

**GENERAL CERTIFICATE OF SECONDARY EDUCATION
GATEWAY SCIENCE
CHEMISTRY B**

B641/02

Unit 1 Modules C1 C2 C3 (Higher Tier)

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

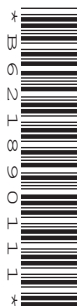
OCR supplied materials:
None

Other materials required:

- Pencil
- Ruler (cm/mm)

**Monday 17 January 2011
Morning**

Duration: 1 hour



Candidate forename		Candidate surname	
Centre number		Candidate number	

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Answer **all** the questions.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

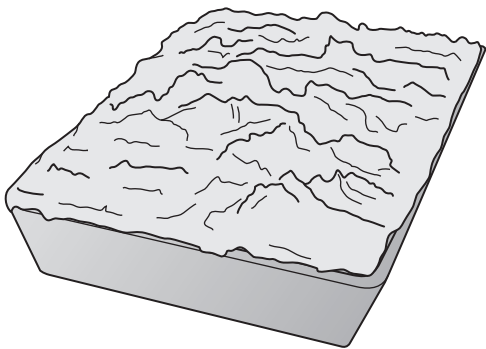
- The number of marks is given in brackets [] at the end of each question or part question.
- The Periodic Table is printed on the back page.
- The total number of marks for this paper is **60**.
- This document consists of **24** pages. Any blank pages are indicated.

2

Answer **all** the questions.**Section A – Module C1**

- 1 John is cooking a fish pie for Debbie.

Look at the food label for the fish pie he is cooking.

	FISH PIE Food label potato, salmon, prawn, water, milk, onion, double cream, skimmed milk powder, starch, cheddar cheese, lemon juice, parsley, E150, mustard powder, pepper
---	---

- (a) E150 is a food additive.

Suggest why there are food additives in the fish pie.

..... [1]

- (b) John serves the fish pie with tomatoes.

The tomatoes are sold in a special kind of bag.

This is an example of **active packaging** because the bag absorbs gases that speed up the ripening of the fruit.



- (i) Put a tick (✓) in the box next to **one other** example of how active packaging can work.

jar of mayonnaise containing an emulsifier

packet with a sensor to tell when fruit is ripe

self-cooling drinks can

tinned fruit containing an antioxidant

☐
☐
☐
☐

[1]

3

- (ii) Packing which removes water from inside the pack is another example of active packaging.

This helps to extend the shelf life of the food.

Explain how.

.....

.....

..... [2]

[Total: 4]

2 This question is about fuels.

(a) The table shows some information about four fuels.

fuel	state at room temperature	relative cost	energy value	method of delivery	how easy is it to light?
propane	gas	expensive	high	in small cylinders	easy
coal	solid	cheap	medium	in bags	difficult
natural gas	gas	moderate	high	supplied by underground pipes	easy
oil	liquid	expensive	high	in a metal tank	easy

Look at the picture of a camping stove.



Which fuel is most suitable for a camping stove?

answer

Give reasons for your answer. Use information from the table.

.....

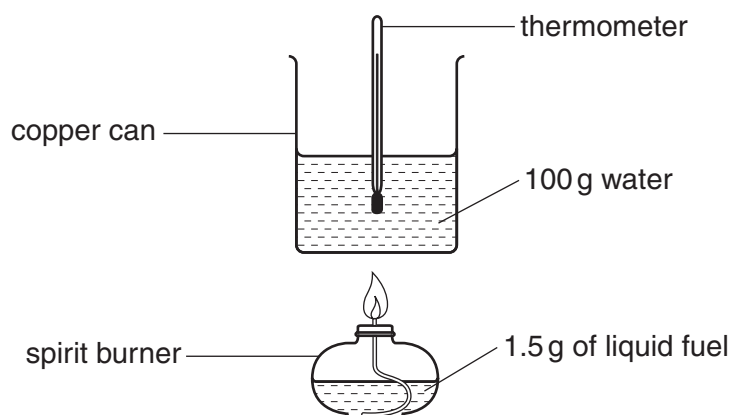
 [2]

5

(b) Karen and Phil investigate four different liquid fuels.

They want to find out which fuel releases most energy.

The diagram shows the apparatus they use.



Look at Karen and Phil's results.

fuel	temperature of water at start in °C	temperature of water at end in °C	temperature change in °C
A	18	29	11
B	15	34	19
C	15	25	10
D	19	35	16

(i) Calculate the amount of energy transferred when fuel **B** burns.

energy transferred = mass × specific heat capacity × temperature change

The specific heat capacity of water is 4.2 J/g °C.

.....

.....

.....

answer J

[2]

6

(ii) Karen and Phil burn 1.5 g of fuel **C**.

4200 J of energy is transferred.

Calculate the amount of energy transferred when **1.0 g** of fuel **C** burns.

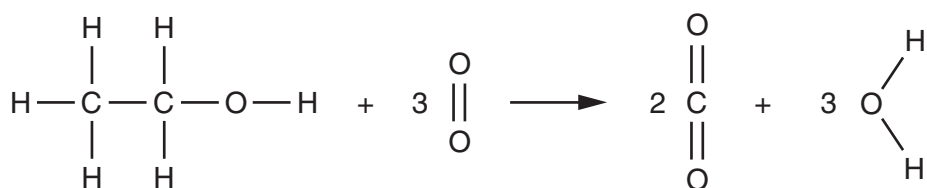
.....

answer J

[1]

(c) Fuel **B** is ethanol.

Look at this equation. It shows the complete combustion of ethanol.



The reaction is **exothermic**.

Look at the list of sentences.

One sentence is a correct explanation of an exothermic reaction.

Which one?

Put a tick (✓) in the box next to the correct sentence.

More energy is given out during bond breaking
than is taken in during bond making.

☐

More energy is given out during bond making
than is taken in during bond breaking.

☐

More bonds are broken than are made.

☐

More energy is taken in during bond breaking
than is given out during bond making.

☐

[1]

[Total: 6]

- 3 Colette uses nail varnish remover to remove her nail varnish.



The nail varnish remover dissolves the nail varnish.

- (a) The nail varnish remover contains a type of chemical called an **ester**.

Complete the following sentence.

Choose the best answer from the list.

solute

solution

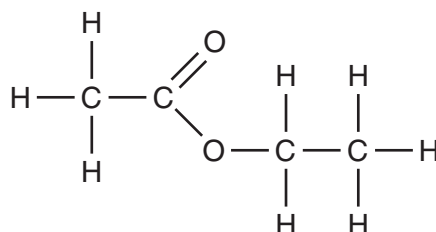
solvent

synthetic material

The ester in nail varnish remover is used because it is a [1]

- (b) Ethyl ethanoate is an ester.

Look at the displayed formula of ethyl ethanoate.



- (i) Write down the **molecular formula** for ethyl ethanoate.

..... [1]

- (ii) Ethyl ethanoate is **not** a hydrocarbon.

Explain how you can tell from the displayed formula.

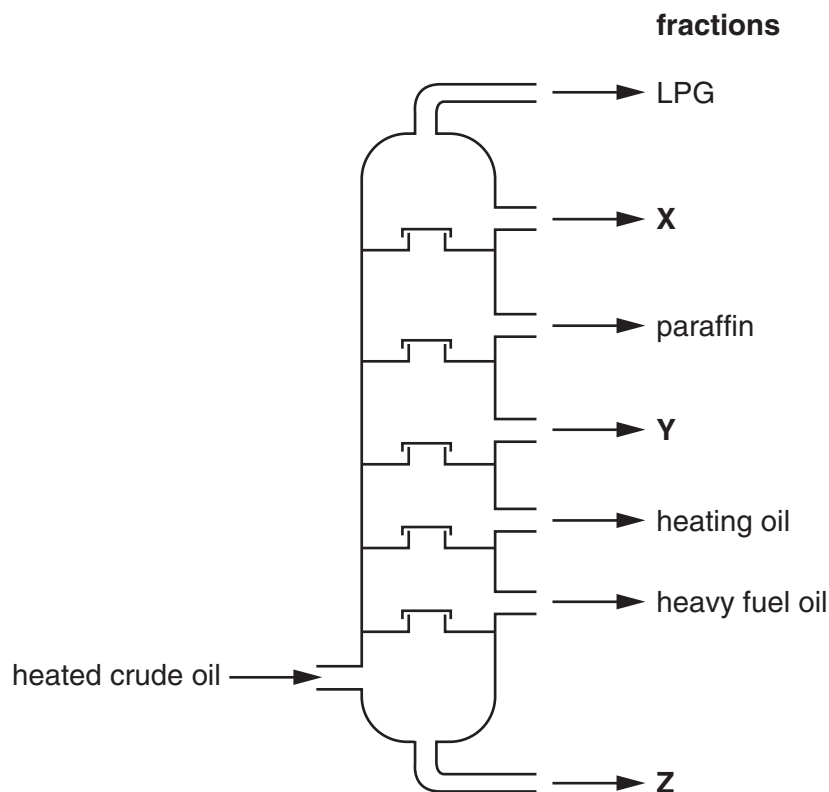
.....
 [1]

4 This question is about crude oil.

(a) Crude oil is separated into different parts by fractional distillation.

Look at the diagram.

It shows a fractionating column.



What are the names of the missing fractions **X**, **Y** and **Z**?

Choose your answers from the list.

bitumen

diesel

petrol

Fraction **X** is

Fraction **Y** is

Fraction **Z** is

[2]

(b) (i) Which of the fractions has the **lowest** boiling temperature?

..... [1]

(ii) Which of the fractions contains the **largest** molecules?

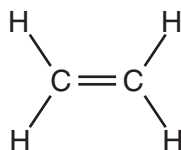
..... [1]

[Total: 4]

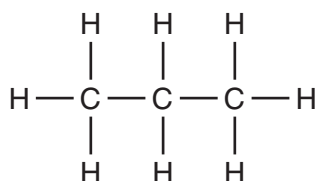
9

- 5 This question is about compounds that contain carbon.

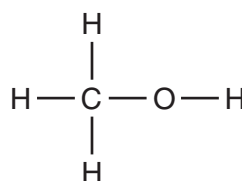
Look at the displayed formulas of some compounds.



ethene



propane



methanol

- (a) Propane is an **alkane**.

Write down how you can tell propane is an alkane.

..... [1]

- (b) Methanol, CH_3OH , burns in oxygen, O_2 .

Carbon dioxide and water are made.

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

..... [2]

[Total: 3]

Section B – Module C2

6 This question is about metals.

Look at the table. It shows the properties of some metals and an alloy.

metal	melting point in °C	density in g/cm ³	relative electrical conductivity	cost per tonne in £
aluminium	660	2.7	40	1350
copper	1083	8.9	64	3800
iron	1535	7.9	11	400
lead	328	11.3	5	1500
silver	962	10.5	67	20 000
solder	188	8.2	7	6700
tin	232	5.7	9	10 000

(a) Solder is used for joining electrical wires.

Suggest why. Use information from the table.

..... [1]

(b) Aluminium is used for making aeroplane bodies.

Apart from cost, suggest why. Use information from the table.

..... [1]

(c) Car bodies can be made from aluminium or from iron.

Explain one **advantage** and one **disadvantage** of using aluminium to make car bodies.

Use the table to help you.

.....

 [2]

[Total: 4]

7 This question is about paints.



Paints contain a **solvent**, a **binding medium** and a **pigment**.

(a) Pigments give the paint its colour.

Some pigments are **thermochromic**.

Thermochromic pigments change colour when they are heated.

Write down **one** use of thermochromic pigments.

..... [1]

(b) In oil paints the pigment is dispersed in an oil.

Oil paints dry slowly.

The first stage of the drying process is the evaporation of the solvent.

What happens to the oil in the next stage of the drying process?

..... [1]

(c) Paints are **colloids**.

Look at the sentences about colloids.

Which sentences about colloids are correct?

Put ticks (✓) in the boxes next to the **two** correct sentences.

Particles are mixed and dispersed through a liquid.

☐

Solid particles are dissolved in a liquid.

☐

A colloid is a single compound.

☐

Solid particles are suspended in a liquid.

☐

A colloid is two separated liquids.

☐

[2]

[Total: 4]

Turn over

8 Emily investigates antacid tablets.

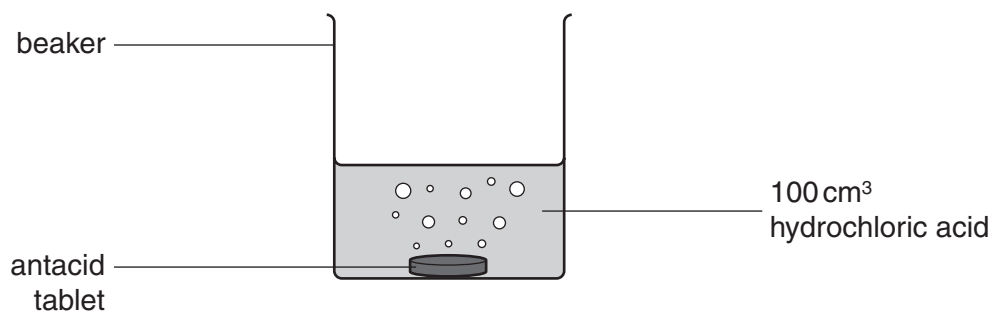
Antacids neutralise excess acid in your stomach.

Emily uses one tablet in each experiment.

She adds the tablet to 100 cm^3 of hydrochloric acid.

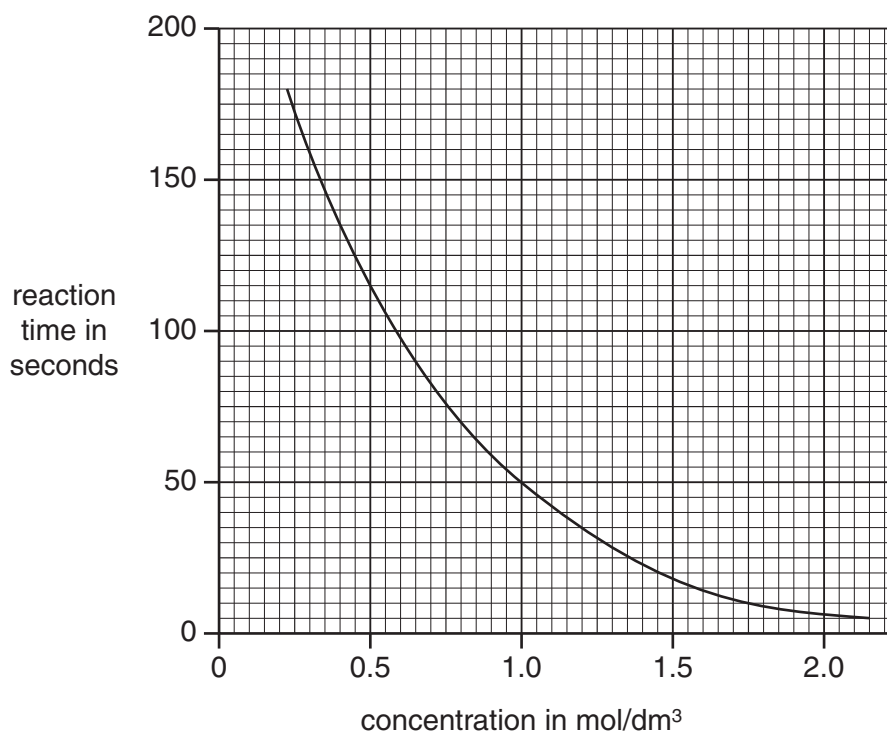
She measures the time it takes to fully react. This is the **reaction time**.

Look at the diagram. It shows the apparatus she uses.



Emily does the experiment several times. Each time she uses a different concentration of acid.

Look at the graph of Emily's results.



(a) Emily uses hydrochloric acid with a concentration of **1.5 mol/dm³**.

Look at the graph.

What is the reaction time?

..... seconds

[1]

- (b) Emily finds that the reaction time is shorter with **concentrated** acid than with **dilute** acid.

Explain why. Use ideas about particles.

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

- (c) Emily repeats the experiment using a **crushed** tablet.

She finds that the reaction is faster.

Explain why. Use ideas about collisions between particles.

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

- (d) These antacid tablets contain calcium carbonate.

In this reaction, calcium carbonate, CaCO_3 , reacts with hydrochloric acid, HCl .

Calcium chloride, CaCl_2 , carbon dioxide and water are made.

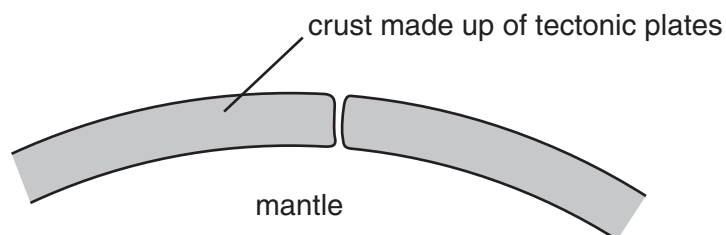
Write a **balanced symbol** equation for this reaction.

..... [2]

[Total: 7]

- 9 This question is about tectonic plates.

Look at the diagram. It shows the outer layers of the Earth.



- (a) One type of tectonic plate is an **oceanic** plate.

Write down the name of the other **type** of tectonic plate.

..... [1]

- (b) Tectonic plates float **on top of** the mantle.

Explain why.

..... [1]

- (c) Tectonic plates move slowly.

What causes tectonic plates to move?

.....
 [1]

- (d) The two types of plate collide.

The oceanic plate goes underneath the other plate.

The oceanic plate then remelts.

What is the name of this process?

..... [1]

- (e) What is meant by the word **lithosphere**?

..... [1]

[Total: 5]

Section C – Module C3

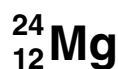
10 This question is about atomic structure.

Look at the table. It shows some information about the particles which make up atoms.

particle	charge	relative mass
proton		1
electron	negative	0.0005
neutron	neutral	

(a) Complete the table. [2]

(b) Look at the symbol for magnesium.



The **mass number** of magnesium is 24.

(i) What is meant by mass number?

.....
 [1]

(ii) Write down the **electronic structure** of magnesium.

..... [1]

(iii) A magnesium atom is electrically **neutral**.

Explain why.

.....
 [1]

[Total: 5]

11 Sodium, potassium and lithium are Group 1 metals.

The Group 1 metals react when put into water.

Look at the table.

metal	time for 0.5 g of metal to react in seconds	observations
sodium	12	melts skates across surface of water gas given off alkaline solution made
potassium	6	melts and catches fire skates across surface of water gas given off alkaline solution made
lithium	20	skates across surface of water gas given off alkaline solution made

(a) All three reactions give off the same gas.

Write down the name of this gas.

..... [1]

(b) Look at the observations for sodium.

Write down the name of the substance that makes the solution alkaline.

..... [1]

(c) What is the flame colour when potassium burns?

..... [1]

17

(d) Rubidium is another element in Group 1.

It is **below** lithium, sodium and potassium.

Predict the observations you should get when 0.5 g of rubidium reacts with water.

Your answer should include

- an estimate of the time it takes to react
- what you would see.

.....

.....

.....

.....

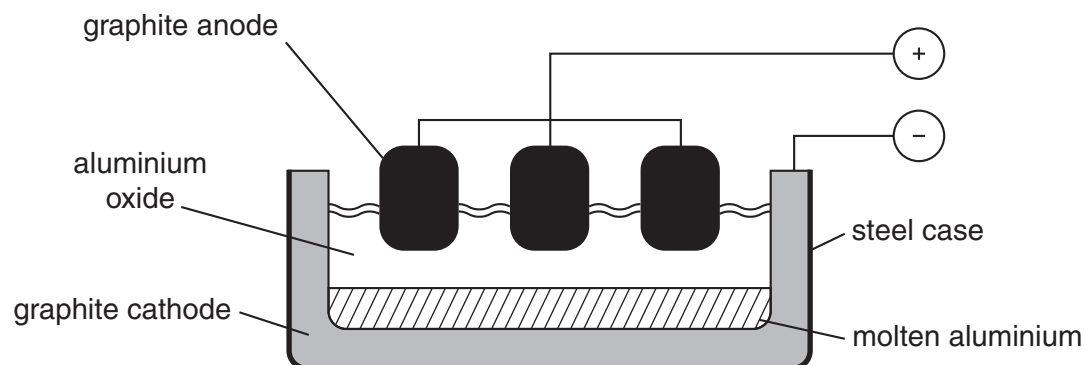
..... [2]

[Total: 5]

18

12 This question is about the extraction of aluminium.

Look at the diagram. It shows the equipment used.



(a) Aluminium oxide is broken down into aluminium and oxygen.

Write a **word** equation for this reaction.

..... [1]

(b) Oxygen is made at one of the electrodes.

Which one?

..... [1]

(c) Aluminium ions, Al^{3+} , gain electrons to make aluminium atoms, Al .

Write a **balanced symbol** equation for this reaction. Use e^- to represent an electron.

..... [2]

[Total: 4]

13 There are three types of bonding.

They are

- ionic bonding
- covalent bonding
- metallic bonding.

(a) Sodium chloride is an ionic compound.

Write down **one** property of sodium chloride.

Choose from

conducts electricity when molten

conducts electricity when solid

insoluble in water

low melting point

answer [1]

(b) Metals conduct electricity.

Explain how. Use ideas about metallic bonding.

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

20

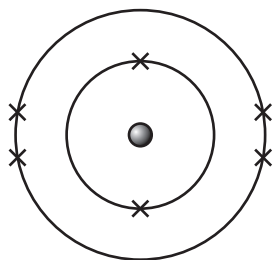
- (c) Electrons are shared between atoms in covalent bonding.

What happens to the electrons in **ionic** bonding?

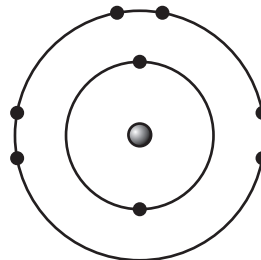
..... [1]

- (d) Carbon dioxide is a covalent compound.

Look at the electronic structures of carbon and oxygen.



carbon 2.4.



oxygen 2.6.

Electrons are shared when covalent bonds are made.

Draw a 'dot and cross' diagram to show a molecule of carbon dioxide, CO₂.

[2]

[Total: 6]

END OF QUESTION PAPER

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The Periodic Table of the Elements

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1	2	Key										3	4	5	6	7	0				
		relative atomic mass atomic symbol name atomic (proton) number																			
7 Li lithium 3	9 Be beryllium 4	23 Na sodium 11	24 Mg magnesium 12	39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54	[222] Rn radon 86			
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86				
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[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

* 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.