Surname	Centre Number	Candidate Number
Other Names		0

GCSE

0236/02

SCIENCE
HIGHER TIER
CHEMISTRY 1

A.M. TUESDAY, 29 January 2013

45 minutes

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

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ADDITIONAL MATERIALS

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

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

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

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

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

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

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

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Answer **all** *questions.*

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

These letters are **not** chemical symbols.

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

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

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

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

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

Reason .....

.....

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

Element .....

Reason .....

.....

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

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

.....

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

.....

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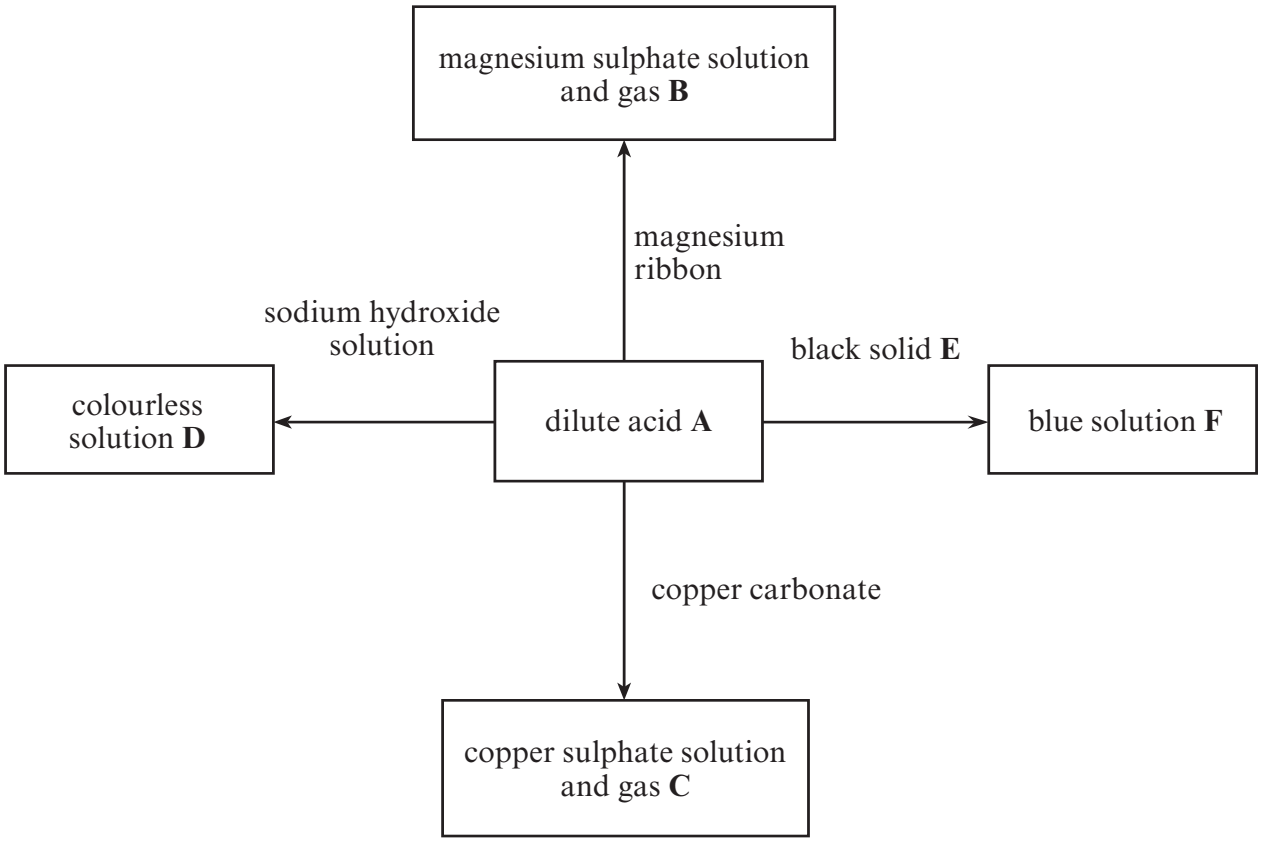
2. The diagram below shows some reactions of a common acid.



Give the name of

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

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

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

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

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

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

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

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3

4. This question is about Group 1 elements.

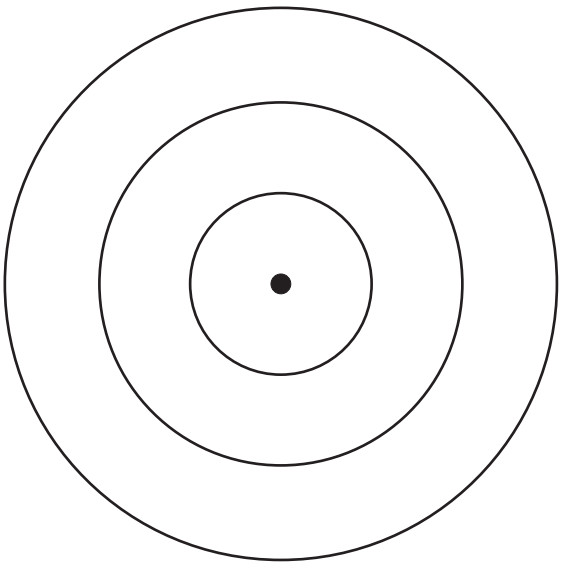
(a) Complete the following sentences using the Periodic Table shown on the back page of this examination paper.

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

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

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

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



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

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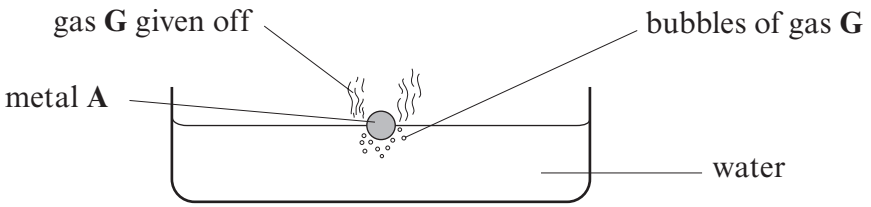
(ii) The following diagram shows the reaction between a Group 1 metal and water. Although the metal reacts vigorously with the water, gas **G** does not ignite spontaneously.



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

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

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

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(d) Potassium burns readily in air.

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

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

..... + ... ⟶ .....

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

(i) photosynthesis, [2]

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(ii) respiration. [2]

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

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5

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

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

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

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.....

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

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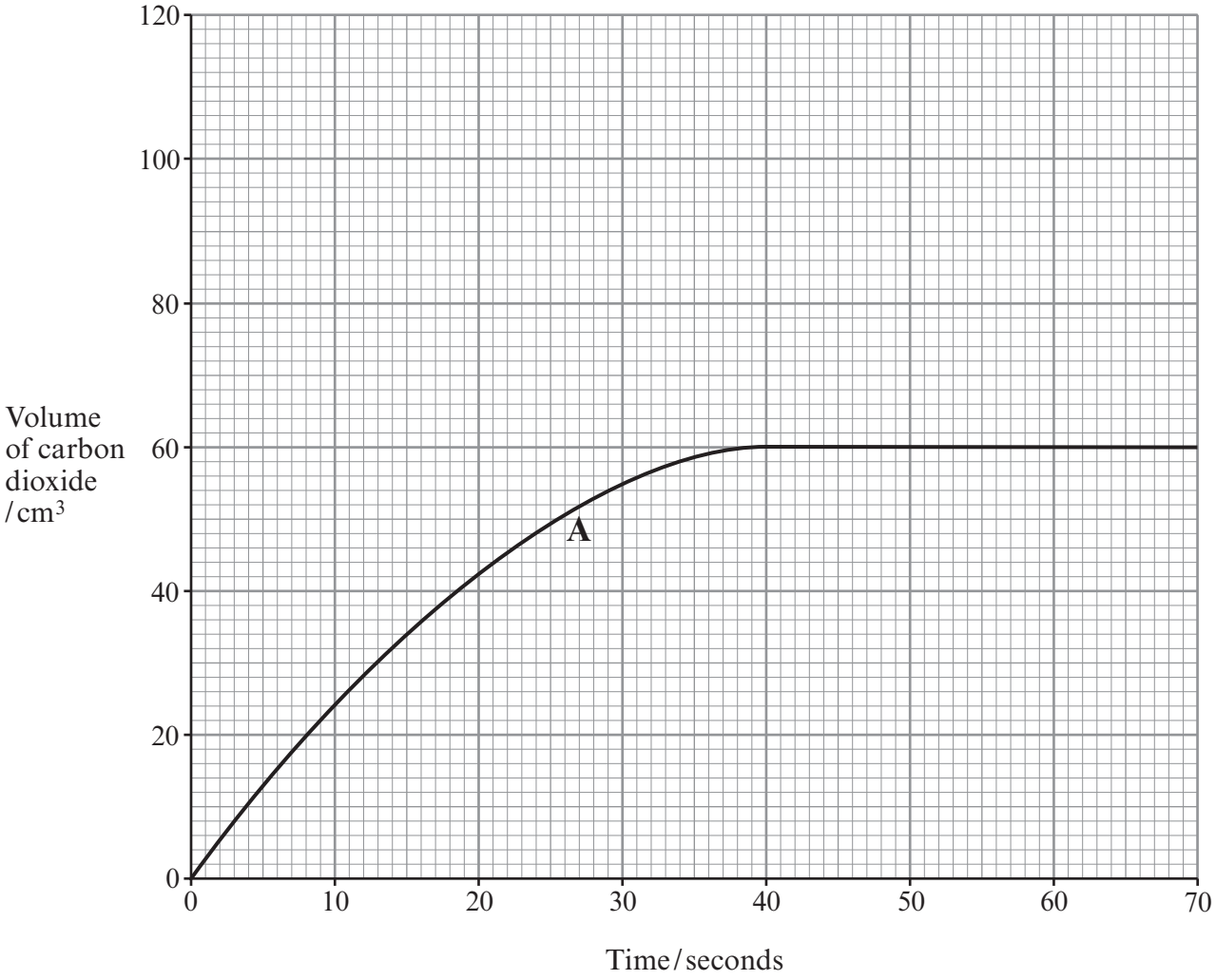
7. Graph **A** below shows the volume of carbon dioxide formed during a reaction between **excess** marble chips (calcium carbonate) and dilute hydrochloric acid.



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

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

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

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Turn over.

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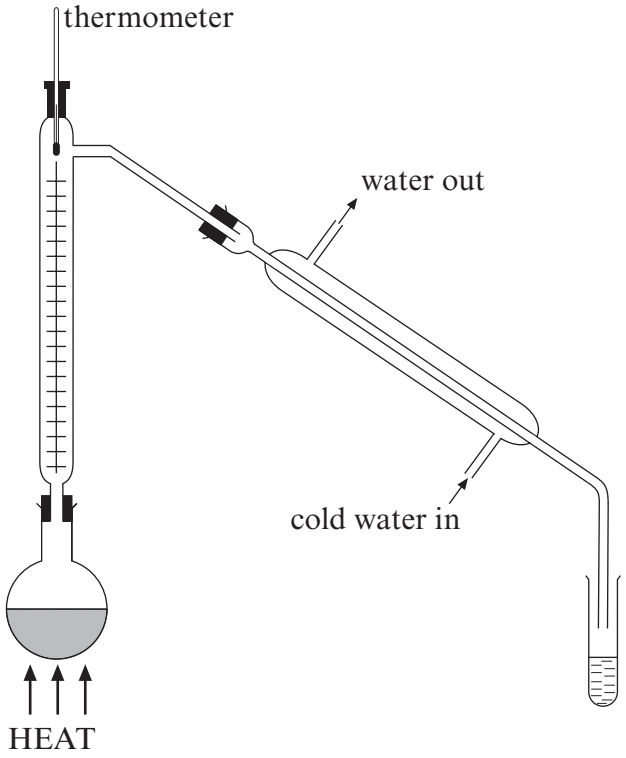
8. *(a)* Crude oil is a mixture of compounds called hydrocarbons. The following equipment can be used in a school laboratory to separate crude oil into its fractions.



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

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

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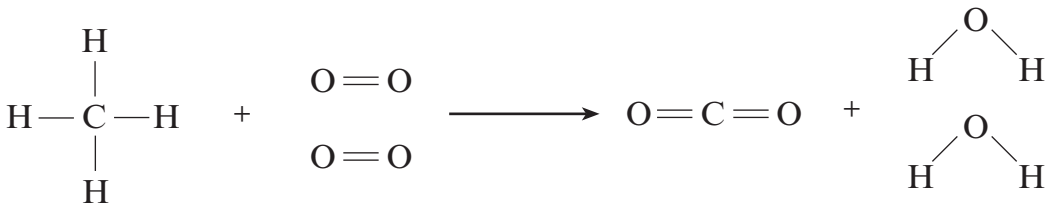
(b) Methane, CH_4, burns in air to give carbon dioxide and water. The reaction can be represented as follows.



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

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

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

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

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

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

8

END OF PAPER

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FORMULAE FOR SOME COMMON IONS

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

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: