OCR
RECOGNISING ACHIEVEMENT

F

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE
ADDITIONAL SCIENCE B

B623/01

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 20 May 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.
- 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.

EQUATIONS

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

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

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

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

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

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

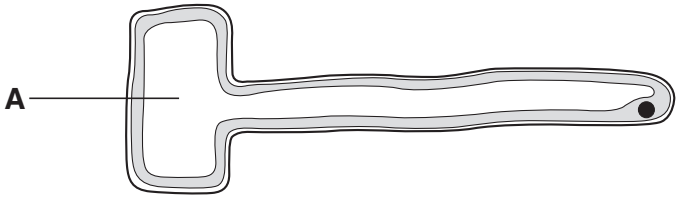
Answer **all** the questions.

Section A – Module B3

1 Sam is investigating roots.

She uses a microscope to look at a root hair cell.

The diagram shows one of the cells Sam sees.



(a) (i) Write down the name of the part labelled **A**.

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

(ii) Write down the job of part **A**.

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

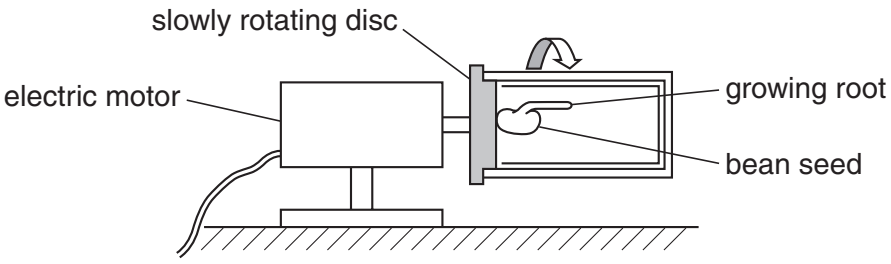
(b) Oxygen moves into the root hair cell by diffusion.

What is meant by the term **diffusion**?

.....

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

(c) Sam places a growing bean seed on a rotating disc.



Finish the sentences about the growing root.

Roots normally grow downwards because they are positively ..... .

The root on this bean is growing outwards because Sam has removed the effect of

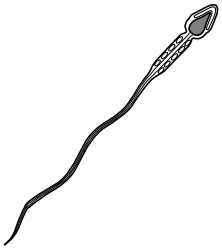
..... . **[2]**

[Total: 5]

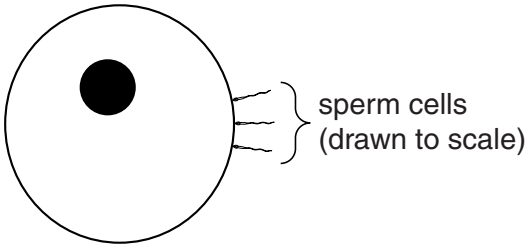
2 This question is about fertilisation.

(a) Sperm and egg cells are adapted to carry out fertilisation.

They both have a nucleus to carry genes.



sperm cell
(not to scale)



egg cell

The table shows one adaptation for the egg and sperm.

Finish the table to show:

- **one other** adaptation for the egg and why it is useful.
- **one other** adaptation for the sperm and why it is useful.

	adaptation	**why it is useful**
egg	nucleus	to carry genes
sperm	nucleus	to carry genes

[2]

(b) Write down the name of the type of cell division that **makes** egg and sperm cells.

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

(c) After fertilisation, cell division takes place to form a foetus.

The foetus gets some substances from the mother which pass across the placenta.

Choose your answers for the following questions from this list.

blood **carbon dioxide** **DNA** **nitrogen** **oxygen**

(i) Write down **one** substance the foetus **gets** from its mother across the placenta.

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

(ii) Write down **one** substance the foetus **passes** to the mother across the placenta.

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

[Total: 5]

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PLEASE DO NOT WRITE ON THIS PAGE

3 Bill investigates the effect of exercise on his pulse rate.

He counts his pulse for 30 seconds at rest. He multiplies this by two to get his pulse rate.

He pedals an exercise bike for 2 minutes and then counts his pulse again.

He repeats the experiment but changes how fast he pedals.

The table shows his results.

speed of exercise in km/h	pulse rate in beats per minute
0 (rest)	76
10	96
15	
20	110
25	120

(a) Finish the sentence about Bill's results.

When Bill exercises faster his pulse rate ..... . **[1]**

(b) After pedalling at 15 km/h Bill counted 45 beats in 30 seconds.

(i) Calculate Bill's pulse rate after pedalling at 15 km/h.

pulse rate ..... beats per minute **[1]**

(ii) What is unusual about the result for 15 km/h?

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

(c) Describe the job of the heart.

In your answer, include

- the job of the left side of the heart
- the job of the right side of the heart.

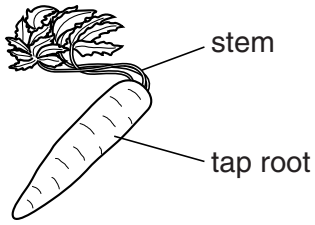
.....

.....

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

[Total: 5]

4 Carol grows carrots to enter in the biggest carrot competition.



(a) She uses selective breeding to help her to produce large carrots.

Put a tick (✓) in the box next to **one** characteristic Carol wants in her carrots.

short stems	☐
bright yellow colour	☐
large tap root	☐
few leaves	☐

[1]

(b) Describe how Carol would carry out the selective breeding process.

.....

.....

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

(c) Carrots contain a gene that controls beta-carotene production.

Beta-carotene is used to make vitamin A, which is needed for good eyesight.

The beta-carotene gene can be removed from carrots and placed in rice plants.

Finish the sentences.

Choose your answers from this list.

cloning

cytoplasm

genetic engineering

membrane

mutation

nucleus

Genes are found in the part of the cell called the ..... .

Removing the genes from a carrot and putting them into rice is

called ..... . **[2]**

[Total: 5]

Section B – Module C3

5 This question is about the elements in the Periodic Table.

Look at the list of elements.

argon	**chromium**
hydrogen	**iodine**
magnesium	**neon**
nitrogen	**oxygen**
potassium	**sodium**

Answer the questions.

Choose your answers from the list.

Each element can be used **once**, **more than once** or **not at all**.

The Periodic Table on the back page may help you.

(a) Write down the name of the element which has the **atomic number** of **11**.

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

(b) Write down the names of two elements in **Period 2**.

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

(c) Write down the name of the element which has only **6 electrons** in its outer shell.

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

(d) A compound gives a **lilac** colour in a flame test.

Write down the name of the element in the compound which gives this colour.

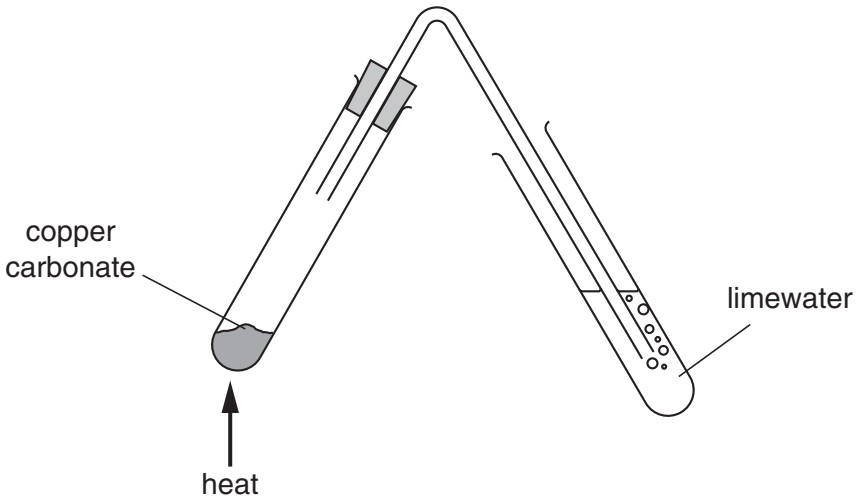
..... **[1]**

[Total: 4]

6 This question is about thermal decomposition.

Nick and Phil are heating some copper carbonate.

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



(a) Copper carbonate decomposes when it is heated.

Copper oxide and carbon dioxide are made.

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

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

(b) This reaction is an example of **decomposition**.

What does decomposition mean?

.....

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

(c) The diagram shows carbon dioxide bubbling through **limewater**.

What happens to the limewater?

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

[Total: 3]

7 Iron is a metal.

Look at the picture of a bridge.

It is made from iron.

(a) Iron has a high melting point and a high boiling point.

These are two of its properties.

What **other** property of iron makes it a suitable material for making the bridge?

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

(b) Look at this list of properties.

colourless

good conductor of electricity

low density

soft

Most metals have one of the properties in the list.

Which one?

Choose your answer from the list.

answer ..... **[1]**

(c) The photograph shows a train built in Japan.

The train can travel at over 500 km per hour.

The train floats above a track.

This is possible by the use of superconductors.

(i) Some metals can become superconductors.

Look at the list.

Choose the temperature at which some metals can become superconductors.

the boiling point of the metal

the melting point of the metal

at a very low temperature

above room temperature

answer ..... **[1]**

(ii) The Japanese train is held above the track by magnetism.

A superconductor uses a large current to make a powerful magnet.

Write down the name of this type of magnet.

answer ..... **[1]**

(iii) These powerful magnets are an advantage of superconductors.

Write down **one other** advantage of using superconductors.

.....

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

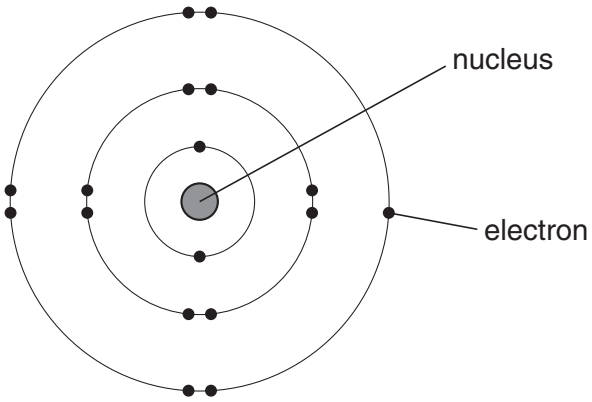
[Total: 5]

8 This question is about the halogens.

Chlorine and iodine are two of the halogens.

They are in Group 7 of the Periodic Table.

Look at the diagram. It shows an atom of chlorine.



(a) What is the electrical charge on an electron?

Choose from the list.

negative

neutral

positive

answer ..... **[1]**

(b) The halogens have similar chemical properties.

Explain why. Use ideas about electronic structure.

.....

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

(c) **(i)** Write down **one** use of chlorine.

.....

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

(ii) Write down **one** use of iodine.

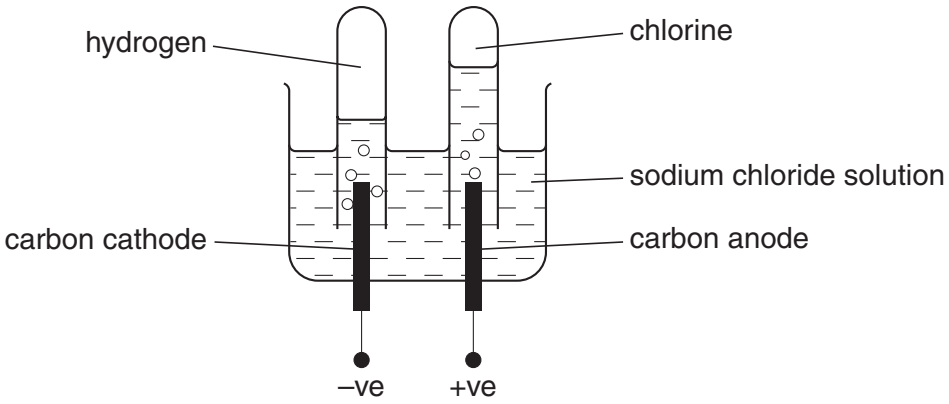
.....

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

[Total: 4]

9 Sophie investigates passing an electric current through dilute sodium chloride solution.

Look at the apparatus she uses.



(a) Look at the list. It shows the particles in sodium chloride solution.

H^+ **H_2O** **OH^-** **Cl^-** **Na^+**

Cations are attracted to the cathode.

Write down **one** particle which is a cation.

Choose from the list.

answer ..... **[1]**

(b) Sodium atoms, Na, lose electrons to make sodium ions, Na^+.

How many electrons does each sodium atom lose?

answer ..... **[1]**

(c) The electrolysis of sodium chloride solution makes hydrogen gas.

Write about how you can test for hydrogen.

.....

.....

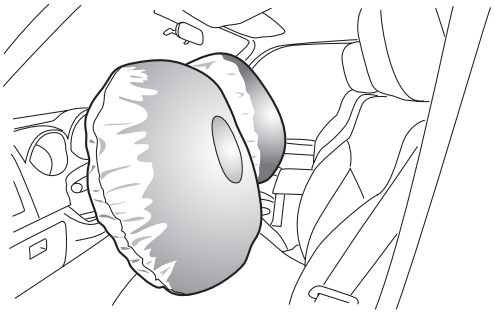
..... **[2]**

[Total: 4]

Section C – Module P3

10 **(a)** Some cars have air bags fitted.

Look at the picture.



Air bags reduce injury if there is a crash.

Write down one **other** safety feature that reduces injury in a crash.

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

(b) Some safety devices such as electric windows make driving safer.

They make it easier for the driver to concentrate.

Write down one **other** example of a safety feature that helps the driver to concentrate.

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

[Total: 2]

11 This question is about gravitational potential energy.

(a) Look at the information in the table.

planet	gravitational field strength in N/kg
Earth	10
Jupiter	25
Mercury	4
Neptune	11
Pluto	1
Venus	9

Oliver calculates the gravitational potential energy for a 1 kg mass at a height of 2 m above the surface of each planet.

Where will the 1 kg mass have the greatest gravitational potential energy?

Choose from

Earth

Jupiter

Mercury

Neptune

Pluto

Venus

answer ..... **[1]**

(b) Oliver is weight training.

Look at the diagram.

He wants to increase the **gravitational potential energy** of the weights.

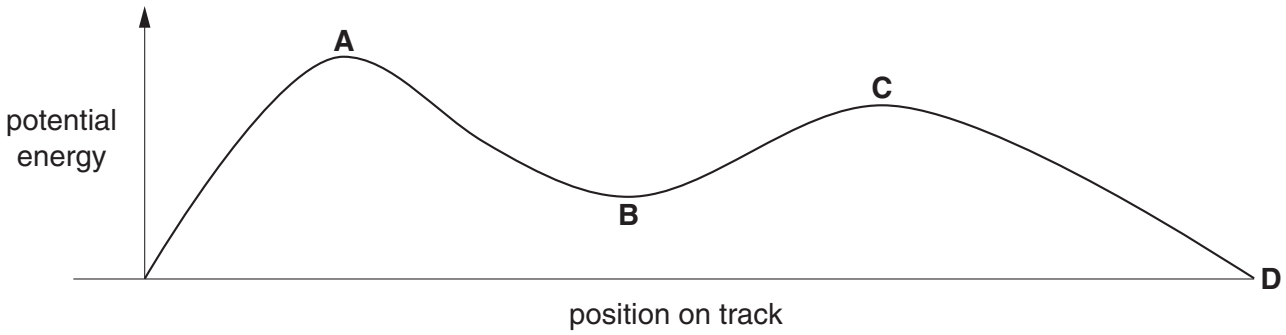
To do this he could add more weights to the bar.

What **other** thing could he do to increase the gravitational potential energy?

answer ..... **[1]**

(c) Look at the graph.

It shows how the potential energy of a roller coaster car changes as it moves along the track.



The car is pulled to the top of the roller coaster and starts with a speed of 0 m/s at point **A**.

Complete the table to show how the energy of the car changes as it moves along the track.

position on track	potential energy	kinetic energy
A → B	decreases	
B → C		
C → D	decreases	increases

[2]

[Total: 4]

12 This question is about forces, motion and terminal speed.

Vehicles can reach a maximum speed.

Several factors affect this maximum speed.

Look at the table.

factor	increases maximum speed	decreases maximum speed	has no effect on maximum speed
wedge shaped car (instead of box shaped car)			
putting a roof box on a car			
towing a caravan		✓	
putting an air deflector on a lorry			
painting a car a brighter colour			✓

(a) Put a tick (✓) in each of the rows to show the correct effect on the maximum speed.

Two have been done for you. **[2]**

(b) Frictional forces can be a problem in car engines.

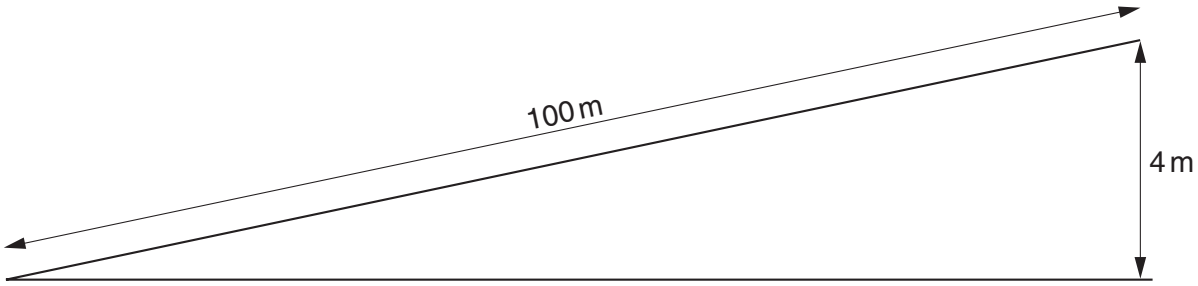
Write down **one** way that frictional forces are reduced in car engines.

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

[Total: 3]

13 Penny drives her car up a hill.

(a) Look at the diagram.



Her car climbs 4 m for every 100 m that it moves along the road.

The car weighs 7000 N.

(i) Show that the work done is 28 000 J.

The equations on page 2 may help you.

.....

.....

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

(ii) It takes 8 seconds to do 28 000 J of work.

Calculate the power the engine needs to climb the hill.

The equations on page 2 may help you.

.....

.....

.....

answer ..... W **[2]**

(b) As Penny drives along the road she drives past a speed camera.

(i) There are lines marked on the road in front of the camera.

Suggest a reason for these lines on the road.

.....

.....

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

(ii) The police need to know the speed of Penny's car.

They have information from the lines on the road.

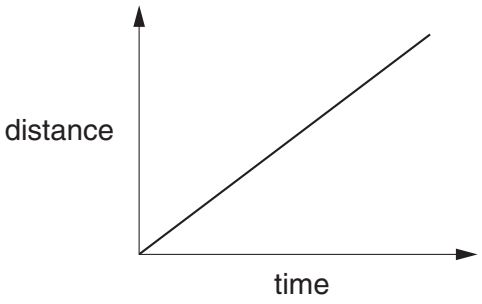
What **other** information is needed to calculate the speed of the car?

.....

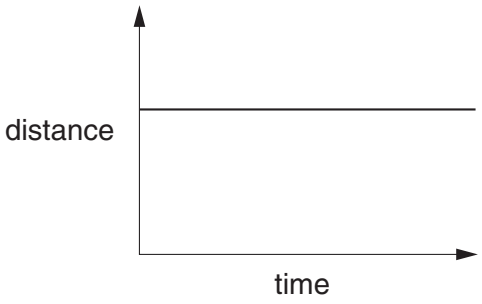
..... **[1]**

[Total: 5]

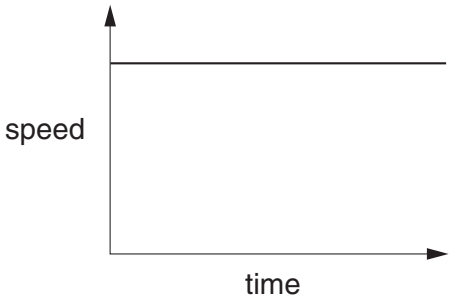
14 Look at the sketch graphs. Some are distance-time graphs, some are speed-time graphs.



A



B



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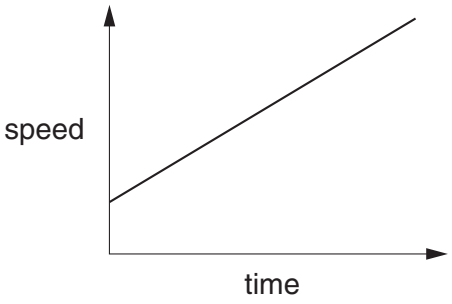
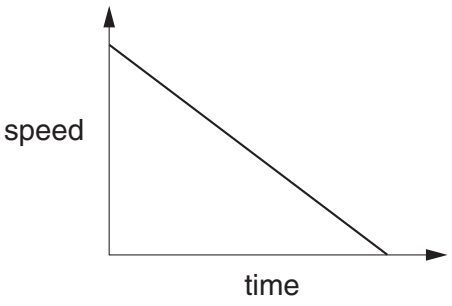


D



E

(a) (i) Which **two** graphs show an object moving at a steady speed?

Choose from: **A** **B** **C** **D** **E**

answer ..... and ..... **[2]**

(ii) Which graph shows an increase in speed?

Choose from: **A** **B** **C** **D** **E**

answer ..... **[1]**

(iii) Which graph shows something that is stationary (not moving)?

Choose from: **A** **B** **C** **D** **E**

answer ..... **[1]**

(b) At a speed of 25 m/s the stopping distance is 53 m.

This is made up of

- the thinking distance (15 m)
- the braking distance (38 m).

What does **braking distance** mean?

.....

.....

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

[Total: 6]

END OF QUESTION PAPER

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.