

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

Unit 2 Modules C4 C5 C6
(Foundation Tier)

B642/01

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)

**Friday 23 January 2009
Morning**

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	

2

Answer **all** the questions.**Section A – Module C4**

- 1 (a) Stowmarket Synthetics make a washing-up liquid.



The washing-up liquid is used to clean dirty plates.

It contains different ingredients.

Draw a straight line to join each **ingredient** to the **reason** it is used.

One line has been drawn for you.

ingredient	reason
detergent	to help water to drain off plates
colouring agent	as an active cleaner
rinse agent	to make it look attractive
water	to soften hard water
water softener	to thin out washing-up liquid so it is easier to squeeze out of bottle

[3]

3

(b) Rachel and James work for Stowmarket Synthetics.

They want to investigate the cleaning power of the washing-up liquid at different temperatures.

To make the investigation fair they always use

- 1 cm³ of washing-up liquid
- 1000 cm³ of water
- identical dirty plates.

Look at the table. It shows the results of their investigation.

temperature of water in °C	number of dirty plates that could be cleaned	height of foam produced in cm
10	15	15
20	19	16
30	23	14
40	27	15
50	31	15

(i) What is the height of foam produced at 30 °C?

..... cm

[1]

(ii) Increasing the temperature affects the number of plates that can be cleaned.

Describe how.

.....

..... [1]

[Total: 5]

4

2 This question is about acids and bases.

(a) What is the name of the **type** of reaction that happens when an acid reacts with a base?

Choose from:

decomposition

electrolysis

neutralisation

precipitation

answer [1]

(b) Look at the table. It shows the name and formula of some bases.

name of base	formula of base
ammonia	NH_3
calcium hydroxide	$\text{Ca}(\text{OH})_2$
copper oxide	CuO
sodium oxide	Na_2O

(i) How many different **elements** are chemically bonded in sodium oxide?

..... [1]

(ii) Which base has a formula with five **atoms** in total?

..... [1]

5

- (c) (i) Copper oxide reacts with dilute sulfuric acid.

It makes copper sulfate and one other product.

What is the name of the **other product**?

..... [1]

- (ii) Copper oxide reacts with dilute nitric acid to make a salt.

What is the name of this **salt**?

..... [1]

- (d) Copper carbonate reacts with dilute nitric acid. It makes a gas.

What is the name of this **gas**?

..... [1]

[Total: 6]

3 Medicines and pharmaceutical drugs are speciality chemicals.



- (a) It often takes years to develop a drug before it can be used by the public.

There are many factors that affect the cost of developing and making a new drug.

One of these is the cost of research and testing.

Write about some of the **other** factors.

.....

.....

.....

.....

..... [3]

- (b) Drugs are made on demand in small amounts called batches.

Ammonia is made in large amounts all of the time.

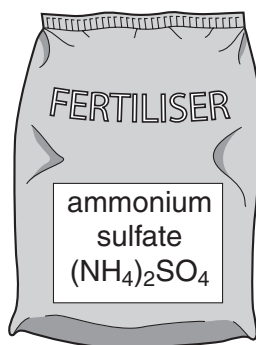
What is the name of a process that makes a chemical all of the time, 24 hours a day, 7 days a week?

..... [1]

[Total: 4]

7

- 4 Ammonium sulfate is a fertiliser used by farmers.



Ammonium sulfate has the formula $(\text{NH}_4)_2\text{SO}_4$.

- (a) Ammonium sulfate contains one of the essential elements needed by plants.

Write down the name of **one** essential element needed by plants.

..... [1]

- (b) Why do farmers use fertilisers?

.....
 [1]

- (c) Cassie makes some ammonium sulfate crystals.

She predicts she should make 24.6 g of crystals.

She actually makes 4.92 g of crystals.

What is her percentage yield?

.....

percentage yield = % [2]

- (d) A solution of fertiliser in water has a pH of 3.5.

What does this tell you about the fertiliser solution?

..... [1]

[Total: 5]

Section B – Module C5

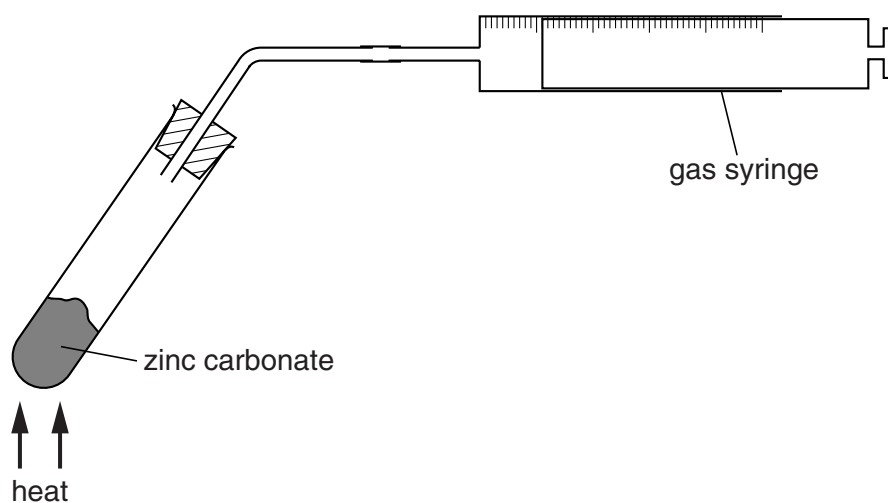
- 5 Viviana investigates the thermal decomposition of zinc carbonate.

She puts 0.47 g of zinc carbonate into a test-tube.

She then heats the zinc carbonate using a blue Bunsen flame.

Carbon dioxide and zinc oxide are made.

Look at the apparatus she uses.

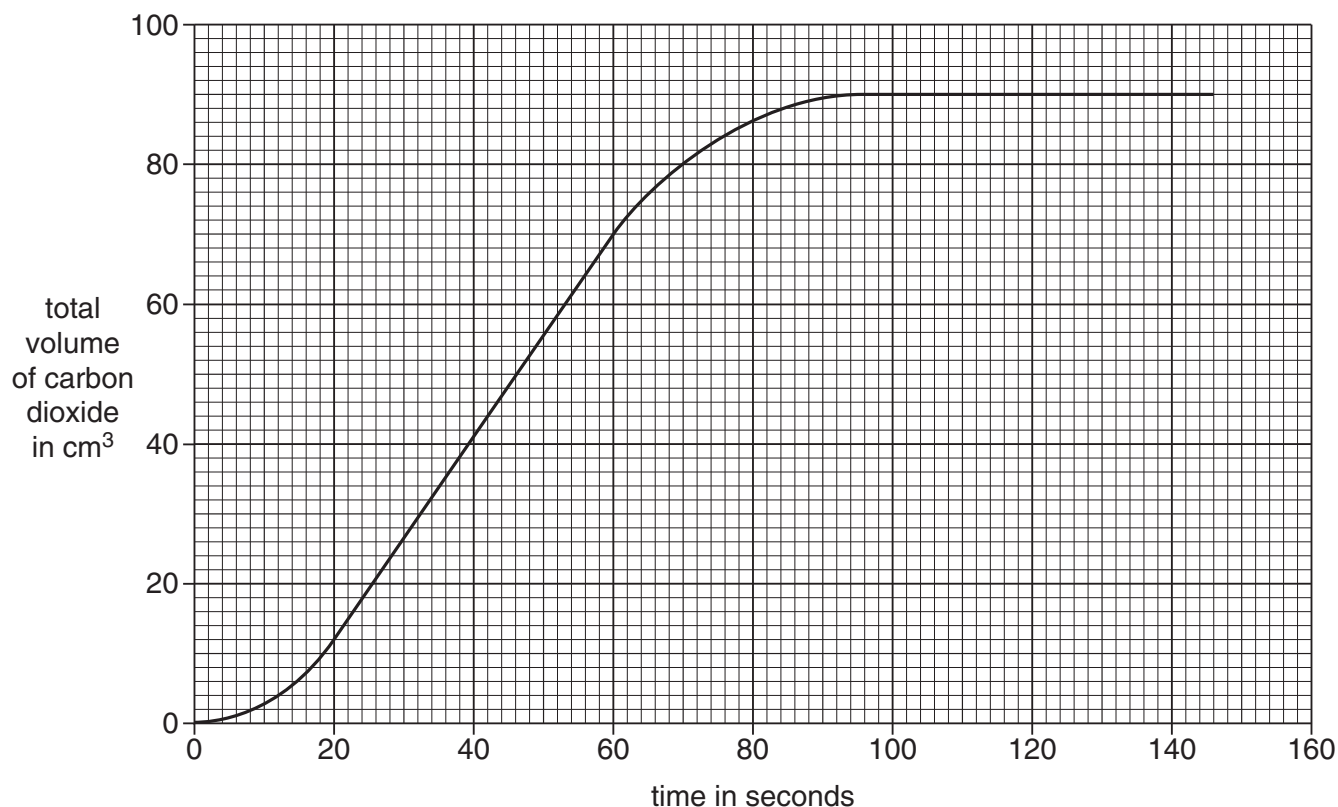


9

She uses a gas syringe to collect the carbon dioxide made.

Every 30 seconds she measures the total volume of carbon dioxide in the gas syringe.

Look at the graph of Viviana's results.



(a) (i) How long does it take to make 70 cm³ of carbon dioxide?

..... seconds [1]

(ii) What is the total volume of carbon dioxide made at the end of the reaction?

..... cm³ [1]

(iii) At what time does the reaction stop?

..... seconds [1]

10

(b) At the end of the experiment Viviana finds out how much zinc oxide she has made.

Look at her table of results.

substance	mass in grams
mass of zinc carbonate before heating	0.47
mass of zinc oxide after heating	0.30
mass of carbon dioxide made

(i) What is the mass of carbon dioxide made?

Put your answer in the table.

[1]

(ii) Viviana repeats the experiment.

This time she uses **0.94** g of zinc carbonate instead of 0.47 g.

Predict how much zinc oxide she should make.

.....

.....

mass of zinc oxide = g

[1]

[Total: 5]

- 6 Sulfur, air and water are raw materials used to make sulfuric acid.

Sulfuric acid is made by the Contact Process.

- (a) Complete the word equation for **stage 1** of the Contact Process.

Stage 1 + \rightarrow sulfur dioxide

Stage 2 sulfur dioxide + oxygen \rightleftharpoons sulfur trioxide

Stage 3 sulfur trioxide + water \rightarrow sulfuric acid [1]

- (b) Look at **stage 2**.

- (i) What is the meaning of the symbol \rightleftharpoons ?

..... [1]

- (ii) The conditions used for **stage 2** are

- 450 °C
- atmospheric pressure
- a catalyst.

What is the name or formula of the catalyst used?

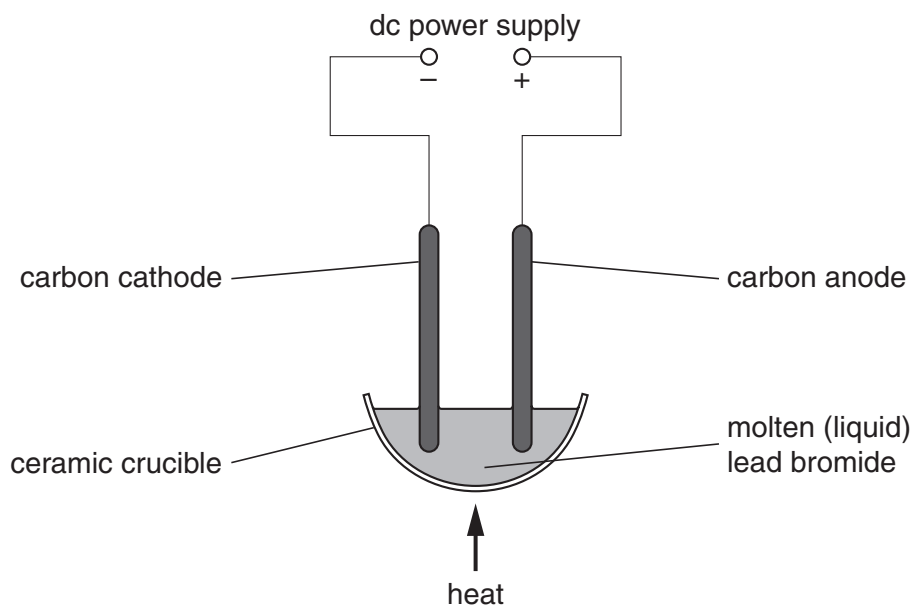
..... [1]

[Total: 3]

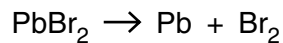
7 This question is about electrolysis.

Look at the diagram.

It shows the apparatus needed for the electrolysis of molten (liquid) lead bromide.



Look at the symbol equation. It shows how lead bromide is broken down during electrolysis.



(a) Molten lead bromide is electrolysed.

(i) Write down the **name** of one **product** of this electrolysis.

..... [1]

(ii) Two factors affect how much product is made in this electrolysis.

One factor is the current used.

Write down the **other factor** that affects how much product is made.

..... [1]

13

(b) Electrolysis involves the movement of ions.

Molten (liquid) lead bromide can be electrolysed but **solid** lead bromide cannot.

Explain why.

.....

.....

..... [2]

[Total: 4]

14

- 8 Imran researches acids using the internet.

He finds out that hydrobromic acid is a **strong** acid.

He also finds out that citric acid is a **weak** acid.

- (a) Imran tests the pH value of both acids.

Both acids have the same concentration.

Finish the sentence.

Choose words from the list.

less than

more than

the same as

The pH value of hydrobromic acid is the pH value of citric acid. [1]

- (b) Write down the name of another **weak** acid.

Choose from the list.

ethanoic acid

hydrochloric acid

nitric acid

sulfuric acid

answer [1]

- (c) Ethanoic acid reacts with magnesium ribbon.

It makes a gas.

What is the name of this gas?

Choose from the list.

carbon dioxide

ethane

hydrogen

oxygen

answer [1]

15

(d) The molar mass of hydrochloric acid, HCl , is 36.5 g/mol .

What is the molar mass of nitric acid, HNO_3 ?

The relative atomic mass (A_r) of H is 1, of N is 14, of O is 16 and of Cl is 35.5.

.....
.....
.....

molar mass = g/mol

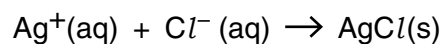
[1]

[Total: 4]

- 9 Precipitation reactions can be used to test for ions in solution.

Silver nitrate solution can be used to test for the halide ions.

Look at the ionic equation.



- (a) What does the symbol **(s)** in the ionic equation mean?

..... [1]

- (b) What does the symbol **(aq)** in the ionic equation mean?

..... [1]

- (c) Rachael tests a solution to see if it contains either

- chloride ions, Cl^-
- or iodide ions, I^- .

She adds silver nitrate to the solution.

Her results tell her which ion is present in the solution.

Describe how.

Include the possible results of her test.

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

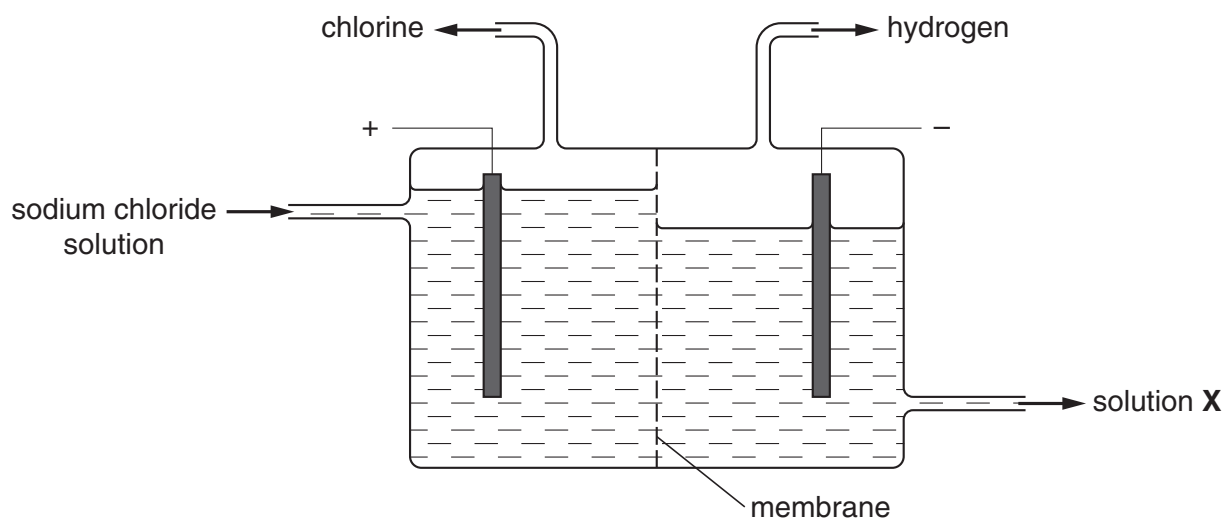
[Total: 4]

Section C – Module C6

10 This question is about chemicals made from sodium chloride.

(a) A solution of concentrated sodium chloride is electrolysed.

Look at the diagram. It shows the apparatus used.



Hydrogen gas and chlorine gas are made.

(i) Write down a chemical test for hydrogen.

test

result [2]

(ii) Write down a chemical test for chlorine.

test

result [2]

(iii) Solution X is also made in the electrolysis cell.

What is the name of solution X?

..... [1]

(b) Write down a use for hydrogen gas.

..... [1]

[Total: 6]

- 11 This question is about chlorofluorocarbons, CFCs.

Most CFCs are now banned in the UK.

This is because they damage the ozone layer.

- (a) Chlorofluorocarbons contain **three** different elements.

Two of these elements are chlorine and carbon.

Write down the **name** of the **other** element.

..... [1]

- (b) Write down **two** uses of chlorofluorocarbons.

1

2 [2]

- (c) The damage to the ozone layer can cause medical problems.

Write down **two** of these problems.

1

2 [2]

[Total: 5]

12 This question is about aspirin.

Aspirin is used to thin the blood.



(a) Write down **two** other reasons for taking aspirin.

1

2 [2]

(b) Aspirin can be extracted from a plant.

What is the name of this plant?

..... [1]

(c) Aspirins and other medicines are sold in some shops.

Look at the list.

engineers

geologists

pharmacists

Complete this sentence. Choose from the list.

Trained people allowed to sell medicines are called [1]

[Total: 4]

13 This question is about the hardness of water.

Hardness of water is caused by chemicals dissolved in the water.

There are two types of hardness, temporary and permanent.

(a) Look at the list of chemicals.

calcium hydrogencarbonate

calcium sulfate

sodium chloride

sodium hydroxide

Complete the sentences using chemicals from the list.

(i) Temporary hardness is caused by [1]

(ii) Permanent hardness is caused by [1]

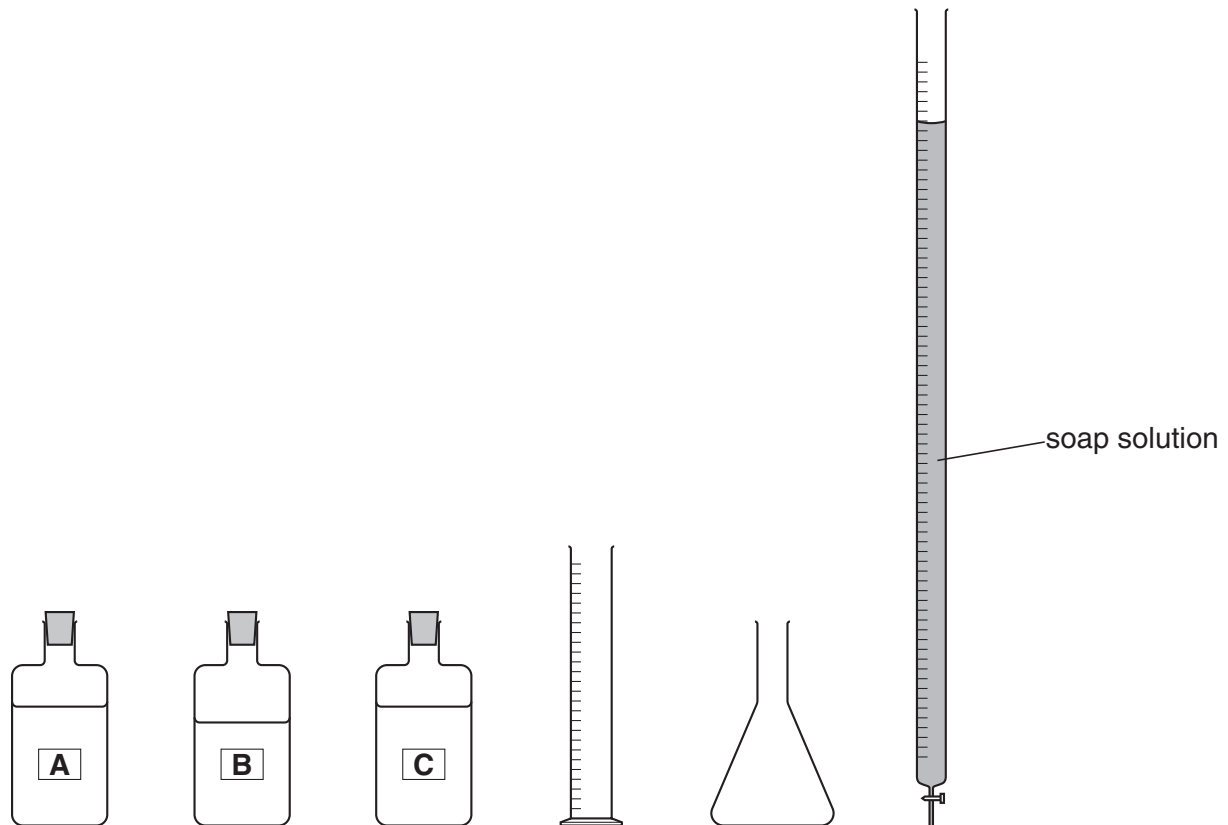
21

(b) Claire collects water samples from three different places, **A**, **B** and **C**.

They have different amounts of hardness.

She wants to compare the hardness of these samples.

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



Write about how Claire uses the apparatus to compare the hardness of the water samples.

.....

.....

.....

.....

..... [3]

[Total: 5]

END OF QUESTION PAPER

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The Periodic Table of the Elements

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24

1	2	Key										3	4	5	6	7	0													
		relative atomic mass atomic symbol name atomic (proton) number																1 H hydrogen 1												
7 Li lithium 3	9 Be beryllium 4																	11 B boron 5		12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10						
23 Na sodium 11	24 Mg magnesium 12																							27 Al aluminium 13		28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
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													
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																			

* 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.