

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

B641/02

CHEMISTRY B

Unit 1 Modules C1 C2 C3
(Higher Tier)

Candidates answer on the question paper
A calculator may be used for this paper

OCR Supplied Materials:
None

Other Materials Required:

- Pencil
- Ruler (cm/mm)

Thursday 15 January 2009

Afternoon

Duration: 1 hour



Candidate Forename		Candidate Surname	
Centre Number		Candidate Number	

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The Periodic Table is printed on the back page.
- The total number of marks for this paper is **60**.
- This document consists of **24** pages. Any blank pages are indicated.

FOR EXAMINER'S USE		
Section	Max.	Mark
A	20	
B	20	
C	20	
TOTAL	60	

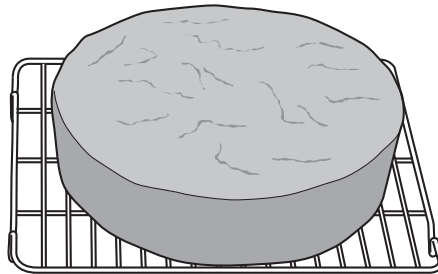
BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

Section A – Module C1

1 Colin baked this cake in an oven.



Baking powder is added to a cake mixture before it is put in the oven.

Baking powder contains sodium hydrogencarbonate.

Sodium hydrogencarbonate breaks down when heated.

It makes sodium carbonate, carbon dioxide and water.

(a) Write down the **word** equation for the breakdown of sodium hydrogencarbonate.

.....	→	+	+
-------------------------	---	-------------------------	---	-------------------------	---	-------------------------

[1]

(b) Write down how you would test for carbon dioxide gas.

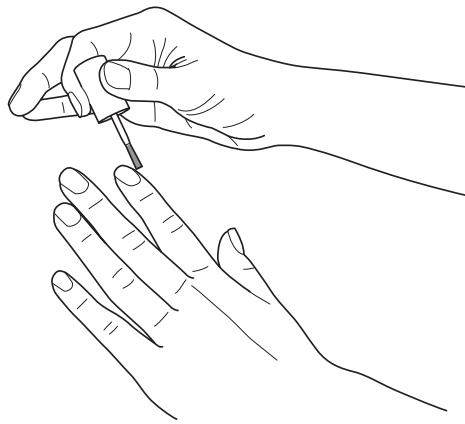
.....

.....

..... [2]

[Total: 3]

2 Terri's nails are covered with nail varnish.



She wants to remove the nail varnish.

She uses nail varnish remover.

(a) Water will **not** dissolve the nail varnish.

Explain why.

Use ideas about forces between molecules of nail varnish and molecules of water.

A labelled diagram may help your answer.

.....
.....
.....
..... [2]

(b) Cosmetic products like nail varnish have to be tested before they can be used by people.

Describe one **advantage** and one **disadvantage** of using animals for testing.

advantage

.....

disadvantage

..... [2]

3 Look at the table.

It gives information about the amount of energy released when some fuels burn.

It also lists some of the products of burning.

fuel	energy released by one gram of fuel in kJ	products of burning
biofuels (ethanol)	44.3	carbon dioxide and water
hydrogen	143.0	water
methane	55.6	carbon dioxide and water
methanol	22.3	carbon dioxide and water
petrol	48.3	carbon dioxide, water and other gases

(a) (i) Petrol can be used to power a car.

Choose **another** fuel from the table that can be used to power a car.

Explain your choice.

Use the information in the table.

name of fuel

explanation

..... [1]

(ii) Two factors to think about in choosing a fuel are the energy released and the products of burning.

Write down **one** other factor.

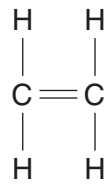
..... [1]

(b) Write a balanced **symbol** equation for the complete combustion of methane, CH₄, with oxygen, O₂.

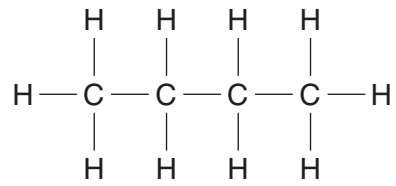
..... [2]

[Total: 4]

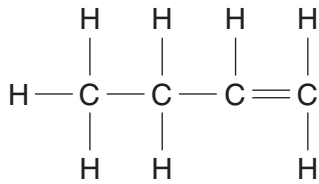
4 Look at the displayed formulas of some compounds.



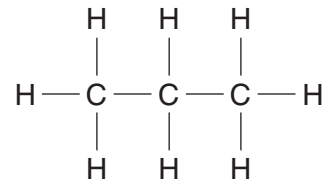
compound **A**



compound **B**



compound **C**



compound **D**

(a) (i) One of the compounds has the molecular formula C_4H_8 .

Which one?

Choose from **A**, **B**, **C** or **D**.

answer

[1]

(ii) Compounds **B** and **D** are described as **alkanes**.

Use the displayed formulas to explain why.

..... [1]

(b) Bromine water is used to test for **unsaturation**.

Compound **C** is bubbled through bromine water.

Write down what happens to the orange colour of bromine water.

.....

..... [1]

(c) Compound **A** is ethene.

Poly(ethene) is made from ethene in a reaction called polymerisation.

Write about two **conditions** needed for polymerisation.

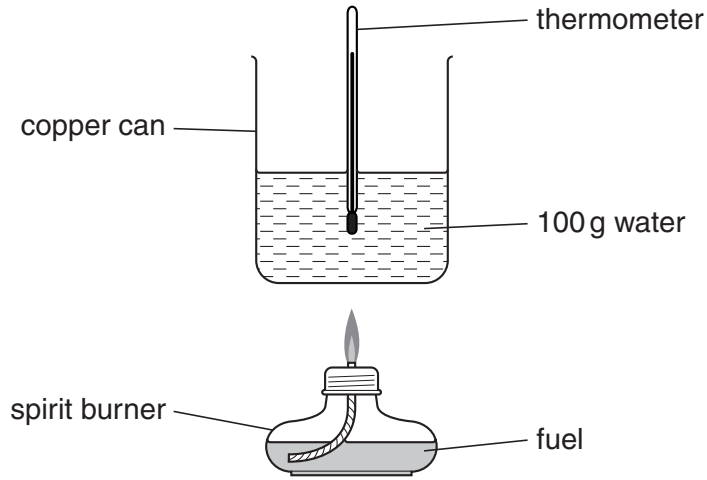
1

2 [2]

[Total: 5]

5 Michael and Alison investigate a fuel.

Look at the diagram. It shows the apparatus they use.



(a) They burn 1.0 gram of the fuel.

The temperature of the water increased by 10 °C.

Calculate the energy given out by the fuel.

(Specific heat capacity of water is 4.2J/g °C.)

$$\text{energy} = \text{mass} \times \text{specific heat capacity} \times \text{temperature change}$$

.....

.....

.....

answer J [2]

(b) Bond making is an exothermic process.

Exothermic reactions transfer energy to the surroundings as heat.

The burning of fuels is an exothermic reaction.

Explain why.

Use ideas about bond breaking and bond making.

.....

.....

..... [2]

[Total: 4]

Turn over

Section B – Module C2

6 Paul investigates the reaction between sulfuric acid and zinc metal.

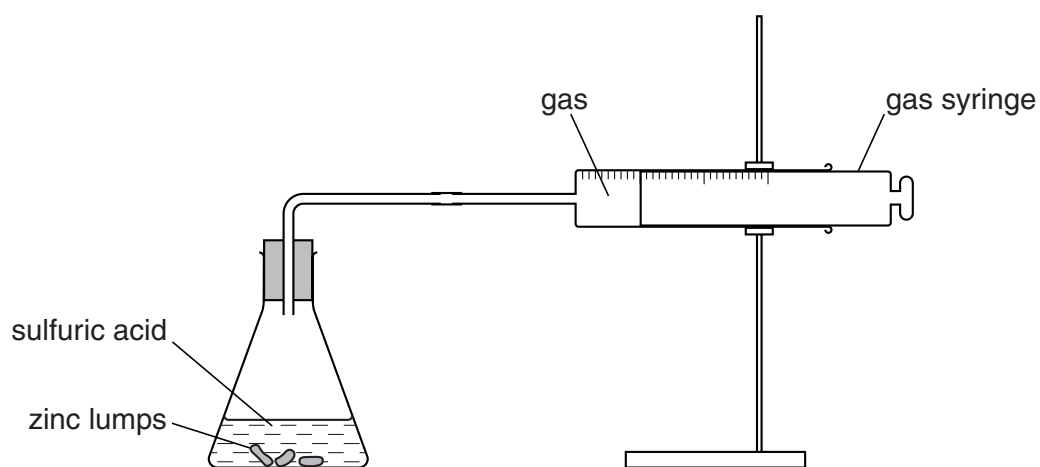
Hydrogen gas and zinc sulfate are made.

(a) Write a **word** equation for the reaction.

..... [1]

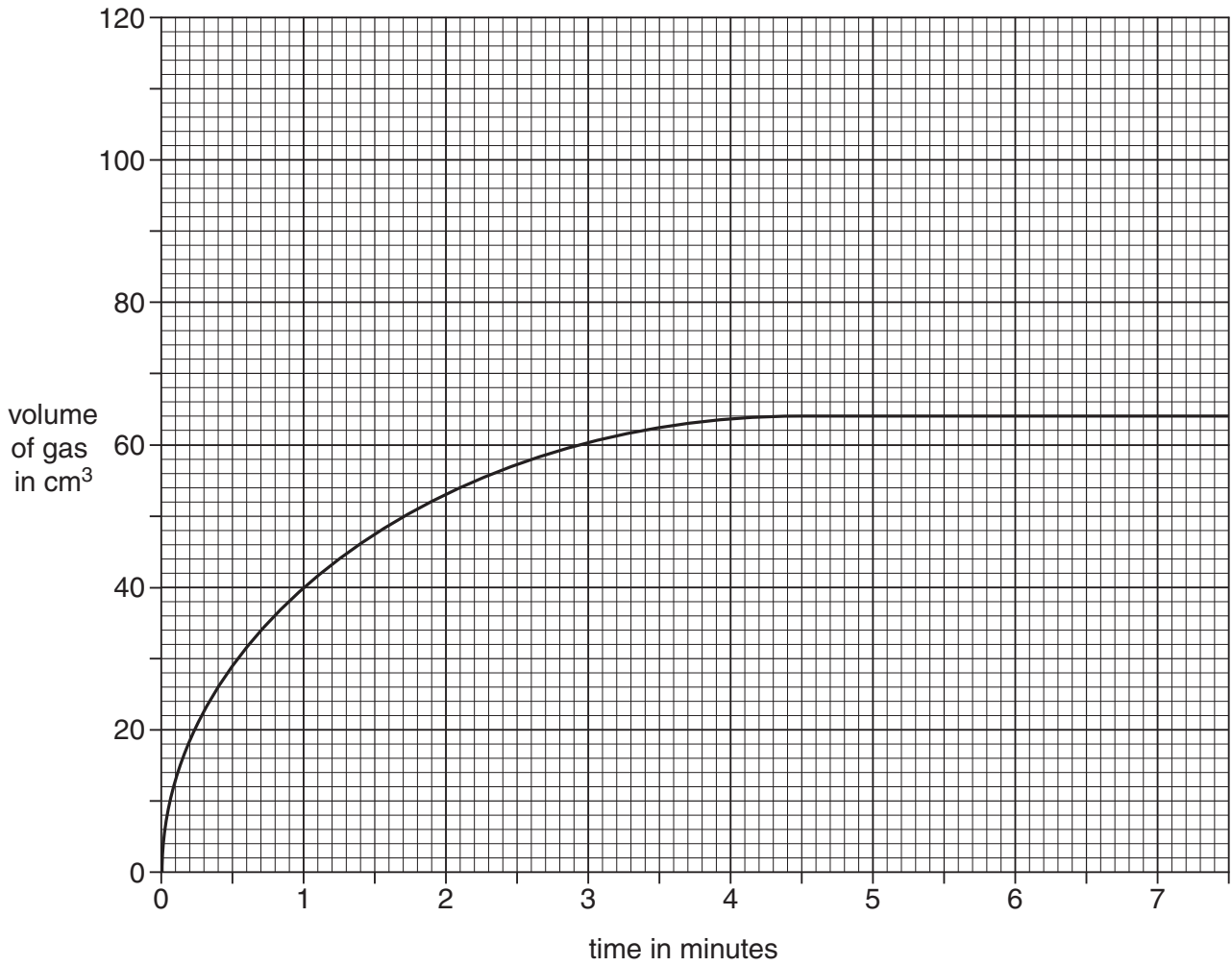
(b) Look at the diagram.

It shows the apparatus he uses.



He measures the volume of gas in the gas syringe every minute.

Look at the graph. It shows his results.



(i) At what time did the reaction finish?

..... minutes [1]

(ii) Paul uses a catalyst to speed up the reaction.

He does not change anything else.

Sketch **on the graph** what his new results may look like. [2]

(c) This reaction can also be speeded up by using zinc **powder** instead of zinc **lumps**.

Explain why.

.....
 [1]

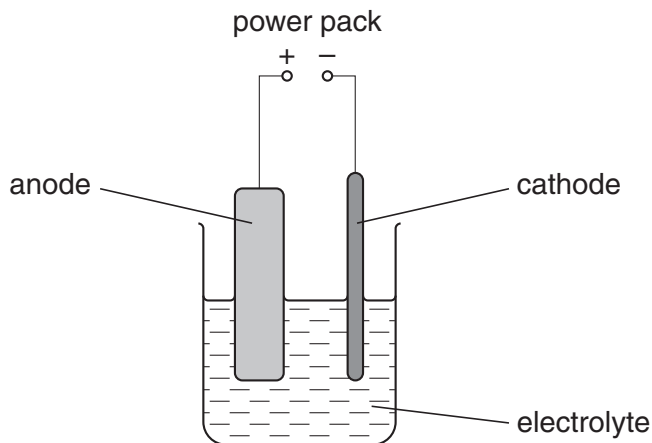
[Total: 5]

7 This question is about copper and alloys.

(a) Impure copper can be purified using electrolysis.

Look at the diagram.

It shows the apparatus used to purify impure copper.



(i) Write down the name of the electrolyte.

..... [1]

(ii) What are the electrodes made of?

anode

cathode [1]

(iii) Describe what happens at each electrode.

.....
 [1]

(b) Copper can be recycled and used in alloys and copper pipes.

Describe one of the problems of recycling copper.

..... [1]

(c) Solder is an alloy.

Write down the names of the **two** main metals in solder.

..... and [2]

[Total: 6]

8 This question is about the atmosphere.

(a) The air that we breathe is a mixture of gases.

Complete the table to show the percentage composition of the air.

gas	percentage
carbon dioxide	0.04
nitrogen	
other gases	1.0
oxygen	

[2]

(b) Human activity may affect the composition of the air.

(i) Describe how deforestation may change the composition of the air.

.....
..... [1]

(ii) Describe how the increased burning of fossil fuels may change the composition of the air.

.....
..... [1]

(c) Some scientists believe that many millions of years ago the atmosphere contained mainly ammonia and carbon dioxide.

This atmosphere changed over time to give the composition of the air we have today.

Describe a possible theory to show how this happened.

.....
.....
.....
..... [3]

[Total: 7]

9 This question is about oil paints.

Oil paints take a long time to dry.

Explain how oil paints dry.

Use ideas about

- what happens to the solvent
- what happens to the oil molecules.

.....

.....

..... [2]

[Total: 2]

13
BLANK PAGE

Question 10 begins on page 14.

PLEASE DO NOT WRITE ON THIS PAGE

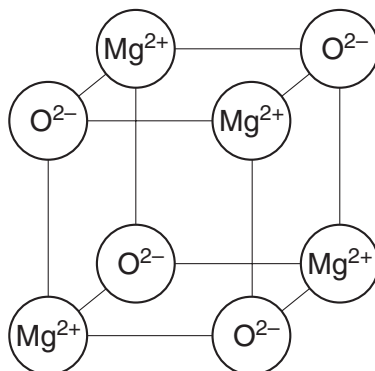
Section C – Module C3

10 The physical properties of a substance are related to its structure and bonding.

Magnesium oxide has a high melting point.

Carbon dioxide has a low melting point.

(a) Look at this diagram. It shows part of the giant ionic lattice of magnesium oxide.



Magnesium oxide has a high melting point.

Explain why.

.....
 [1]

(b) Look at this diagram. It shows the displayed formula of carbon dioxide.



Draw a 'dot and cross' diagram for carbon dioxide.

The electronic structure for carbon is 2, 4 and for oxygen is 2, 6.

[2]

(c) Carbon dioxide has a low melting point.

Explain why.

Use ideas about

- structure
- intermolecular forces.

.....

.....

.....

..... [2]

[Total: 5]

11 This question is about the elements in Group 7.

Elements in Group 7 are called halogens.

Two examples of elements in Group 7 are chlorine and iodine.

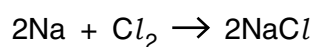
(a) One of the halogens is an orange liquid at room temperature.

Which one?

..... [1]

(b) Look at the balanced symbol equation.

It shows the reaction between sodium and chlorine.



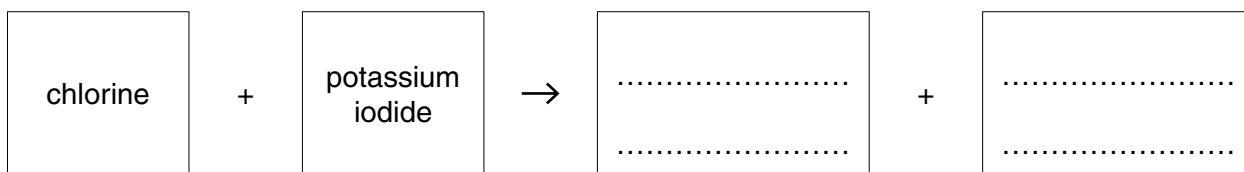
Write down the **name** of the **product** of this reaction.

..... [1]

(c) Chlorine will react with a solution of potassium iodide to make potassium chloride.

This is a displacement reaction.

Complete the **word** equation for this displacement reaction.



[1]

(d) Astatine, At, is another halogen.

It is highly radioactive and so is very difficult to investigate in a laboratory.

A scientist predicts astatine will react with sodium.

Write the balanced **symbol** equation for this reaction.

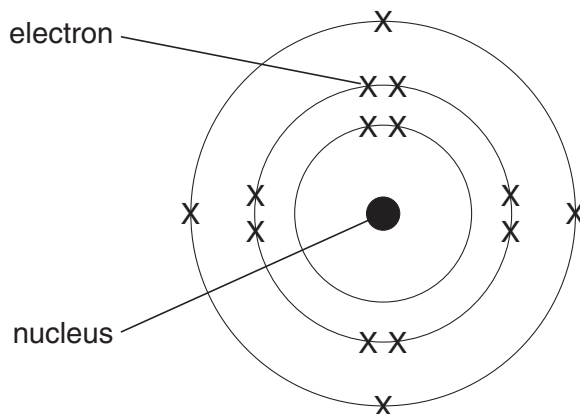
..... [2]

[Total: 5]

12 This question is about atomic structure.

Look at the diagram.

It shows the electronic structure of an atom.



(a) The nucleus contains **two** types of particles.

What are the names of these **two** particles?

..... and [1]

(b) What is the **atomic number** of this element?

..... [1]

(c) Look at the diagram of the electronic structure of an atom.

An element contains atoms with this electronic structure.

(i) Which **group** of the Periodic Table is this element in?

..... [1]

(ii) Explain how you can tell that this element is in **Period 3** of the Periodic Table.

.....
 [1]

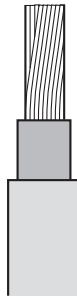
[Total: 4]

13 Metals have useful properties.

Look at the table. It shows some of the properties of five metals.

metal	density in g/cm ³	melting point in °C	relative hardness	relative electrical conductivity	relative thermal conductivity
chromium	7.2	1857	8.5	0.8	0.9
cobalt	8.9	1495	5.0	1.7	1.0
copper	9.0	1085	3.0	6.0	4.1
nickel	8.9	1453	4.0	1.4	0.9
zinc	7.1	420	2.5	1.7	1.2

(a) Look at the diagram. It shows an electrical wire.



Copper is the most suitable metal from the table to make electrical wires.

Explain why.

Use information from the table.

.....

..... [1]

(b) Look at the diagram.

This drill bit is used to make holes in metal.



Which metal would be most suitable to make a drill bit?

Choose from the table. Explain your answer.

.....
.....
..... [2]

(c) Metals are good electrical conductors.

This is because a charged particle can move.

What is the name of this charged particle?

Choose from:

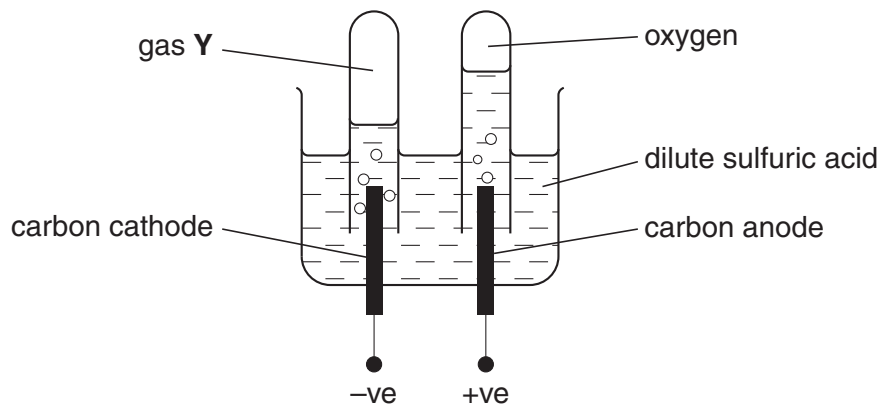
- anion
- atom
- cation
- electron
- molecule

answer [1]

[Total: 4]

14 Alwin investigates the electrolysis of dilute sulfuric acid.

Look at the apparatus he uses.



(a) What is the name of gas **Y** made at the cathode?

..... [1]

(b) Look at the list.

It shows the particles in dilute sulfuric acid.



Which particle reacts at the anode to make oxygen?

Choose from the list.

answer

[1]

[Total: 2]

END OF QUESTION PAPER

21
BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

PLEASE DO NOT WRITE ON THIS PAGE

PLEASE DO NOT WRITE ON THIS PAGE



Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (OCR) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

OCR is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

The Periodic Table of the Elements

1	2	3	4	5	6	7	0										
7 Li lithium 3	9 Be beryllium 4	11 Na sodium 11	12 C carbon 6	13 Al aluminium 13	14 N nitrogen 7	16 O oxygen 8	17 F fluorine 9	18 Ar argon 18									
19 K potassium 19	20 Ca calcium 20	23 V vanadium 23	24 Cr chromium 24	25 Mn manganese 25	26 Fe iron 26	27 Co cobalt 27	28 Ni nickel 28	29 Cu copper 29	30 Zn zinc 30	31 Ga gallium 31	32 Ge germanium 32	33 As arsenic 33	34 Se selenium 34	35 Br bromine 35	36 Kr krypton 36		
37 Rb rubidium 37	38 Sr strontium 38	40 Zr zirconium 40	41 Nb niobium 41	42 Mo molybdenum 42	43 Tc technetium [98]	44 Ru ruthenium 44	45 Rh rhodium 45	46 Pd palladium 46	47 Ag silver 47	48 Cd cadmium 48	49 In indium 49	50 Sn tin 50	51 Sb antimony 51	52 Te tellurium 52	53 I iodine 53	54 Xe xenon 54	
55 Cs caesium 55	56 Ba barium 56	72 Hf hafnium 72	73 Ta tantalum 73	74 W tungsten 74	75 Re rhenium 75	76 Os osmium 76	77 Ir iridium 77	78 Pt platinum 78	79 Au gold 79	80 Hg mercury 80	81 Tl thallium 81	82 Pb lead 82	83 Bi bismuth 83	84 Po polonium [209]	85 At astatine [210]	86 Rn radon [222]	
[223] Fr francium 87	[226] Ra radium 88	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated							

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

1
H
hydrogen
1

4
He
helium
2

* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.