Surname	Centre Number	Candidate Number
Other Names		0

GCSE

236/02

SCIENCE
HIGHER TIER
CHEMISTRY 1

A.M. WEDNESDAY, 15 June 2011

45 minutes

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

0236
020001

ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

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

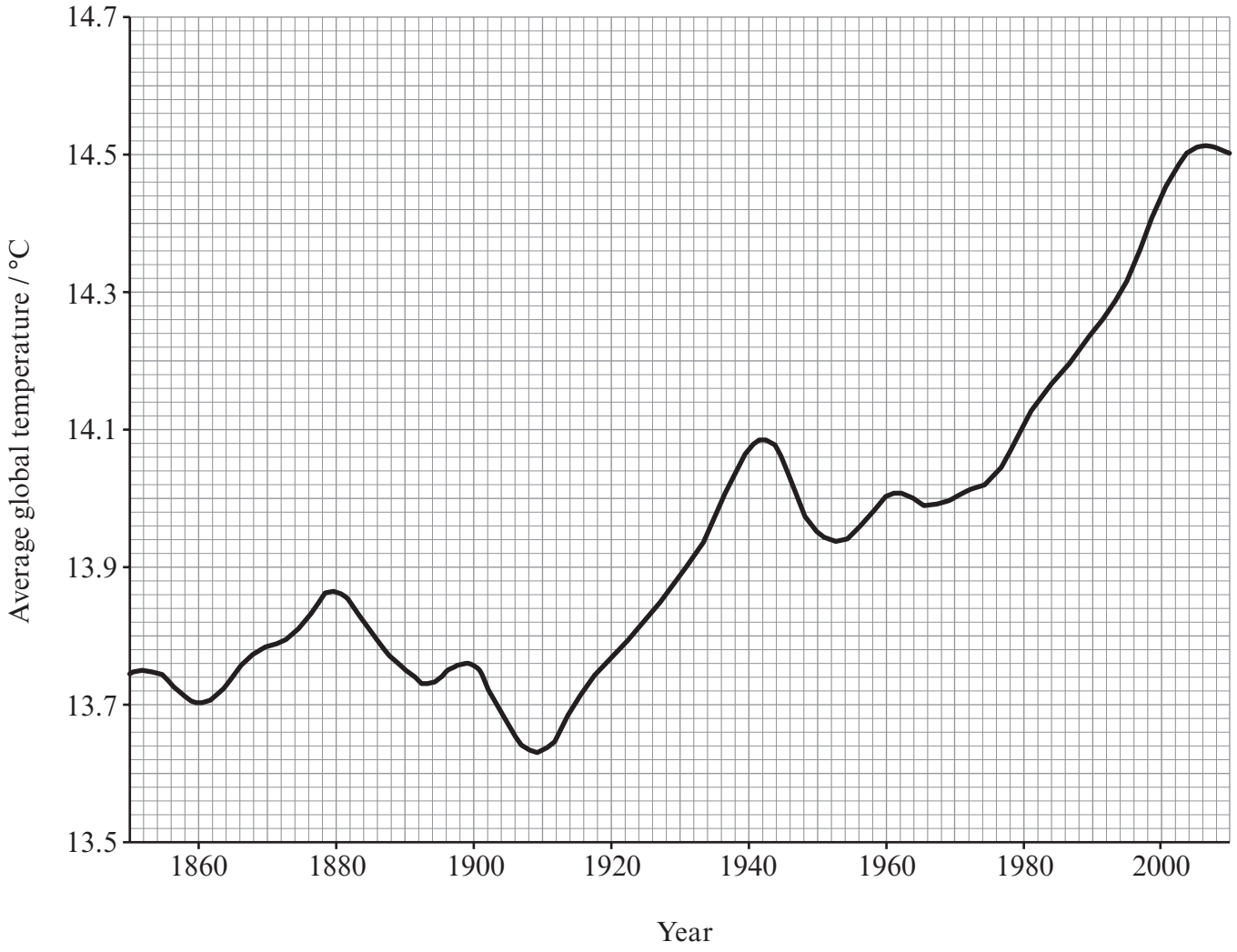
You are reminded of the necessity for good English and orderly presentation in your answers.

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

Examiner only

Answer **all** *questions.*

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



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

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

..... °C

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

.....

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

.....

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

(i) Name this gas. [1]

.....

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

.....

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

.....

.....

(d) Some fossil fuels contain sulphur.

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

..... + ... ⟶ .....

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

.....

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

.....

.....

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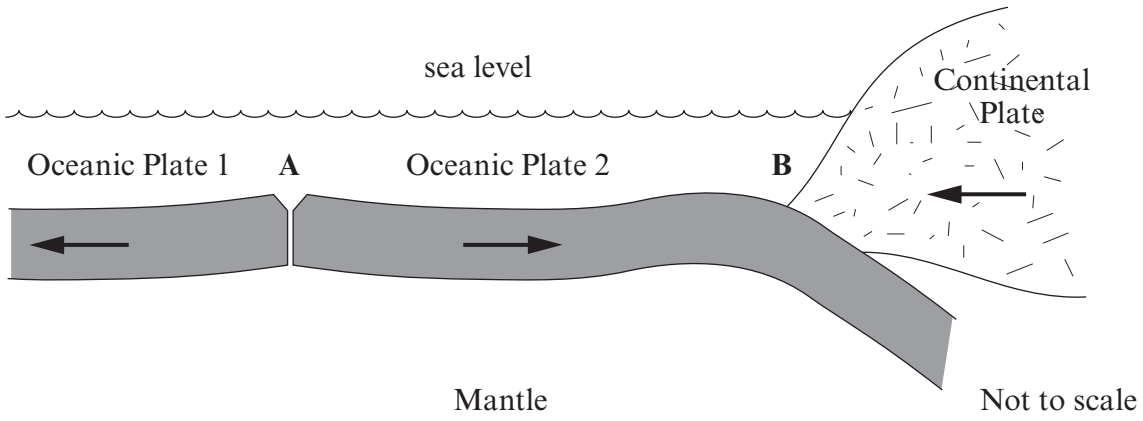
2. The Earth's crust (lithosphere) is broken up into huge plates.

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



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

.....

.....

.....

(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]

.....

.....

.....

.....

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

.....

.....

.....

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

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

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

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

.....

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

.....

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

State .....

Explanation .....

.....

.....

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

.....

Examiner only

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

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

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

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

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

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

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

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

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

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

.....

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

.....

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

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

Explanation .....

.....

.....

4

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Turn over.

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

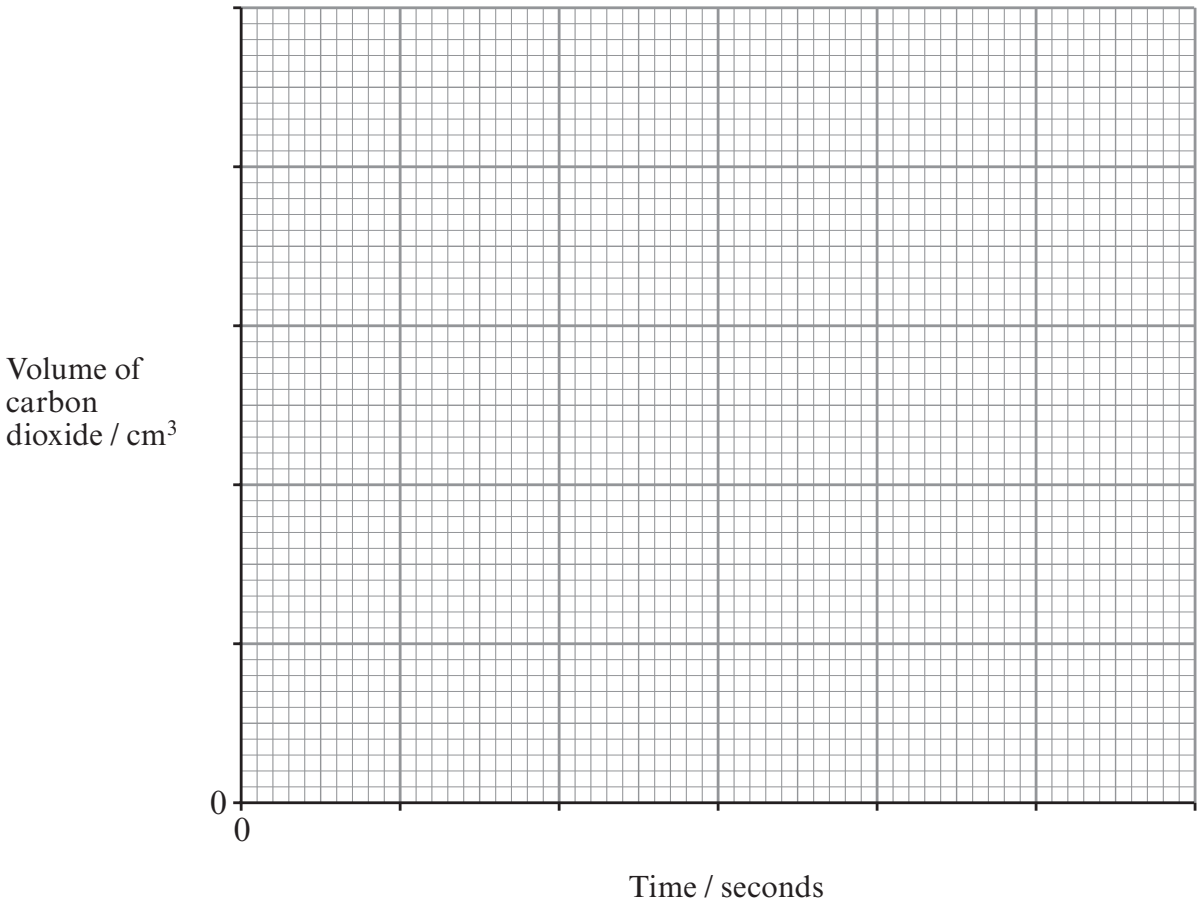
(a) Give the balanced **symbol** equation for the reaction that takes place.
Use the table of ions on **the inside of the back cover of this examination paper** to help you write the formulae of the substances. [3]

..... + ... ⟶ ..... + ... + ...

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

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

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



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

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

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

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

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

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

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

Explanation .....

.....

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

Test .....

Results .....

.....

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

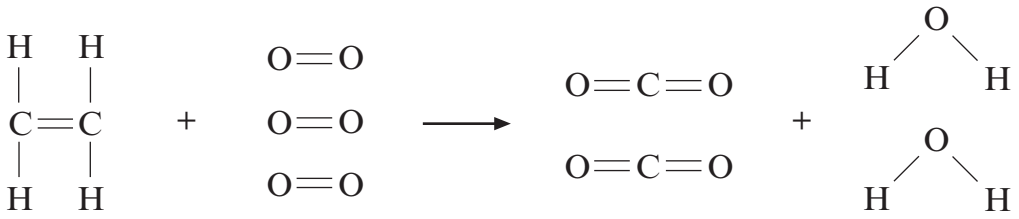
.....

.....

5

Examiner only

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



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

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

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

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

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

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.....

.....

.....

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

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

.....

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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^{+}		

Turn over.

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: