WJEC GCSE CHEMISTRY

CHEMISTRY



EXAM QUESTION PACK

UNIT C1 FOUNDATION TIER 0236 PAPERS

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0236/01

SCIENCE
FOUNDATION TIER
CHEMISTRY 1

A.M. TUESDAY, 29 January 2013

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**3**	
2.	**3**	
3.	**5**	
4.	**3**	
5.	**5**	
6.	**5**	
7.	**6**	
8.	**5**	
9.	**6**	
10.	**6**	
11.	**3**	
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 atoms of carbon, hydrogen and oxygen can be represented by the following diagrams.



represents carbon (symbol C)

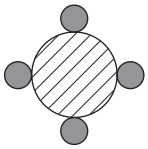


represents hydrogen (symbol H)



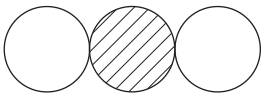
represents oxygen (symbol O)

(a) Methane, CH_4, is represented as follows.



Using the information given above, draw a diagram to represent water, H_2O. [1]

(b) Give the formula **and** name of the molecule represented by the following diagram.



Formula ..... [2]

Name .....

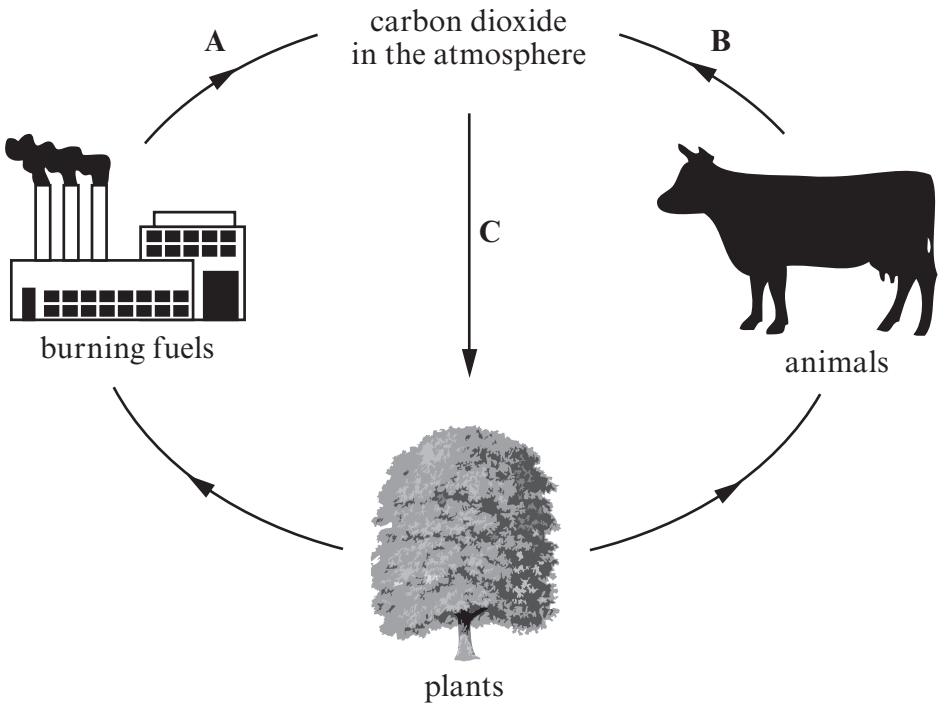
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2. The diagram below shows the carbon cycle.



A, **B** and **C** are processes by which carbon dioxide is removed from or added to the atmosphere.

(a) Name the processes labelled **A**, **B** and **C** using the words from the box below. [2]

combustion	**photosynthesis**	**respiration**

A .....

B .....

C .....

(b) If very large quantities of trees were cut down, state what would happen to the amount of carbon dioxide in the atmosphere. [1]

.....

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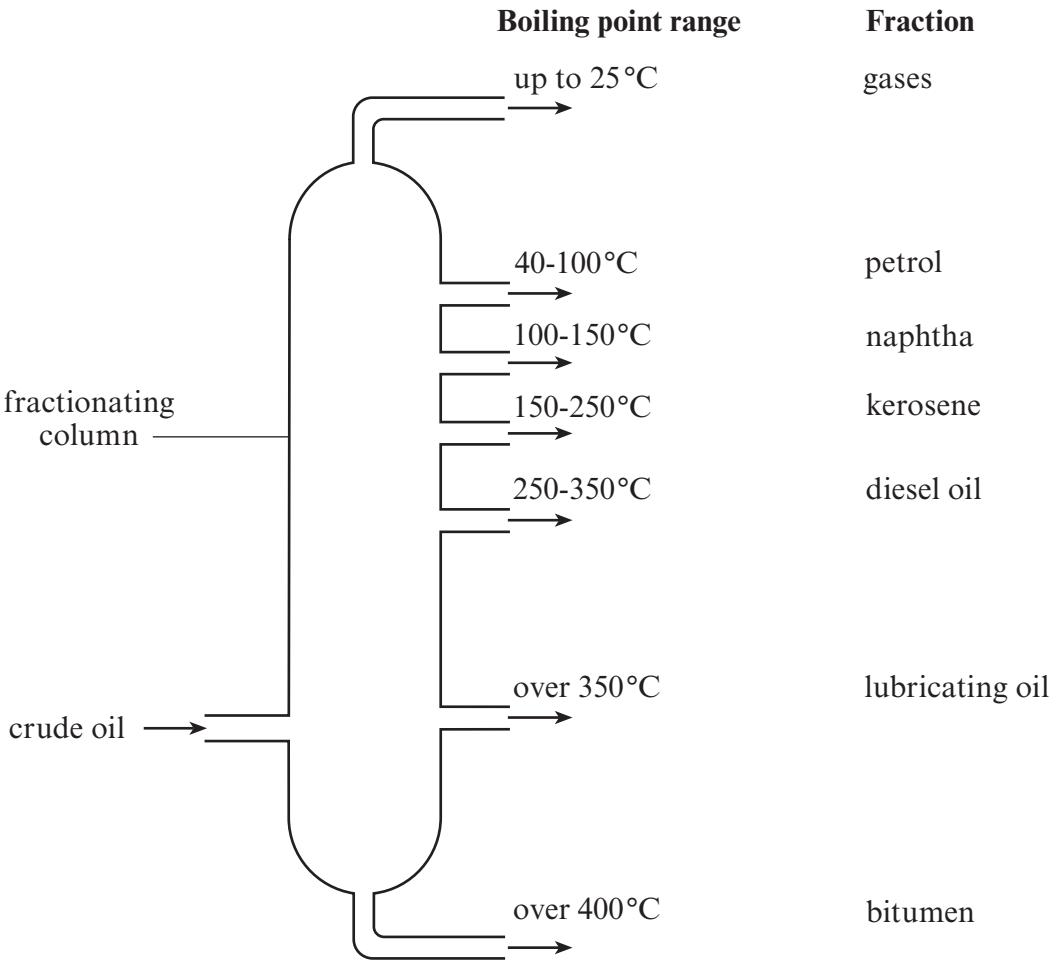
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3. *(a)* Crude oil is separated into fractions in a fractionating column.



(i) Name the fraction with the boiling point range of 100-150 °C. [1]

.....

(ii) State what must be done to the crude oil before it enters the fractionating column. [1]

.....

(iii) Although the crude oil enters the fractionating column as a vapour or a gas, many of the fractions are collected as liquids. Name the process taking place when a gas changes to a liquid. [1]

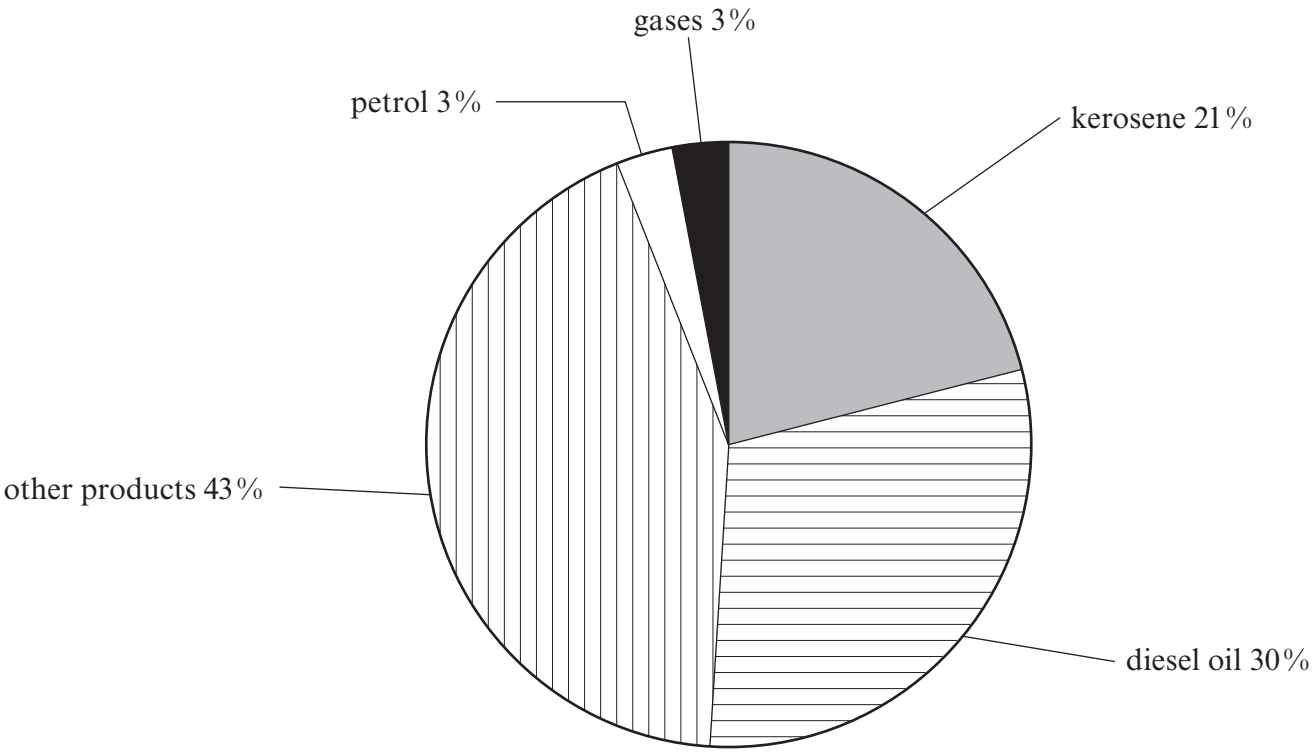
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(b) The pie chart below shows the composition of North Sea Oil.



Percentage (%) of fraction in North Sea Oil

Use the pie chart to complete the following sentences.

(i) The percentage of kerosene in North Sea Oil is ..... %. [1]

(ii) The fraction which makes up 30% of North Sea Oil is

..... . [1]

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4. Nanoscience involves the study of very small particles.

(a) (i) Which of the following is considered to be a size in the nanoscale range?

Tick (✓) only **one** box. [1]

length of a bacterium 5000 nm	☐
length of a protein molecule 40 nm	☐
diameter of a red blood cell 500 nm	☐
width of a human hair 50000 nm	☐

(ii) From the box below, choose the correct number to complete the following sentence. [1]

hundred	**million**	**thousand**

1 nm is one ..... times smaller than 1 mm.

(b) From the box below, choose the reason why nano-sized silver particles are used to clean hospital operating theatres. [1]

cheap	**give a shiny surface**
kill germs	**pleasant smell**

Reason .....

3

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5. The table below shows some physical properties of four non-metals and the metal iron.

Element	Melting point / °C	Boiling point / °C	Density / g cm^{-3}
bromine	–7	59	3.1
chlorine	–101	–35	0.003
iron	1540	2750	7.9
iodine	114	184	4.9
sulphur	115	444	2

(a) Name the **non-metal** with the highest boiling point. [1]

.....

(b) State how the information in the table shows that iron is a metal. [1]

.....

(c) State which of the above elements would be a **gas** at room temperature (20 °C). Explain your answer. [2]

.....

.....

(d) Give **one** general physical property of non-metals, other than those relating to melting point, boiling point and density. [1]

.....

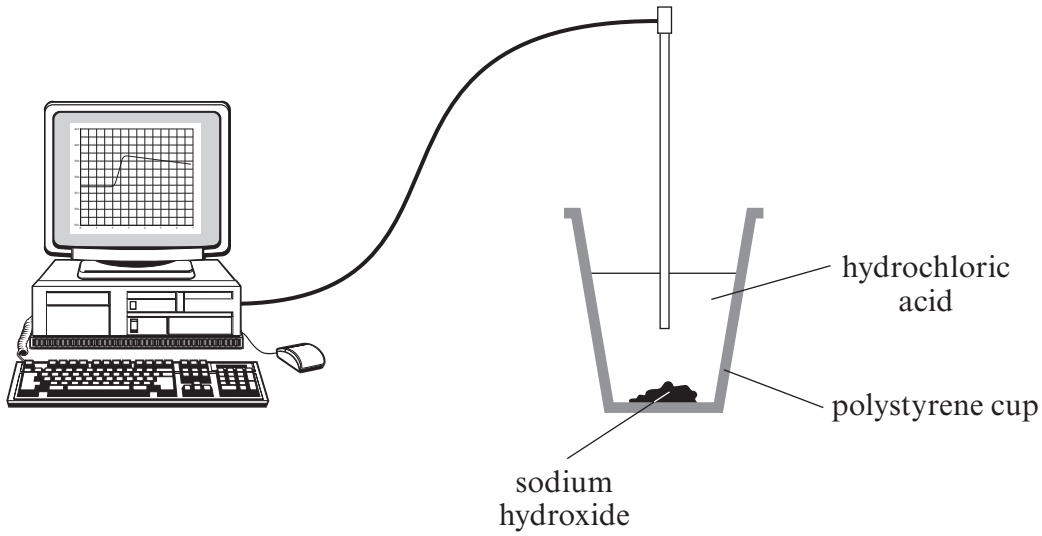
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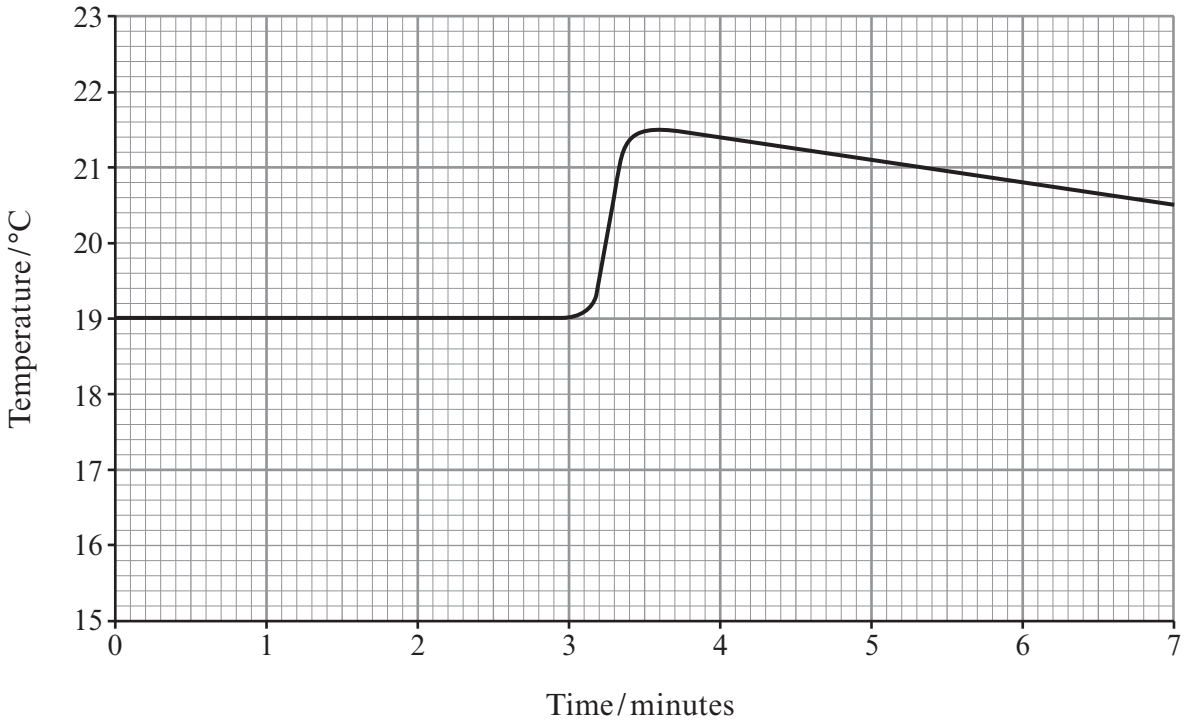
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6. An experiment was carried out to investigate the temperature change which occurs when sodium hydroxide and hydrochloric acid react. The apparatus was set up as shown below.
It recorded the temperature of the acid for three minutes. Sodium hydroxide was added at this point and the temperature was recorded for a further four minutes.



The graph produced by the computer is shown below.



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(a) Use the graph to give the

(i) **highest** temperature recorded, ... °C [1]

(ii) **increase** in temperature during the reaction. ..... °C [1]

(b) Using the substances in the box below, write a **word** equation for the reaction that took place inside the polystyrene cup. [2]

hydrochloric acid	**sodium chloride**
sodium hydroxide	**water**

..... + ... ⟶ ..... + ...

(c) State whether the reaction is exothermic or endothermic and give a reason for your answer. [1]

.....

.....

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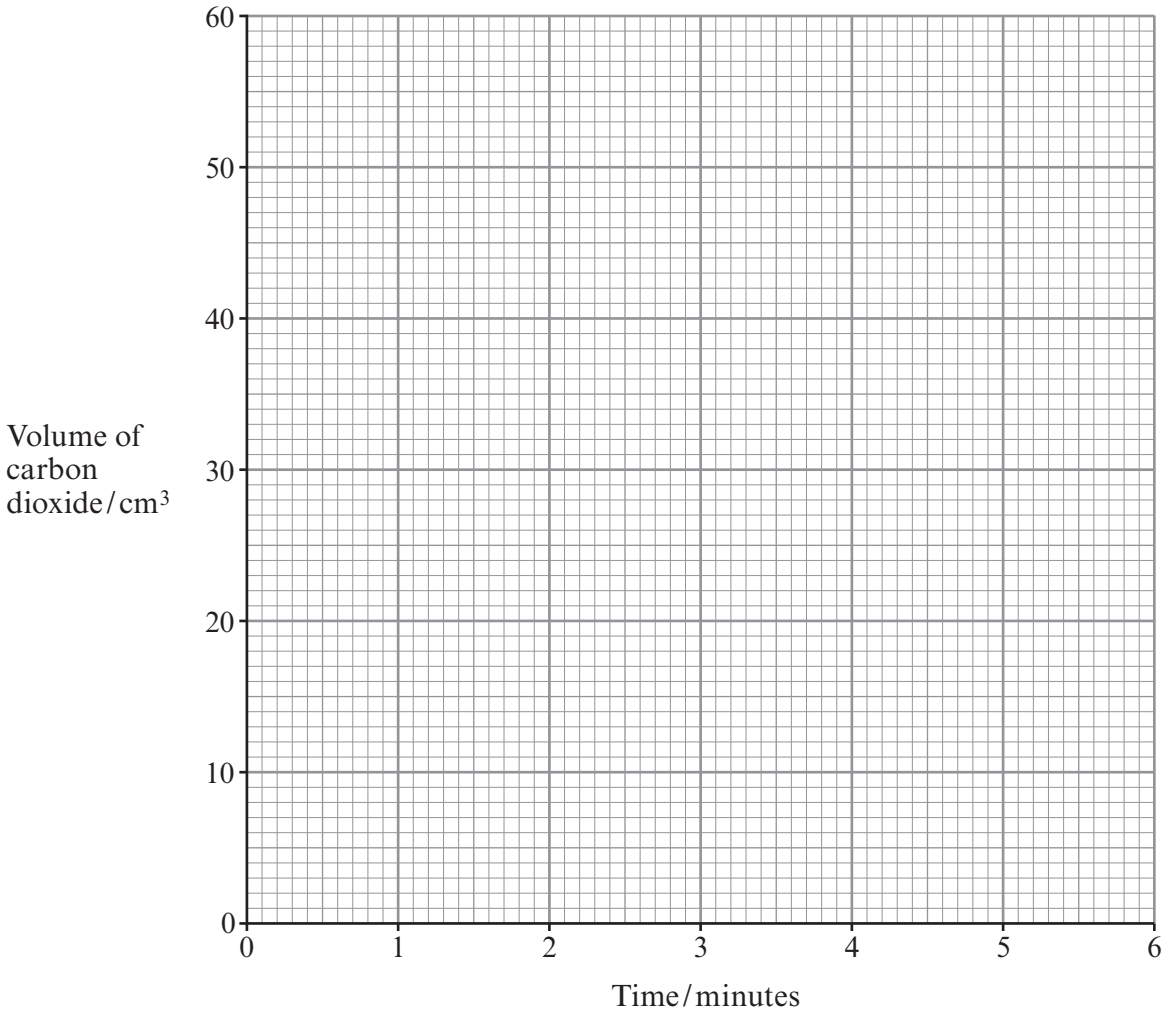
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7. Calcium carbonate reacts with dilute hydrochloric acid to produce carbon dioxide gas.

Some calcium carbonate was placed in **excess** dilute hydrochloric acid. The total volume of carbon dioxide produced was recorded every minute. The experiment was carried out at room temperature. The results obtained are shown in the following table.

Time/minutes	0	1	2	3	4	5	6
Volume of carbon dioxide/cm^3	0	20	32	40	45	48	48

(a) Plot the results from the table on the grid below and draw a smooth curve through the points. [3]



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(b) Give the volume of carbon dioxide produced after 2½ minutes. [1]

..... cm^3

(c) If the reaction had been repeated using **half the amount** of calcium carbonate and the same amount of the original acid, give the expected final volume of carbon dioxide produced and explain your answer. [2]

Final volume of carbon dioxide ..... cm^3

Explanation .....

.....

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8. *(a)* The following table shows five compounds and their formulae.

Name of compound	Formula
ammonia	NH_3
hydrochloric acid	HCl
sodium chloride	NaCl
sulphuric acid	H_2SO_4
water	H_2O

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

(i) Give the **name** of the compound that contains the elements hydrogen and oxygen **only**. [1]

.....

(ii) Give the **names** of the elements present in hydrochloric acid. [1]

..... and .....

(iii) Give the **name** of the compound that contains **three** different elements. [1]

.....

(b) Use the table of formulae for some common ions on the inside of the back cover of this examination paper to give the formula of

(i) ammonium chloride, ... [1]

(ii) sodium oxide. ..... [1]

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9. The electronic structures 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]

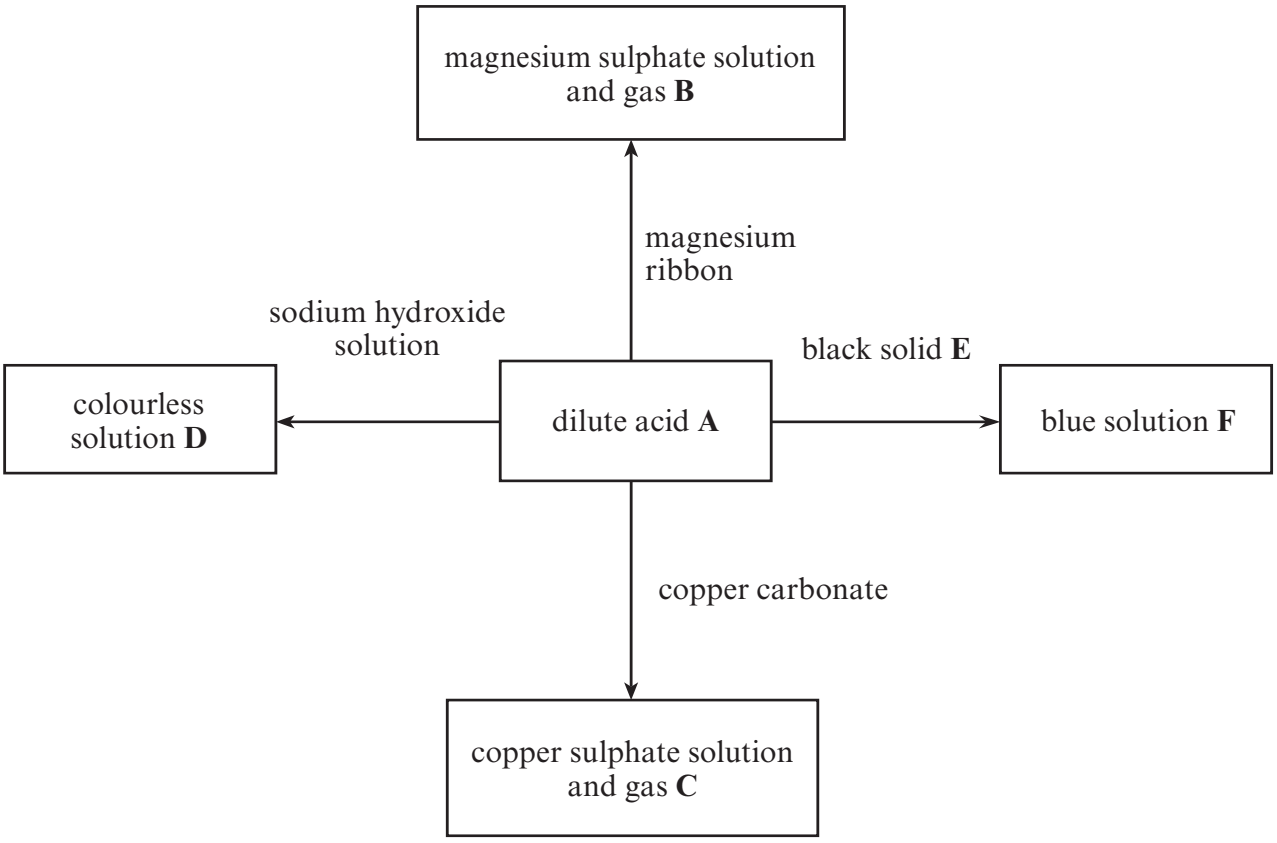
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10. The diagram below shows some reactions of a common acid.



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]

6

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

.....

.....

.....

.....

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+}		

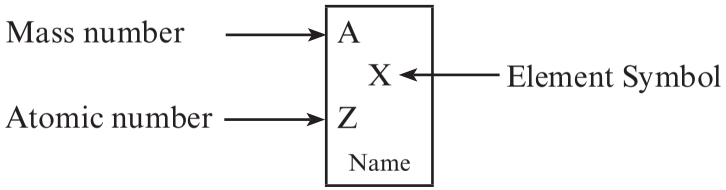
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PERIODIC TABLE OF ELEMENTS

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.

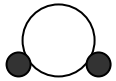
Unit	Page
C1 (LEGACY)	1
C2 (LEGACY)	17
C3 (LEGACY)	31

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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

0236/01

SCIENCE
FOUNDATION TIER
CHEMISTRY 1

A.M. TUESDAY, 12 June 2012

45 minutes

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

0236 010001

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.
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.

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 box contains some information about chemical reactions. Read the information carefully and answer the questions that follow.

> Chemical reactions involve converting reactants into products.
>
> reactants ⟶ products
>
> They are used in industry to produce new and useful materials from raw materials. Raw materials can be obtained from the earth, sea and air. Examples of raw materials include crude oil, nitrogen and metal ores.
>
> Useful products include fuels, plastics, medicines, metals and fertilisers.

Use the information in the box above to help you answer parts (i)-(iv).

(i) State what happens during a chemical reaction. [1]

.....

(ii) State why chemical reactions are important in industry. [1]

.....

(iii) Name a raw material obtained from

I. the earth, ... [1]

II. the air. ..... [1]

(iv) Name the raw material used to produce petrol. [1]

.....

(b) Sulphuric acid, H_2SO_4, is produced during the Contact Process. One stage of the process involves burning sulphur in air to produce sulphur dioxide, SO_2.

(i) Name the gas, found in the air, that reacts with sulphur to form sulphur dioxide.

..... [1]

(ii) State how many atoms of sulphur are found in a molecule of sulphur dioxide, SO_2.

..... [1]

(iii) Give the **total** number of atoms found in a molecule of sulphuric acid, H_2SO_4.

..... [1]

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2. *(a)* The following table shows information about some ionic substances. There are **three** errors in the table.

Circle each of the **three** errors. [3]

Name	Positive ion present	Negative ion present	Formula
sodium chloride	Na^+	Cl^-	NaCl
calcium chloride	Ca^{2+}	Cl^-	CaCl
magnesium oxide	Mg^{2+}	O^{2-}	MgO_2
potassium iodide	Li^+	I^-	KI

(b) Ammonia, NH_3, can be represented by the diagram shown below.



(i) State why ammonia is a compound. [1]

.....

.....

(ii) I. Use the diagram of ammonia to complete the key shown below. [1]

 = ...

 = carbon

 = ...

 = oxygen

II. Use the key to draw a diagram that represents a molecule of methane, CH_4. [1]

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3. Nano-silver particles have been widely used in recent years.

(a) Choose from the box below one use for nano-silver particles. [1]

air freshener	**deodorant**	**shampoo**	**window cleaner**

Use of nano-silver .....

(b) Choose from the box below a property of nano-silver that allows it to be used in this way. [1]

anti-bacterial	**low density**	**shiny**	**water repellent**

Property of nano-silver .....

(c) Choose from the box below the size range of nano-silver particles. [1]

1-100 cm	**1-100 m**	**1-100 mm**	**1-100 nm**

Size range of nano-silver .....

(d) Nano-silver particles could be absorbed through the skin. Suggest a reason why some people are concerned about this. [1]

.....

.....

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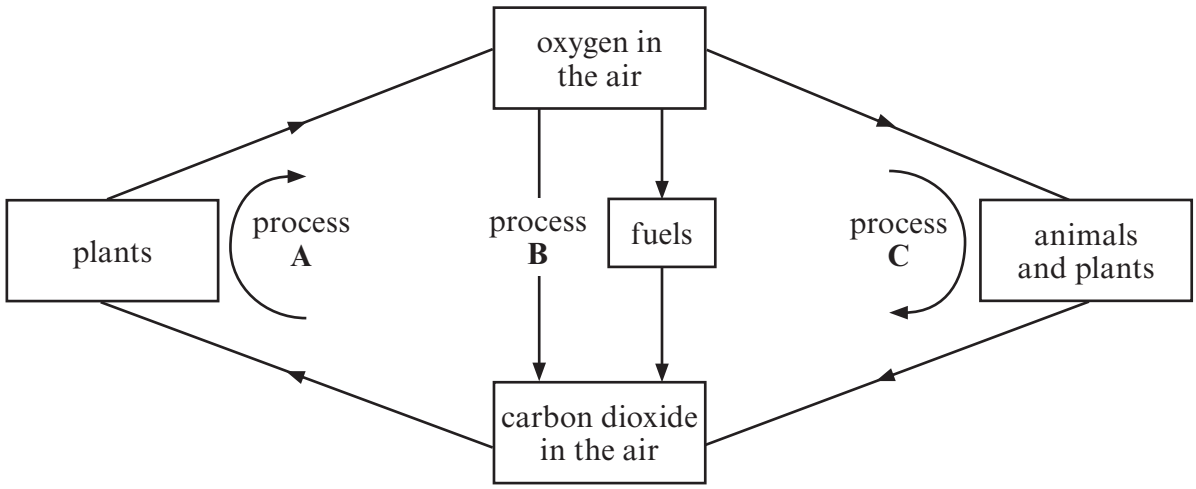
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4. Levels of oxygen and carbon dioxide in the air are maintained by the processes shown in the following diagram.



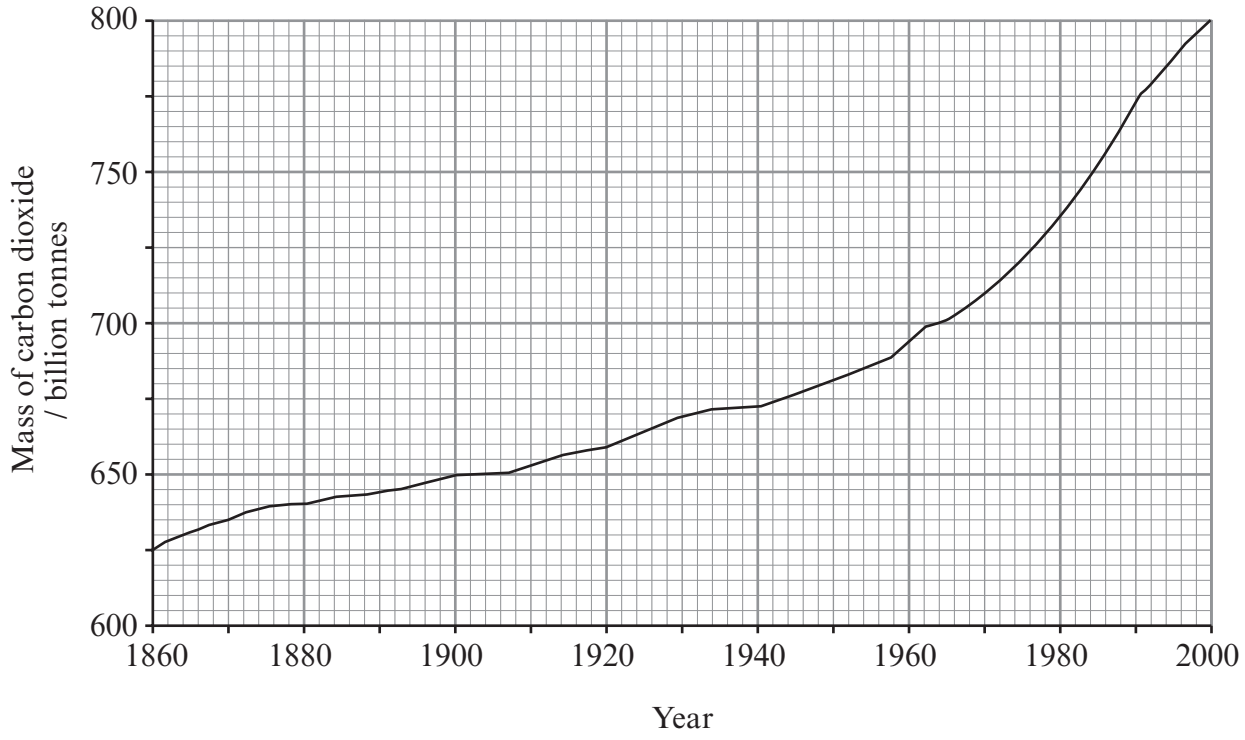
(a) Give the letter, **A**, **B** or **C** from the diagram, which represents the process of [2]

respiration, ...

photosynthesis, ...

combustion. .....

(b) The following graph shows how the mass of carbon dioxide in the atmosphere has changed since 1860.



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(i) Give the mass of carbon dioxide in the atmosphere in 1900.

..... [1]

(ii) Calculate the change in mass of carbon dioxide in the atmosphere between 1860 and 2000 and suggest a reason for this change. [2]

Change ..... billion tonnes

Reason .....

.....

(iii) Choose from the box below the effect most scientists believe this change in carbon dioxide levels has on the temperature of the Earth's atmosphere. [1]

decreases	**increases**	**stays the same**

.....

(iv) Give the term used to describe this change. [1]

.....

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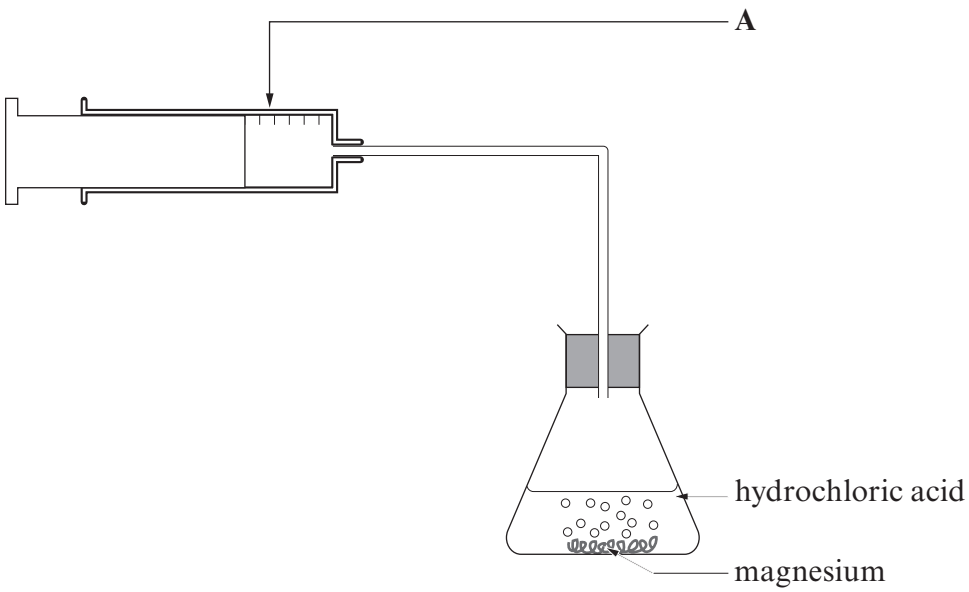
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5. When magnesium ribbon is added to hydrochloric acid, magnesium chloride and hydrogen gas are produced.

(a) Write a **word** equation for the reaction taking place. [2]

..... + ... ⟶ ..... + ...

(b) The rate of this reaction can be investigated using the apparatus shown below.



(i) Name the apparatus **A**, shown in the diagram. [1]

.....

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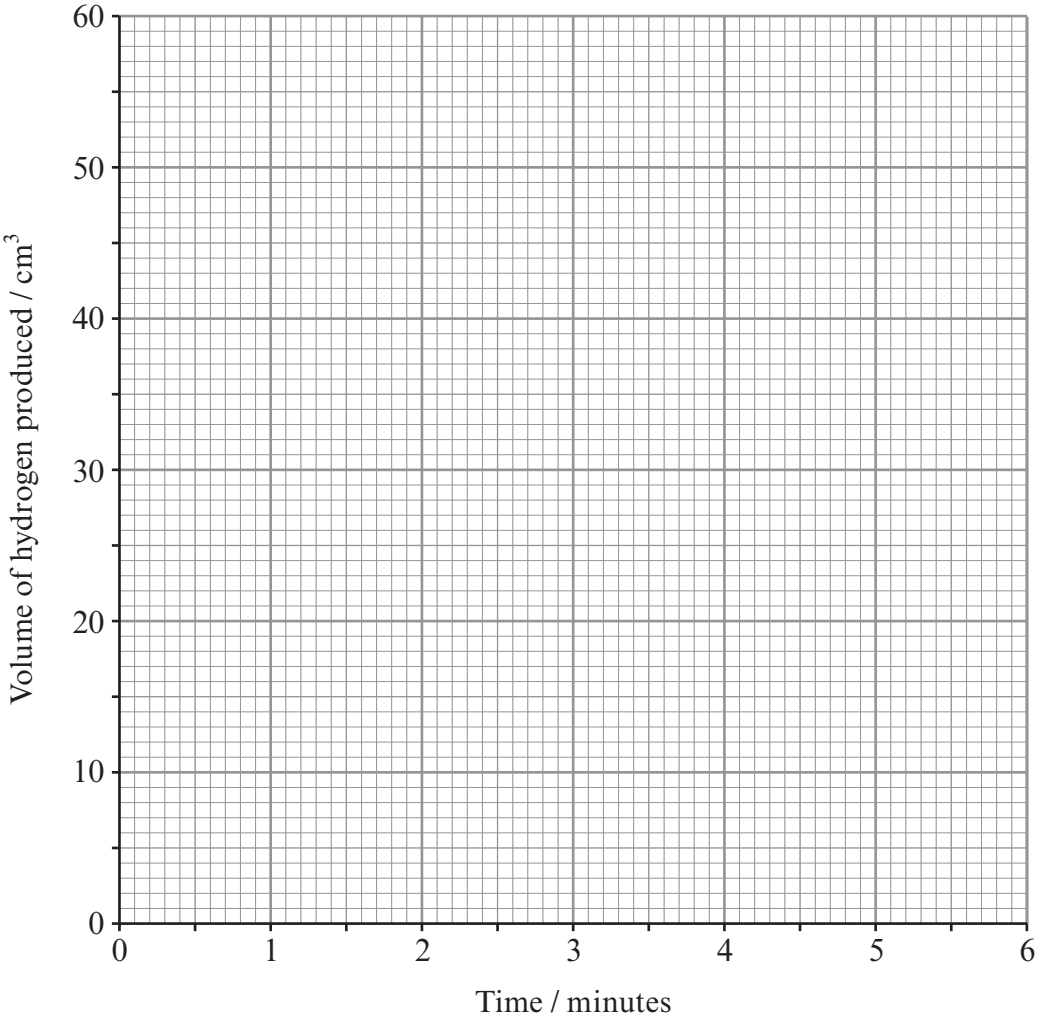
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(ii) John carried out an experiment using the apparatus shown opposite. He measured the volume of hydrogen every minute for 6 minutes.
His results are shown in the table below.

Time / minutes	0	1	2	3	4	5	6
Volume of hydrogen produced / cm^3	0	20	34	42	48	50	50

Plot the results from the table on the grid below and draw a line of best fit.
Your line should go through the origin (0,0). [3]



(iii) John used an *excess* of hydrochloric acid during the experiment. Give the reason why the reaction came to an end after 5 minutes. [1]

.....

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6. In 1915 Alfred Wegener suggested that the Earth's continents were once joined and that they had drifted apart to their present positions.

Choose words from the box below to complete the following sentences, describing the evidence Wegener used to support his idea. [3]

animals	**coastlines**	**countries**	**earthquakes**	**fossils**
mountains	**plants**	**rocks**	**volcanoes**	

Wegener noticed that the ..... of different continents appear to have shapes that would fit together like a jigsaw.

He also found that similar patterns of ..... of the same age and similar ..... exist on different continents, separated by huge oceans.

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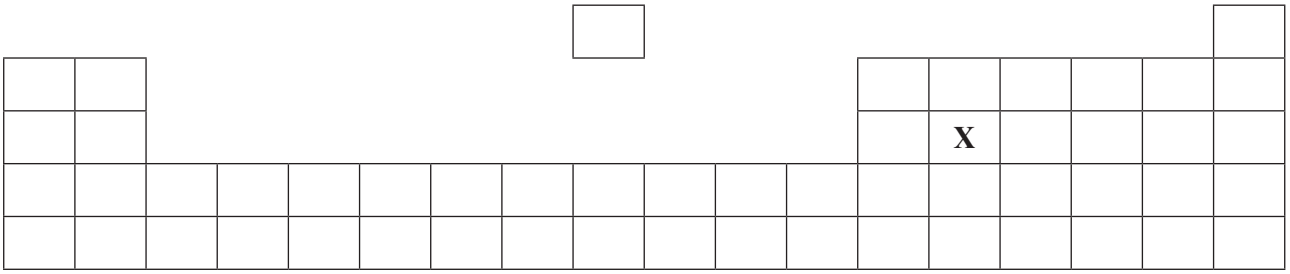
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3

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

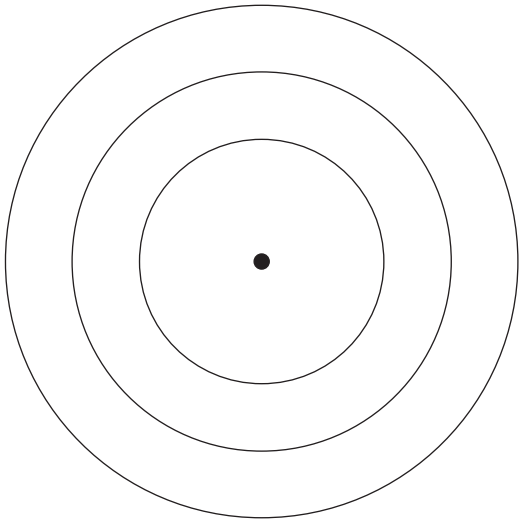
You may find the Periodic Table shown on the back page of this examination paper useful in answering this question.



(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]

.....

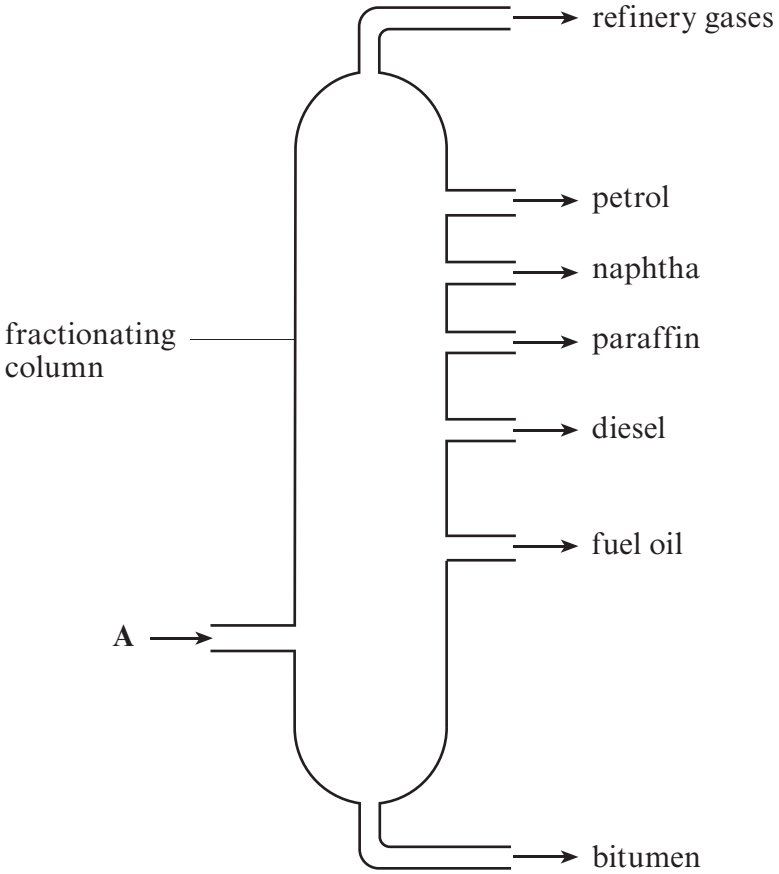
.....

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8. *(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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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^{+}		

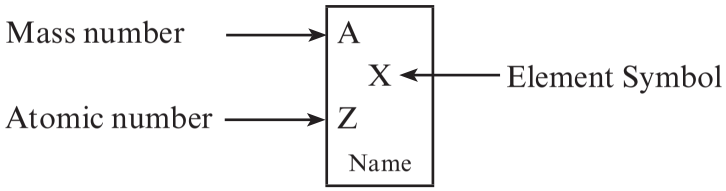
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PERIODIC TABLE OF ELEMENTS

Group 1	2											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.

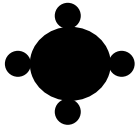
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Chemistry 1 (Legacy)

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

0236/01

SCIENCE
FOUNDATION TIER
CHEMISTRY 1

A.M. THURSDAY, 26 January 2012

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**4**	
2.	**6**	
3.	**5**	
4.	**5**	
5.	**5**	
6.	**4**	
7.	**6**	
8.	**4**	
9.	**5**	
10.	**6**	
Total	**50**	

0236 010001

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. The table below shows the physical properties of some elements.

Element	Melting point / °C	Boiling point / °C	Density / $g\,cm^{-3}$
nickel	1455	5267	8.9
iodine	114	184	4.9
tungsten	3422	5550	19.3
phosphorus	44	280	1.8
platinum	1768	3820	21.4

Use the information above to answer part *(a)*.

(a) Give the **name** of the

(i) **metal** with the lowest density, ... [1]

(ii) **non-metal** with the highest melting point. ..... [1]

(b) Element **X** (**X** is not the chemical symbol) has a melting point of 113 °C, a boiling point of 445 °C and a density of 2.1 $g\,cm^{-3}$.

State, giving a reason, whether element **X** is a metal or a non-metal. [2]

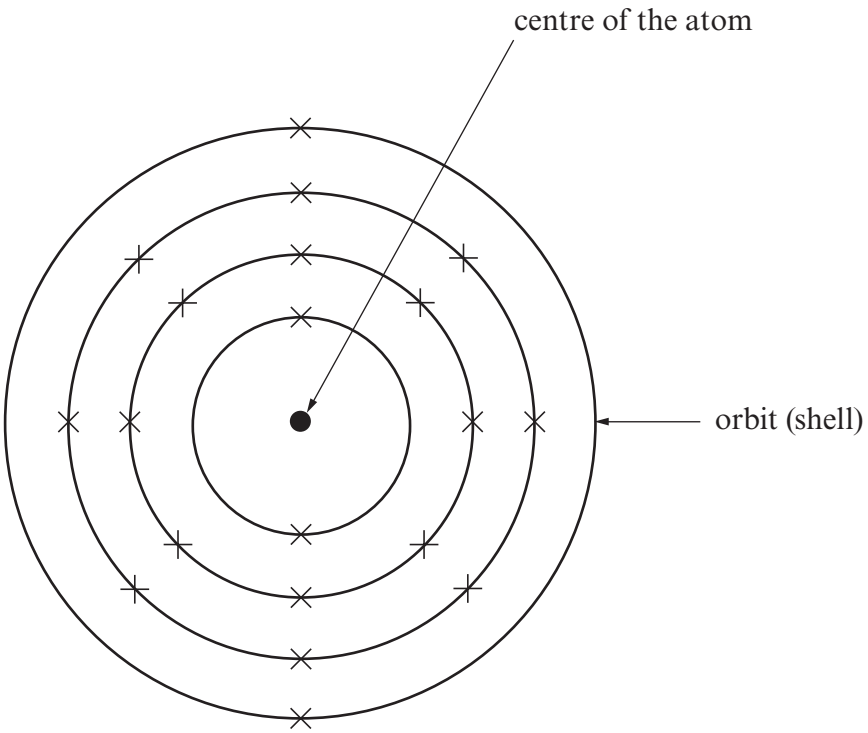
Element **X** is a .....

Reason .....

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2. *(a)* The diagram below shows an atom of calcium.



(i) The box below shows the names of particles found in atoms.

electrons	**neutrons**	**protons**

Choose particles from the box to complete the following sentence.

The nucleus of a calcium atom contains ..... and ..... . [2]

(ii) Use only the numbers in the box below to complete the following sentences.

2	**8**	**10**	**18**	**20**	**40**

I. The atomic number of calcium is ..... . [1]

II. The electronic structure for an atom of calcium is 2,8, ... [1]

(b) Phosphoric acid, H_3PO_4 is found in some cola drinks.

(i) State how many phosphorus atoms are present in the formula, H_3PO_4.

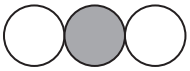
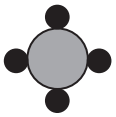
..... [1]

(ii) Give the **total** number of atoms shown in the formula. ..... [1]

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3. The following table shows some substances, their formulae and diagrams that can be used to represent them.

Substance	Formula	Diagram
ammonia	NH_3	
carbon dioxide	CO_2	
hydrogen chloride	HCl	
methane	CH_4	
water	H_2O	

(a) Use the information in the table to work out the key being used to represent the different elements in the diagrams.

● represents the element ..... [1]

 represents the element ..... [1]

 represents the element ..... [1]

 represents the element ..... [1]

(b) Choose from the box below the term used to describe all the substances in the table above. [1]

compound	**element**	**mixture**

Answer .....

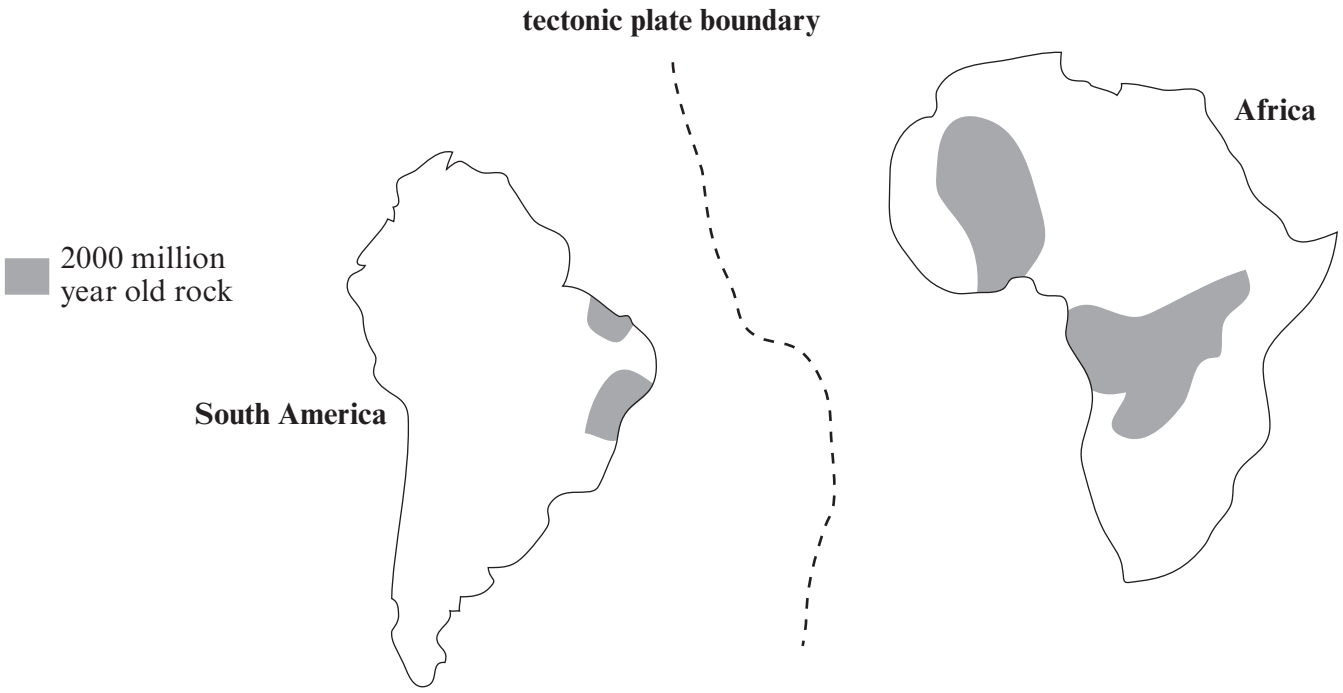
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4. *(a)* The diagram below shows the position of the boundary between the tectonic plates on which South America and Africa lie. The shaded areas show where similar rock patterns are found.



Choose words/phrases from the box below to complete the sentences that follow.

moving towards each other	**moving away from each other**	**sliding past each other**
hour	**day**	**week**	**year**

The similar rock patterns shown on the continents in the diagram suggest that Africa and South America are ..... . They move with a relative speed of a few centimetres per ..... . [2]

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(b) Use the information in the box below to answer parts (i) and (ii).

continental shrinking	**convection currents**	**continental expansion**
continental drift	**ocean currents**	**rotation of the Earth**

Tectonic plates are constantly moving.

(i) State the term used to describe the movement of tectonic plates.

..... [1]

(ii) State what causes tectonic plates to move. [1]

.....

(c) Apart from rock patterns, give **one** other piece of evidence that is used to support the theory that the continents are moving. [1]

.....

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5. The boxes below outline the arguments used by opponents and supporters of the fluoridation of drinking water. Read the information before attempting the questions that follow.

Opponents of fluoridation

Fluoridation of water is unnecessary if people take proper care of their teeth. Fluoride is only beneficial to growing children and has no benefits to adults.

Teeth can be stained if a child receives too much fluoride during tooth development.

Fluoride may have harmful side-effects such as an increased risk of bone cancer.

The government has no ethical right to give medication to an individual without personal consent.

Supporters of fluoridation

Fluoridation of water is an effective way of reducing tooth decay in children. Less tooth decay leads to fewer tooth extractions and therefore a reduction in the number of children given general anaesthetics.

Scientific studies show that fluoride in water, at or around 1 ppm, does not have any effect on the health of the body.

The public accepts that the chlorination of drinking water is necessary because it sterilises water making it safe to drink. Water fluoridation should be treated no differently.

1 ppm = one part per million

Use only the information in the boxes to answer the following questions.

(a) Give the approximate quantity of fluoride in water that has been shown by some scientists not to have any effect on our health. [1]

.....

(b) Give **one medical** argument used to

(i) support fluoridation, ... [1]

(ii) oppose fluoridation. ..... [1]

(c) Give **one ethical** argument used to oppose fluoridation. [1]

.....

(d) Give the reason why opponents of fluoridation are not against the chlorination of water supplies. [1]

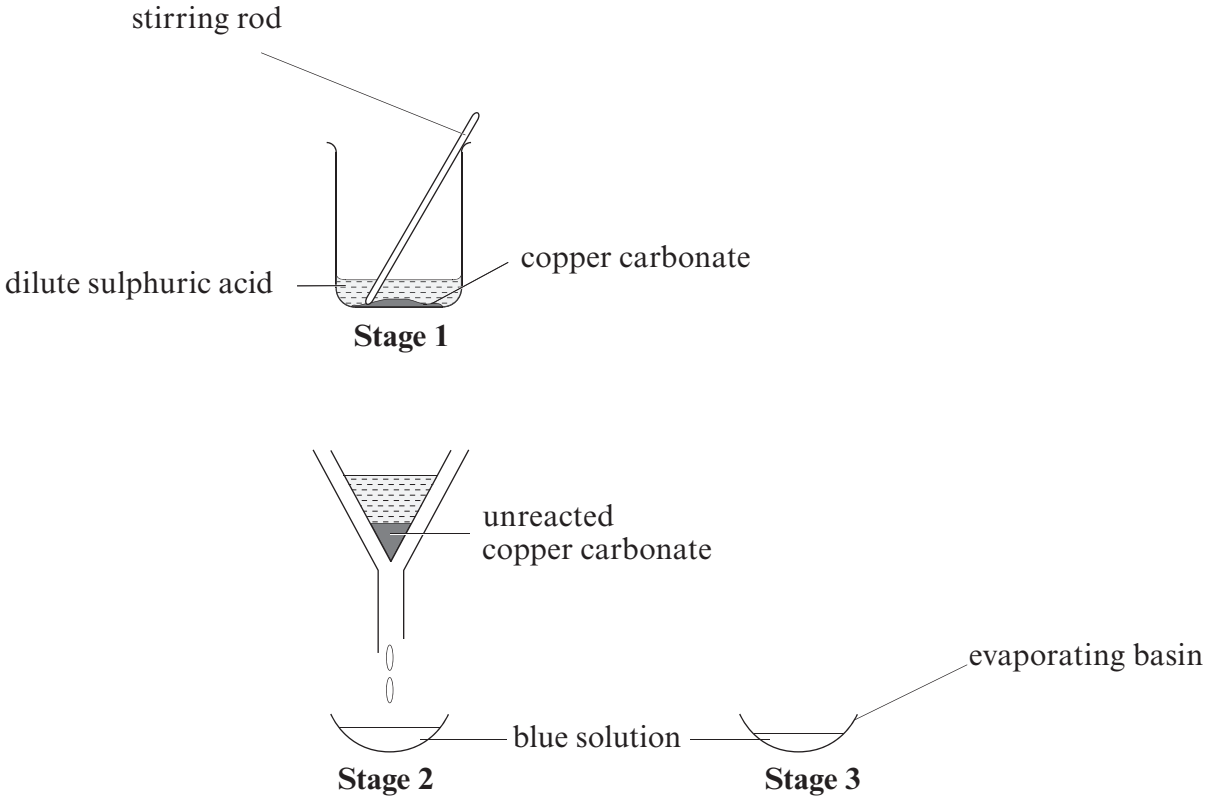
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6. The diagram below shows the stages in making some **dry crystals** of copper sulphate by reacting copper carbonate with dilute sulphuric acid.

copper carbonate + sulphuric acid ⟶ copper sulphate + water + carbon dioxide



Write a method describing how this experiment could be carried out. [4]

.....

.....

.....

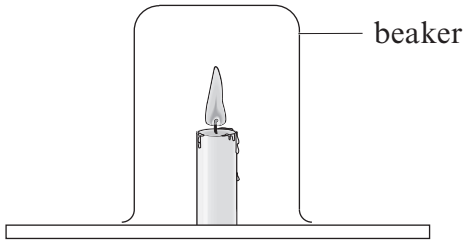
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7. An investigation was carried out to find how long a candle stayed alight under different sized beakers.



The **average** burning time from three readings was calculated.
The results are shown in the table below.

Beaker volume / cm^3	Burning time / seconds			
	Reading 1	Reading 2	Reading 3	Average
100	4	4	4	4
200	12	11	10	11
400	20	18	22	20
600	30	29	31	30
800	60	20	40	40

(a) (i) Using the information in the table of results, give the beaker volume which has **unreliable** readings.

Beaker volume ..... [1]

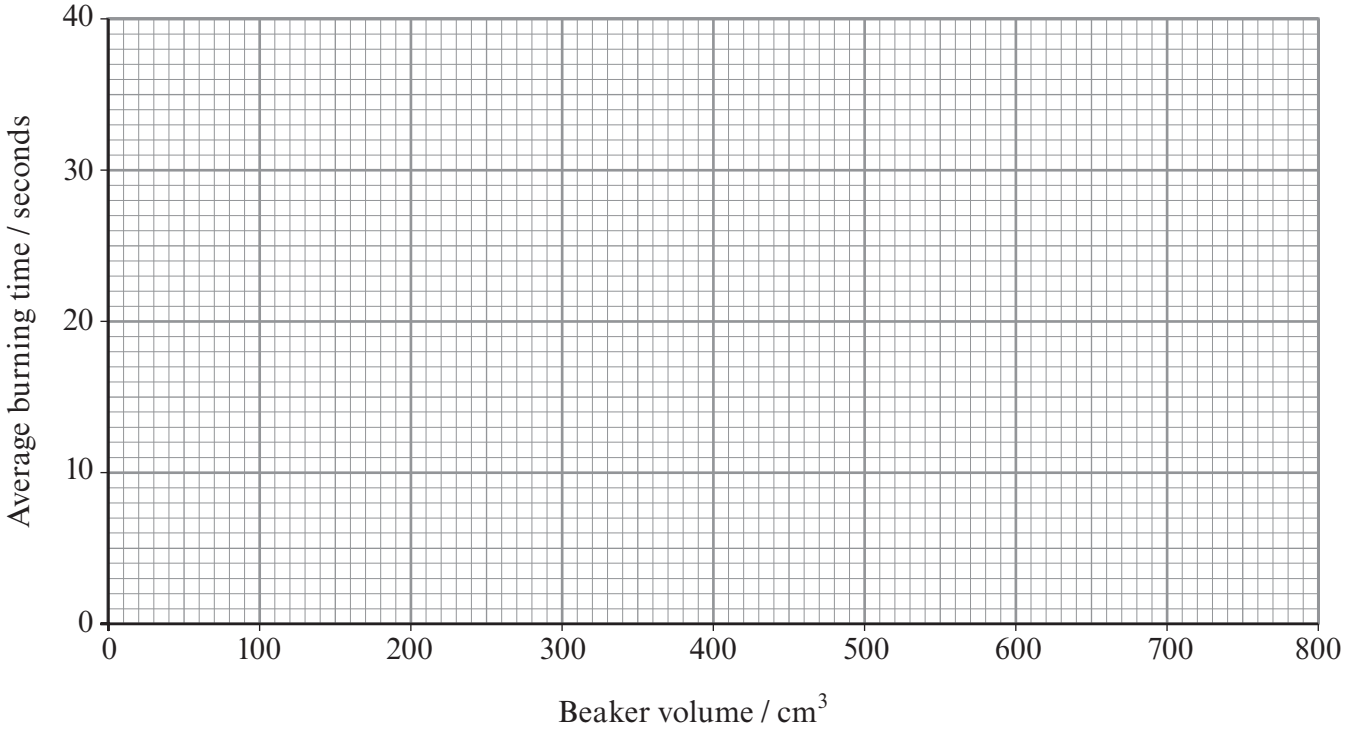
(ii) Give the reason for your choice in part (i). [1]

.....

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(b) On the grid below, plot the average burning times given in the table against beaker volume. Draw a line of best fit for these points. ***Your line should go through the origin (0,0).*** [3]



(c) State what happens to the burning time as the beaker volume increases. [1]

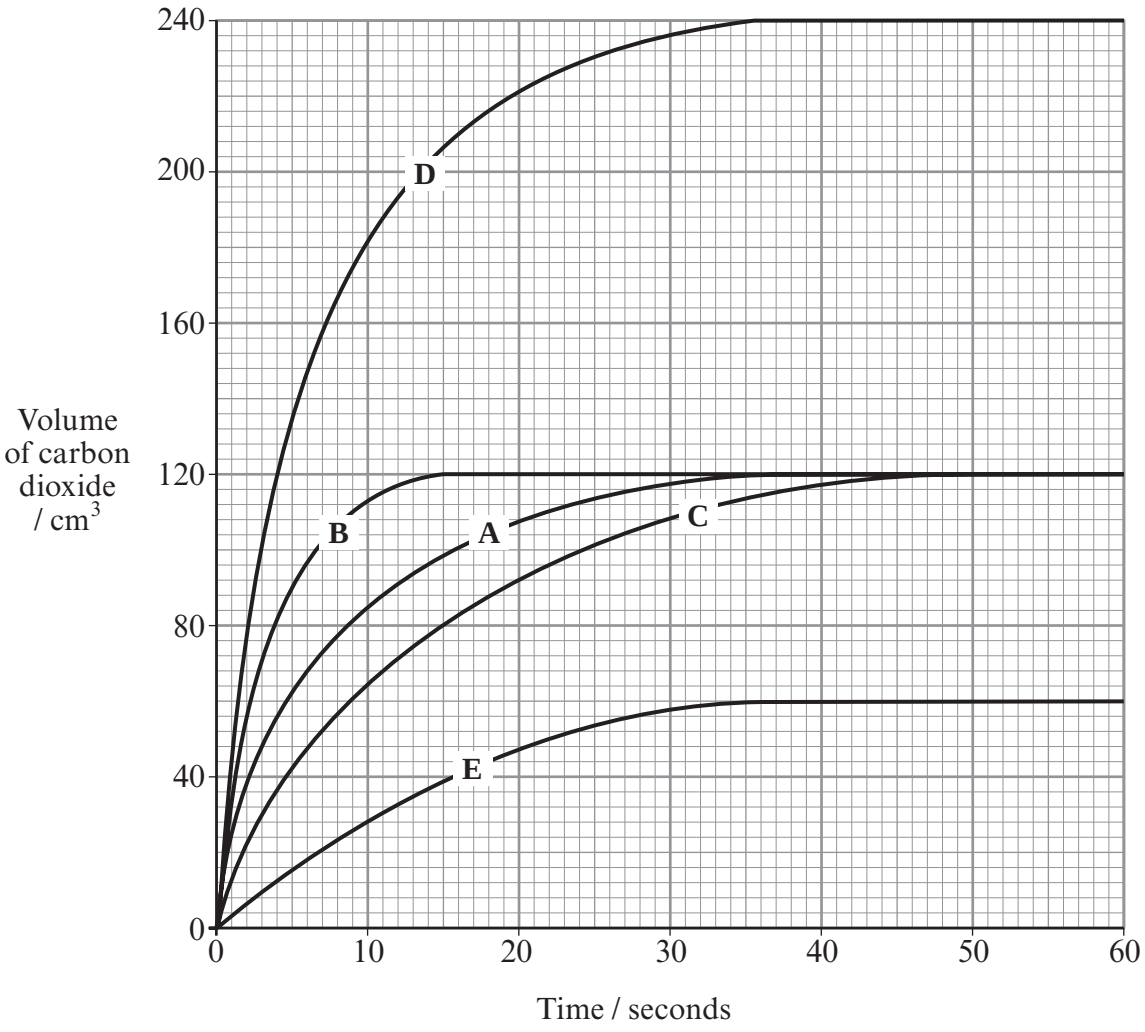
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8. Marble chips (calcium carbonate) react with dilute hydrochloric acid forming carbon dioxide.

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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9. 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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10. 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.

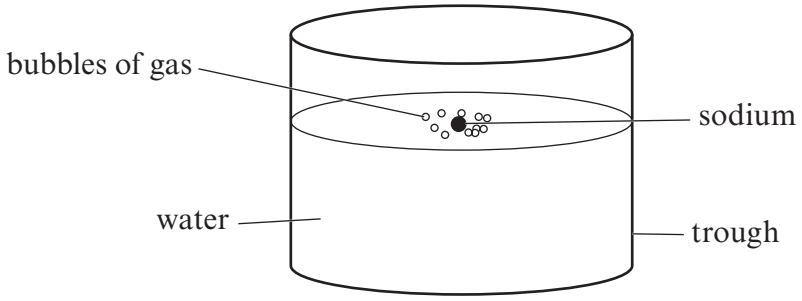
Give the name of this liquid. [1]

.....

(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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FORMULAE FOR SOME COMMON IONS

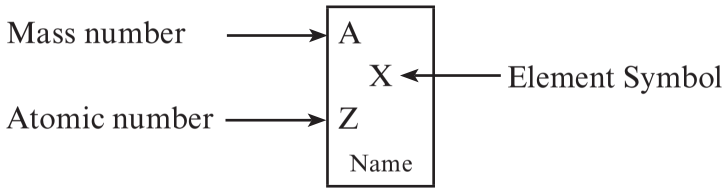
POSITIVE IONS		NEGATIVE IONS	
Name	**Formula**	**Name**	**Formula**
Aluminium	Al^{3+}	Bromide	Br^{-}
Ammonium	NH_4^{+}	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^{-}
Calcium	Ca^{2+}	Fluoride	F^{-}
Copper(II)	Cu^{2+}	Hydroxide	OH^{-}
Hydrogen	H^{+}	Iodide	I^{-}
Iron(II)	Fe^{2+}	Nitrate	NO_3^{-}
Iron(III)	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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(0236-01)

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)

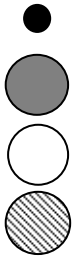
January 2012 – Chemistry 1 - Foundation Tier only questions

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

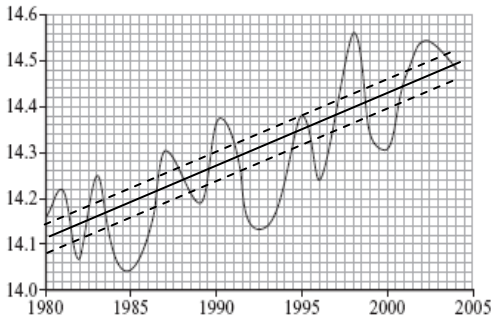
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Question Number									
FT	**HT**	**Sub-section**			**Mark**	**Answer**	**Accept**	**Neutral answer**	**Do not accept**
10	3	(a)	(i)		1	liquid paraffin / oil			paraffin
			(ii)		1	4:(1):2	8:2:4 2:½:(1)		4:0:2
		(b)	(i)		1	low density / lower density 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

GCSE

236/01

SCIENCE
FOUNDATION TIER
CHEMISTRY 1

A.M. WEDNESDAY, 15 June 2011

45 minutes

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

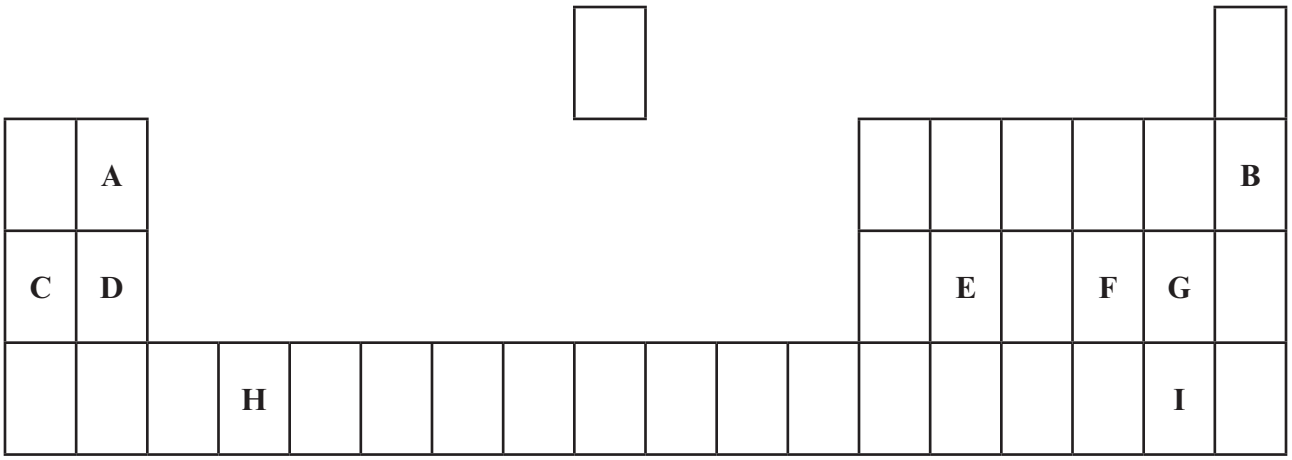
The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

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Answer **all** *questions.*

1. The diagram below shows part of the Periodic Table of Elements in which some elements are shown by letters. **The letters are not chemical symbols.**



In this question each letter may be used once, more than once or not at all.

(a) Give the **letter** which represents the element that

(i) has **four** electrons in its outer orbit (shell), ... [1]

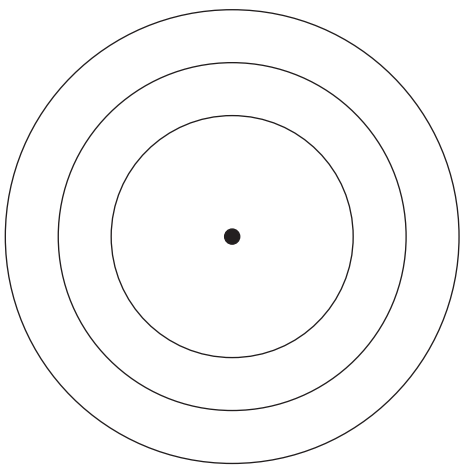
(ii) has the electronic structure 2,8,7, ... [1]

(iii) is in the same group as element **D**, ... [1]

(iv) is in the same period as element **I**, ... [1]

(v) has the atomic number 11. ..... [1]

(b) Complete the following diagram to show the electronic structure of element **D**. [1]

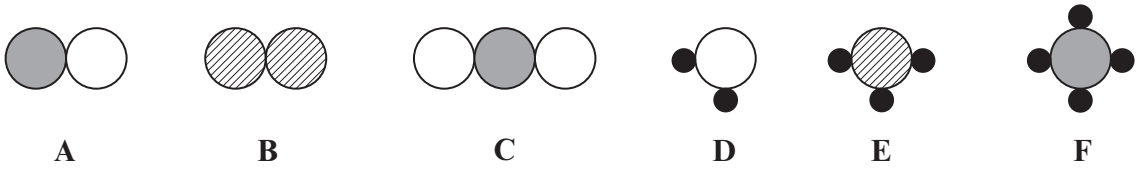


6

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2. *(a)* The diagrams below represent **six** different substances.



A **B** **C** **D** **E** **F**

represents an atom of carbon (symbol C)

represents an atom of hydrogen (symbol H)

represents an atom of nitrogen (symbol N)

represents an atom of oxygen (symbol O)

(i) Give the letter, **A**, **B**, **C**, **D**, **E** or **F**, of the diagram which represents

I. NH_3, ... [1]

II. an element, ... [1]

III. a compound containing **five** atoms. ..... [1]

(ii) Give the chemical formula for substance **D**. ..... [1]

(b) Sulphuric acid is a strong acid and is one of the acids responsible for acid rain.
Each molecule of sulphuric acid contains two atoms of hydrogen, one atom of sulphur and four atoms of oxygen.
Use this information to give the chemical formula for sulphuric acid. [2]

.....

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3. *(a)* Choose symbols/formulae from the box below to answer parts (i)-(iv).

Br^-	CH_4	CO_2	Mg	Na^+	S

Each symbol/formula may be used once, more than once or not at all.

Give

(i) two atoms ..... and ..... [1]

(ii) two molecules ..... and ..... [1]

(iii) two ions ..... and ..... [1]

(iv) one metal atom ..... [1]

(b) Give the **name** and **formula** of the compound formed when K^+ and O^{2-} combine.

Name of compound ..... [1]

Formula of compound ..... [1]

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4. Group 1 of the Periodic Table is shown below. **M** represents a Group 1 element.
M is not the symbol of the element.
The Periodic Table of Elements shown on the **back cover of this examination paper** may be of use in answering this question.

Group 1
lithium
sodium
potassium
M
caesium
francium

(a) Give the number of electrons in the outer orbit (shell) of an atom of potassium. [1]

.....

(b) Name the missing element **M**. [1]

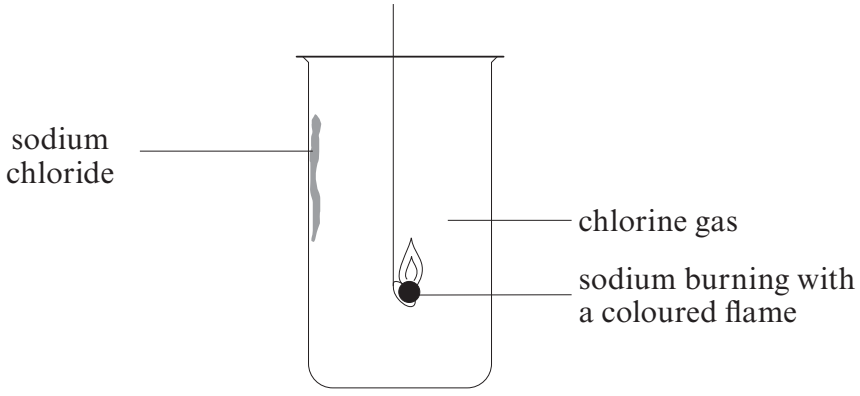
.....

(c) Choose from the list below the name by which Group 1 elements are also known.

alkali metals	**halogens**	**noble gases**	**transition metals**

..... [1]

(d) The diagram below shows sodium reacting with chlorine.



(i) Give the colour of the flame seen during the reaction. [1]

.....

(ii) Give the **word** equation for the reaction that takes place. [2]

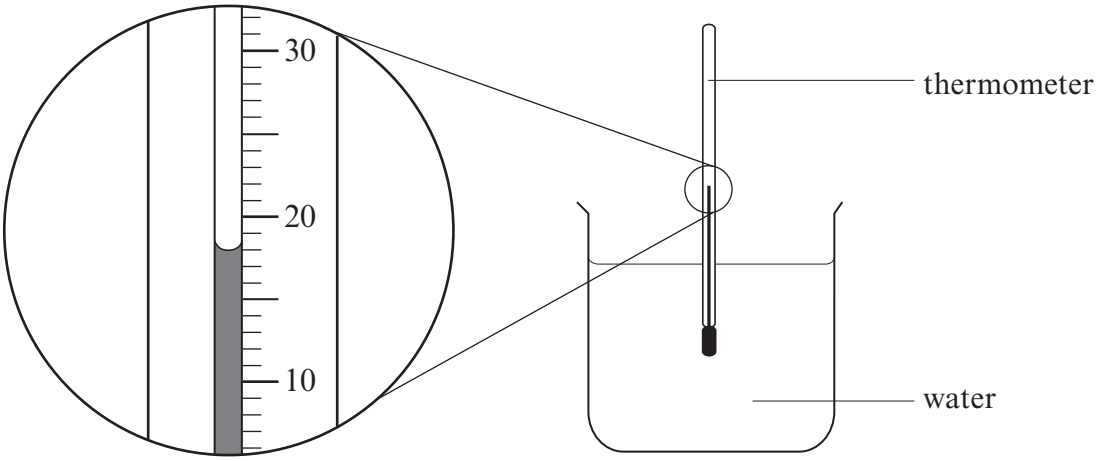
..... + ... ⟶ .....

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5. *(a)* A thermometer was placed in some water. The diagram below shows part of that thermometer.



(i) State the temperature shown on the thermometer. [1]

..... °C

(ii) A solid was added to the water. An **endothermic** reaction took place and the temperature changed by 5.5 °C.
Place a tick (✓) in the box with the correct final reading on the thermometer. [1]

12.5 °C ☐

13 °C ☐

13.5 °C ☐

23 °C ☐

23.5 °C ☐

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(b) Natural gas is mainly methane, CH_4. The symbol equation for methane burning in air is as follows.

$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$$

(i) Give **one** product of this reaction. [1]

.....

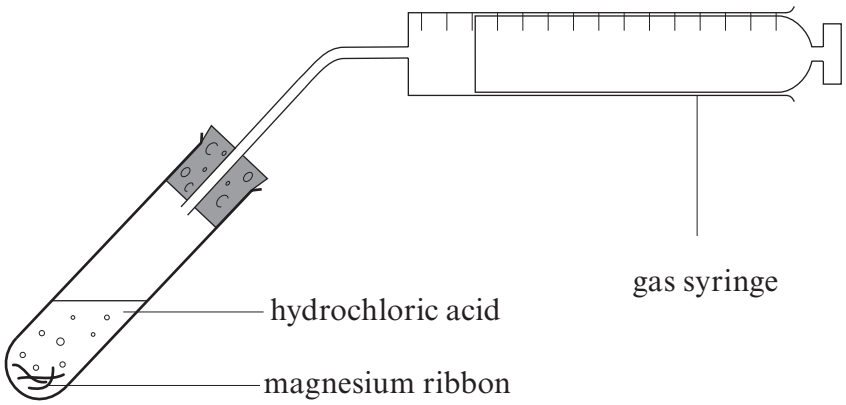
(ii) Give the **word** equation for the burning of methane. [2]

..... + ... ⟶ ..... + ...

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6. The following apparatus was used to investigate the effect of particle size on the speed of a chemical reaction.

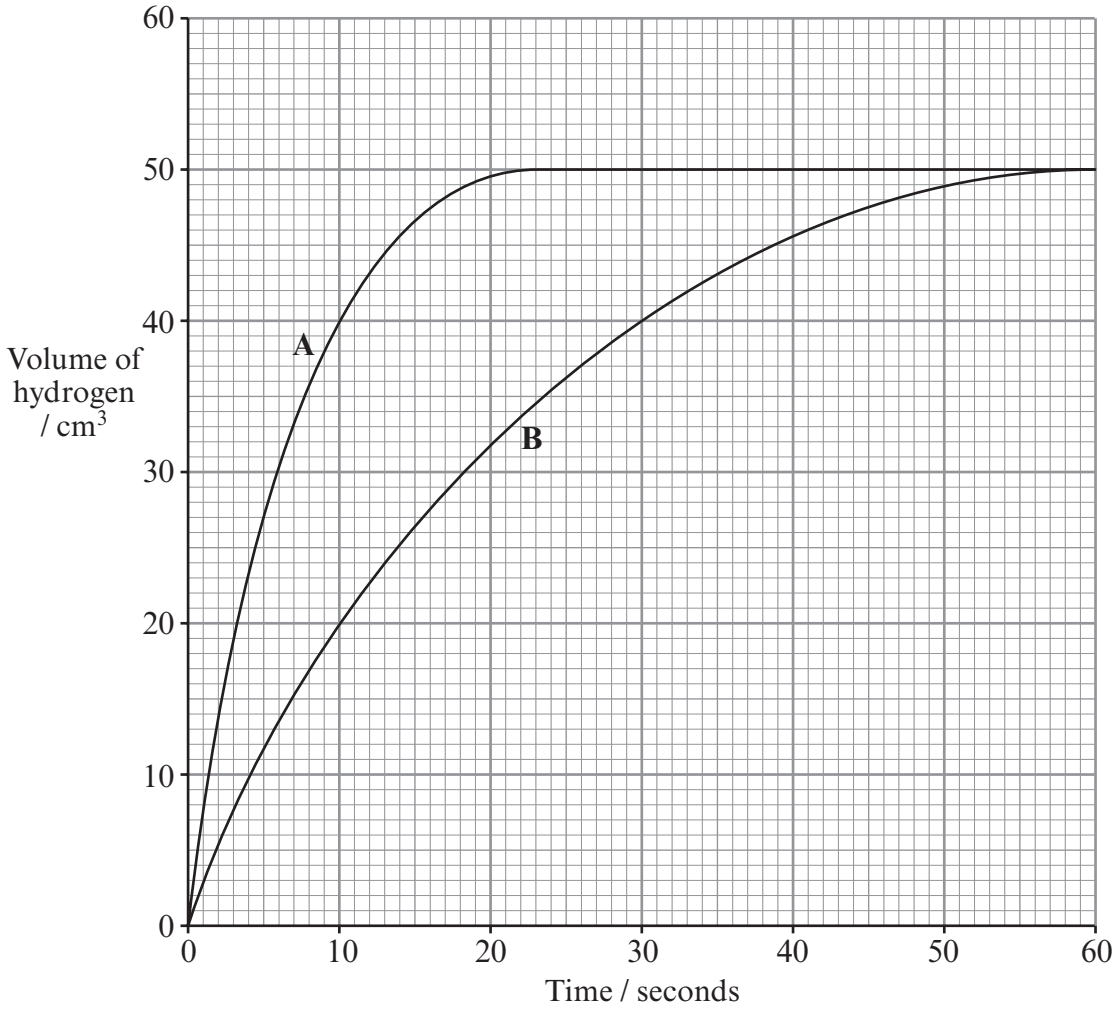


Two experiments were carried out.

In the first experiment 0.05 g of magnesium **powder** was added to 20 cm^3 of dilute hydrochloric acid at 20 °C. The volume of hydrogen produced was recorded at regular intervals and the results were plotted on the grid below. The line was labelled **A**.

In the second experiment 0.05 g of magnesium **ribbon** was added to 20 cm^3 of hydrochloric acid of the same concentration at 20 °C. The results were again plotted and this line was labelled **B**.

In both experiments the acid used was *in excess*.



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(a) State the purpose of the gas syringe. [1]

.....

(b) Use the graph to find

(i) the volume of hydrogen produced after 30 seconds when magnesium **ribbon** was used, [1]

..... cm^3

(ii) the time taken for the reaction to stop when magnesium **powder** was used. [1]

..... seconds

(c) State which of the above reactions was the faster and explain how the graph shows this. [1]

Faster reaction was experiment .....

Explanation .....

.....

(d) Give **two** ways in which this experiment was made a fair test. [2]

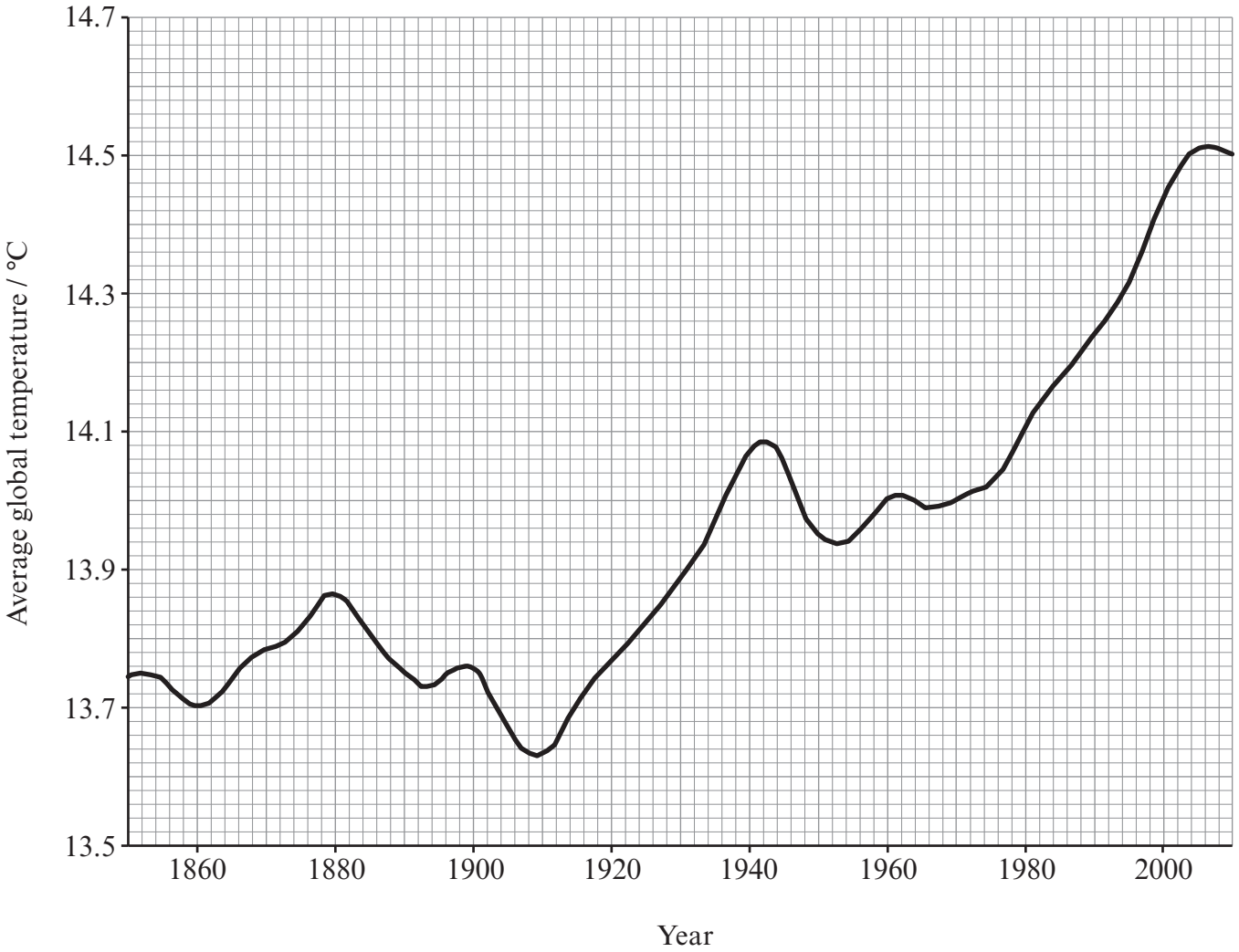
1. .....

2. .....

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7. *(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]

.....

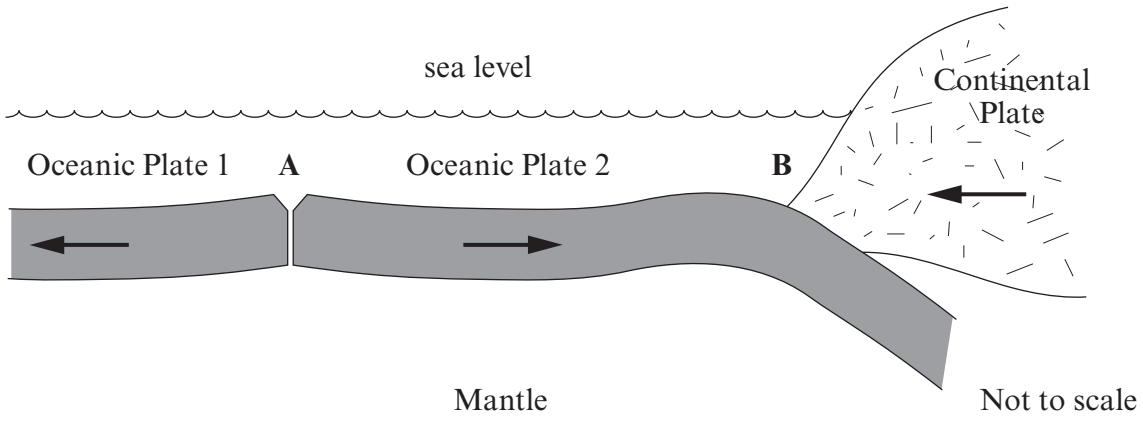
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8. The Earth's crust (lithosphere) is broken up into huge plates.

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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FORMULAE FOR SOME COMMON IONS

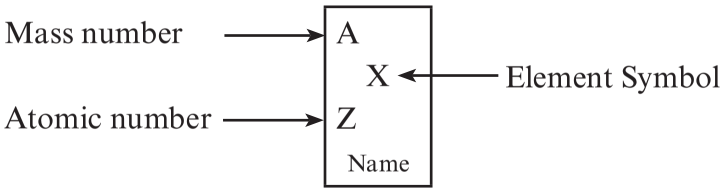
POSITIVE IONS		NEGATIVE IONS	
Name	**Formula**	**Name**	**Formula**
Aluminium	Al^{3+}	Bromide	Br^{-}
Ammonium	NH_4^{+}	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^{-}
Calcium	Ca^{2+}	Fluoride	F^{-}
Copper(II)	Cu^{2+}	Hydroxide	OH^{-}
Hydrogen	H^{+}	Iodide	I^{-}
Iron(II)	Fe^{2+}	Nitrate	NO_3^{-}
Iron(III)	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											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:



STEMUP.CO.UK (0236-01)

Candidate Name	Centre Number	Candidate Number
		0

GCSE

236/01

SCIENCE
FOUNDATION TIER
CHEMISTRY 1

A.M. MONDAY, 17 January 2011

45 minutes

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**9**	
2.	**3**	
3.	**3**	
4.	**9**	
5.	**6**	
6.	**5**	
7.	**6**	
8.	**9**	
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 box contains some information about atoms. Read the information in the box and then answer the questions that follow.

> Atoms are the smallest particles that make up elements. The word comes from the Greek word *atomos*. Atoms cannot be broken down into simpler substances by chemical means.
>
> Atoms have a central nucleus that contains protons and neutrons. This is surrounded by orbits or shells that contain electrons.
>
> An element is made up of only one type of atom. Different elements contain different atoms. When two different atoms join together, a compound is formed.

Use only the information in the box to answer the following questions.

(i) What name is given to the smallest particles that make up an element? [1]

.....

(ii) Name the **two** different particles found in the nucleus of an atom. [2]

..... and .....

(iii) State in which part of the atom electrons are found. [1]

.....

(iv) State what is meant by

I. an element, [1]

.....

.....

II. a compound. [1]

.....

.....

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(b) The following table shows four compounds and their formulae.

Name of compound	Formula
ammonia	NH_3
carbon dioxide	CO_2
methane	CH_4
water	H_2O

Use the information in the table to answer the following questions.

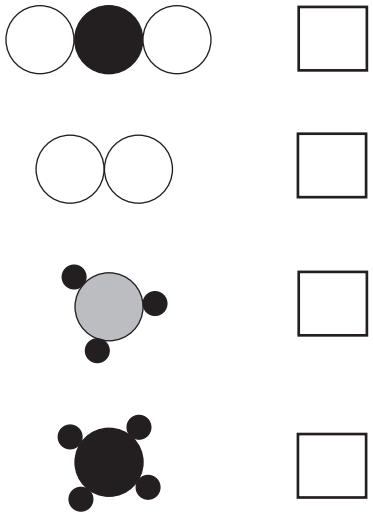
(i) Give the **name** of the compound that contains the elements carbon and oxygen. [1]

.....

(ii) Give the **names** of the elements present in water. [1]

..... and .....

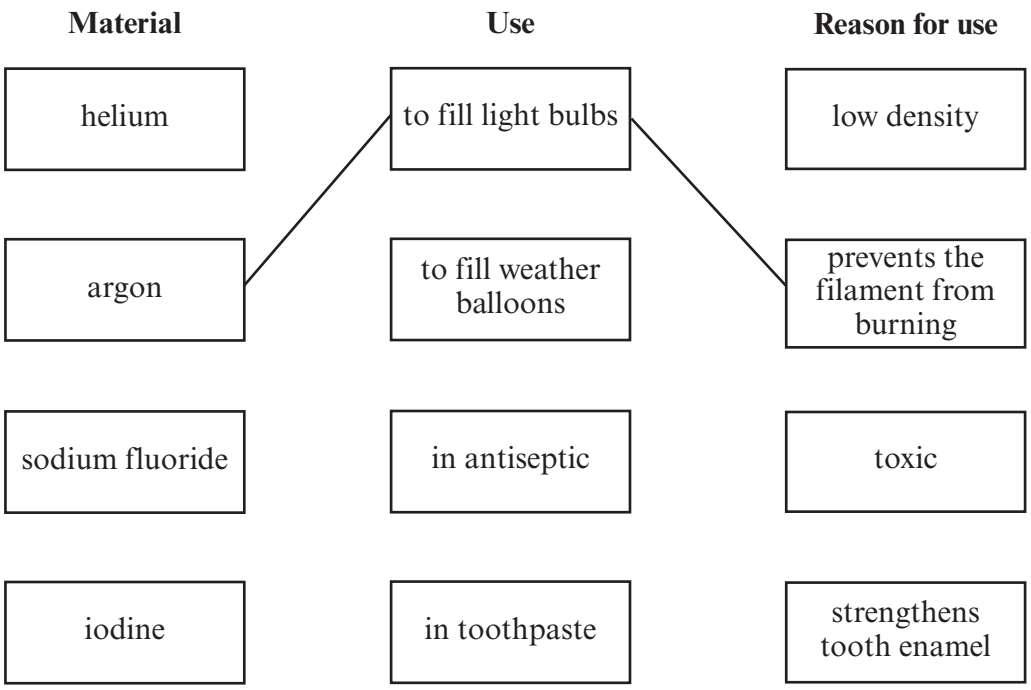
(iii) Place a tick (✓) in the box next to the diagram that best represents a molecule of ammonia, NH_3. [1]



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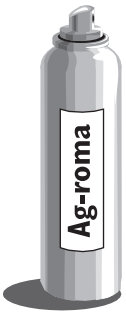
2. Draw a line to link each material to its use and the reason it is used in this way.
One has already been done for you. [3]



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3. Nanoscience involves the study of particles with sizes in the range 1-100 nm.
One new use of nano-sized silver particles is in deodorants. These deodorants are used to prevent body odour caused by bacteria.



(i) State the property of nano-sized silver particles that enables them to be used in this way. [1]

.....

(ii) Give another use of nano-sized silver particles that depends on this property. [1]

.....

(iii) Some people are concerned that nanoparticles, being so small, could be absorbed into the body. Give **one** reason why this may be a cause for concern. [1]

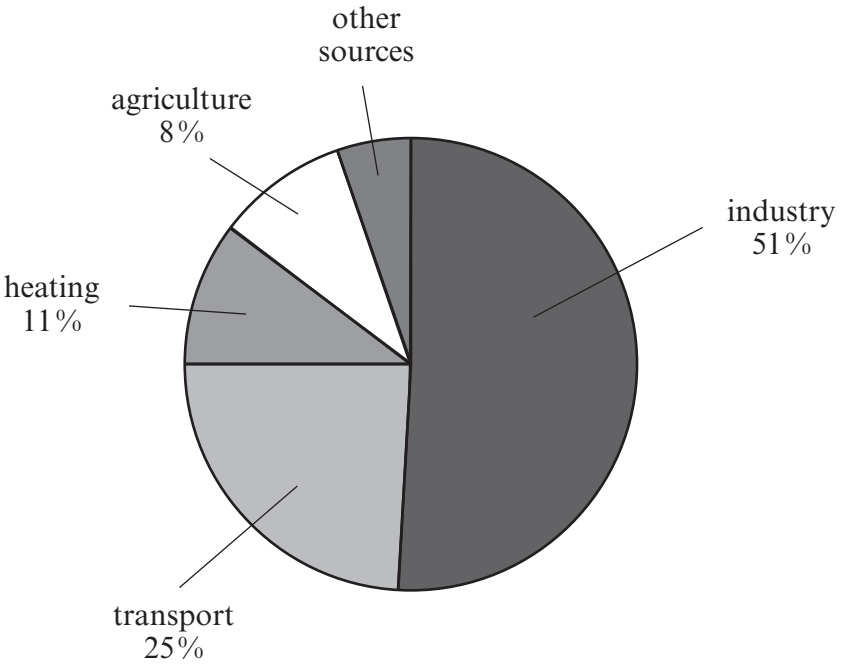
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4. *(a)* The following chart shows the sources of greenhouse gases.



Use the chart to answer parts (i) and (ii).

(i) Name the main source of greenhouse gases. ..... [1]

(ii) Calculate the percentage of greenhouse gases produced by sources other than industry, transport, heating and agriculture. [2]

Other sources = ... %

(iii) I. Most scientists believe that greenhouse gases are causing an increase in the temperature of the Earth's atmosphere. Give the term used to describe this change. [1]

.....

II. Describe **one** environmental problem caused by this increase in temperature. [1]

.....

III. Suggest **one** way in which people could reduce the amount of greenhouse gases produced by transport. [1]

.....

.....

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(b) Gases such as methane are used as fuels in the home. The combustion of methane produces the greenhouse gas carbon dioxide, and water. The reaction is exothermic.

I. Give the meaning of the term *exothermic*. [1]

.....

II. Write a **word equation** to show the combustion of methane. [2]

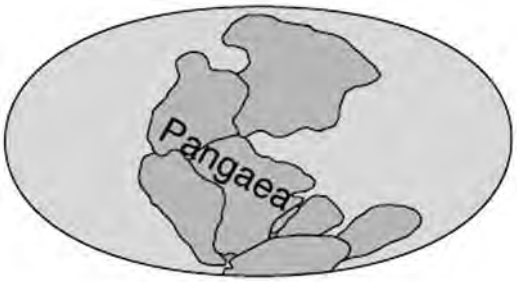
..... + ... → ..... + ...

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5. In 1915, a famous scientist suggested that the Earth's continents were once joined together as shown below.



(i) From the box below, choose the name of the scientist who suggested this idea. [1]

Charles Darwin	**Dmitri Mendeleev**
Isaac Newton	**Alfred Wegener**

Scientist .....

(ii) Using the letter **A**, **B**, **C** or **D**, choose from the box below the piece of evidence that this scientist did **not use** to support his idea. [1]

A - similar fossils were found on different continents

B - similar plants were found on different continents

C - similar rocks were found on different continents

D - the coastlines fitted together like a jigsaw

Choice of letter .....

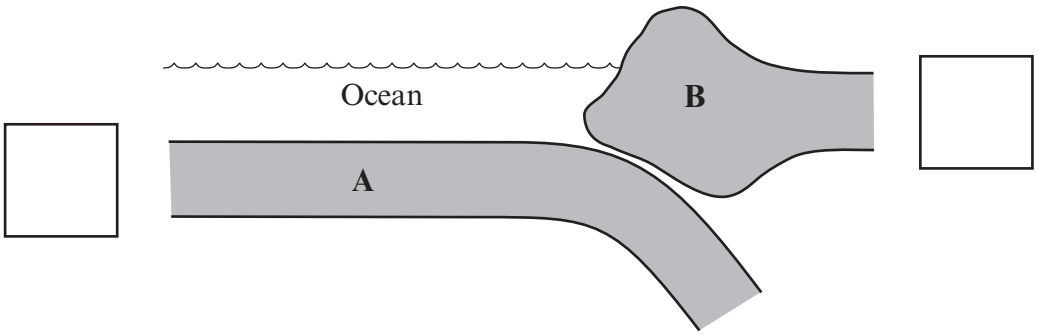
(iii) Give **one** reason why his ideas were finally accepted in the 1960s. [1]

.....

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(iv) The following diagram shows a possible effect of plate movement.



I. Place arrows in the boxes to show the direction of movement of plates **A** and **B**. [1]

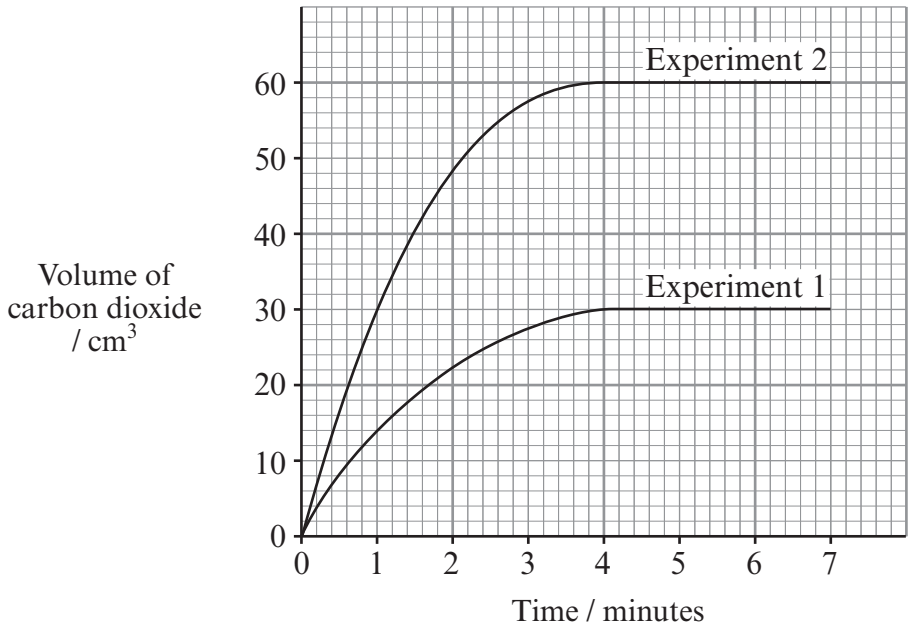
II. Tick (✓) the boxes next to the **two** statements below which describe what happens to plate **A** as a result of this movement. [2]

It cools down	☐
It melts to form magma	☐
It heats up	☐
It is pushed on top of plate **B**	☐

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6. A student studied the rate of reaction between hydrochloric acid and marble chips. He added *excess* acid to different amounts of marble chips and recorded the volume of gas produced every minute. The results are shown in the graph below.



Use the graph above to answer the following questions.

(i) Give

I. the volume of gas produced after 1 minute in experiment 2, [1]

..... cm^3

II. the time taken for the reaction to end in experiment 1. [1]

..... minutes

(ii) 0.2 g of marble chips were used in experiment 1. Give the mass of marble chips used in experiment 2. [1]

Mass = ... g

(iii) The reaction in experiment 2 was faster than that in experiment 1. Explain how the graph shows this. [1]

.....

.....

(iv) State what could have been done to the hydrochloric acid in these experiments to make the reactions even faster. [1]

.....

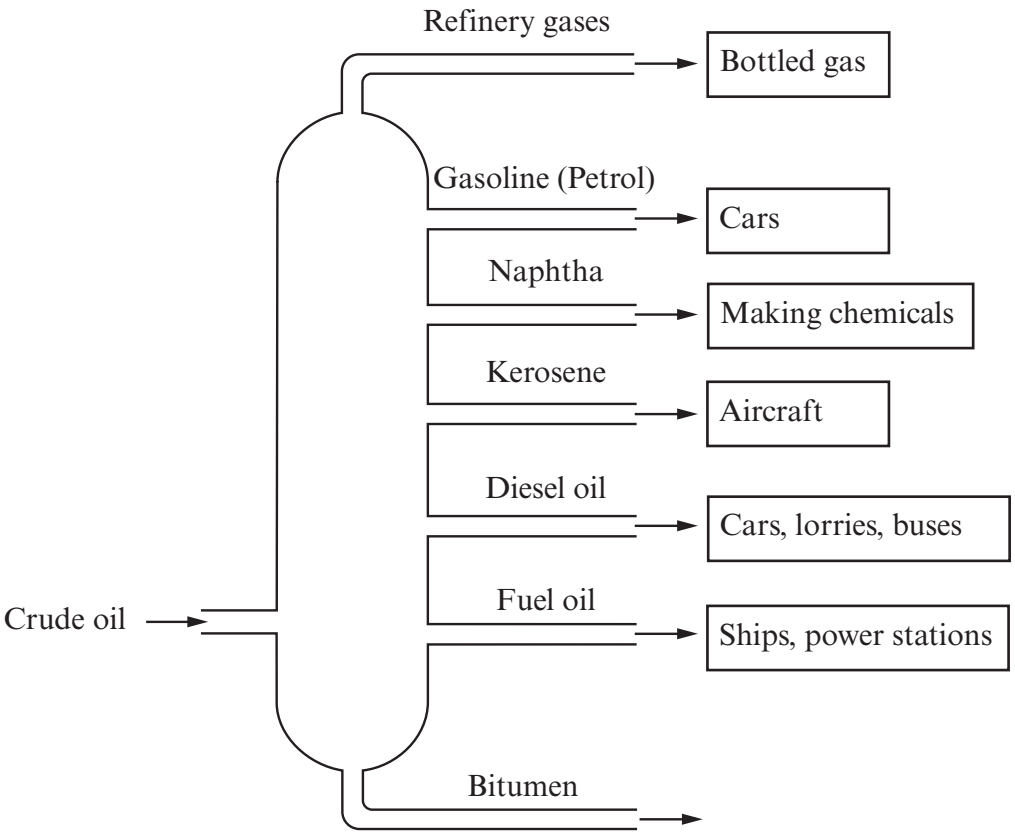
.....

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7. *(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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8. *(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 .....

.....

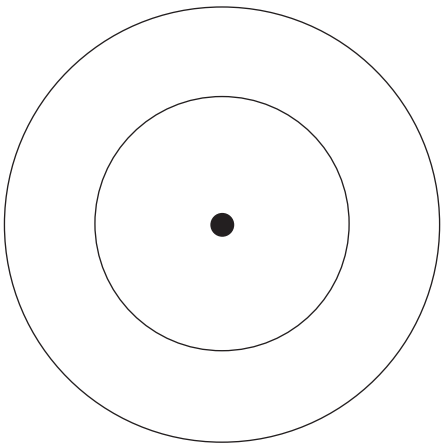
Period .....

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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FORMULAE FOR SOME COMMON IONS

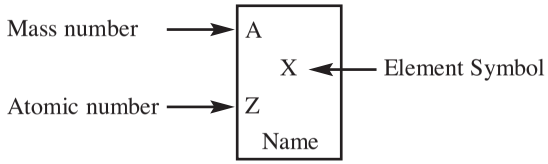
POSITIVE IONS		NEGATIVE IONS	
Name	**Formula**	**Name**	**Formula**
Aluminium	Al^{3+}	Bromide	Br^{-}
Ammonium	NH_4^{+}	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^{-}
Calcium	Ca^{2+}	Fluoride	F^{-}
Copper(II)	Cu^{2+}	Hydroxide	OH^{-}
Hydrogen	H^{+}	Iodide	I^{-}
Iron(II)	Fe^{2+}	Nitrate	NO_3^{-}
Iron(III)	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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