

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE

B623/01

ADDITIONAL SCIENCE B

Unit 1 Modules B3 C3 P3 (Foundation 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)

Wednesday 25 May 2011
Morning

Duration: 1 hour



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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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.
- A list of physics equations is printed on page two.
- 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

EQUATIONS

$$\text{speed} = \frac{\text{distance}}{\text{time taken}}$$

$$\text{acceleration} = \frac{\text{change in speed}}{\text{time taken}}$$

$$\text{force} = \text{mass} \times \text{acceleration}$$

$$\text{work done} = \text{force} \times \text{distance}$$

$$\text{power} = \frac{\text{work done}}{\text{time}}$$

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

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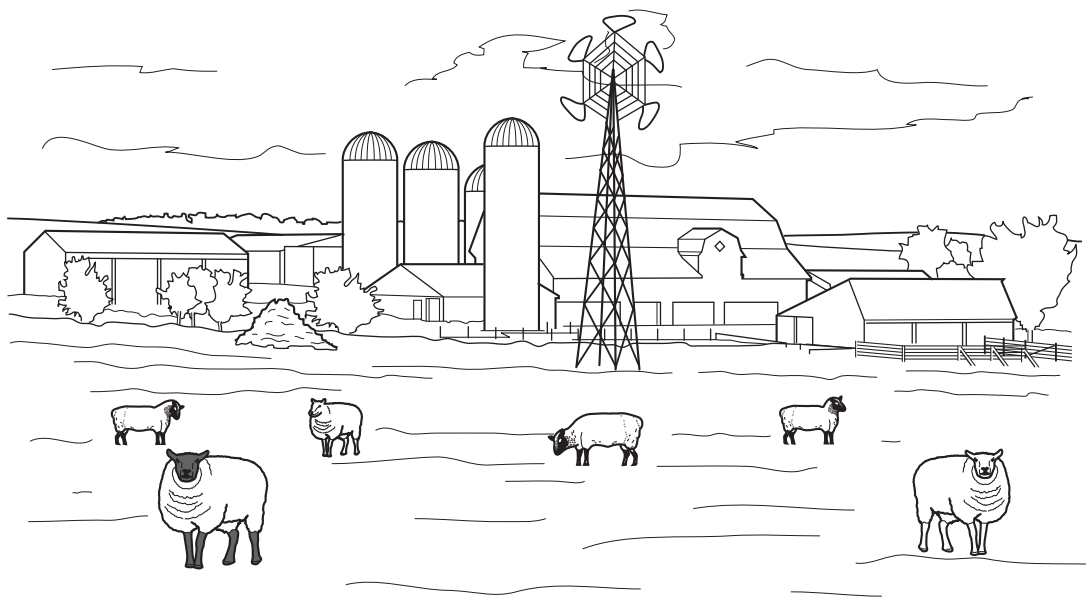
Question 1 starts on page 4.

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

Section A – Module B3

- 1** Rob has a sheep farm.



He wants to improve his flock of sheep to make more money.

- (a)** Look at the list of features.

Two features would improve his sheep to make more money.

Put a tick (✓) in the box next to these two features.

big ears

☐

big eyes

☐

fast growth

☐

thick wool

☐

wide hooves

☐

[2]

- (b) Rob chooses sheep with the best features and breeds them together to get lambs.

This is called selective breeding.

- (i) Could any of the lambs be **clones** of their **parents**?

Explain your answer

..... [1]

- (ii) Could any of the lambs be **clones** of **each other**?

Explain your answer

..... [1]

- (c) The flock of sheep could also be improved by transferring genes from other organisms into sheep embryos.

- (i) What scientific term describes transferring genes from one organism to another?

..... [1]

- (ii) Suggest **one** advantage of improving sheep by transferring genes compared with selective breeding.

.....

..... [1]

[Total: 6]

2 Ethan is two years old.

His body mass has been measured every three months.

The table shows his results.

age in months	0	3	6	9	12	15	18	21	24
mass in kg	2.4	5.0	6.3	7.6	8.8	9.6	9.9	10.1	10.2

(a) Look at the table.

(i) In which three month period did Ethan's mass increase the **most**?

answer: from age months to age months [1]

(ii) In which three month period did Ethan's mass increase the **least**?

answer: from age months to age months [1]

(b) What phase of growth is Ethan in?

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

adolescence ☐

childhood ☐

infancy ☐

maturity ☐

old age ☐

[1]

(c) Ethan started life when a sperm cell from his father joined with an egg cell from his mother.

Complete the following sentences.

The joining of a sperm cell and an egg cell is called

As a baby grows, more cells are formed by cell

New **types** of cells are formed by cell [3]

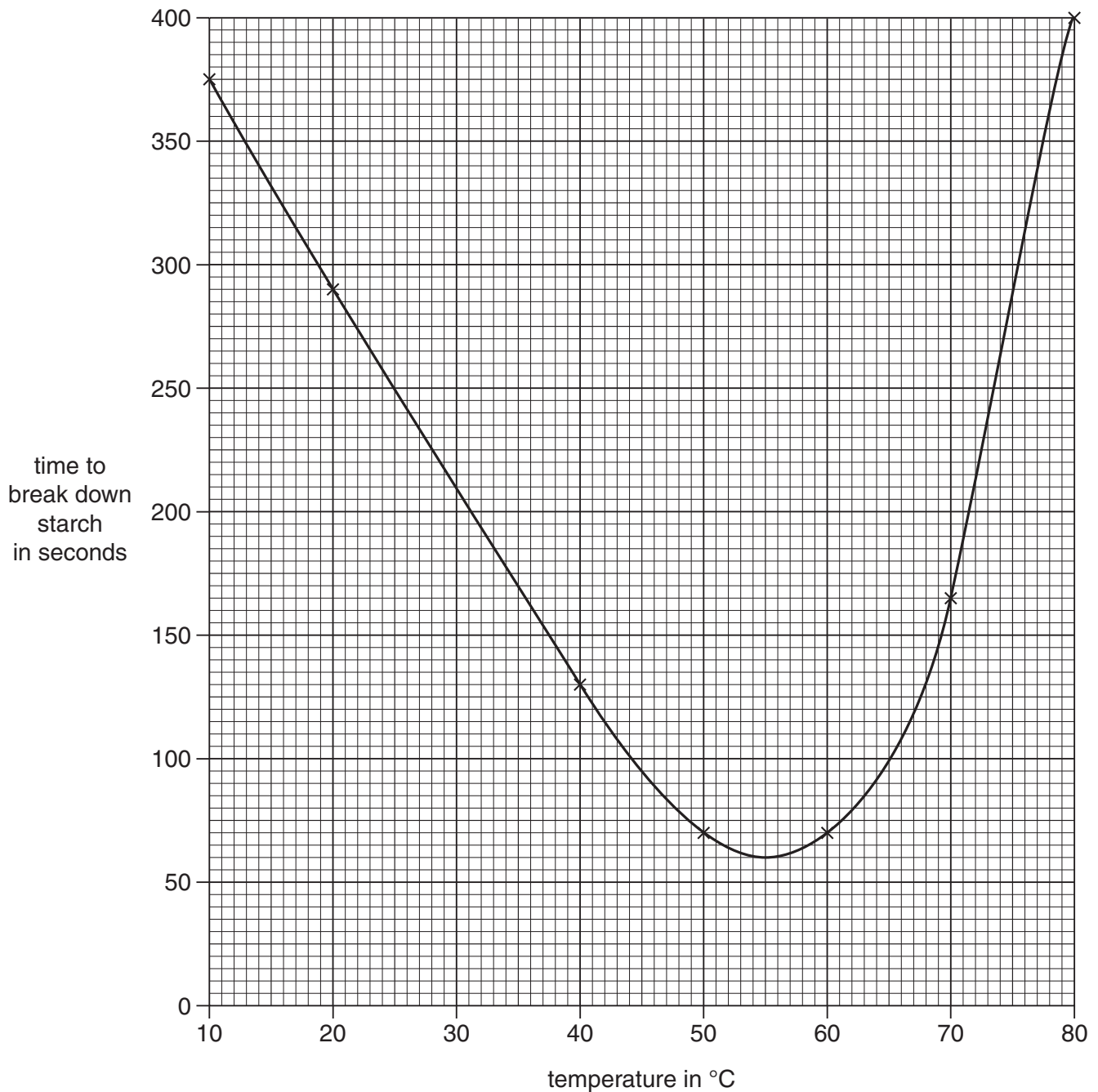
[Total: 6]

7

3 Amylase is an enzyme that breaks down starch.

(a) Ann investigates how quickly one type of amylase breaks down starch at different temperatures.

The graph shows her results.



Look at the graph. What is the optimum temperature of this amylase?

answer °C

[1]

- (b)** In the digestive system, amylase helps break down starch molecules into glucose molecules.

The glucose molecules are absorbed into the blood.

- (i)** By what process are glucose molecules absorbed into the blood?

..... [1]

- (ii)** Starch has to be broken down into glucose before it can be absorbed into the blood.

Suggest why starch has to be broken down before it can be absorbed.

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

- (iii)** In which part of the digestive system is glucose absorbed into the blood?

..... [1]

- (c)** Glucose is absorbed into the blood so it can be transported around the body.

- (i)** Which part of the blood transports glucose?

..... [1]

- (ii)** Blood moves around the body because of the action of the heart.

Describe how each side of the heart moves blood around the body.

In your answer include

- how the heart moves blood
- where each side of the heart moves blood to.

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

[Total: 8]

- 5 Jenny investigates using different metals for electrical wiring.

Look at the table.

It shows information about four different metals.

metal	density in g/cm ³	relative electrical conductivity	melting point in °C	relative thermal conductivity
iron	8	10	1536	80
aluminium	3	38	660	237
copper	9	60	1084	401
magnesium	2	23	650	156

- (a) (i) Iron is the cheapest of the four metals.

Iron is **not** used for electrical wiring in houses.

Explain why. Use information from the table.

.....
 [1]

- (ii) The picture shows some overhead power cables.



Aluminium is used for making overhead power cables instead of copper.

Aluminium is cheaper than copper.

Suggest one **other** reason why aluminium is used. Use information from the table.

.....
 [1]

11

(b) Complete the sentences about metals.

Use words from the list.

alkalis

ionic

metallic

random

regular

superconductors

The particles in a solid metal are in a arrangement.

The particles in a metal are held together by bonds.

At low temperatures some metals can be used as

[3]

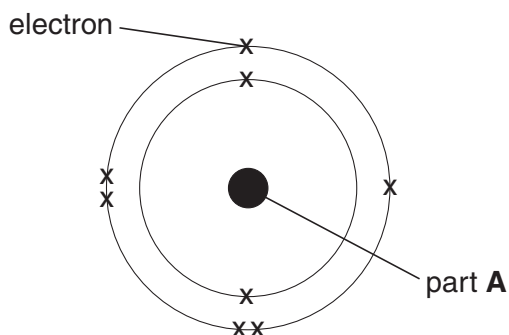
[Total: 5]

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- 6 This question is about atomic structure.

The diagram shows the structure of an oxygen atom.



Complete the crossword puzzle using the clues given. One has been done for you.

clues across

2 Part **A** is called the _____.

3 A particle with a relative mass of 1 is called a _____.

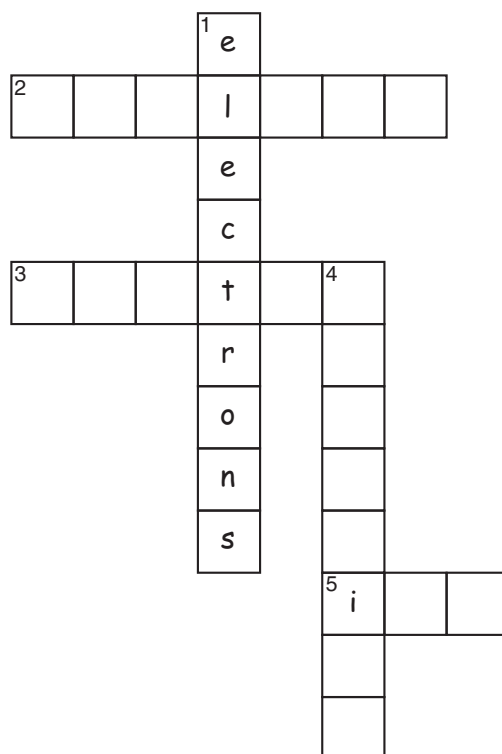
5 A charged atom is called an ____.

clues down

1 The space around part **A** is occupied by e l e c t r o n s.

4 The electrical charge on an electron is _____.

clues across →



↓ clues down

[4]

[Total: 4]

Turn over

- 7 Trevor works for a firework company.



- (a) Trevor has seen flame tests done in a laboratory.

He wants to make a firework that gives red and lilac colours.

He needs to use two different metal compounds.

Which **two** should he use?

Choose from the list.

copper chloride

iron(II) chloride

lithium chloride

sodium chloride

potassium chloride

answer and [2]

- (b) Lithium, sodium and potassium are Group 1 elements.

- (i) The Group 7 elements are called the halogens.

What are the Group 1 elements called?

..... [1]

- (ii) The Group 1 elements are stored under oil.

Explain why.

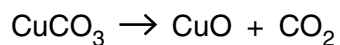
.....
..... [2]

[Total: 5]

15

- 8 Copper carbonate decomposes when heated.

The symbol equation for this reaction is



- (a) Write down the formula for a reactant in this reaction.

.....

[1]

- (b) Copper carbonate has the formula CuCO_3 .

How many **atoms** are there in this formula?

.....

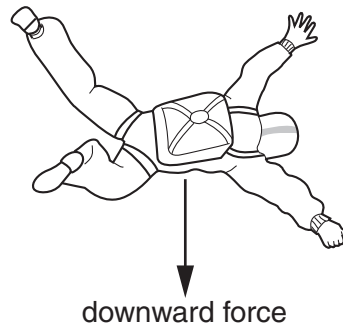
[1]

[Total: 2]

Section C – Module P3

- 9 (a) Patrick is a parachutist.

He jumps out of an aeroplane.



- (i) Write down the **name** of the **downward** force acting on Patrick.

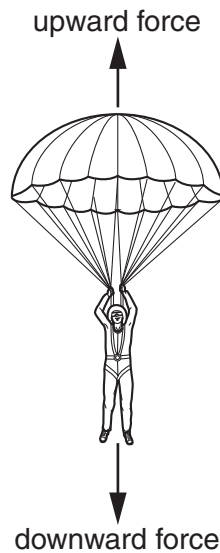
..... [1]

- (ii) What happens to Patrick's **speed** just after he jumps from the plane?

..... [1]

- (b) Patrick opens his parachute.

After a short time he falls at a steady speed.



- (i) The upward force on Patrick acts against the downward force.

Write down the **name** of the **upward** force acting on Patrick.

..... [1]

17

- (ii) Jane wants to calculate Patrick's **speed** as he falls.

What two **measurements** will Jane need to take to calculate speed?

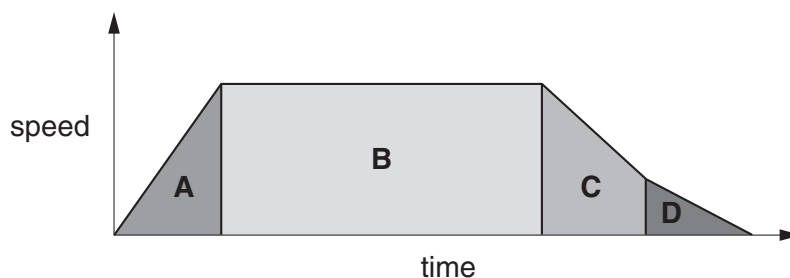
1

2 [2]

[Total: 5]

10 Fernando is a racing driver.

Look at the graph. It shows the speed of his car during part of a race.



(a) (i) Which part of the graph shows the car travelling at a **constant speed**?

Choose from **A** **B** **C** **D**

answer

[1]

(ii) Which part of the graph shows the car **speeding up**?

Choose from **A** **B** **C** **D**

answer

[1]

(b) In a different part of the race Fernando makes the car **accelerate** quickly.

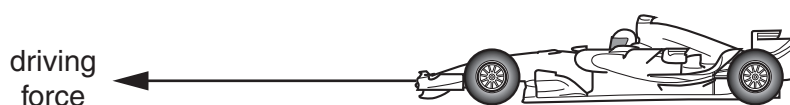
(i) Complete the sentence.

Acceleration is the in speed per unit

[1]

(ii) The acceleration of the car is 5 m/s^2 .

The total mass of the car and driver is 1200 kg.



Calculate the **driving force**.

The equations on page 2 may help you.

.....

answer N

[2]

19

- (iii) Fernando drives the car along a **straight** part of the racing circuit.

The length of the straight part of the racing circuit is 200 m.

The driving force is now 8000 N.

The driving force stays the same along the straight part of the racing circuit.

Calculate the **work done** by the car's engine.

The equations on page 2 may help you.

.....

.....

.....

answer J

[2]

[Total: 7]

20

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11 Hybrid cars are becoming more popular with motorists.



Some hybrid cars run on fuels made from fossil fuels. They store and reuse energy from braking.

Look at the table.

type of car	type of fossil fuel	engine size	fuel consumption in kilometres travelled per litre of fuel
hybrid	petrol	medium	25
non-hybrid	petrol	medium	12
non-hybrid	diesel	medium	16
non-hybrid	petrol	small	14

These cars have the same shape and mass.

Suggest how cars can be made **more efficient**.

Use the information in the table to write about

- the type of car
- the type of fossil fuel used by the car
- the engine size.

.....

.....

.....

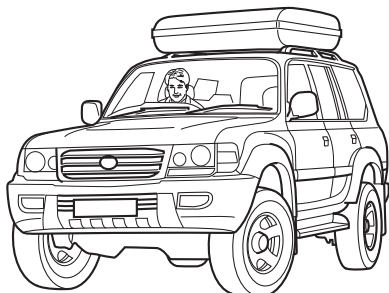
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..... [3]

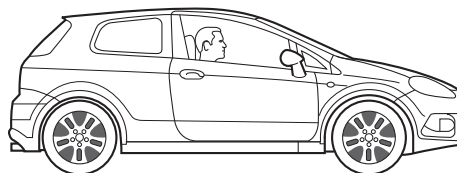
[Total: 3]

12 Look at the two cars.

They have the same size engine.



car **A**
four wheel drive SUV
mass = 2000 kg
top speed = 140 km/h



car **B**
super-mini
mass = 1400 kg
top speed = 170 km/h

(a) (i) Both cars accelerate.

Car **B** has higher acceleration.

Suggest **one** reason why car **B** has **higher** acceleration.

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

(ii) The cars are driven up a hill to the same height.

Car **A** has more gravitational **potential** energy (PE) than car **B**.

Why does car **A** have **more** potential energy?

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

(iii) What is the unit for **energy**?

Choose from the list.

joule

metre

newton

watt

answer [1]

(b) Car **A** then travels down the hill.

The car travels at **twice** the speed that it did on the way up.

Complete the sentence to show how much the kinetic energy (KE) of the car changes.

As the **speed** of the car doubles, the KE of the car [1]

(c) Both cars have similar safety features.

They both have crumple zones, air bags and seat belts.

These safety features can reduce injuries in a **crash**.

Look at the statements.

Which one is correct?

A	in a crash the safety features produce energy
B	in a crash the safety features destroy energy
C	in a crash the safety features absorb energy
D	in a crash the safety features increase the energy

answer [1]

[Total: 5]

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											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.