OCR
RECOGNISING ACHIEVEMENT

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B641/02

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

CHEMISTRY B

Unit 1 Modules C1 C2 C3 (Higher Tier)

THURSDAY 5 JUNE 2008

Morning
Time: 1 hour

CUP/T50942

Candidates answer on the question paper.
Additional materials (enclosed):
None

Calculators may be used.
Additional materials: Pencil
Ruler (cm/mm)

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

- Write your name in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use blue or 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.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is **60**.
- The Periodic Table is printed on the back page.

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

This document consists of **19** printed pages and **1** blank page.

[Turn over

Answer **all** the questions.

Section A – Module C1

1 This question is about foods and food additives.

Look at the table. It gives some information about E-numbers.

type of food additive	E-number range
food colour	E101 to E199
preservative	E200 to E299
antioxidant	E300 to E321
emulsifiers	E400 to E499
sweeteners	E950 to E967

Look at the food label found on a jar of mayonnaise.

Ingredients:
Vegetable oil, water, egg yolk, sugar, vinegar, salt, E202, E472 and E953.

(a) What type of additive is E202?

.....[1]

(b) Does this mayonnaise contain a food colour? .....

Explain your answer.

.....

.....

.....[1]

(c) Egg yolk is an emulsifier in mayonnaise.

Egg yolk stops the water and oil from separating.

Look at the diagram.

It shows a molecule of an emulsifier.

Explain how emulsifier molecules stop oil and water from separating.

Use a labelled diagram to help you.

.....

.....

.....

.....[2]

[Total: 4]

2 A perfume needs certain properties.

These properties include

- evaporates easily
- non-toxic
- insoluble in water.

(a) **(i)** Explain why a perfume should be non-toxic.

.....[1]

(ii) Explain why a perfume should be insoluble in water.

.....[1]

(b) Explain why a perfume evaporates easily.

Use ideas about particles and the forces between particles.

.....

.....

.....[2]

(c) An ester is used to make a nail varnish remover.

Look at the list.

soluble

solute

solution

solvent

Finish this sentence.

Choose from the list.

The ester in the nail varnish remover is a ..... . [1]

[Total: 5]

3 This question is about crude oil and cracking.

(a) Distillation is used to separate crude oil into fractions.

Look at the table.

It compares the amounts of each fraction **produced** by distillation with the amounts needed (**demand**).

fraction	amount produced in tonnes	demand in tonnes
gases	2	4
petrol	18	27
diesel	14	8
lubricating oils	23	23
heating oil and tar	47	38

(i) For one fraction, the amount produced exactly matches the demand.

Which fraction?

.....[1]

(ii) For **two** fractions, the demand is greater than the amount produced.

Which two fractions?

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

(b) Cracking helps a refinery to match the amount produced to the demand.

Explain how cracking does this.

.....

.....

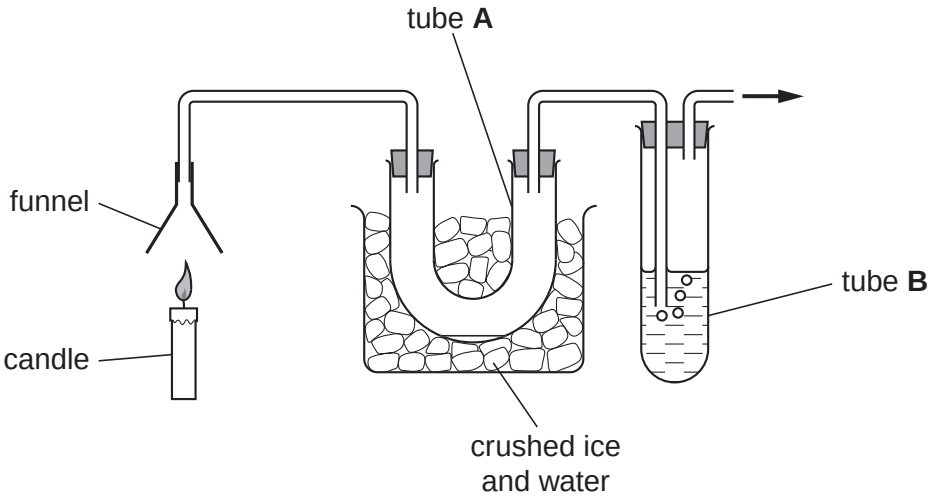
.....[2]

[Total: 4]

4 Look at the diagram.

It shows a hydrocarbon fuel burning.

The chemicals made when the fuel burns go through the apparatus.



(a) **(i)** Tube **A** is surrounded by ice.

A colourless liquid slowly collects in tube **A**.

Write down the name of this liquid.

.....[1]

(ii) The liquid in tube **B** is used to test for carbon dioxide.

Write down the name of the liquid used to test for carbon dioxide.

.....[1]

(b) The complete combustion of a hydrocarbon is **better** and **safer** than incomplete combustion.

One reason is that complete combustion produces less soot.

Write down **one other** reason why complete combustion is better and safer.

.....

.....[1]

[Total: 3]

5 This question is about energy changes during reactions.

(a) Look at the table.

It shows the temperature changes for three different reactions.

reaction	start temperature in °C	end temperature in °C	temperature change in °C
A	18	11	–7
B	17	17	0
C	19	23	+4

One reaction is exothermic.

Which one?

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

answer ..... [1]

(b) During a chemical reaction, bonds are broken. Other bonds are made.

Bond breaking takes in energy.

Bond making gives out energy.

Burning a hydrocarbon fuel is exothermic.

Explain why it is exothermic.

Use ideas about bond breaking and making.

.....

.....[1]

(c) Liz burns **0.7 g** of a fuel. It gives out 560 joules of energy.

Calculate how much energy **1.0 g** of this fuel gives out when it burns.

.....

.....

.....

.....

answer ..... J [2]

[Total: 4]

Section B – Module C2

6 **Granite**, **limestone** and **marble** are three rocks used to construct buildings.

(a) Granite, limestone and marble have different hardness.

Look at the list of sentences about these rocks.

Which sentences about the rocks are correct?

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

Granite is an igneous rock.	☐
Granite is harder than marble.	☐
Limestone is a metamorphic rock.	☐
Limestone is harder than marble.	☐
Marble is a sedimentary rock.	☐

[2]

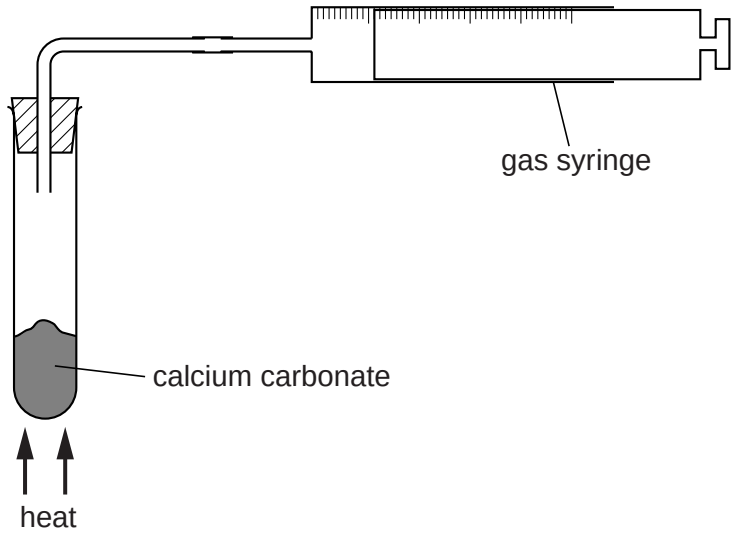
(b) When heated, calcium carbonate makes calcium oxide and carbon dioxide.

Write down the **word** equation for this reaction.

.....[1]

(c) Georgia heats a sample of calcium carbonate.

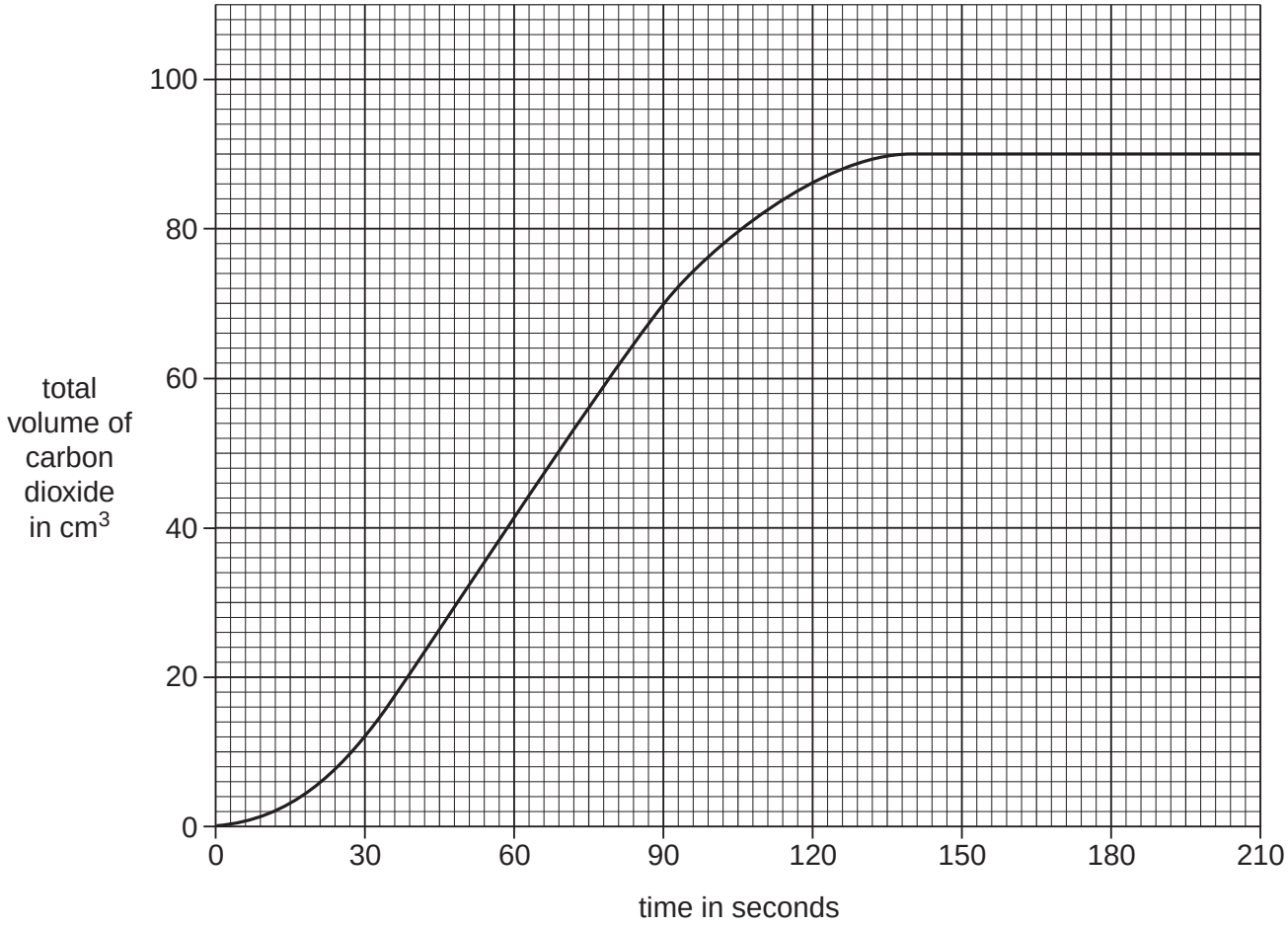
Look at the apparatus she uses.



The carbon dioxide made is collected in a gas syringe.

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

Look at the graph of Georgia's results.



(i) At which time is the reaction the **fastest**?

Choose from the list.

0 – 30 seconds **60 – 90 seconds**

120 – 150 seconds **180 – 210 seconds**

answer .....[1]

(ii) Georgia repeats the experiment using the same mass of calcium carbonate.

This time she uses a much **hotter** Bunsen flame.

Sketch on the **graph** the results you would expect her to get. [1]

(d) Cement is made by heating a mixture of limestone and another substance.

What is the name of the other substance?

Choose from the list.

aluminium **clay** **marble** **sand**

answer .....[1]

[Total: 6]

7 This question is about molten rock and volcanoes.

(a) Some people live near volcanoes because the soil is fertile.

Geologists study these volcanoes.

Suggest why geologists study these volcanoes.

.....

.....[1]

(b) Some volcanic eruptions are very explosive and others are not.

Describe one factor that affects whether an eruption is explosive or not.

.....

.....[1]

(c) Volcanoes are often found at the boundaries between two tectonic plates.

Explain how the collision between two tectonic plates can lead to subduction.

Include in your answer

- the names of the types of tectonic plates involved
- what happens to the plates during subduction
- ideas about density of tectonic plates.

A labelled diagram will help you answer this question.

.....

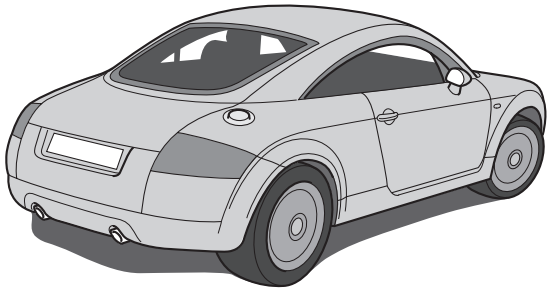
.....

.....

.....[3]

[Total: 5]

8 Motor cars are made from a large number of materials including plastics, iron and steel.



(a) New laws mean that almost all the materials used to make a car should be able to be recycled.

(i) Explain one advantage, other than cost, of recycling materials used to make a car.

.....[1]

(ii) Explain one disadvantage of recycling materials used to make a car.

.....[1]

(b) The parts of a car made from iron will rust.

Rusting happens when iron reacts with water and oxygen.

Rusting is very slow in cold and dry conditions.

Write about the conditions that will speed up rusting.

.....

.....

.....[2]

[Total: 4]

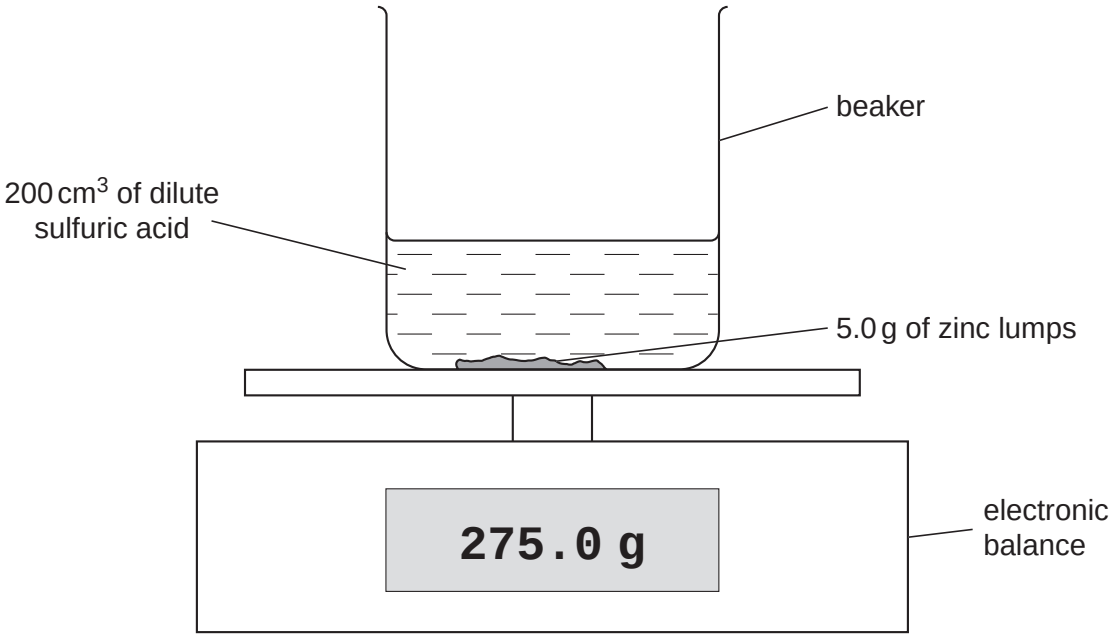
9 Zinc reacts with dilute sulfuric acid.

Look at the word equation for this reaction.

zinc + sulfuric acid ⟶ zinc sulfate + hydrogen

Mike and Ellis investigate the reaction between zinc and dilute sulfuric acid.

Look at the apparatus they use.



Mike and Ellis do four experiments.

They do each experiment using acid at a different concentration.

Each time they use

- 200 cm^3 of sulfuric acid
- 5.0 g of zinc lumps
- a temperature of 20 °C.

(a) The reading on the balance decreases as the reaction happens.

Suggest why.

.....[1]

(b) Mike and Ellis measure the time it takes for the mass on the balance to decrease by 0.1 g.

Look at their results.

concentration of acid in mol / dm^3	time to make 0.1 g of gas in seconds
0.5	900
1.0	450
1.5	250
2.0	140

(i) What happens to the **rate** of reaction as the concentration **increases**?

.....[1]

(ii) Mike and Ellis do another experiment.

They use

- 200 cm^3 of sulfuric acid of concentration 2.0 mol / dm^3
- a temperature of 20 °C
- 5.0 g of zinc **powder** instead of zinc lumps.

Predict how long it will take to make 0.1 g of gas.

..... seconds [1]

[Total: 3]

10 The composition of the atmosphere today remains fairly constant.

- 21% oxygen
- 78% nitrogen
- 0.035% carbon dioxide

Scientists think that the Earth did not have an atmosphere when it was first formed.
One theory is that gases such as ammonia and carbon dioxide escaped from under the Earth's crust.
Later on, water was formed by reactions between ammonia and hot rocks.

Describe one theory of how the ancient atmosphere of ammonia, carbon dioxide and water evolved into the atmosphere of today.

.....

.....

.....[2]

[Total: 2]

Section C – Module C3

11 This question is about different types of bonding.

(a) One type of bonding is **ionic** bonding.

Describe ionic bonding.

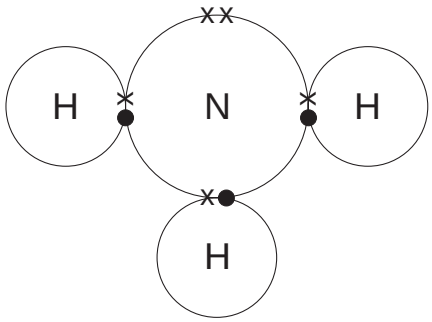
.....

.....

.....[2]

(b) The bonding in ammonia is covalent.

Look at the 'dot and cross' diagram for ammonia, NH_3.



Draw a 'dot and cross' diagram for water, H_2O.

The electronic structure for oxygen is 2.6.

You only need to show the electrons in the outer shell for oxygen.

[2]

(c) Sodium chloride solution conducts electricity.

Pure water does not.

Explain why pure water does not conduct electricity.

.....

.....[1]

[Total: 5]

12 This question is about Group 1 elements.

(a) (i) Sodium reacts with water.

Sodium hydroxide and hydrogen gas are made.

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

.....[1]

(ii) Potassium also reacts with water.

What are the names of the **products** of this reaction?

.....[1]

(b) (i) Lithium, sodium and potassium all react in a similar way with water.

Explain why.

Use ideas about electrons.

.....

.....[1]

(ii) Potassium is more reactive than lithium.

Explain why.

Use ideas about loss of electrons.

.....

.....[1]

(c) Sodium hydroxide contains sodium ions.

A metal ion is formed when a metal atom loses an electron.

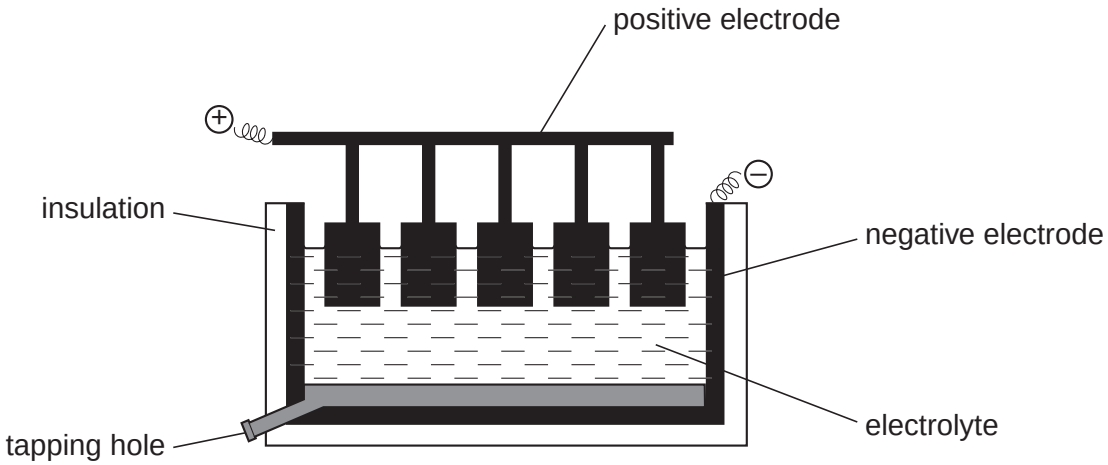
Write a symbol equation for the formation of a sodium ion from a sodium atom.

Use e^- as the symbol for an electron.

.....[1]

[Total: 5]

13 Look at the diagram. It shows how aluminium is made during electrolysis.



(a) Write about how the aluminium is made using this equipment.

Your answer should include

- what chemicals are used
- what is made at each electrode.

.....

.....

.....

.....[3]

(b) There is a higher percentage of aluminium compounds than iron compounds in the Earth's crust.

However, aluminium is much more expensive than iron.

Explain why.

.....[1]

[Total: 4]

14 This question is about the properties of metals.

(a) The bottom of a saucepan is often made from copper.

Suggest why.

.....[1]

(b) Look at the table. It shows information about some metals.

metal	density in g / cm^3	relative strength (1 is low)
aluminium	2.7	10
copper	8.9	44
iron	7.9	42
lead	11.3	3
tin	7.3	2

Aeroplanes are often made from aluminium even though it is not very strong.

Use the information in the table to explain why.

.....

.....[1]

(c) Explain how metals conduct electricity.

Use ideas about metallic bonding.

A diagram may help your answer.

.....

.....

.....[2]

(d) When some metals are cooled to very low temperatures they become superconductors.

Write down **two** possible benefits of using superconductors.

1 .....

2 .....[2]

[Total: 6]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
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						

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.