

Surname	Centre Number	Candidate Number
Other Names		0



New GCSE

4462/01

**SCIENCE A
FOUNDATION TIER
CHEMISTRY 1**

A.M. WEDNESDAY, 18 January 2012

1 hour

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

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.

Answer **all** questions.

1. The following table gives some information about five resources found in the Earth's crust.

Resource	Formula of important substance found in the resource
haematite	Fe_2O_3
bauxite	Al_2O_3
galena	PbS
cassiterite	SnO_2
gold	Au

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

- (a) Give the **names** of the elements present in bauxite. [1]

..... and

- (b) Give the **name** of the resource

- (i) from which lead can be extracted, [1]

.....

- (ii) that contains the elements tin and oxygen. [1]

.....

- (c) State how the information in the table shows that gold is an unreactive metal. [1]

.....

- (d) Haematite contains the compound iron oxide, Fe_2O_3 .

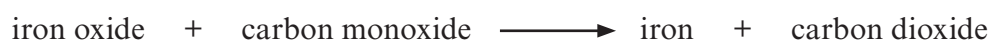
- (i) State the number of iron atoms present in the formula Fe_2O_3 . [1]

.....

- (ii) Give the **total** number of atoms shown in the formula Fe_2O_3 . [1]

.....

(e) Iron can be extracted from iron oxide using carbon monoxide.



During this process, reduction takes place.

(i) Give the name of the substance that is reduced.

[1]

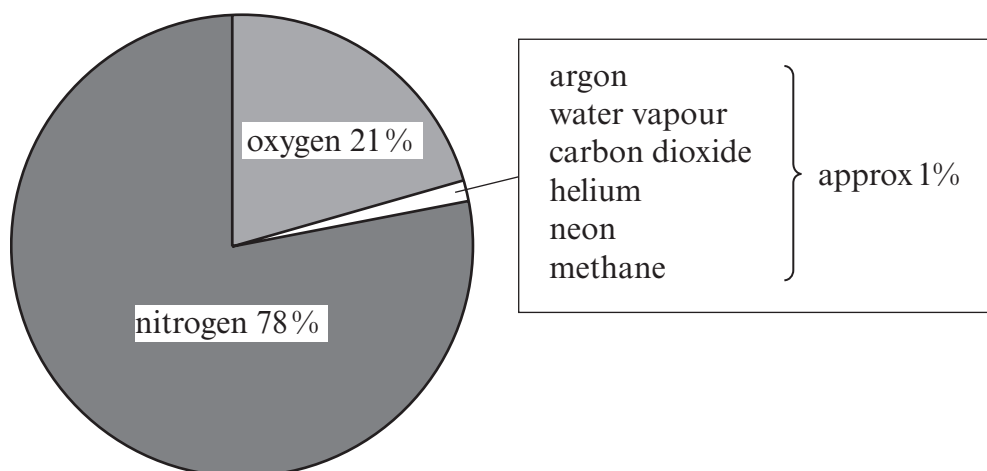
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(ii) State the meaning of the term *reduction*.

[1]

.....

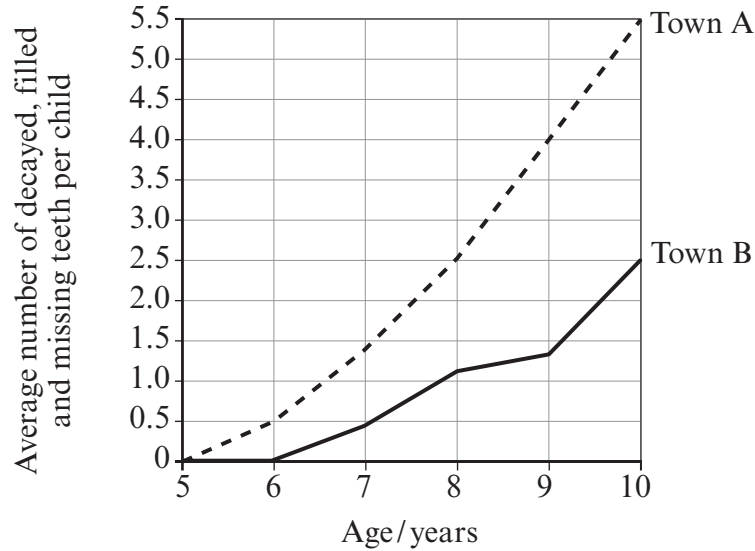
2. The following chart shows the approximate composition of the air.



Use the gases named in the chart to complete the following sentences.
Each gas may be used once, more than once or not at all.

- (a) The gas used to fill weather balloons is [1]
- (b) The gas that will relight a glowing splint is [1]
- (c) The gas that will turn limewater milky is [1]
- (d) The Earth's original atmosphere contained mainly
..... and [2]
- (e) The gas produced during photosynthesis is [1]

3. The following graph shows the average number of decayed, filled and missing teeth present in children in two different towns. Town A does not add fluoride to its water supply but Town B does.



- (a) Use the graph to find
- (i) the average number of decayed, filled or missing teeth in 9 year-old children in Town A, [1]

 - (ii) the difference between the average number of decayed, filled or missing teeth present in 10 year-old children in the two towns. [1]

- (b) State how the graph can be used to persuade people that adding fluoride to water supplies is beneficial. [1]

- (c) Suggest why some people argue that there is not enough evidence in this graph to support fluoridation. [2]

4462-010005

4. (a) Crude oil is an important raw material obtained from the Earth's crust. It is formed from the remains of simple marine organisms.

(i) Choose from the box below the time it takes to form crude oil. [1]

hundreds of years	millions of years	tens of years	thousands of years
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Answer of years

(ii) Choose from the box below the name given to the type of compounds present in crude oil. [1]

hydrocarbons	monomers	plastics	polymers
--------------	----------	----------	----------

Answer

- (b) A barrel of crude oil contains 42 gallons. It is separated into fractions with a range of different uses. The following table shows the amount of each fraction obtained from this barrel.

Fraction obtained	Number of gallons obtained from this 42 gallon barrel
gases	2.9
petrol	21.0
kerosene
diesel fuel	8.6
lubricants	0.6
fuel oil	3.7
bitumen (tar)	1.2

- (i) Use the figures in the table opposite to calculate the number of gallons of kerosene that are obtained from this barrel. Show your workings. [2]

Number of gallons of kerosene obtained = gallons

- (ii) Calculate the percentage of petrol present in this barrel of crude oil. Show your workings. [2]

Percentage of petrol in this barrel of crude oil = %

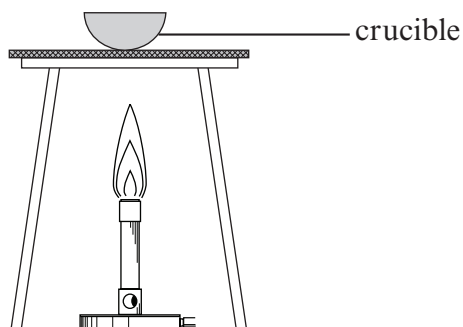
5. (a) The following list shows three metals in order of their reactivity. The most reactive metal is at the top of the list.

↑

 magnesium
zinc
copper

More reactive

John carried out an experiment to find out which metals could be used to extract iron from iron oxide. He heated iron oxide with each metal powder separately as shown in the diagram below.



The table below shows whether or not a reaction took place.

Mixture being heated	Reaction takes place
magnesium powder and iron oxide	yes
zinc powder and iron oxide	yes
copper powder and iron oxide	no

- (i) Using this information, select the list of reactivity which shows **iron** in its correct position. Place a tick (✓) in the appropriate box. [1]

↑ <i>More reactive</i>	iron	magnesium	magnesium	magnesium
	magnesium	iron	zinc	zinc
	zinc	zinc	iron	copper
	copper	copper	copper	iron
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- (ii) Give the reasons for your choice. [1]

.....

.....

(b) A similar reaction took place when John heated a mixture of carbon with copper oxide.

Write a **word** equation for the reaction taking place. [1]

..... + \longrightarrow +

(c) (i) One use of copper is in water pipes. Explain in terms of its properties why copper can be used in this way. [2]

.....
.....

(ii) Give **one** other use of copper in everyday life. [1]

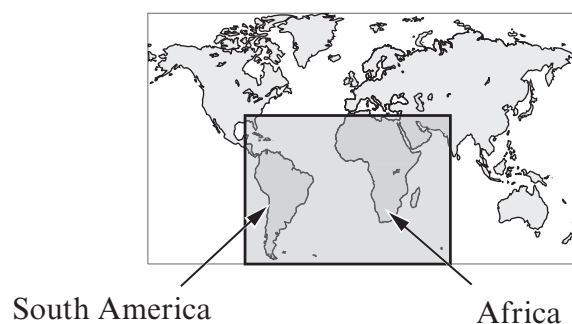
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6. Alfred Wegener studied the structure of the Earth's surface.

(a) State how he suggested the surface of the Earth has changed over time. [1]

.....

(b) Alfred Wegener supported his theory using evidence from the continents of South America and Africa.



(i) Describe the evidence he used to support his theory. [3]

.....

.....

.....

(ii) Give the reason why Wegener's theory was **not** accepted by other scientists. [1]

.....

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

The letters shown are NOT the chemical symbols of the elements.

A																		
													B		D			
	C					F												
																	E	

(i) Give the letters of the elements that represent metals and those that represent non-metals. [1]

Metals

Non-metals

(ii) One of the elements **A-F** shows properties of both metals and non-metals.

I. Give the letter that represents this element.

.....

[1]

II. State the group and period to which this element belongs.

[1]

Group

Period

- (b) The following table shows information about some of the elements in Group 7 of the Periodic Table.

Name of element	Symbol	Melting point / °C	Boiling point / °C	Reaction with hot sodium
fluorine	F	-219	-188	explosive
chlorine	Cl	-101	-34	very vigorous
bromine	Br	-7	59	vigorous
iodine	I	114	184	slow

- (i) Fluorine is a gas at room temperature, 20 °C. Give the states of bromine and iodine at room temperature. [2]

	State at room temperature
bromine	
iodine	

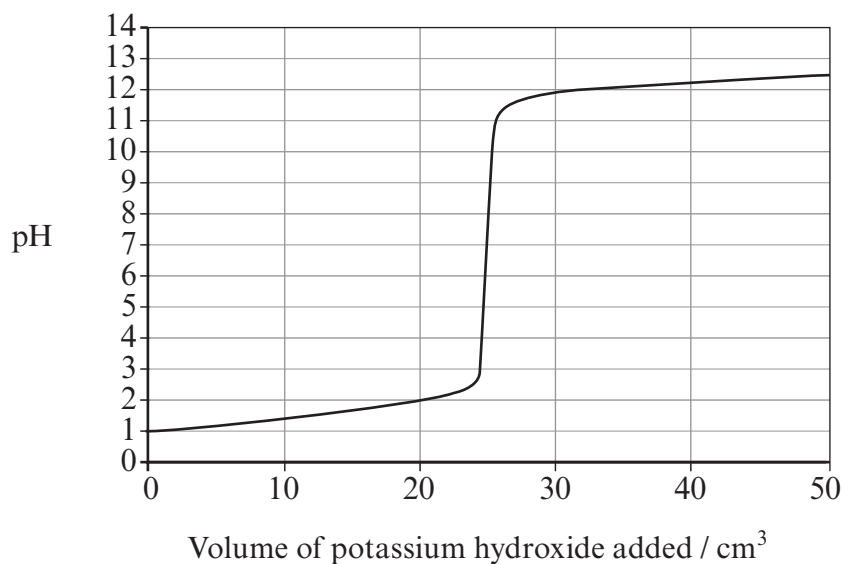
- (ii) Astatine is below iodine in this group of the Periodic Table. Use the information in the table to predict the properties of astatine. [2]

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.....

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8. Rebecca was asked to investigate how the pH changed during the reaction between hydrochloric acid and potassium hydroxide. She slowly added potassium hydroxide solution to 25 cm^3 of dilute hydrochloric acid and recorded the pH using a pH sensor. The results are shown in the graph below.



- (a) (i) Use the graph to give
- I. the pH of the hydrochloric acid **before** adding potassium hydroxide, [1]
.....
 - II. the volume of potassium hydroxide required to **neutralise** the acid. [1]
..... cm^3
- (ii) Rebecca could also have investigated the pH change using universal indicator solution.
- I. State the colour of universal indicator when the solution is neutral. [1]
.....
 - II. Give **one** advantage of using a pH sensor to investigate changes in pH. [1]
.....
.....

(b) Acids also react with bases such as copper oxide.

Describe how a pure sample of copper sulfate crystals can be prepared from copper oxide. [3]

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.....

.....

7

9. The following diagram shows the ‘periodic table’ published by Dmitri Mendeleev in 1869.

I	II	III	IV	V	VI	VII	VIII		
H 1.01									
Li 6.94	Be 9.01	B 10.8	C 12.0	N 14.0	O 16.0	F 19.0			
Na 23.0	Mg 24.3	Al 27.0	Si 28.1	P 31.0	S 32.1	Cl 35.5			
K 39.1	Ca 40.1		Ti 47.9	V 50.9	Cr 52.0	Mn 54.9	Fe 55.9	Co 58.9	Ni 58.7
Cu 63.5	Zn 65.4			As 74.9	Se 79.0	Br 79.9			
Rb 85.5	Sr 87.6	Y 88.9	Zr 91.2	Nb 92.9	Mo 95.9		Ru 101	Rh 103	Pd 106
Ag 108	Cd 112	In 115	Sn 119	Sb 122	Te 128	I 127			
Cs 133	Ba 137	La 139		Ta 181	W 184		Os 194	Ir 192	Pt 195
Au 197	Hg 201	Tl 204	Pb 207	Bi 209					

The modern version of the Periodic Table is shown on the back page of this examination paper.

Describe how Mendeleev constructed his table and how it compares with today’s Periodic Table. [6 QWC]

In your answer you should refer to

- how Mendeleev arranged the elements in his table,
- differences and similarities between the two tables.

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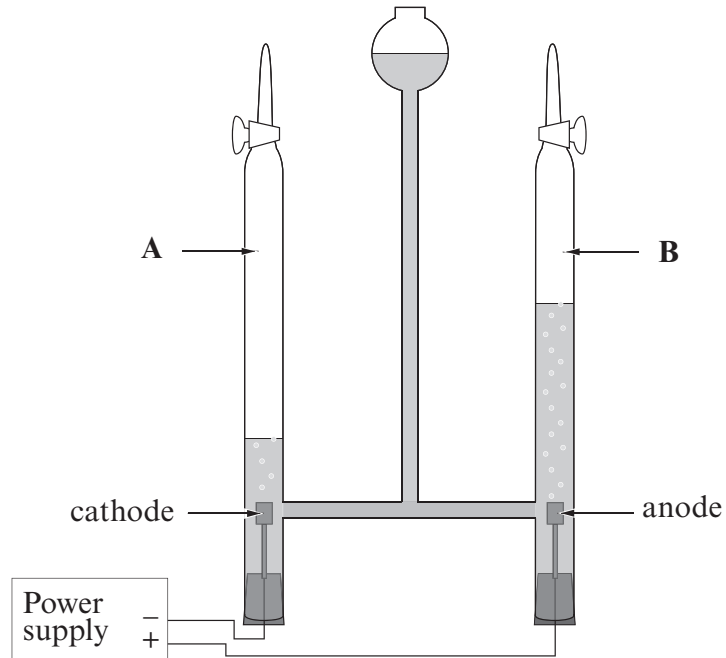
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10. (a) Hydrogen gas can be produced from water using electrolysis. The following diagram shows the apparatus that could be used in the laboratory to demonstrate the electrolysis of water.



Name gases **A** and **B**. Give the chemical test for each gas, giving the expected result in both cases. [3]

Gas **A**

Gas **B**

Test for gas **A**

.....

Test for gas **B**

.....

- (b) Hydrogen gas is used as a fuel. Give **one** advantage of the use of hydrogen as a fuel. [1]

.....

.....

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FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
Aluminium	Al³⁺	Bromide	Br⁻
Ammonium	NH₄⁺	Carbonate	CO₃²⁻
Barium	Ba²⁺	Chloride	Cl⁻
Calcium	Ca²⁺	Fluoride	F⁻
Copper(II)	Cu²⁺	Hydroxide	OH⁻
Hydrogen	H⁺	Iodide	I⁻
Iron(II)	Fe²⁺	Nitrate	NO₃⁻
Iron(III)	Fe³⁺	Oxide	O²⁻
Lithium	Li⁺	Sulfate	SO₄²⁻
Magnesium	Mg²⁺		
Nickel	Ni²⁺		
Potassium	K⁺		
Silver	Ag⁺		
Sodium	Na⁺		

PERIODIC TABLE OF ELEMENTS

1 2 3 4 5 6 7 0
Group

${}^7_3\text{Li}$ Lithium	${}^9_4\text{Be}$ Beryllium	<table border="1"> <tr> <td>${}^1_1\text{H}$ Hydrogen</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>					${}^1_1\text{H}$ Hydrogen														${}^{10}_{10}\text{Ne}$ Neon	${}^{19}_9\text{F}$ Fluorine	${}^4_2\text{He}$ Helium
${}^1_1\text{H}$ Hydrogen																							
${}^{23}_{11}\text{Na}$ Sodium	${}^{24}_{12}\text{Mg}$ Magnesium							${}^{31}_{15}\text{P}$ Phosphorus	${}^{35}_{17}\text{Cl}$ Chlorine	${}^{40}_{18}\text{Ar}$ Argon													
${}^{39}_{19}\text{K}$ Potassium	${}^{40}_{20}\text{Ca}$ Calcium	${}^{45}_{21}\text{Sc}$ Scandium	${}^{48}_{22}\text{Ti}$ Titanium	${}^{51}_{23}\text{V}$ Vanadium	${}^{52}_{24}\text{Cr}$ Chromium	${}^{55}_{25}\text{Mn}$ Manganese	${}^{56}_{26}\text{Fe}$ Iron	${}^{59}_{27}\text{Co}$ Cobalt	${}^{59}_{28}\text{Ni}$ Nickel	${}^{64}_{29}\text{Cu}$ Copper	${}^{65}_{30}\text{Zn}$ Zinc	${}^{70}_{31}\text{Ga}$ Gallium	${}^{73}_{32}\text{Ge}$ Germanium	${}^{75}_{33}\text{As}$ Arsenic	${}^{79}_{34}\text{Se}$ Selenium	${}^{80}_{35}\text{Br}$ Bromine	${}^{84}_{36}\text{Kr}$ Krypton						
${}^{86}_{37}\text{Rb}$ Rubidium	${}^{88}_{38}\text{Sr}$ Strontium	${}^{89}_{39}\text{Y}$ Yttrium	${}^{91}_{40}\text{Zr}$ Zirconium	${}^{93}_{41}\text{Nb}$ Niobium	${}^{96}_{42}\text{Mo}$ Molybdenum	${}^{99}_{43}\text{Tc}$ Technetium	${}^{101}_{44}\text{Ru}$ Ruthenium	${}^{103}_{45}\text{Rh}$ Rhodium	${}^{106}_{46}\text{Pd}$ Palladium	${}^{108}_{47}\text{Ag}$ Silver	${}^{112}_{48}\text{Cd}$ Cadmium	${}^{115}_{49}\text{In}$ Indium	${}^{119}_{50}\text{Sn}$ Tin	${}^{122}_{51}\text{Sb}$ Antimony	${}^{128}_{52}\text{Te}$ Tellurium	${}^{127}_{53}\text{I}$ Iodine	${}^{131}_{54}\text{Xe}$ Xenon						
${}^{133}_{55}\text{Cs}$ Caesium	${}^{137}_{56}\text{Ba}$ Barium	${}^{139}_{57}\text{La}$ Lanthanum	${}^{179}_{72}\text{Hf}$ Hafnium	${}^{181}_{73}\text{Ta}$ Tantalum	${}^{184}_{74}\text{W}$ Tungsten	${}^{186}_{75}\text{Re}$ Rhenium	${}^{190}_{76}\text{Os}$ Osmium	${}^{192}_{77}\text{Ir}$ Iridium	${}^{195}_{78}\text{Pt}$ Platinum	${}^{197}_{79}\text{Au}$ Gold	${}^{201}_{80}\text{Hg}$ Mercury	${}^{204}_{81}\text{Tl}$ Thallium	${}^{207}_{82}\text{Pb}$ Lead	${}^{209}_{83}\text{Bi}$ Bismuth	${}^{210}_{84}\text{Po}$ Polonium	${}^{210}_{85}\text{At}$ Astatine	${}^{222}_{86}\text{Rn}$ Radon						
${}^{223}_{87}\text{Fr}$ Francium	${}^{226}_{88}\text{Ra}$ Radium	${}^{227}_{89}\text{Ac}$ Actinium																					

Key:

