Surname	Centre Number	Candidate Number
Other Names		0

WJEC CBAC

GCSE

4462/02

SCIENCE A/CHEMISTRY

CHEMISTRY 1
HIGHER TIER

A.M. THURSDAY, 13 June 2013

1 hour

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**9**	
2.	**6**	
3.	**3**	
4.	**6**	
5.	**4**	
6.	**5**	
7.	**6**	
8.	**7**	
9.	**8**	
10.	**6**	
Total	**60**	

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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 additional page(s) 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 that assessment will take into account the quality of written communication used in your answer to questions **4** and **10**.

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. The table below shows some information about elements **A-F**. The letters are not the chemical symbols of the elements.

Element	Colour	Melting point (°C)	Boiling point (°C)	Conducts electricity	Density (g/cm^3)
A	dull grey	1414	2900	yes	2.03
B	pale yellow	–219	–188	no	0.0017
C	orange brown	–7	59	no	3.10
D	shiny brown	1084	2927	yes	8.92
E	shiny grey	1538	2861	yes	7.87
F	colourless	–157	–153	no	0.0033

(a) State which of the elements **A-F** are gases at room temperature. [1]

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(b) Give the letter of the element **A-F** that has the biggest difference between melting point and boiling point. [1]

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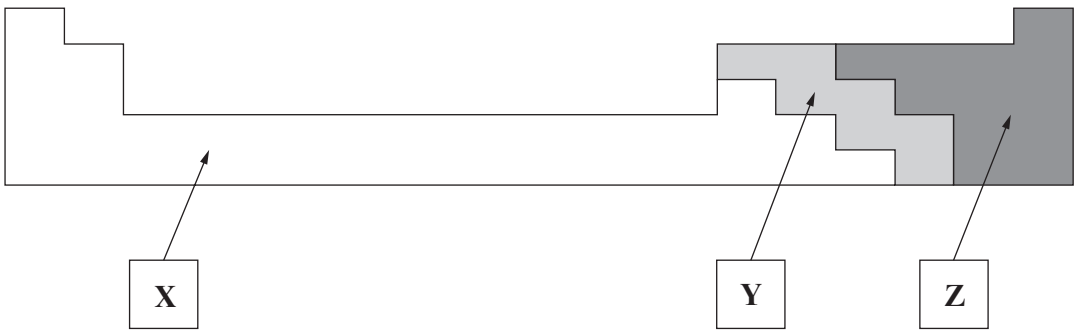
(c) The following diagram shows an outline of the Periodic Table.



(i) Element **A** is found in area **Y** of the Periodic Table. Explain how the information in the table supports this. [2]

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.....

(ii) From elements **B-F**, identify **all** that would be found in area **X**. [1]

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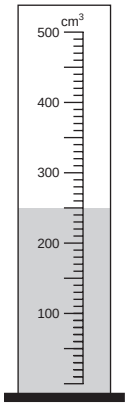
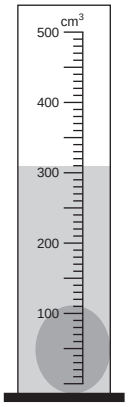
Examiner only

(d) A student has a sample of element **D** of mass 540 g. She measures its volume using a measuring cylinder as shown below.



Measuring cylinder before adding sample of element **D**



Measuring cylinder after adding sample of element **D**

(i) Using the information given above and the equation below, calculate the density of the sample of element **D**. [2]

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

Density of sample of element **D** = ... g/cm^3

(ii) Another pupil obtained a value of 9.10 g/cm^3. Suggest why this value is different to that given in the table. [2]

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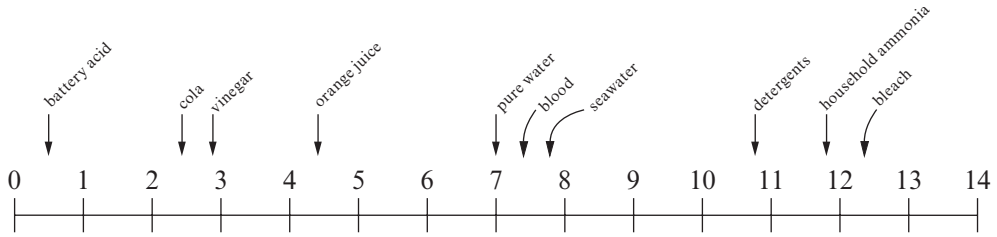
9

Examiner only

2. The following diagram shows the pH scale and the pH values of some common substances.



(a) From the substances above, name

(i) the strongest acid, ... [1]

(ii) the weakest alkali, ... [1]

(iii) a neutral substance. ..... [1]

(b) John was studying the reactions of acids with three different substances, **A**, **B** and **C**. He recorded his observations and temperature changes in the table shown below.

Substance added to acid	Observations	Temperature change (°C)
A	bubbles of gas produced, gas collected turns limewater milky, substance reacts to produce blue solution	+4
B	no gas produced, substance reacts to produce a blue solution	0
C	no visible change	+8

Identify **A**, **B** and **C** from the substances in the box below. [3]

copper carbonate	**copper oxide**	**magnesium**
sodium chloride	**sodium hydroxide**	

A .....

B .....

C .....

6

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3. Nano-silver particles can be used in socks, plasters and disinfectant sprays.

Explain why nano-silver is suitable for use in these examples and state why some people are concerned about the use of nanoparticles in everyday life. [3]

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Examiner only

4. Copper and titanium are important metals. The following table shows some of their uses.

Metal	Uses
copper	electrical wiring, water pipes, saucepan bases, jewellery
titanium	hip replacements, rotors on helicopters, pipes in chemical industry

Describe how the properties of copper and titanium make them suitable for these uses.

[6 QWC]

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Examiner only

5. *(a)* Complete the table below that shows information about four ionic compounds. [3]

Compound	Formula	Elements present
aluminium oxide	Al_2O_3	aluminium and oxygen
calcium hydroxide	$Ca(OH)_2$	.....
sodium carbonate	.....	sodium, carbon and oxygen
calcium nitrate	.....	calcium, nitrogen and oxygen

(b) Sodium oxalate occurs naturally in many plants. It can be made from oxalic acid. Oxalic acid contains two hydrogen atoms, two carbon atoms and four oxygen atoms.

Use this information to write the formula of oxalic acid. [1]

Formula of oxalic acid .....

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4

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6. The table below shows some properties of the elements in Group 0 – the noble gases.

Element	Atomic mass	Density (g/dm^3)	Melting point (°C)	Boiling point (°C)
helium	4	0.18	–272	–269
neon	20	0.9	–249	–246
argon	40	1.8	.....	–186
krypton	84	3.7	–157	–152
xenon	131	5.9	–112	–105

(a) Describe the trend in the melting point going down the group. [1]

.....

.....

(b) Use the data in the table to estimate the melting point of argon. [1]

..... °C

(c) All Group 0 elements are gases at room temperature. State how the information in the table supports this. [1]

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.....

(d) Helium is used to fill party balloons. Give **one** property **not shown** in the table that makes helium suitable for this purpose. [1]

.....

(e) Under certain conditions, xenon can be made to burn in oxygen to form xenon trioxide, XeO_3. Balance the following symbol equation for the reaction. [1]

$$\square\ Xe + \square\ O_2 \longrightarrow \square\ XeO_3$$

5

Examiner only

7. *(a)* State how the burning of coal results in the production of sulfur dioxide and why this leads to environmental problems when released into the atmosphere. Include in your answer **one** example of the resulting environmental damage. [3]

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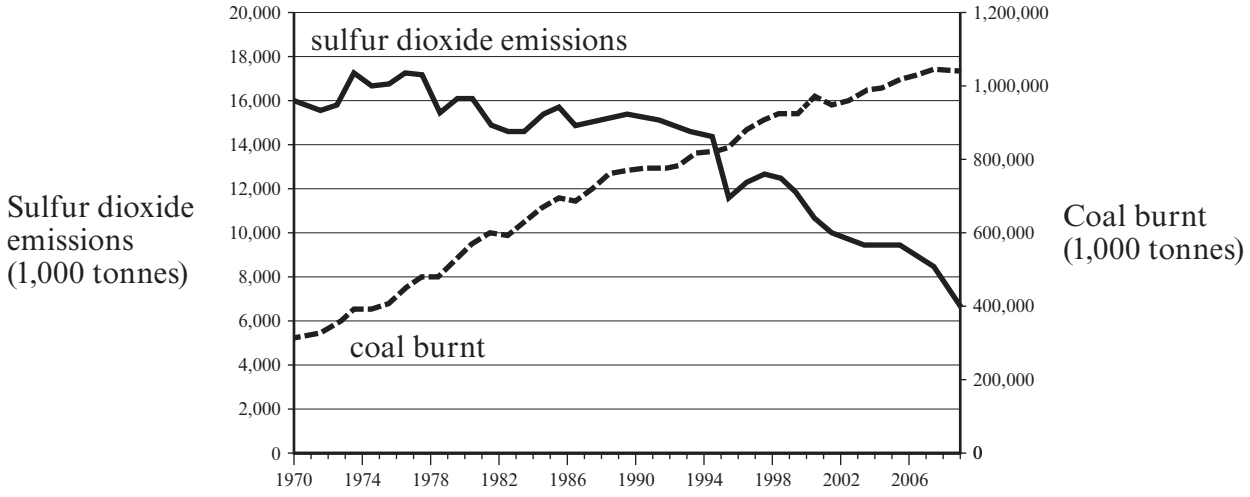
(b) The following graph shows the amount of coal burnt and sulfur dioxide emissions in the USA between 1970 and 2008.



(i) State why the data shown in this graph is not as expected. [2]

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(ii) Suggest a possible reason for the unexpected data. [1]

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6

Examiner only

8. Crude oil is a mixture of hydrocarbons that is formed from the remains of simple marine organisms.

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

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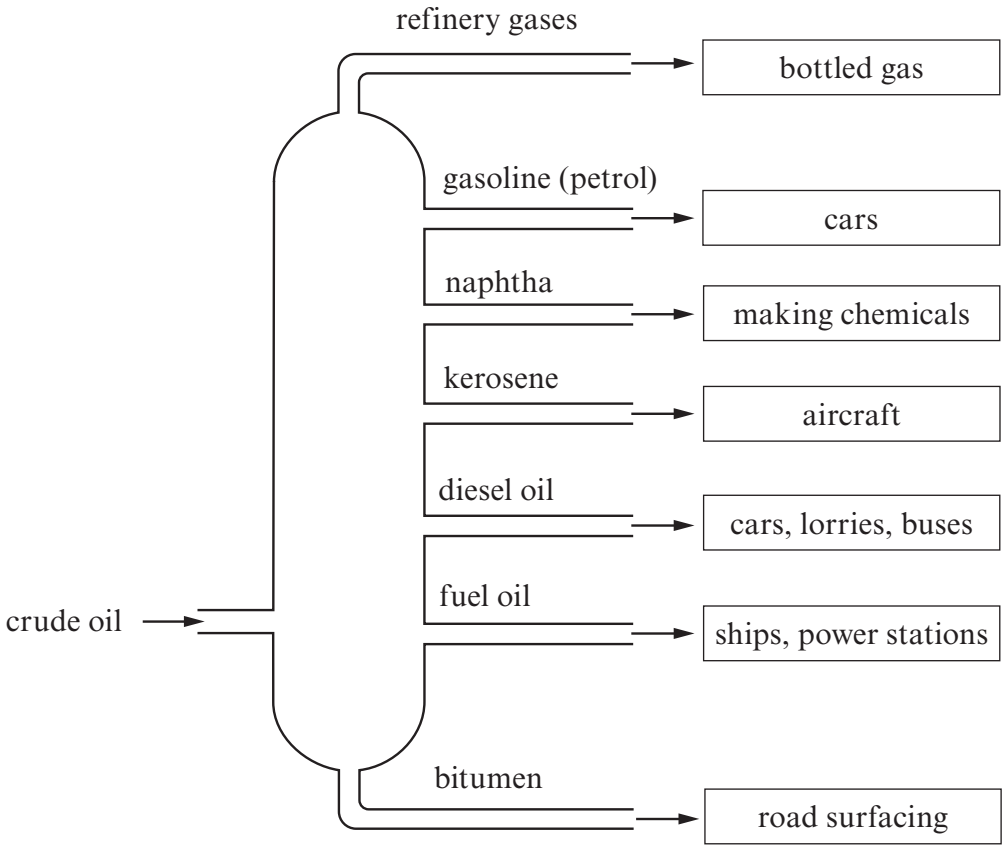
(b) Crude oil is separated into fractions in a process called fractional distillation.



State why the fractions obtained are not single compounds. [1]

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Examiner only

(c) Most fractions are used as fuels. However, others are converted into small reactive molecules that can be used to form plastics.

Name the process used to

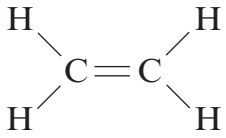
(i) produce the small reactive molecules,

..... [1]

(ii) make plastics from these small reactive molecules.

..... [1]

(d) Ethene is an example of a monomer. It is used to produce polythene. The structure of ethene is shown below.



Describe what happens to ethene molecules in the production of polythene. [2]

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.....

(e) Give **one** disadvantage of the use of plastics such as polythene. [1]

.....

7

Examiner only

9. The electrolysis of water can be used to produce hydrogen. The following table shows the results of an experiment carried out to determine the effect of current on the volume of hydrogen produced after 30 seconds.

	Volume of hydrogen produced after 30 seconds (cm^3)			
Current (mA)	Experiment 1	Experiment 2	Experiment 3	Mean
100	0.7	0.2	0.6	.....
200	1.0	0.8	1.0	0.93
300	1.4	1.3	1.2	1.30
400	1.6	1.6	1.6	1.60
500	2.3	2.2	2.1	2.20

(a) Using only the reliable results, calculate the mean volume of hydrogen produced using a current of 100 mA. [1]

Mean volume of hydrogen = ... cm^3

(b) Describe the relationship between the current and the mean volume of hydrogen produced. [1]

.....

.....

(c) Using the results for a current of 300 mA and the following equation, calculate the percentage error in these measurements. [2]

$$\text{percentage error} = \frac{\text{furthest volume from mean volume} - \text{mean volume}}{\text{mean volume}} \times 100\%$$

Percentage error = ... %

Examiner only

(d) Balance the following electrode equations showing the electrolysis of water. [2]

$$\square\ H^+ + \square\ e^- \longrightarrow H_2$$

$$\square\ O^{2-} - \square\ e^- \longrightarrow O_2$$

(e) In your opinion, do the advantages of using hydrogen as a fuel outweigh the disadvantages? Give reasons to support your answer. [2]

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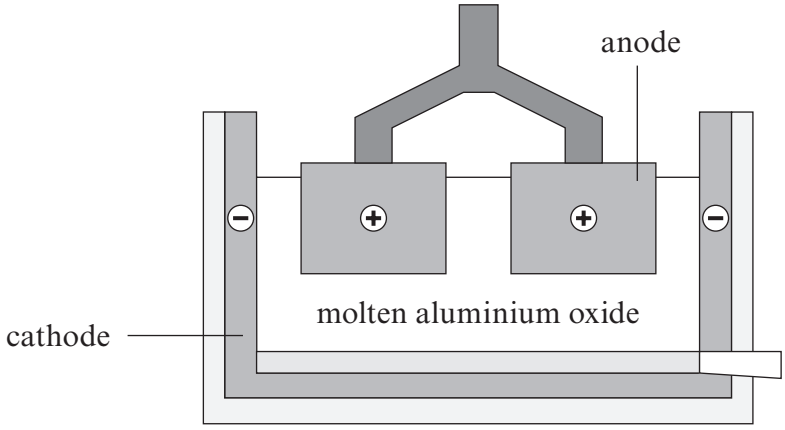
Examiner only

10. Aluminium is extracted using electrolysis. The diagram below shows the apparatus used.



Describe and explain how electrolysis can be used to extract aluminium from its ore.

[6 QWC]

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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^{+}	Sulfate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^{+}		
Silver	Ag^{+}		
Sodium	Na^{+}		
Zinc	Zn^{2+}		

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 Sulfur	$^{35}_{17}$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: