

.....

(iii) Give **one** consequence of this change in temperature. [1]

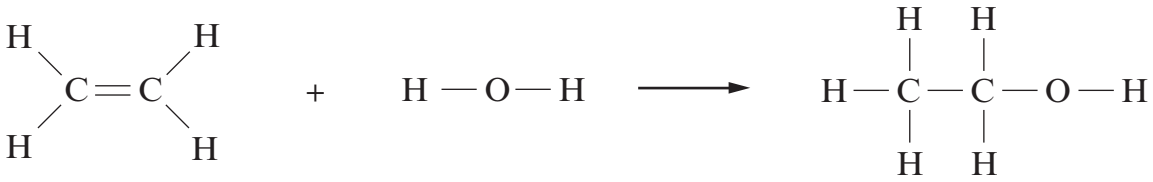
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(b) Alternative fuels such as ethanol are becoming increasingly important.
One method of producing ethanol is to react a hydrocarbon called ethene with water as shown in the following equation.



This reaction is exothermic and gives out 42 kJ of energy.

(i) The energy released when forming bonds in the product is 3234 kJ.
Calculate the energy needed to break all bonds in the reactants. [1]

.....

.....

(ii) Use your answer in (i) and the bond energies shown in the table below to calculate the amount of energy needed to break a C═C bond. [2]

Bond	Amount of energy needed to break the bond / kJ
C—H	413
O—H	464

Note: The amount of energy released in making a bond is equal and opposite to that needed to break the bond.

.....

.....

.....

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8. Group 1 elements are known as the alkali metals due to the way they react with water.

(a) Describe the observations made when lithium, sodium and potassium react with water. [3]

.....

.....

.....

.....

(b) Write a balanced **symbol** equation for the reaction between sodium and water. [3]

..... + ... ⟶ ..... + ...

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9. A technician has three solutions, **A**, **B** and **C**. The solutions are known to be sodium chloride, potassium iodide and silver nitrate but not necessarily in that order.

The following table shows the results obtained when the solutions were added to each other.

Solution	**A**	**B**	**C**
A		white precipitate formed	yellow precipitate formed
B	white precipitate formed		no reaction
C	yellow precipitate formed	no reaction	

not carried out

(a) Give the meaning of the term *precipitate*. [1]

.....

.....

(b) Use the results given to identify solutions **A**, **B** and **C**. [2]

A .....

B .....

C .....

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Question number	Write the question numbers in the left-hand margin

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FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	**Formula**	**Name**	**Formula**
Aluminium	Al^{3+}	Bromide	Br^{-}
Ammonium	NH_4^{+}	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^{-}
Calcium	Ca^{2+}	Fluoride	F^{-}
Copper(II)	Cu^{2+}	Hydroxide	OH^{-}
Hydrogen	H^{+}	Iodide	I^{-}
Iron(II)	Fe^{2+}	Nitrate	NO_3^{-}
Iron(III)	Fe^{3+}	Oxide	O^{2-}
Lithium	Li^{+}	Sulphate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^{+}		
Silver	Ag^{+}		
Sodium	Na^{+}		

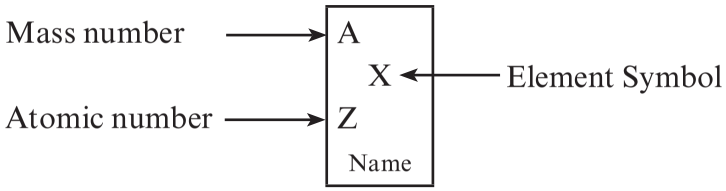
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PERIODIC TABLE OF ELEMENTS

1	2	Group										3	4	5	6	7	0
								$^{1}_{1}$H Hydrogen									$^{4}_{2}$He Helium
$^{7}_{3}$Li Lithium	$^{9}_{4}$Be Beryllium											$^{11}_{5}$B Boron	$^{12}_{6}$C Carbon	$^{14}_{7}$N Nitrogen	$^{16}_{8}$O Oxygen	$^{19}_{9}$F Fluorine	$^{20}_{10}$Ne Neon
$^{23}_{11}$Na Sodium	$^{24}_{12}$Mg Magnesium											$^{27}_{13}$Al Aluminium	$^{28}_{14}$Si Silicon	$^{31}_{15}$P Phosphorus	$^{32}_{16}$S Sulphur	$^{35}_{17}$Cl Chlorine	$^{40}_{18}$Ar Argon
$^{39}_{19}$K Potassium	$^{40}_{20}$Ca Calcium	$^{45}_{21}$Sc Scandium	$^{48}_{22}$Ti Titanium	$^{51}_{23}$V Vanadium	$^{52}_{24}$Cr Chromium	$^{55}_{25}$Mn Manganese	$^{56}_{26}$Fe Iron	$^{59}_{27}$Co Cobalt	$^{59}_{28}$Ni Nickel	$^{64}_{29}$Cu Copper	$^{65}_{30}$Zn Zinc	$^{70}_{31}$Ga Gallium	$^{73}_{32}$Ge Germanium	$^{75}_{33}$As Arsenic	$^{79}_{34}$Se Selenium	$^{80}_{35}$Br Bromine	$^{84}_{36}$Kr Krypton
$^{86}_{37}$Rb Rubidium	$^{88}_{38}$Sr Strontium	$^{89}_{39}$Y Yttrium	$^{91}_{40}$Zr Zirconium	$^{93}_{41}$Nb Niobium	$^{96}_{42}$Mo Molybdenum	$^{99}_{43}$Tc Technetium	$^{101}_{44}$Ru Ruthenium	$^{103}_{45}$Rh Rhodium	$^{106}_{46}$Pd Palladium	$^{108}_{47}$Ag Silver	$^{112}_{48}$Cd Cadmium	$^{115}_{49}$In Indium	$^{119}_{50}$Sn Tin	$^{122}_{51}$Sb Antimony	$^{128}_{52}$Te Tellurium	$^{127}_{53}$I Iodine	$^{131}_{54}$Xe Xenon
$^{133}_{55}$Cs Caesium	$^{137}_{56}$Ba Barium	$^{139}_{57}$La Lanthanum	$^{179}_{72}$Hf Hafnium	$^{181}_{73}$Ta Tantalum	$^{184}_{74}$W Tungsten	$^{186}_{75}$Re Rhenium	$^{190}_{76}$Os Osmium	$^{192}_{77}$Ir Iridium	$^{195}_{78}$Pt Platinum	$^{197}_{79}$Au Gold	$^{201}_{80}$Hg Mercury	$^{204}_{81}$Tl Thallium	$^{207}_{82}$Pb Lead	$^{209}_{83}$Bi Bismuth	$^{210}_{84}$Po Polonium	$^{210}_{85}$At Astatine	$^{222}_{86}$Rn Radon
$^{223}_{87}$Fr Francium	$^{226}_{88}$Ra Radium	$^{227}_{89}$Ac Actinium															

Key:



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GCSE MARKING SCHEME

SCIENCE - CHEMISTRY (LEGACY)

SUMMER 2012

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the Summer 2012 examination in GCSE SCIENCE - CHEMISTRY (LEGACY). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

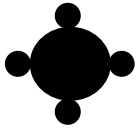
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Chemistry 1 (Legacy)

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
1		(a)	(i)		1	reactants are converted into products	products made produce new materials	useful materials	
			(ii)		1	produce new / useful materials		make fuels, plastics etc.	
			(iii)	I	1	crude oil / metal ores			metals
				II	1	nitrogen	N_2	N	
			(iv)		1	**crude** oil			
		(b)	(i)		1	oxygen	O_2	oxide / O	
			(ii)		1	1			
			(iii)		1	7			

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
2		(a)			3	CaCl (1) MgO_2 (1) Li^+ (1)			
		(b)	(i)		1	more than one **type** of atom joined (both needed for mark)	different elements joined together		
			(ii)	I	1	hydrogen nitrogen (both needed)		H N	
				II	1				

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
3		(a)			1	deodorant			
		(b)			1	anti-bacterial			
		(c)			1	1-100**nm**			
		(d)			1	**may** cause long term health problems/long-term effects unknown	named health problems	harmful	**will cause** cancer etc.

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
4		(a)			2	respiration – C photosynthesis – A combustion – B all correct (2) any 1 correct (1)			
		(b)	(i)		1	650			
			(ii)		2	175 (1) **increased** burning of fossil fuels / deforestation (1)	more factories / industry / pollution		–175
			(iii)		1	increases			
			(iv)		1	global warming			

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
5		(a)			2	magnesium + hydrochloric acid (1) → magnesium chloride + hydrogen (1)			magnesium *ribbon* hydrogen *gas*
		(b)	(i)		1	**gas** syringe			
			(ii)		3	all points correct (2) 6 points correct (1) 5 or fewer correct (0) smooth curve through points (1) consequential, must go through (0,0)			
			(iii)		1	magnesium all used up		magnesium dissolved / melts	
6					3	coastlines (1) rocks (1) fossils (1)	 fossils rocks		

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Question Number								
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
7	1	(a)			5	A – bottom of Group 1 B – bottom of Group 7 C – top of Group 0 D – 2nd in Group 7 E – 2nd in Group 2 (see below)			
		(b)			1	2, 8, 4 shown on diagram	**if no diagram** 2,8,4 written		
		(c)			1	add up the total number of electrons (in the structure)		number of protons	number of electrons in particular shell

																	C(1)
	E(1)												X			D(1)	
A(1)																B(1)	

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
8	2	(a)	(i)		1	carbon and hydrogen (both needed)		C and H	
			(ii)	I	1	heated	vaporised/ turned into a gas /boiled		burned
				II	1	condensed / cool down			
			(iii)		1	**fractional** distillation			fractionation fractionating
			(iv)		2	smaller molecules (1) lower boiling point(1)		 different boiling points	
		(b)	(i)		1	increases			
			(ii)		1	crude oil is running out / finite resource more demand for petrol/crude oil		tax increases more cars	

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	3	(a)	(i)		1	magnesium carbonate/magnesium	$MgCO_3$ / Mg		
			(ii)		1	carbon dioxide	CO_2		
			(iii)		1	sodium chloride	NaCl		
			(iv)		1	hydrogen	H_2		
			(v)		1	zinc oxide / zinc	ZnO / Zn		
		(b)			1	$Mg(OH)_2$	Mg^{2+} $(OH^-)_2$		

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	4	(a)			1	Nazca and South American / Pacific and Eurasian			
		(b)			3	magma rises to fill gap (1) cools and solidifies / forms new rock (1) igneous rock / basalt (1)			
	5	(a)			1	study of particles between 1 and 100 nm in size	study of **very small** particles / nano particles		
		(b)			2	anti bacterial / viral / fungal (1) sterilising sprays / deodorants / in socks / in underwear / plasters / wound dressings (1)			reference to 'cleaning'
		(c)			1	may cause long-term health problems / long term effects unknown		reference to tracing in environment	**will cause** cancer etc.

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	6				5	surface area / concentration / temperature (any 2 for 1 mark) explanation – 2 marks max for each factor *surface area* – greater surface area = more particles exposed / more chance of collision / faster rate (any 2 for 1 mark each) *concentration* – increased concentration = more particles in given volume / more chance of collision / faster rate (any 2 for 1 mark each) *temperature* – higher temperature = particles have more energy / move faster / more chance of collision / faster rate (any 2 for 1 mark each)	 ‘more chance of collision’ credited once only higher level answer in terms of activation energy	reference to catalyst more collisions	
	7	(a)	(i)		2	increases (1) but more rapidly as time goes on (1)	slow then rapid increase (2)		
			(ii)		1	increases	gets hotter		
			(iii)		1	more flooding / extreme weather / increased sea levels / ice caps melting more quickly			
		(b)	(i)		1	3234 – 42 = 3192 (1)			
			(ii)		2	3192 – 2(464) – 4(413) (1) = 612 (1) correct answer only - 2 marks	consequential marking		

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	8	(a)			3	lithium – floats and bubbles / moves slowly(1) sodium - melts into a ball / moves quicker(1) potassium - produces lilac flame / moves even faster(1) - 2 max if general e.g all three float/move/fizz			
		(b)			3	Na + H_2O (1) → NaOH + H_2 (1) balancing 2,2,2,1 (1)			
	9	(a)			1	insoluble solid formed when two solutions react (1)			
		(b)			2	A silver nitrate B sodium chloride C potassium iodide all 3 for 2 marks, any 1 for 1 mark			

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0236/02

SCIENCE
HIGHER TIER
CHEMISTRY 1

A.M. THURSDAY, 26 January 2012

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**5**	
3.	**6**	
4.	**7**	
5.	**5**	
6.	**8**	
7.	**5**	
8.	**5**	
9.	**5**	
Total	**50**	

0236
020001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

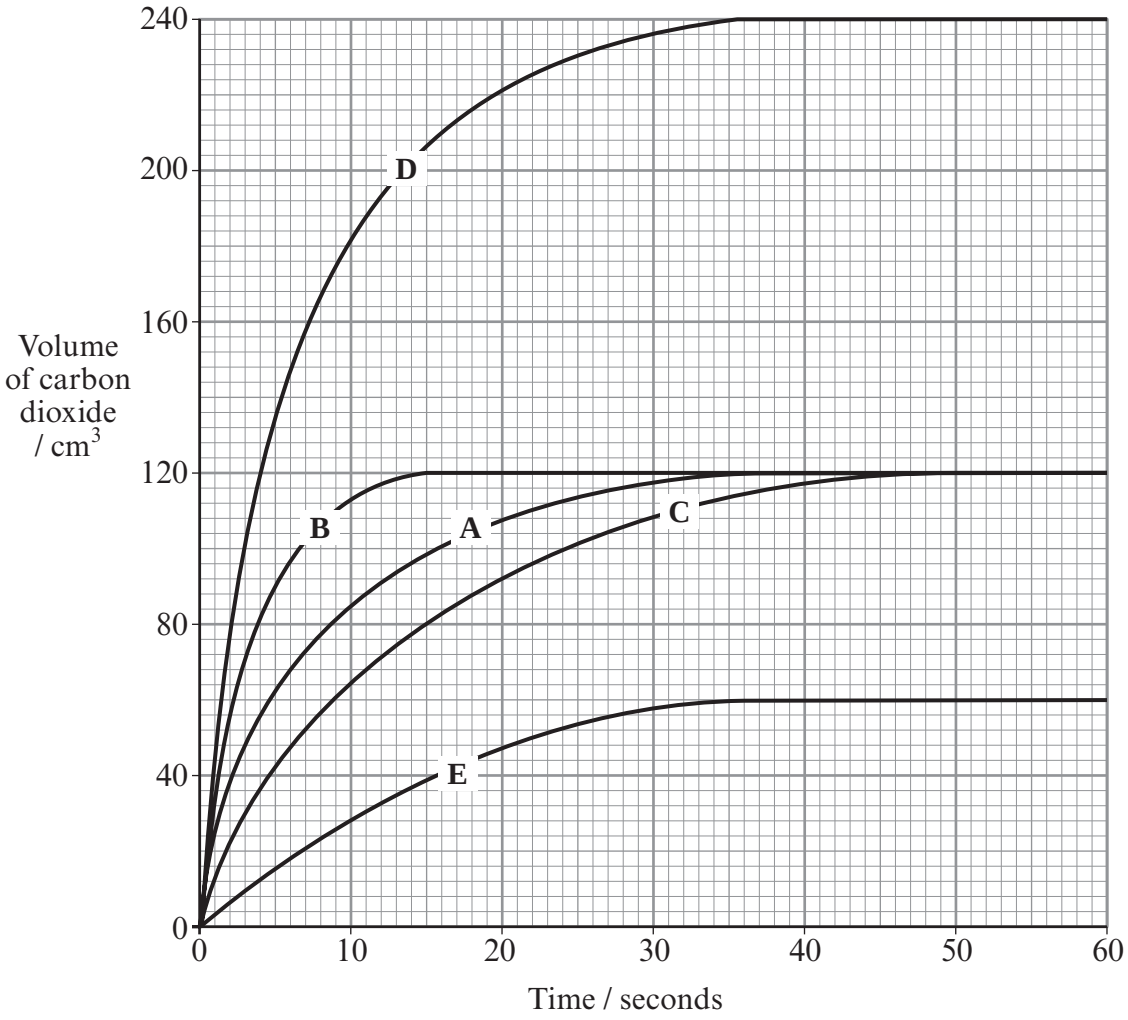
The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

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Answer **all** *questions.*

1. Marble chips (calcium carbonate) react with dilute hydrochloric acid forming carbon dioxide.

Graph **A** below, shows the volume of carbon dioxide formed during the reaction between 0.5 g of marble chips and ***excess*** dilute hydrochloric acid at 20 °C.



Give the letter, **B**-**E**, of the graph which could represent the results obtained when an ***excess*** of the same dilute hydrochloric acid as above was added to

(a) 0.5 g of marble chips at 10 °C, ... [1]

(b) 0.25 g of marble chips at 20 °C, ... [1]

(c) 1.0 g of marble chips at 20 °C, ... [1]

(d) 0.5 g of **crushed** marble chips at 20 °C. ..... [1]

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2. Crude oil is a mixture of compounds called hydrocarbons, which can be separated into fractions.

(a) Give the name of the process which separates crude oil into fractions. [1]

.....

(b) The table below shows some information about the main fractions obtained.

Main fraction	A hydrocarbon found in this fraction	The boiling point of this hydrocarbon / °C
refinery gases	propane, C_3H_8	–42
petrol	octane, C_8H_{18}	126
naphtha	decane, $C_{10}H_{22}$	170
paraffin (kerosene)	dodecane, $C_{12}H_{26}$	216
diesel oil (gas oil)	eicosane, $C_{20}H_{42}$	344

Use only the information in the table to answer parts (i)-(iv).

(i) State how the number of carbon atoms in a hydrocarbon affects its boiling point. [1]

.....

(ii) Suggest a value for the **lowest** temperature needed to boil **all** the named hydrocarbons in the table. [1]

..... °C

(iii) Decane boils at 170 °C. State the temperature at which decane gas condenses to a liquid. [1]

..... °C

(iv) Name the elements present in **all** the fractions. [1]

..... and .....

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3. Sodium is found in Group 1 of the Periodic Table of Elements.

(a) When a freshly cut piece of sodium is exposed to air, its cut surface quickly reacts with oxygen forming sodium oxide.

(i) Sodium is normally stored in a liquid to prevent this reaction occurring.

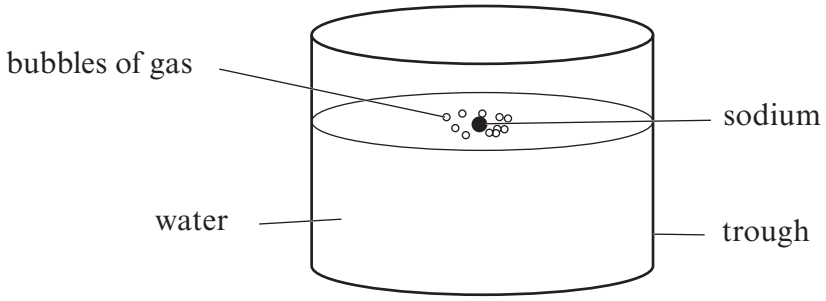
Give the name of this liquid. [1]

.....

(ii) Balance the **symbol** equation for the reaction between sodium and oxygen. [1]

..... Na + ... O_2 ⟶ ..... Na_2O

(b) The diagram below shows sodium reacting with water.



(i) Using the information in the diagram, state one **unusual** physical property of sodium that is not common to most metals. [1]

.....

(ii) Universal indicator turns purple when added to the water after the sodium has reacted. Give the reason for this colour change. [1]

.....

(iii) Give the **name** of the gas formed when sodium reacts with water. [1]

.....

(iv) Name a Group 1 metal which would react **less** vigorously with water than sodium does. [1]

.....

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4. *(a)* Use the **data** and **key** on the Periodic Table of Elements, shown on the **back page of this examination paper**, to answer parts (i) and (ii).

(i) I. The element which has the electronic structure 2,3 is ..... [1]

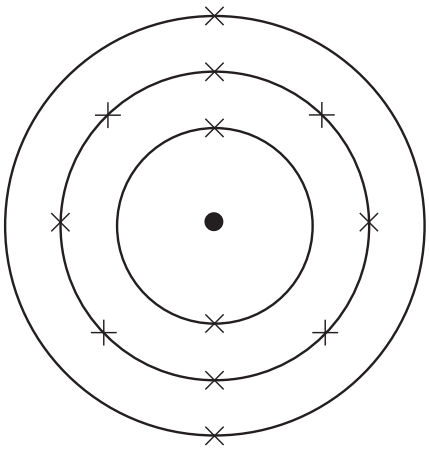
II. The element which is in Group 2 and Period 2 is ..... [1]

III. The element which has the highest atomic number in Group 1 is

..... [1]

IV. An element which has the same number of electrons in its outer orbit (shell) as carbon is ..... [1]

(ii) The diagram below shows the electronic structure of an element in the Periodic Table.



Using **X** to represent an electron, draw a similar style diagram to show the electronic structure of the element which lies directly **below** this one in the Periodic Table. [1]

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(b) Use the **table of common ions** on the **inside of the back cover of this examination paper** to help you answer this question.

(i) Give the **formulae** of the **ions** present in the compound aluminium oxide, Al_2O_3. [1]

Positive ion ..... Negative ion .....

(ii) Give the chemical formula for calcium nitrate. [1]

.....

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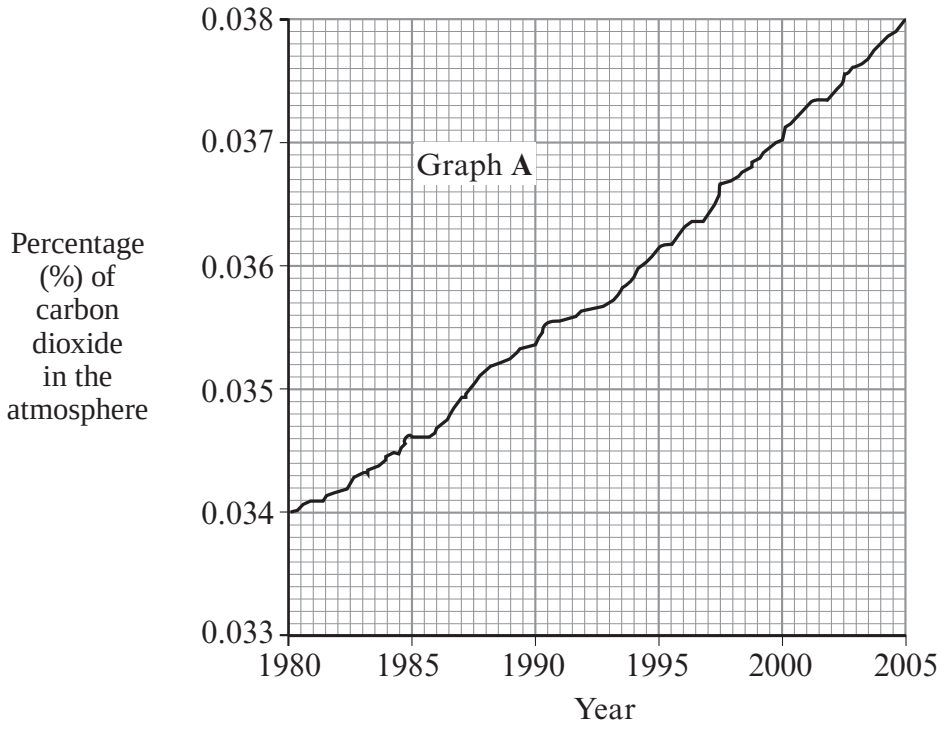
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5. *(a)* Graph **A** shows the percentage (%) of carbon dioxide in the Earth's atmosphere between 1980 and 2005.



(i) Use the graph to find the increase in percentage (%) of carbon dioxide in the Earth's atmosphere between 1980 and 2005. [1]

.....

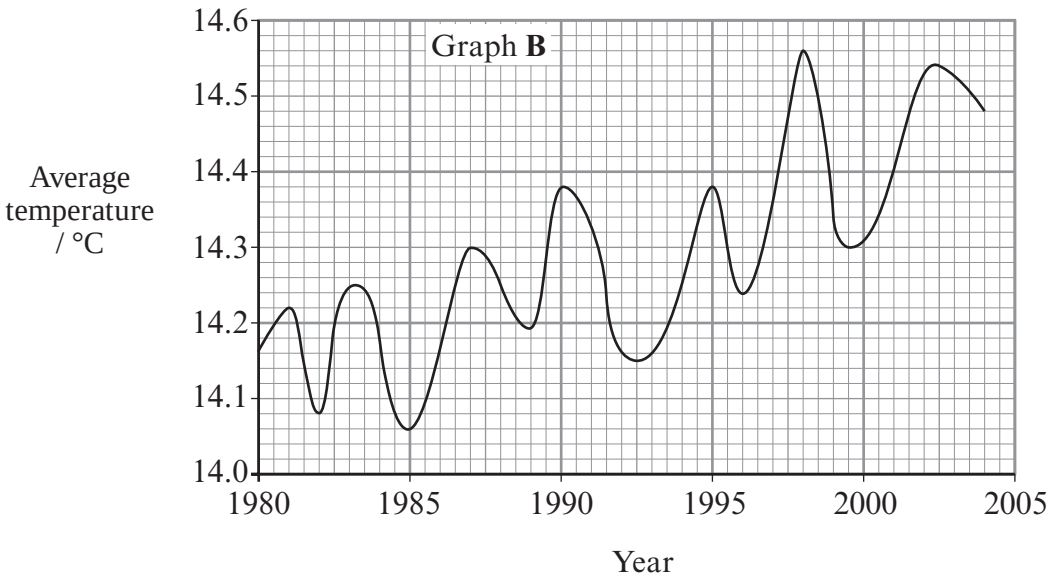
(ii) Give **one** cause for the increase in carbon dioxide in the atmosphere. [1]

.....

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(b) Graph **B** shows the change in the average temperature of the Earth's atmosphere between 1980 and 2004.



(i) Give the year when the Earth's average temperature first reached 14.3 °C. [1]

.....

(ii) Using a ruler draw a line **on the graph** to show the **overall trend** in the Earth's average temperature between 1980 and 2004. [1]

(iii) In Wales many people live around the coast. Give **one** way the increase in the average global temperature could cause problems for these people. [1]

.....

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6. *(a)* The table below shows some physical properties of three Group 7 elements.

Element	Melting point / °C	Boiling point / °C	Density / g cm^{-3}
chlorine	–101	–35	0.0029
bromine	–7	59	3.1
iodine	114	184	4.9

(i) A sample of bromine is put in a test tube in a water bath at 65 °C. Describe what will happen to it. [1]

.....

(ii) Fluorine is **above** chlorine in Group 7. Predict the **state** (solid, liquid or gas) of fluorine at 20 °C.

..... [1]

(iii) Astatine is **below** iodine in Group 7. Suggest an approximate value for the **melting point** of astatine.

..... °C [1]

(b) Bromine, Br_2, reacts with sodium forming sodium bromide.

Write a balanced **symbol** equation for this reaction. [3]

..... + ... ⟶ .....

(c) **A**, **B** and **C** represent solutions of the sodium halides, NaCl, NaBr and NaI, but not necessarily in that order.
Chlorine, Cl_2, bromine, Br_2, and iodine, I_2, were added separately to each sodium halide solution.
The table below shows the results obtained from the series of experiments.

Halogen	Solution of sodium halide		
	A	**B**	**C**
chlorine, Cl_2	no reaction	solution turns brown	solution turns orange
bromine, Br_2	no reaction	solution turns brown	no reaction
iodine, I_2	no reaction	no reaction	no reaction

Use the information in the table to identify each of the halide solutions. [2]

A .....

B .....

C .....

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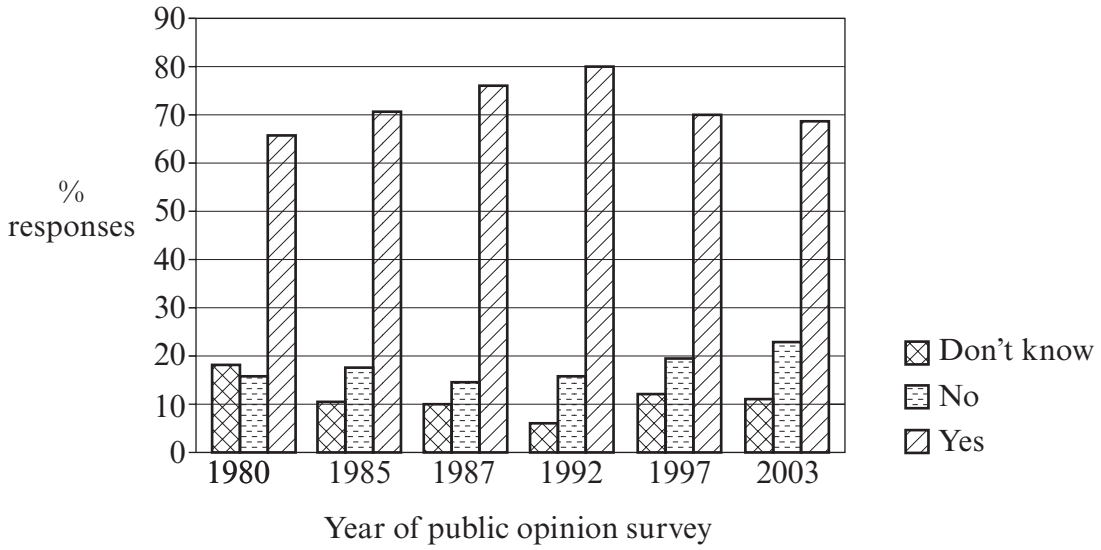
Examiner only

7. *(a)* Many medical and scientific organisations support the fluoridation of drinking water as safe and beneficial for public health.

Over the past 20 years national surveys have been carried out to find public opinion on the fluoridation of drinking water.

The graph below shows the responses to a question used in one particular survey:

"Do you think fluoride should be added to water if it can reduce tooth decay?"



(i) State how the graph can be used to support the argument for the fluoridation of drinking water. [1]

.....

(ii) Some opponents of fluoridation disagree with the wording of the question in the survey saying it was biased.

Give **one** reason why some opponents believed the question was biased. [1]

.....

.....

(iii) Give **one** factor which is important to consider when choosing the sample of people to be surveyed. [1]

.....

(b) Give **one ethical** and **one medical** reason opponents of fluoridation use to support their views. [2]

Ethical .....

Medical .....

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8. The diagram below shows how the continents are arranged today.



In 1915, Alfred Wegener proposed the theory of continental drift which was not accepted by other scientists.

(a) State what Wegener suggested about how the continents were originally arranged. [1]

.....

(b) Give the evidence Wegener used to support his theory. [3]

.....

.....

.....

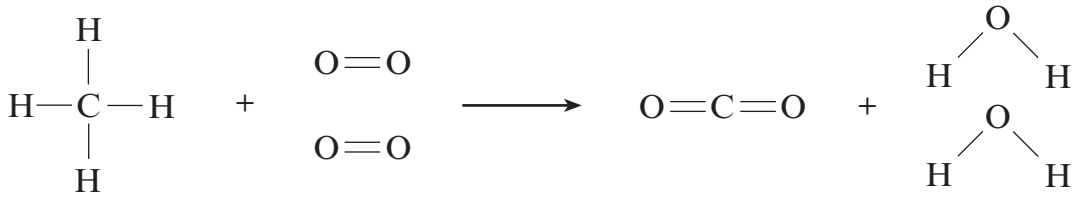
(c) About 50 years after Wegener put forward his theory, scientists began to accept it.

State the evidence that resulted in other scientists accepting Wegener's theory. [1]

.....

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9. When methane burns in air carbon dioxide and water are formed.



The relative amounts of energy needed to break the bonds in the above reaction are shown in the table below.

Bond	Amount of energy needed to break the bond / kJ
C═O	805
C—H	413

Note: The amount of energy released in making a bond is equal and opposite to that needed to break the bond.

Use the bond energy values in the table above to help you answer parts *(a)* and *(b)*.

(a) The relative energy needed to break all the bonds in the reactants is 2648 kJ. Calculate the amount of energy needed to break an O═O bond. [2]

.....

.....

.....

(b) The relative energy released when all the bonds in the products are formed is 3466 kJ. Calculate the amount of energy released in making an O—H bond. [2]

.....

.....

.....

(c) The burning of methane gives out heat and is said to be exothermic. Use the values for energy needed (2648 kJ) and energy released (3466 kJ) to support the observation that the reaction is exothermic.

[1]

.....

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FORMULAE FOR SOME COMMON IONS

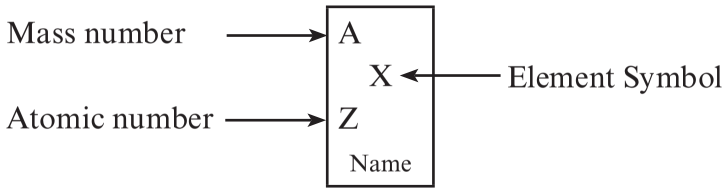
POSITIVE IONS		NEGATIVE IONS	
Name	**Formula**	**Name**	**Formula**
Aluminium	Al^{3+}	Bromide	Br^{-}
Ammonium	NH_4^{+}	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^{-}
Calcium	Ca^{2+}	Fluoride	F^{-}
Copper(II)	Cu^{2+}	Hydroxide	OH^{-}
Hydrogen	H^{+}	Iodide	I^{-}
Iron(II)	Fe^{2+}	Nitrate	NO_3^{-}
Iron(III)	Fe^{3+}	Oxide	O^{2-}
Lithium	Li^{+}	Sulphate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^{+}		
Silver	Ag^{+}		
Sodium	Na^{+}		

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PERIODIC TABLE OF ELEMENTS

1	2	Group										3	4	5	6	7	0
								$^{1}_{1}$H Hydrogen									$^{4}_{2}$He Helium
$^{7}_{3}$Li Lithium	$^{9}_{4}$Be Beryllium											$^{11}_{5}$B Boron	$^{12}_{6}$C Carbon	$^{14}_{7}$N Nitrogen	$^{16}_{8}$O Oxygen	$^{19}_{9}$F Fluorine	$^{20}_{10}$Ne Neon
$^{23}_{11}$Na Sodium	$^{24}_{12}$Mg Magnesium											$^{27}_{13}$Al Aluminium	$^{28}_{14}$Si Silicon	$^{31}_{15}$P Phosphorus	$^{32}_{16}$S Sulphur	$^{35}_{17}$Cl Chlorine	$^{40}_{18}$Ar Argon
$^{39}_{19}$K Potassium	$^{40}_{20}$Ca Calcium	$^{45}_{21}$Sc Scandium	$^{48}_{22}$Ti Titanium	$^{51}_{23}$V Vanadium	$^{52}_{24}$Cr Chromium	$^{55}_{25}$Mn Manganese	$^{56}_{26}$Fe Iron	$^{59}_{27}$Co Cobalt	$^{59}_{28}$Ni Nickel	$^{64}_{29}$Cu Copper	$^{65}_{30}$Zn Zinc	$^{70}_{31}$Ga Gallium	$^{73}_{32}$Ge Germanium	$^{75}_{33}$As Arsenic	$^{79}_{34}$Se Selenium	$^{80}_{35}$Br Bromine	$^{84}_{36}$Kr Krypton
$^{86}_{37}$Rb Rubidium	$^{88}_{38}$Sr Strontium	$^{89}_{39}$Y Yttrium	$^{91}_{40}$Zr Zirconium	$^{93}_{41}$Nb Niobium	$^{96}_{42}$Mo Molybdenum	$^{99}_{43}$Tc Technetium	$^{101}_{44}$Ru Ruthenium	$^{103}_{45}$Rh Rhodium	$^{106}_{46}$Pd Palladium	$^{108}_{47}$Ag Silver	$^{112}_{48}$Cd Cadmium	$^{115}_{49}$In Indium	$^{119}_{50}$Sn Tin	$^{122}_{51}$Sb Antimony	$^{128}_{52}$Te Tellurium	$^{127}_{53}$I Iodine	$^{131}_{54}$Xe Xenon
$^{133}_{55}$Cs Caesium	$^{137}_{56}$Ba Barium	$^{139}_{57}$La Lanthanum	$^{179}_{72}$Hf Hafnium	$^{181}_{73}$Ta Tantalum	$^{184}_{74}$W Tungsten	$^{186}_{75}$Re Rhenium	$^{190}_{76}$Os Osmium	$^{192}_{77}$Ir Iridium	$^{195}_{78}$Pt Platinum	$^{197}_{79}$Au Gold	$^{201}_{80}$Hg Mercury	$^{204}_{81}$Tl Thallium	$^{207}_{82}$Pb Lead	$^{209}_{83}$Bi Bismuth	$^{210}_{84}$Po Polonium	$^{210}_{85}$At Astatine	$^{222}_{86}$Rn Radon
$^{223}_{87}$Fr Francium	$^{226}_{88}$Ra Radium	$^{227}_{89}$Ac Actinium															

Key:



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WJEC
CBAC

GCSE MARKING SCHEME

SCIENCE – CHEMISTRY (LEGACY)

JANUARY 2012

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INTRODUCTION

The marking schemes which follow were those used by WJEC for the January 2012 examination in GCSE SCIENCE – CHEMISTRY (LEGACY). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

Unit	Page
C1 (Legacy)	1
C2 (Legacy)	17

UNIT C1 (LEGACY)

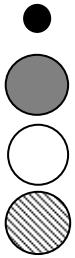
January 2012 – Chemistry 1 - Foundation Tier only questions

Question Number									
FT	**HT**	**Sub-section**			**Mark**	**Answer**	**Accept**	**Neutral answer**	**Do not accept**
1		(a)	(i)		1	nickel / Ni			
			(ii)		1	iodine /I / I_2			
		(b)			2	non-metal [1] low m.p./ low b.p./ low density ***Ref. to 'low' needed*** Any one for [1] *Ignore references to actual numerical values.*	converse statement		

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Question Number									
FT	**HT**	**Sub-section**			**Mark**	**Answer**	**Accept**	**Neutral answer**	**Do not accept**
2		(a)	(i)		2	protons [1] and neutrons [1] *either order*			
			(ii)	I	1	20			
				II	1	2,8,**8,2**			
		(b)	(i)		1	1			
			(ii)		1	8			

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Question Number								
FT	**HT**	**Sub-section**			**Mark**	**Answer**	**Accept**	**Neutral answer**	**Do not accept**
3		(a)			4	 hydrogen / H [1] carbon / C [1] oxygen / O [1] nitrogen / N [1]			H_2 O_2 N_2
		(b)			1	compound			

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Question Number									
FT	**HT**	**Sub-section**			**Mark**	**Answer**	**Accept**	**Neutral answer**	**Do not accept**
4		(a)			2	moving **away** from each other [1] year [1]			
		(b)	(i)		1	continental drift			
			(ii)		1	convection currents			
		(c)			1	similar / same fossils jig-saw fit of coastlines / coastlines fit together /	coastlines ≡ continents	similar shape of coastlines	ref. to 'countries'

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Question Number								
FT	**HT**	**Sub-section**			**Mark**	**Answer**	**Accept**	**Neutral answer**	**Do not accept**
5		(a)			1	1 ppm / around 1ppm / about 1ppm			
		(b)	(i)		1	reduce tooth decay / reduce teeth extractions / reduce number of general anaesthetics any one for [1]			
			(ii)		1	increase bone cancer / stains teeth any one for [1]			
		(c)			1	medication without personal consent / mass medication any one for [1]			
		(d)			1	(chlorination) sterilises water / kills bacteria (chlorination) makes water safe to drink any one for [1] *Accept converse answer*		cleans water makes water healthy to drink	

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Question Number									
FT	**HT**	**Sub-section**			**Mark**	**Answer**	**Accept**	**Neutral answer**	**Do not accept**
6					4	***Four discrete marking points:-*** • add **excess** copper carbonate to (dil.sulphuric) acid add copper carbonate to (dil. sulphuric) acid until **no more dissolves** add copper carbonate to (dil. sulphuric acid) until **some remains** add copper carbonate to (dil. sulphuric) acid until it is **unreacted** add copper carbonate to use up **all** the (dil. sulphuric) acid • stir mixture swirl beaker mix the carbonate and acid together • filter *to remove excess carbonate* – also gains first marking point if not already awarded filter mixture filter solution • evaporate the solution to dryness evaporate completely leave to evaporate to dryness allow the solution to dry up completely leave until (blue) crystals are left behind heat until crystals appear } *removal of water implied*	ref. to 'salt' crystals	ref. to 'heat' pour into funnel 'heat'	

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Question Number									
FT	**HT**	**Sub-section**			**Mark**	**Answer**	**Accept**	**Neutral answer**	**Do not accept**
7		(a)	(i)		1	800			
			(ii)		1	individual readings ***too*** different / erratic readings / readings (1,2 and 3) are ***very*** different	accept converse	readings are *different*	
		(b)			3	All points plotted correctly [2] *if '800cm^3' point missing award* [2] 4 points plotted correctly [1] Line of best fit ***(by eye)*** [1] ***Ruler must be used.*** *Line should go **between** 100 and 200cm^3 points and **through** 400,600 and 800cm^3.* *Consequential marking for line of best fit.*			
		(c)			1	increases (bigger the beaker) the ***longer*** the burning time / (bigger the beaker) the ***bigger*** the burning time			ref. to 'slower'

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January 2012 – Chemistry 1 - Common questions

Question Number								
FT	**HT**	**Sub-section**			**Mark**	**Answer**	**Accept**	**Neutral answer**	**Do not accept**
8	1	(a)			1	C			
		(b)			1	E			
		(c)			1	D			
		(d)			1	B			

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Question Number									
FT	**HT**	**Sub-section**			**Mark**	**Answer**	**Accept**	**Neutral answer**	**Do not accept**
9	2	(a)			1	fractional distillation		distillation	fractionating distillation
		(b)	(i)		1	**bigger** the number of (carbon) atoms the **higher** the b.p. / **longer** the (carbon) chain the **higher** the b.p.	higher ≡ bigger converse		the more hydrocarbons, the higher the boiling point
			(ii)		1	344			
			(iii)		1	170			
			(iv)		1	hydrogen / H and carbon / C both required for [1] *either order*			H_2

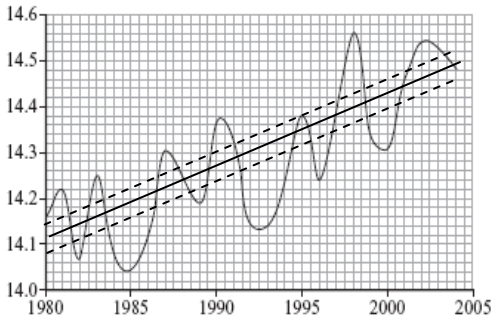
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Question Number									
FT	**HT**	**Sub-section**			**Mark**	**Answer**	**Accept**	**Neutral answer**	**Do not accept**
10	3	(a)	(i)		1	liquid paraffin / oil			paraffin
			(ii)		1	4:(1):2	8:2:4 2:½:(1)		4:0:2
		(b)	(i)		1	low density / lower density than water floats (on water)			ref. to 'bubbles', fizzes around
			(ii)		1	(strong) alkali / alkaline / pH above 7 pH between 8-14	pH value between 12 -14	weak alkali / pH value between 8-11 / forms sodium hydroxide	weak alkali
			(iii)		1	hydrogen / H_2			H
			(iv)		1	lithium / Li			

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Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	4	(a)	(i)	I	1	boron / B	^{11}B $_{5}B$ $^{11}_{5}B$		
				II	1	beryllium / Be	^{9}Be $_{4}Be$ $^{9}_{4}Be$		
				III	1	francium / Fr	^{223}Fr $_{87}Fr$ $^{223}_{87}Fr$		
				IV	1	silicon / Si germanium / Ge tin / Sn lead / Pb any one for [1]	As above ignore ref. to atomic and / or mass numbers...which must be correct.		
			(ii)		1	electronic structure for calcium 2,8,8,2 shown ***diagrammatically***			
		(b)	(i)		1	Al^{3+} O^{2-} both needed for [1]			ref. to subscript values
			(ii)		1	$Ca(NO_3)_2$	$Ca^{2+}(NO_3^-)_2$		

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Question Number									
FT	**HT**	**Sub-section**			**Mark**	**Answer**	**Accept**	**Neutral answer**	**Do not accept**
	5	(a)	(i)		1	0.004			
			(ii)		1	**increase in burning** (fossil) **fuels** / more **coal** power stations / more **oil** power stations / more **gas** power stations / deforestation	burning more named fossil fuel e.g. petrol, wood, diesel, coal etc, more cars which release carbon dioxide	more industry / power stations / more cars	
		(b)	(i)		1	1987			
			(ii)		1	tolerance between dotted lines - by eye  ruler must be used			line drawn form first point to last point line drawn from origin
			(iii)		1	flooding (due to sea-level rise) / flooding (due to polar ice melting) / sea-level rise cliff erosion	coastal erosion		

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Question Number					Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT	Sub-section							
	6	(a)	(i)		1	boil / turn to a gas / vaporise		evaporate	ref. to melting
			(ii)		1	gas [1]			
			(iii)		1	any value above 114 [1]			
		(b)			3	reactants [1] Na; Br_2 product [1] NaBr balancing [1] 2:1:2 *reactant and product must correct before balancing mark awarded*	Na^+Br^-		
		(c)			2	**A** = (sodium) chloride , NaCl, Cl^- **B** = (sodium) iodide , NaI , I^- **C** = (sodium) bromide , NaBr , Br^- all three [2] marks any one [1] mark		Cl I Br	chlorine iodine bromine

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Question Number									
FT	**HT**	**Sub-section**			**Mark**	**Answer**	**Accept**	**Neutral answer**	**Do not accept**
	7	(a)	(i)		1	(nearly) 70% of people in favour / majority of people in favour / over 60% of people in favour			
			(ii)		1	(question) made reference to 'reduce tooth decay' / (question) made reference to 'positive aspect' (of fluoridation) only / gives advantage (of fluoridation)	converse		
			(iii)		1	***different types*** of people / random types of people ***a lot*** of people surveyed	named type e.g. different ages / different class / men & women / different races / different areas		
		(b)			2	Ethical: mass medication / medication without consent / freedom of choice (removed) any one for [1] Medical: causes cancer / bone cancer discolours teeth / fluorosis poisonous / toxic brittle bones / IBS / thyroid problems any one for [1]	it is not right to force people to consume fluoride		

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Question Number								
FT	**HT**	**Sub-section**			**Mark**	**Answer**	**Accept**	**Neutral answer**	**Do not accept**
	8	(a)			1	(continents) were once joined together			
		(b)			3	***Three marking points:*** • close fit of coastlines / jig-saw fit of coastlines • similar rocks / similar rock types / similar rock patterns • similar fossils / similar fossil types	coastlines ≡ continents ref. to South America and Africa similar ≡ same similar ≡ same	countries similar shape of coastlines	ref. to animals and/or plants
		(c)			1	(tectonic) plates were moving / convection currents (in mantle)		continents move continental drift plate tectonics	

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Question Number									
FT	**HT**	**Sub-section**			**Mark**	**Answer**	**Accept**	**Neutral answer**	**Do not accept**
	9	(a)			2	4(413) =1652 2648-1652 = **996** [1] 996/2= **498** [1] *accept consequential marking* *award [2] if correct answer given without any working*			
		(b)			2	2(805)=1610 3466-1610 = **1856** [1] 1856/4 = **464** [1] *accept consequential marking* *award [2] if correct answer given without any working*			
		(c)			1	2648-3466 = **-818** / more energy released in **bond making** than absorbed in **bond breaking** *award [1] if correct answer given without any working*		818 more energy released than absorbed heat given out	

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Surname	Centre Number	Candidate Number
Other Names		0

WJEC CBAC

GCSE

236/02

SCIENCE
HIGHER TIER
CHEMISTRY 1

A.M. WEDNESDAY, 15 June 2011

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**10**	
2.	**5**	
3.	**6**	
4.	**4**	
5.	**4**	
6.	**11**	
7.	**5**	
8.	**5**	
Total	**50**	

0236
020001

ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

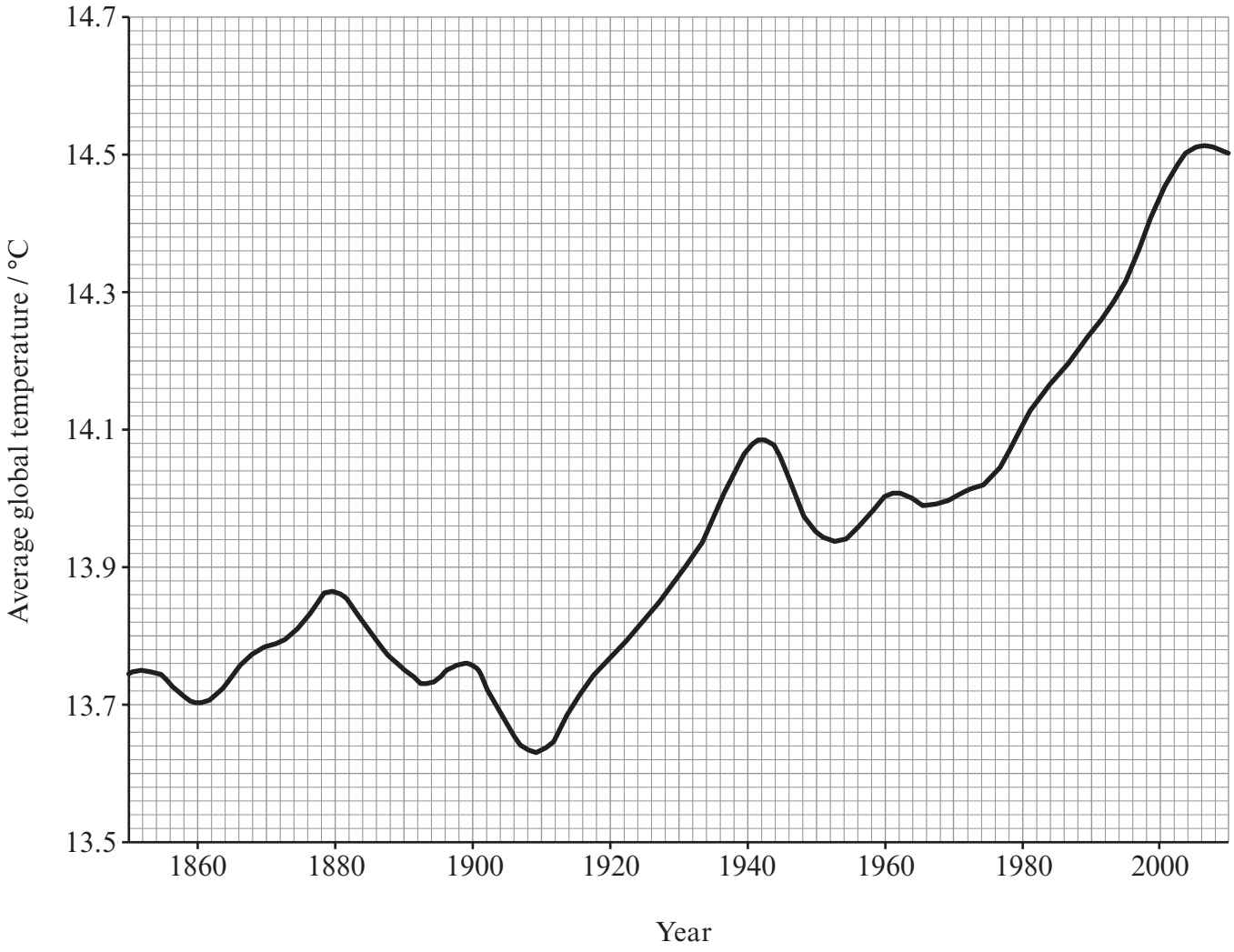
The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

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Answer **all** *questions.*

1. *(a)* Global temperature records go back about 160 years, which allows us to draw conclusions about how our climate has changed over this period of time.
The graph below shows the average global temperature during the last 160 years.



Use the graph to answer parts (i)-(iii).

(i) State the average global temperature in 1990. [1]

..... °C

(ii) Describe the general trend in global temperature since 1910. [1]

.....

(iii) Describe the general trend in global temperature between 1850 and 1910. [1]

.....

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(b) When fossil fuels such as petrol are burned, a gas is released. This is the main gas responsible for the change in global temperature since 1910.

(i) Name this gas. [1]

.....

(ii) Apart from the increase in the amount of fossil fuels burned each year since 1910, give **one** reason for the increased amount of this gas in the atmosphere. [1]

.....

(c) Petrol is a mixture of different hydrocarbon compounds.
State what is meant by a *hydrocarbon*. [1]

.....

.....

(d) Some fossil fuels contain sulphur.

(i) Give the **word** equation for the reaction that takes place when sulphur is burnt in air. [2]

..... + ... ⟶ .....

(ii) State which environmental problem is caused by the product of this reaction. [1]

.....

(iii) Give **one** effect of this environmental problem. [1]

.....

.....

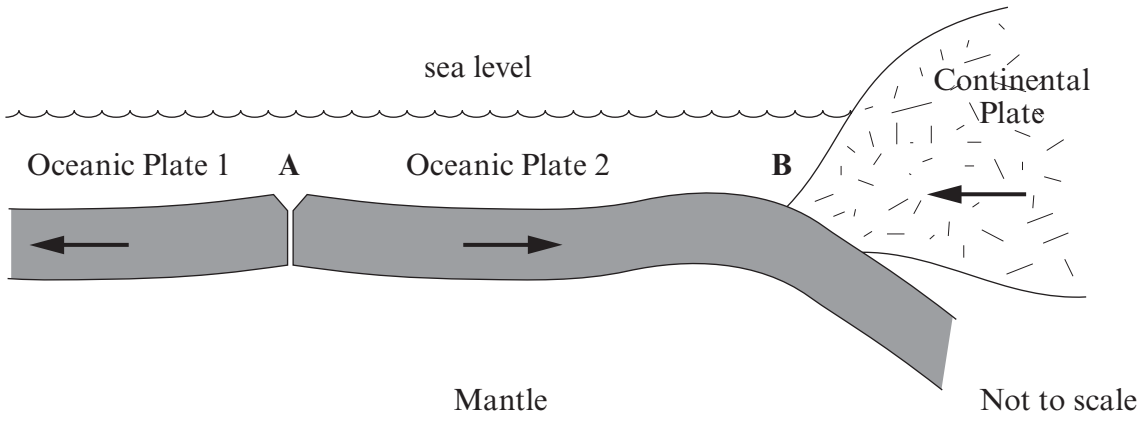
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2. The Earth's crust (lithosphere) is broken up into huge plates.

The diagram below shows two plate boundaries **A** and **B**.



(a) Describe what occurs at plate boundary **A**. [2]

.....

.....

.....

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(b) The two types of plate have different densities as shown in the following table.

Type of plate	Density / g cm^{-3}
continental	2.7
oceanic	3.0

Describe and explain what occurs at plate boundary **B**. [3]

.....

.....

.....

.....

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3. *(a)* The electronic structure of chlorine is given as 2,8,7.
State what this information tells you about the arrangement of electrons in an atom of chlorine. [1]

.....

.....

.....

(b) The table below shows some information about Group 7 elements.

Element	Melting point / °C	Boiling point / °C	Density / g cm^{-3}	Electrical conductivity	Colour of vapour
fluorine	–220	–188	1.11	poor	pale yellow
chlorine	–101	–35	1.56	poor	green
bromine	–7	59	3.12	poor	brown
iodine	114	184	4.93	poor	purple

Use the information in the table to answer parts (i)-(iii).

(i) State **one** property of Group 7 elements which shows that they are non-metals. [1]

.....

(ii) Describe the trend in the melting points of Group 7 elements going down the group. [1]

.....

(iii) Give the state (solid, liquid or gas) of bromine at room temperature (20 °C) and explain your answer. [2]

State .....

Explanation .....

.....

.....

(c) State why adding chlorine to the water supply makes the water safe to drink. [1]

.....

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4. Use the **data** and **key** on the Periodic Table of Elements, shown on the **back page of this examination paper**, to complete the following sentences.

(a) The chemical symbol for the smallest atom in Group 2 is ..... . [1]

(b) The element with the atomic number 16 is ..... . [1]

(c) The element which has the electronic structure 2,8,8,1 is ..... . [1]

(d) The element which is in Group 3 and Period 2 is ..... . [1]

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5. The following table shows the results obtained when different substances were mixed together.

For each experiment the table includes the name of the two substances mixed, the temperature before and after each addition and any observations made.

Experiment	Substances mixed	Temperature / °C		Observations
		Starting	Finishing	
1	sodium carbonate and hydrochloric acid	20	24	fizzing, leaving a colourless solution
2	sodium hydroxide and hydrochloric acid	19	22	no visible change
3	magnesium and sulphuric acid	21	29	fizzing, leaving a colourless solution
4	solution of potassium iodide and potassium chloride	21	21	no visible change
5	copper oxide and sulphuric acid	21	24	black solid, blue solution formed
6	citric acid and sodium hydrogencarbonate solution	20	18	fizzing, leaving a colourless solution
7	solution of sodium nitrate and silver nitrate	21	21	no visible change
8	solution of sodium chloride and silver nitrate	20	20	white precipitate formed

Use the table to answer parts (a)-(c).

(a) Name the blue solution formed in experiment 5. [1]

.....

(b) In experiment 6 the temperature decreases. Give the name for this type of reaction. [1]

.....

(c) Identify the **two** experiments where no reaction takes place and explain your choice. [2]

Experiments ..... and .....

Explanation .....

.....

.....

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6. Calcium carbonate reacts with hydrochloric acid to produce calcium chloride, carbon dioxide and water.

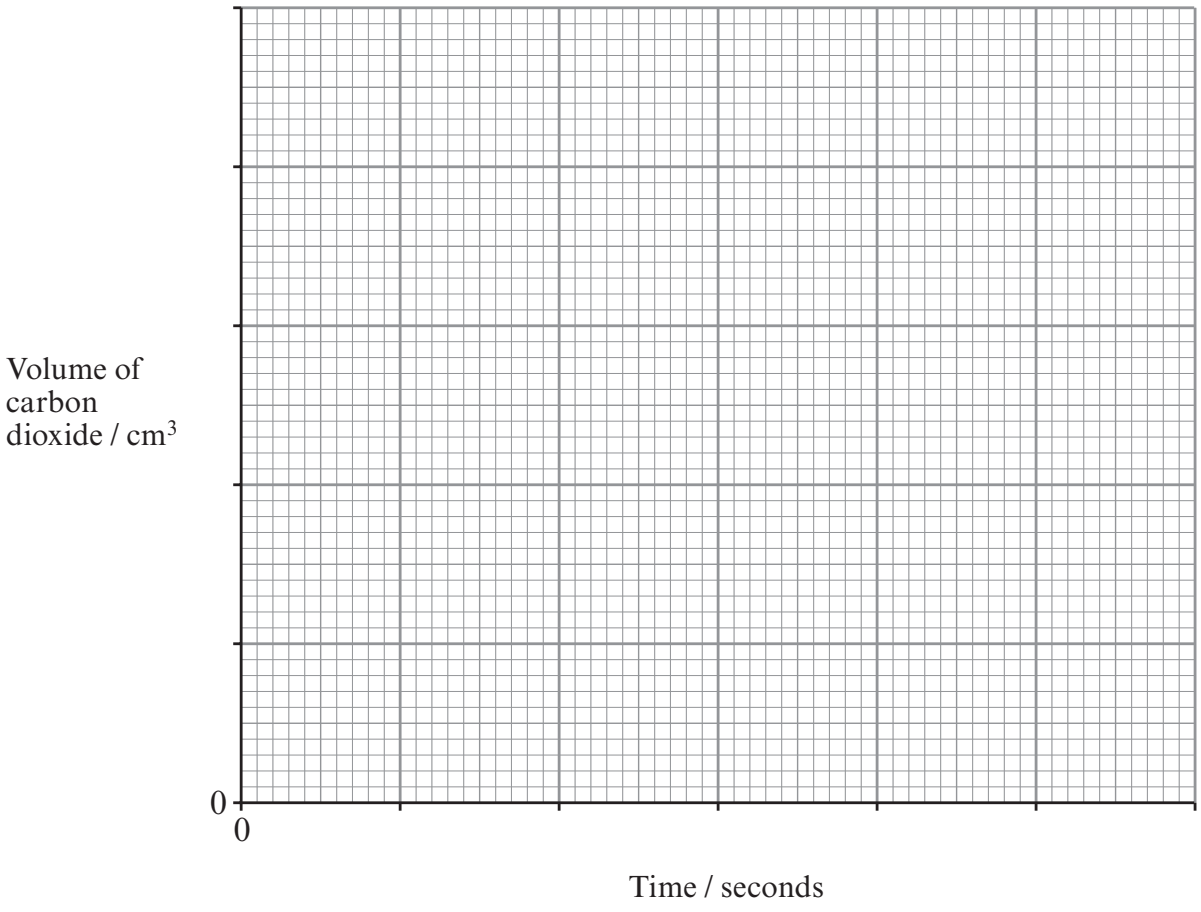
(a) Give the balanced **symbol** equation for the reaction that takes place.
Use the table of ions on **the inside of the back cover of this examination paper** to help you write the formulae of the substances. [3]

..... + ... ⟶ ..... + ... + ...

(b) A student added 0.5 g of calcium carbonate powder to an *excess* of hydrochloric acid and measured the volume of carbon dioxide produced every 10 seconds. His results are shown in the table below.

Time / seconds	0	10	20	30	40	50	60
Volume of carbon dioxide / cm^3	0	44	68	84	94	98	98

(i) Draw a graph of his results and label it **Graph A**. [4]



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(ii) State, in terms of particles, why the rate of reaction was faster at the beginning of the experiment. [2]

.....

.....

.....

(iii) Sketch carefully on the grid, the graph that would be obtained if the powder were replaced with the same mass of calcium carbonate chips. Assume that the temperature, volume and concentration of the excess hydrochloric acid are kept the same. Label this **Graph B**. [2]

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7. Aqueous solutions of potassium iodide, sodium iodide and silver nitrate were stored in three bottles labelled **A**, **B** and **C**, but not necessarily in that order.

When each was mixed with the other in turn, the following results were obtained.

Experiment	Observation
A added to **B**	pale yellow precipitate
A added to **C**	no change
B added to **C**	pale yellow precipitate

(a) Only silver nitrate can be correctly identified from the above results. Identify the bottle in which it is contained. Explain your answer. [2]

Silver nitrate is in the bottle labelled .....

Explanation .....

.....

(b) Describe a test that could be carried out in a chemistry laboratory to distinguish between potassium iodide and sodium iodide, and give the results for **both** tests. [2]

Test .....

Results .....

.....

(c) What difference, if any, would be seen if silver nitrate were added to sodium chloride solution? [1]

.....

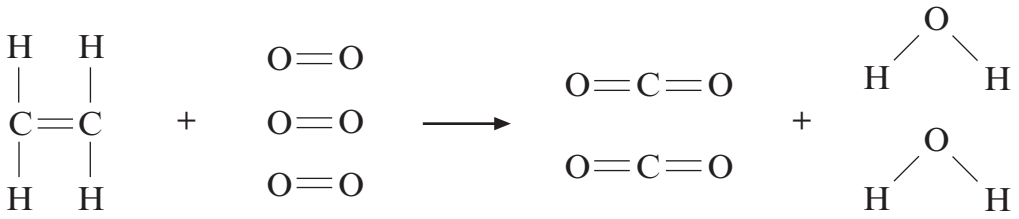
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8. *(a)* Ethene, C_2H_4, burns in air to give carbon dioxide and water. The following equation shows the chemical changes that occur as ethene burns.



The table below gives the relative amounts of energy needed to break the bonds shown in the equation.

Bond	Amount of energy needed to break the bond / kJ
C—H	413
C═C	?
O═O	496
O—H	464
C═O	743

Note: The amount of energy released in making a bond is equal and opposite to that needed to break the bond.

The overall relative energy change during the reaction is –1076 kJ, showing that the reaction is exothermic.

Calculate the energy needed to break the C═C bond. [4]

.....

.....

.....

.....

.....

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.....

Energy needed to break the C═C *bond is* ..... kJ

(b) Name the fuel that gives water as the **only** product on burning. [1]

.....

5

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FORMULAE FOR SOME COMMON IONS

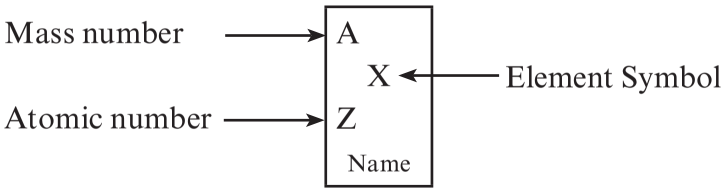
POSITIVE IONS		NEGATIVE IONS	
Name	**Formula**	**Name**	**Formula**
Aluminium	Al^{3+}	Bromide	Br^{-}
Ammonium	NH_4^{+}	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^{-}
Calcium	Ca^{2+}	Fluoride	F^{-}
Copper(II)	Cu^{2+}	Hydroxide	OH^{-}
Hydrogen	H^{+}	Iodide	I^{-}
Iron(II)	Fe^{2+}	Nitrate	NO_3^{-}
Iron(III)	Fe^{3+}	Oxide	O^{2-}
Lithium	Li^{+}	Sulphate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^{+}		
Silver	Ag^{+}		
Sodium	Na^{+}		

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PERIODIC TABLE OF ELEMENTS

1	2	Group										3	4	5	6	7	0
								$^{1}_{1}H$ Hydrogen									$^{4}_{2}He$ Helium
$^{7}_{3}Li$ Lithium	$^{9}_{4}Be$ Beryllium											$^{11}_{5}B$ Boron	$^{12}_{6}C$ Carbon	$^{14}_{7}N$ Nitrogen	$^{16}_{8}O$ Oxygen	$^{19}_{9}F$ Fluorine	$^{20}_{10}Ne$ Neon
$^{23}_{11}Na$ Sodium	$^{24}_{12}Mg$ Magnesium											$^{27}_{13}Al$ Aluminium	$^{28}_{14}Si$ Silicon	$^{31}_{15}P$ Phosphorus	$^{32}_{16}S$ Sulphur	$^{35}_{17}Cl$ Chlorine	$^{40}_{18}Ar$ Argon
$^{39}_{19}K$ Potassium	$^{40}_{20}Ca$ Calcium	$^{45}_{21}Sc$ Scandium	$^{48}_{22}Ti$ Titanium	$^{51}_{23}V$ Vanadium	$^{52}_{24}Cr$ Chromium	$^{55}_{25}Mn$ Manganese	$^{56}_{26}Fe$ Iron	$^{59}_{27}Co$ Cobalt	$^{59}_{28}Ni$ Nickel	$^{64}_{29}Cu$ Copper	$^{65}_{30}Zn$ Zinc	$^{70}_{31}Ga$ Gallium	$^{73}_{32}Ge$ Germanium	$^{75}_{33}As$ Arsenic	$^{79}_{34}Se$ Selenium	$^{80}_{35}Br$ Bromine	$^{84}_{36}Kr$ Krypton
$^{86}_{37}Rb$ Rubidium	$^{88}_{38}Sr$ Strontium	$^{89}_{39}Y$ Yttrium	$^{91}_{40}Zr$ Zirconium	$^{93}_{41}Nb$ Niobium	$^{96}_{42}Mo$ Molybdenum	$^{99}_{43}Tc$ Technetium	$^{101}_{44}Ru$ Ruthenium	$^{103}_{45}Rh$ Rhodium	$^{106}_{46}Pd$ Palladium	$^{108}_{47}Ag$ Silver	$^{112}_{48}Cd$ Cadmium	$^{115}_{49}In$ Indium	$^{119}_{50}Sn$ Tin	$^{122}_{51}Sb$ Antimony	$^{128}_{52}Te$ Tellurium	$^{127}_{53}I$ Iodine	$^{131}_{54}Xe$ Xenon
$^{133}_{55}Cs$ Caesium	$^{137}_{56}Ba$ Barium	$^{139}_{57}La$ Lanthanum	$^{179}_{72}Hf$ Hafnium	$^{181}_{73}Ta$ Tantalum	$^{184}_{74}W$ Tungsten	$^{186}_{75}Re$ Rhenium	$^{190}_{76}Os$ Osmium	$^{192}_{77}Ir$ Iridium	$^{195}_{78}Pt$ Platinum	$^{197}_{79}Au$ Gold	$^{201}_{80}Hg$ Mercury	$^{204}_{81}Tl$ Thallium	$^{207}_{82}Pb$ Lead	$^{209}_{83}Bi$ Bismuth	$^{210}_{84}Po$ Polonium	$^{210}_{85}At$ Astatine	$^{222}_{86}Rn$ Radon
$^{223}_{87}Fr$ Francium	$^{226}_{88}Ra$ Radium	$^{227}_{89}Ac$ Actinium															

Key:



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Candidate Name	Centre Number	Candidate Number
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GCSE

236/02

SCIENCE
HIGHER TIER
CHEMISTRY 1

A.M. MONDAY, 17 January 2011

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**9**	
3.	**4**	
4.	**11**	
5.	**4**	
6.	**3**	
7.	**9**	
8.	**4**	
Total	**50**	

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ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

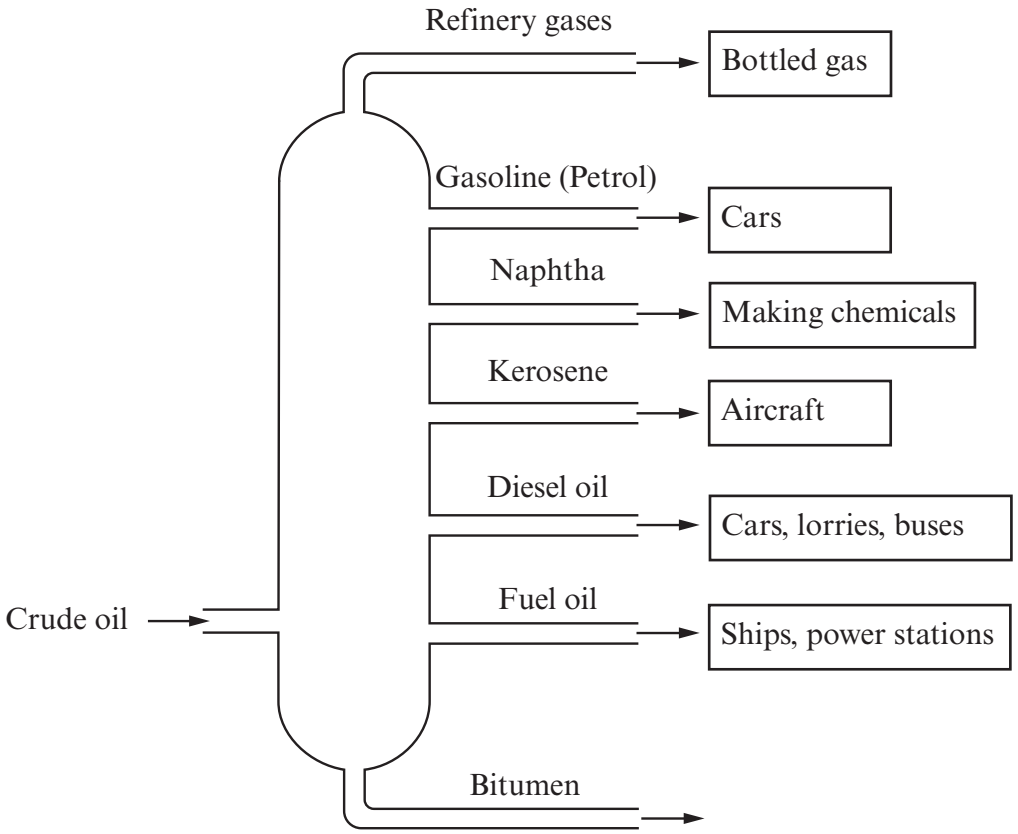
You are reminded of the necessity for good English and orderly presentation in your answers.

The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

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Answer **all** *questions.*

1. *(a)* The following diagram summarises the industrial fractional distillation of crude oil.



Use the diagram above to help you answer the following questions.

(i) State what must happen to the crude oil before it enters the column. [1]

.....

(ii) State how the temperature changes from the bottom to the top of the column. [1]

.....

(iii) At which point in the column are the smallest molecules collected? [1]

.....

(iv) The fractions are collected as liquids. Name the physical process taking place when a gas changes to a liquid. [1]

.....

(v) Differences in which physical property allow the fractions to be collected at different levels in the column? [1]

.....

(b) Many of the fractions are used as fuels and contain sulphur impurities. Name the environmental problem caused by the burning of these sulphur impurities. [1]

.....

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2. *(a)* Use the **data** and **key** on the Periodic Table of Elements, shown on the back page of this examination paper, to answer the following questions.

(i) The chemical **symbol** for gold is ..... . [1]

(ii) The element with the atomic number 9 is ..... . [1]

(iii) An element has the electronic structure 2,8,5.

I. State the group and period in which this element is found and explain your answers in terms of its electronic structure. [2]

Group .....

Reason .....

.....

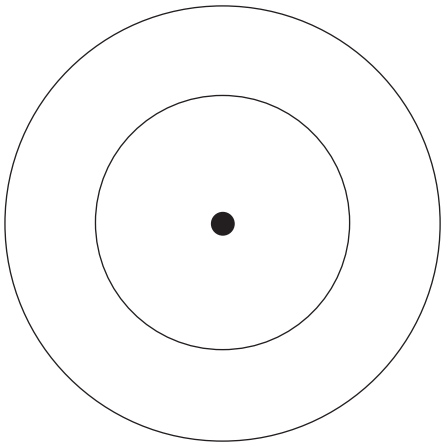
Period .....

Reason .....

.....

II. Identify this element. ..... [1]

(b) Using **X** to represent an electron, complete the following diagram to show the electronic structure of boron. [1]



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(c) The following diagram shows the Periodic Table that was published by Mendeleev in 1869.

Group / Period	1	2	3	4	5	6	7	0
1	H							
2	Li	Be	B	C	N	O	F	
3	Na	Mg	Al	Si	P	S	Cl	
4	K Cu	Ca Zn	* *	Ti *	V As	Cr Se	Mn Br	Fe Co Ni
5	Rb Ag	Sr Cd	Y In	Zr Sn	Nb Sb	Mo Te	* I	Ru Rh Pd

(i) Give a reason why Mendeleev used * in some of the boxes. [1]

.....

.....

(ii) Name **two** elements present in Group 1 of Mendeleev's table that are not in Group 1 of the present day Periodic Table. [1]

..... and .....

(iii) Mendeleev arranged the elements in order of increasing atomic mass. State how the elements are arranged in the present day Periodic Table. [1]

.....

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3. The following table shows information about some compounds. Complete the table. [4]

You may find the table of common ions on the inside of the back cover of this examination paper useful when answering this question.

Compound	Formula	Metal ion present	Non-metal ion present
sodium chloride	NaCl	Na^+	Cl^-
potassium oxide	.....	K^+	O^{2-}
magnesium carbonate	$MgCO_3$	.....	.....
.....	.....	Ca^{2+}	OH^-

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4. *(a)* Hydrogen peroxide, H_2O_2, decomposes very slowly to produce water and oxygen gas.

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

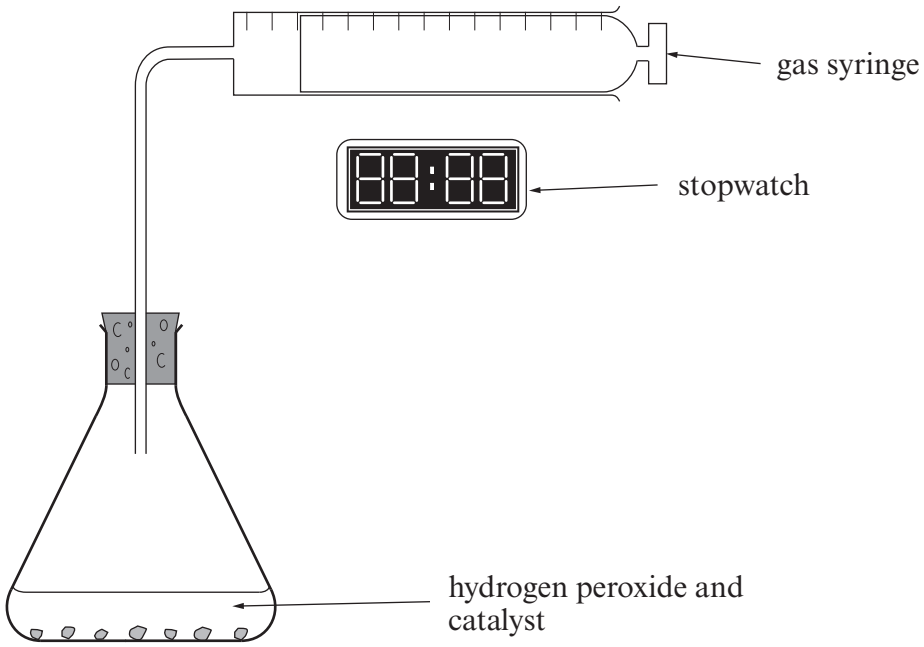
(i) State **one** observation that you would make during this reaction. [1]

.....

(ii) When a catalyst is added to hydrogen peroxide, the reaction speeds up. If 1 g of catalyst was used, how much catalyst would remain at the end of the experiment? [1]

.....

(iii) A student investigated this reaction using the apparatus shown below.



He added 1 g of catalyst to 100 cm^3 of hydrogen peroxide solution.
The volume of oxygen produced was recorded every 10 seconds.

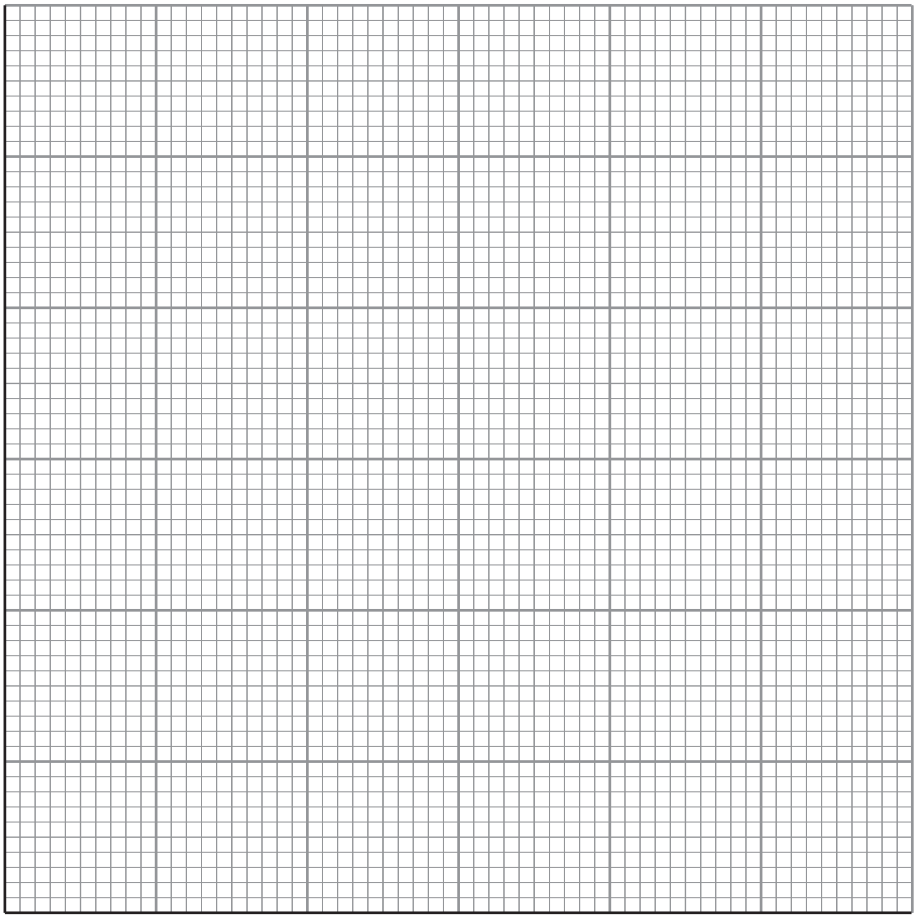
The results are shown in the table below.

Time / s	0	10	20	30	40	50	60
Volume of oxygen produced / cm^3	0	40	66	82	94	100	100

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Plot the results from the table on the grid below and draw a smooth curve of best fit through the points. [4]

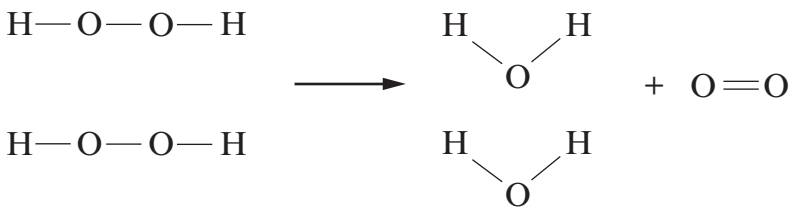


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(b) The reaction taking place is shown by the following equation.



The relative amounts of energy needed to break the bonds in the above reaction are shown in the table below.

Bond	Amount of energy needed to break the bond / kJ
H — O	464
O = O	498
O — O	144

Note: The amount of energy **released** *in making a bond is equal and opposite to that* **needed** *to break the bond.*

Use the bond energy values in the table to show that the overall energy change for the reaction is –210 kJ. [5]

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5. Nano-sized particles of titanium dioxide are used in suncreams.

(i) Give the size range of nanoparticles. [1]

.....

(ii) A magazine article contained the following quotes about the use of nanoparticles.

Quote 1:	People are concerned that nanoparticles used in cosmetics are not safe.
Quote 2:	There will be no ill effects as larger particles of the same substance are perfectly safe.

Give a reason why quote 2 is considered incorrect by many. [1]

.....

.....

(iii) Explain why some people are concerned about using cosmetic products that contain nanoparticles. [2]

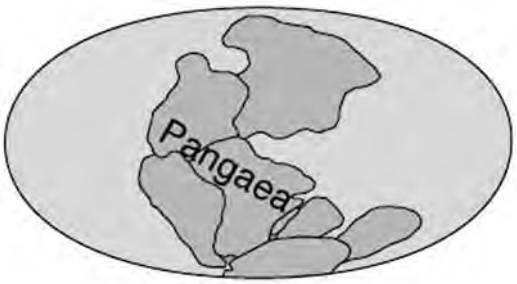
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6. Alfred Wegener's theory of continental drift suggested that the Earth's continents were once joined and moved apart to their present positions.



(i) Give the reason why other scientists did not believe his theory. [1]

.....

.....

(ii) In the 1960s, scientists found new evidence that suggested that the Earth's surface was made up of a number of plates that were constantly moving.

State what they believed to be the cause of this movement. [2]

.....

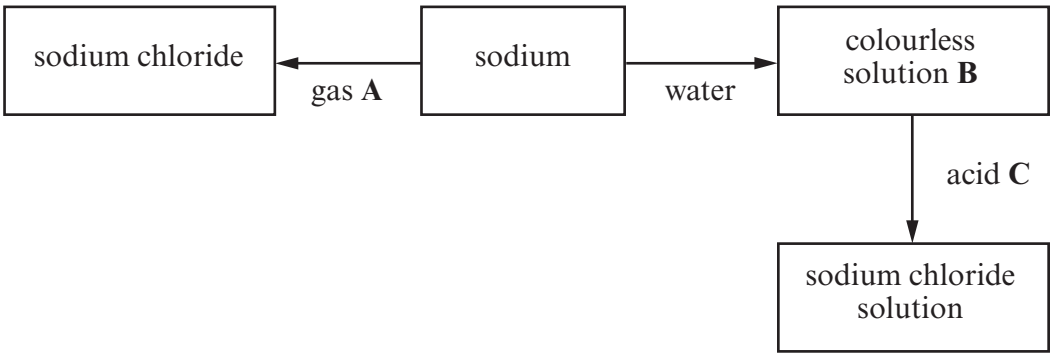
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7. *(a)* The following diagram shows two ways in which sodium metal can be changed into sodium chloride.



Give the name for

(i) gas **A**, ... [1]

(ii) colourless solution **B**, ... [1]

(iii) acid **C**. ..... [1]

(b) A pupil carried out a reaction between sodium and iodine.

(i) Complete and balance the following **symbol** equation for the reaction between sodium and iodine. [2]

..... Na + I_2 → .....

(ii) The pupil was asked to test the product to prove that it contained sodium ions and iodide ions. Describe the test used for each ion and give the expected results. [4]

.....

.....

.....

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8. The following table shows some facts about greenhouse gases found in the atmosphere.

Greenhouse gas	% of all greenhouse gases	% naturally produced	% man-made
water vapour	95.000	94.999	0.001
carbon dioxide	3.618	3.502	0.116
methane	0.360	0.294	.....
nitrous oxide	0.950	0.903	0.047
others e.g. CFCs	0.072	0.025	0.047

(i) Complete the table to show the percentage of man-made methane. [1]

(ii) 'One possible solution to global warming is to reduce our carbon dioxide emissions by burning less fossil fuel.'
Use the figures in the table to explain why this statement could be considered to be correct on one hand but incorrect on the other. [2]

Correct .....

.....

Incorrect .....

.....

(iii) Apart from combustion, give **one** *natural* process that produces carbon dioxide. [1]

.....

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FORMULAE FOR SOME COMMON IONS

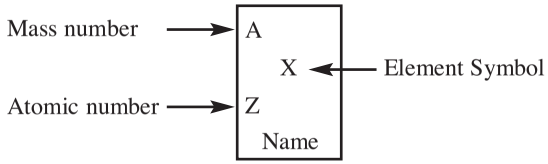
POSITIVE IONS		NEGATIVE IONS	
Name	**Formula**	**Name**	**Formula**
Aluminium	Al^{3+}	Bromide	Br^{-}
Ammonium	NH_4^{+}	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^{-}
Calcium	Ca^{2+}	Fluoride	F^{-}
Copper(II)	Cu^{2+}	Hydroxide	OH^{-}
Hydrogen	H^{+}	Iodide	I^{-}
Iron(II)	Fe^{2+}	Nitrate	NO_3^{-}
Iron(III)	Fe^{3+}	Oxide	O^{2-}
Lithium	Li^{+}	Sulphate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^{+}		
Silver	Ag^{+}		
Sodium	Na^{+}		

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PERIODIC TABLE OF ELEMENTS

1	2	Group										3	4	5	6	7	0
								$^{1}_{1}$H Hydrogen									$^{4}_{2}$He Helium
$^{7}_{3}$Li Lithium	$^{9}_{4}$Be Beryllium											$^{11}_{5}$B Boron	$^{12}_{6}$C Carbon	$^{14}_{7}$N Nitrogen	$^{16}_{8}$O Oxygen	$^{19}_{9}$F Fluorine	$^{20}_{10}$Ne Neon
$^{23}_{11}$Na Sodium	$^{24}_{12}$Mg Magnesium											$^{27}_{13}$Al Aluminium	$^{28}_{14}$Si Silicon	$^{31}_{15}$P Phosphorus	$^{32}_{16}$S Sulphur	$^{35}_{17}$Cl Chlorine	$^{40}_{18}$Ar Argon
$^{39}_{19}$K Potassium	$^{40}_{20}$Ca Calcium	$^{45}_{21}$Sc Scandium	$^{48}_{22}$Ti Titanium	$^{51}_{23}$V Vanadium	$^{52}_{24}$Cr Chromium	$^{55}_{25}$Mn Manganese	$^{56}_{26}$Fe Iron	$^{59}_{27}$Co Cobalt	$^{59}_{28}$Ni Nickel	$^{64}_{29}$Cu Copper	$^{65}_{30}$Zn Zinc	$^{70}_{31}$Ga Gallium	$^{73}_{32}$Ge Germanium	$^{75}_{33}$As Arsenic	$^{79}_{34}$Se Selenium	$^{80}_{35}$Br Bromine	$^{84}_{36}$Kr Krypton
$^{86}_{37}$Rb Rubidium	$^{88}_{38}$Sr Strontium	$^{89}_{39}$Y Yttrium	$^{91}_{40}$Zr Zirconium	$^{93}_{41}$Nb Niobium	$^{96}_{42}$Mo Molybdenum	$^{99}_{43}$Tc Technetium	$^{101}_{44}$Ru Ruthenium	$^{103}_{45}$Rh Rhodium	$^{106}_{46}$Pd Palladium	$^{108}_{47}$Ag Silver	$^{112}_{48}$Cd Cadmium	$^{115}_{49}$In Indium	$^{119}_{50}$Sn Tin	$^{122}_{51}$Sb Antimony	$^{128}_{52}$Te Tellurium	$^{127}_{53}$I Iodine	$^{131}_{54}$Xe Xenon
$^{133}_{55}$Cs Caesium	$^{137}_{56}$Ba Barium	$^{139}_{57}$La Lanthanum	$^{179}_{72}$Hf Hafnium	$^{181}_{73}$Ta Tantalum	$^{184}_{74}$W Tungsten	$^{186}_{75}$Re Rhenium	$^{190}_{76}$Os Osmium	$^{192}_{77}$Ir Iridium	$^{195}_{78}$Pt Platinum	$^{197}_{79}$Au Gold	$^{201}_{80}$Hg Mercury	$^{204}_{81}$Tl Thallium	$^{207}_{82}$Pb Lead	$^{209}_{83}$Bi Bismuth	$^{210}_{84}$Po Polonium	$^{210}_{85}$At Astatine	$^{222}_{86}$Rn Radon
$^{223}_{87}$Fr Francium	$^{226}_{88}$Ra Radium	$^{227}_{89}$Ac Actinium															

Key:



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