OCR
RECOGNISING ACHIEVEMENT

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B622/02

GENERAL CERTIFICATE OF SECONDARY EDUCATION

GATEWAY SCIENCE
SCIENCE B

Unit 2 Modules B2 C2 P2 (Higher Tier)

FRIDAY 18 JANUARY 2008

Afternoon
Time: 1 hour

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

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

CUP/T47808

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.
- Do **not** write outside the box bordering each page.
- 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**.
- A list of physics equations is printed on page two.
- 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.

EQUATIONS

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

fuel energy input = waste energy output + electrical energy output

power = voltage × current

energy supplied = power × time

energy (kilowatt hours) = power (kW) × time (h)

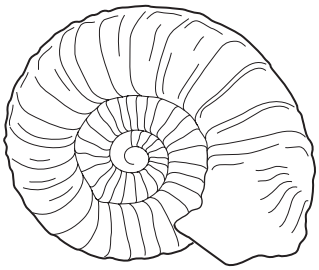
wave speed = frequency × wavelength

Answer **all** the questions.

Section A – Module B2

1 Chris is collecting fossils from a cliff.

The fossils are of extinct animals called ammonites.



an ammonite fossil

(a) The fossil only shows the ammonite shell.

Suggest why the rest of the animal did **not** fossilise.

.....[1]

(b) Describe how fossils are formed from shells.

.....

.....[1]

(c) Ammonites are classified as invertebrates.

How are invertebrates different from vertebrates?

.....[1]

(d) In medieval times, people thought that ammonite fossils were snakes that had been turned to stone.

Why have our ideas about fossils changed?

.....

.....[1]

[Total: 4]

2 **(a)** Plants make food by photosynthesis.

Complete the word equation for photosynthesis.

..... + ... $\xrightarrow[\text{chlorophyll}]{\text{light}}$ glucose + ...

[2]

(b) Plants convert the glucose they make in photosynthesis into starch for storage.

Explain why plants store starch instead of glucose.

.....

.....

.....[2]

(c) Plants also respire.

Explain why they respire.

.....[1]

[Total: 5]

3 **(a)** Iain and Mary want to work out the number of dandelion plants in the school playing field.

They use a quadrat to count the number of dandelion plants in different parts of the playing field.

The table shows their results.

quadrat	number of dandelions
1st	5
2nd	1
3rd	0
4th	2

Each quadrat has an area of 0.25 m^2.

The total area of the playing field is 20 000 m^2.

Use this information to estimate the total number of dandelion plants in the playing field.

You are advised to show your working.

estimated total number of dandelions = ……. [3]

(b) Iain and Mary can improve the accuracy of their estimate by using more quadrats.

Explain why this will give a more accurate estimate.

.....

.....

.....[1]

[Total: 4]

4 **(a)** A farmer adds nitrate fertiliser to the fields where he grows wheat every year.

He needs to do this to make sure his crop grows well.

However, he does **not** need to add nitrate fertiliser to the fields where he grows leguminous plants, such as beans, every year.

The beans do not get all their nitrates from the soil.

Explain where they get the rest of their nitrates from.

.....

.....

.....[2]

(b) The farmer gets fewer weeds in his bean fields than in his wheat fields.

Suggest why.

.....

.....[1]

(c) Bean plants can be pollinated by insects.

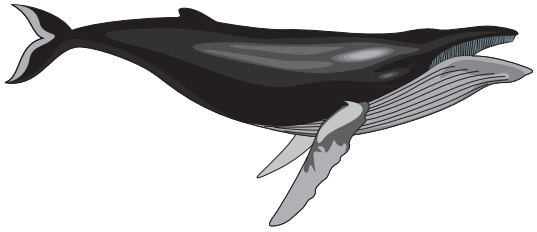
Suggest **one** feature that you would expect to find in bean plants that you would **not** expect to find in plants that are pollinated by the wind.

.....[1]

[Total: 4]

5 Blue whales are an endangered species.

This is because so many have been hunted and killed.



(a) Blue whales were hunted because their bodies had many commercial uses.

Write down **one** commercial use.

.....[1]

(b) Hunting of blue whales is now illegal.

However, scientists are worried there are now **so few** blue whales that they will still become extinct, even if all hunting stops.

Suggest why.

.....

.....

.....[1]

(c) Many people think that hunting of all types of whales should stop.

Why is it difficult to stop all whale hunting?

.....

.....

.....[1]

[Total: 3]

Section B – Module C2

6 Look at the photograph of a car.

(a) Many different materials are used to make a car.

Steel is one material. It is used to make car bodies.

Suggest why.

.....[1]

(b) Car bodies can be made from aluminium.

Aluminium is less dense than steel and does not corrode.

Most car bodies are made from steel rather than aluminium.

Suggest why.

.....[1]

(c) One disadvantage of using steel is that it rusts.

Oxygen and water are needed for rusting to happen.

Hydrated iron(III) oxide is made.

What type of reaction is rusting?

Choose from the list.

decomposition

electrolysis

oxidation

reduction

answer .....[1]

(d) Aluminium does not corrode.

Explain why.

.....

.....[1]

[Total: 4]

7 This question is about the structure of the Earth and igneous rocks.

(a) The surface of the Earth is made up of tectonic plates.

(i) There are two types of tectonic plate.

One type is a continental plate.

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

.....[1]

(ii) Tectonic plates can move very slowly.

Explain how this happens. You may wish to draw a diagram.

.....

.....[1]

(b) **(i)** Igneous rock is made when molten rock cools down.

The crystals in igneous rock can be different sizes.

Describe how the size of the crystals depends on how fast the molten rock cools down.

.....

.....[1]

(ii) When molten rocks in different parts of the Earth cool down, different igneous rocks are made.

Explain why.

.....

.....[1]

[Total: 4]

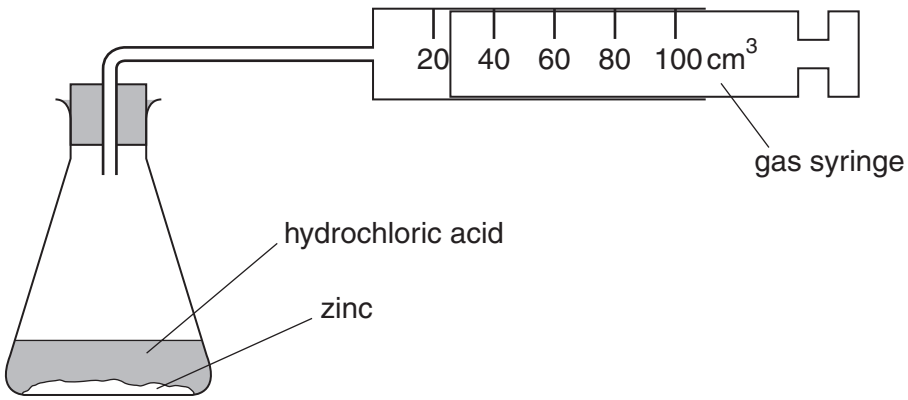
8 Phil and Ann investigate the reaction between zinc and hydrochloric acid.

Zinc chloride and hydrogen are made.

(a) Write the **word** equation for this reaction.

.....[1]

(b) The diagram shows the apparatus they use.



(i) The reaction goes faster if **powdered** zinc is used instead of zinc **lumps**.

Explain why.

Use ideas about collisions between particles.

.....

.....

.....[2]

(ii) The reaction goes faster if a more **concentrated** solution of hydrochloric acid is used.

Explain why.

Use ideas about collisions between particles.

.....

.....

.....[2]

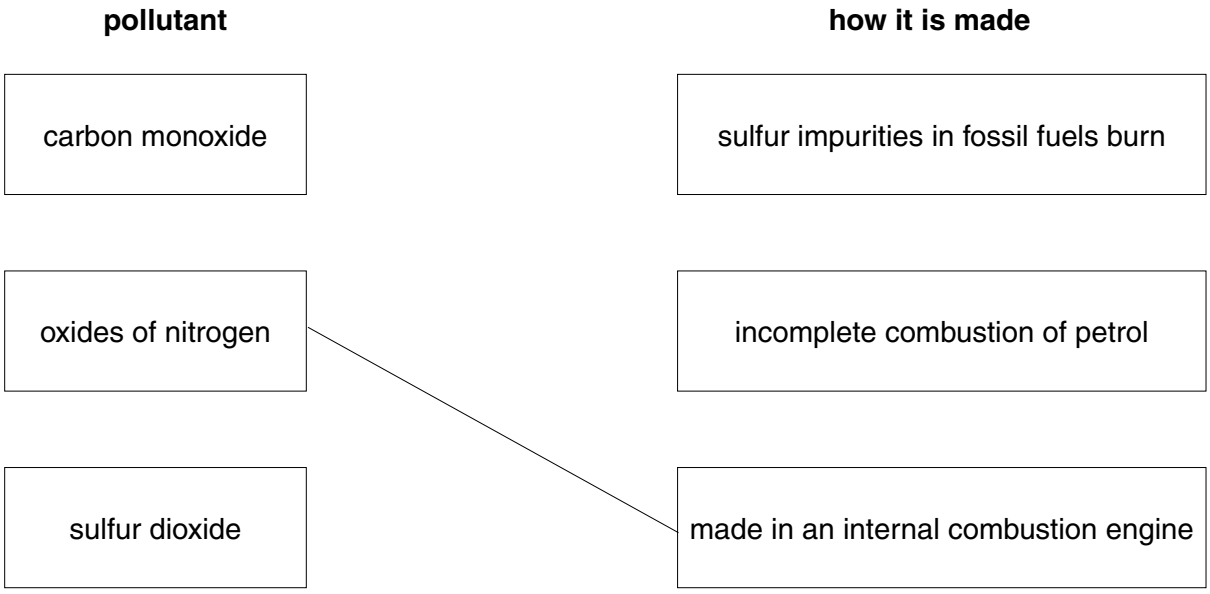
[Total: 5]

9 This question is about pollutants found in the air.

(a) Link each **pollutant** to **how it is made**.

Draw two straight lines.

One has been done for you.



[1]

(b) Carbon monoxide is removed from car exhaust fumes using a catalytic converter.

Carbon dioxide is made.

Why is it important to remove carbon monoxide from car exhaust fumes?

.....[1]

(c) In a catalytic converter carbon monoxide, CO, reacts with nitric oxide, NO.

Nitrogen, N_2, and carbon dioxide are made.

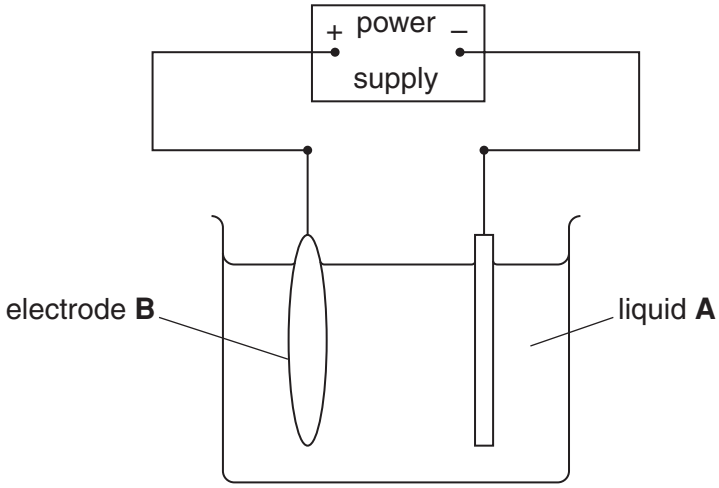
Write a balanced **symbol** equation for this reaction.

.....[2]

[Total: 4]

10 This question is about copper.

(a) Look at the diagram. It shows the apparatus needed to purify impure copper.



(i) Write down the name of liquid **A**.

Choose from the list.

copper sulfate solution

paraffin

dilute sulfuric acid

water

answer.....[1]

(ii) Write down the name of electrode **B**.

Choose from the list.

impure copper anode

impure copper cathode

pure copper anode

pure copper cathode

answer.....[1]

(b) Copper is used to make brass.

Brass is an alloy.

Write down the name of the metal which is mixed with copper to make brass.

.....[1]

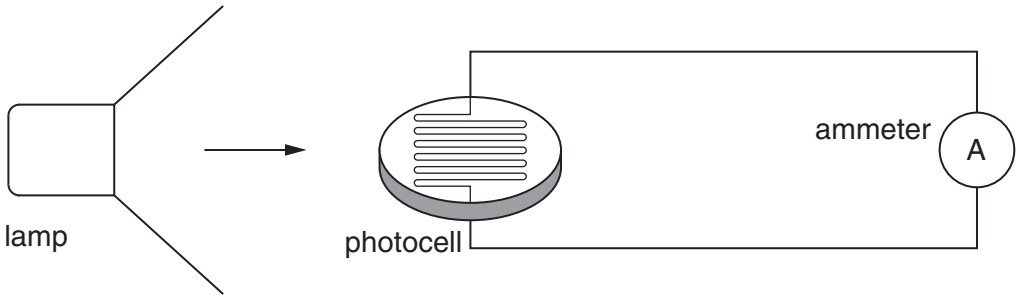
[Total: 3]

Section C – Module P2

11 This question is about photocells.

Olivia investigates photocells.

Look at the diagram.



(a) Olivia shines light from the lamp onto a photocell.

The ammeter shows that a current is flowing.

It is a **direct** current (dc).

Describe how a current is made in the photocell.

In your answer use ideas about

- what is meant by direct current
- energy
- electrons.

.....

.....

.....

.....[3]

(b) Olivia adds a **voltmeter** to the circuit to measure the voltage across the photocell.

Here are her results.

ammeter reading = 0.1 A

voltmeter reading = 2.5 V

Calculate the power output of the photocell.

The equations on page 2 may help you.

.....

.....

.....

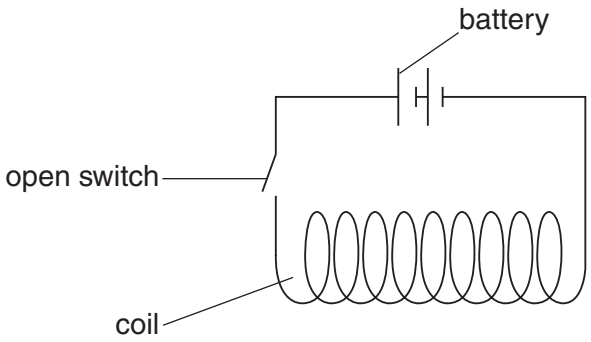
answer ..... units ..... [3]

[Total: 6]

12 This question is about magnetism and generating electric currents.

(a) Sathvir makes a coil of wire and connects it to a battery.

Look at the diagram.



Sathvir closes the switch. A current flows through the coil.

This creates a magnetic field around the coil.

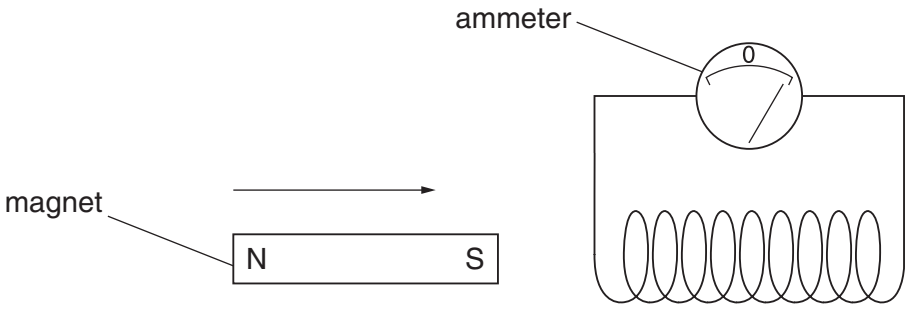
What causes a magnetic field to be produced when the **current flows**?

.....

.....

.....[2]

(b) Sathvir replaces the battery with an ammeter.



He then moves a magnet towards the coil.

A current flows in the coil. The ammeter shows a reading.

How could Sathvir make a **bigger** current flow in the coil?

Describe **two** things he could change to make a bigger current flow.

.....

.....

.....[2]

[Total: 4]

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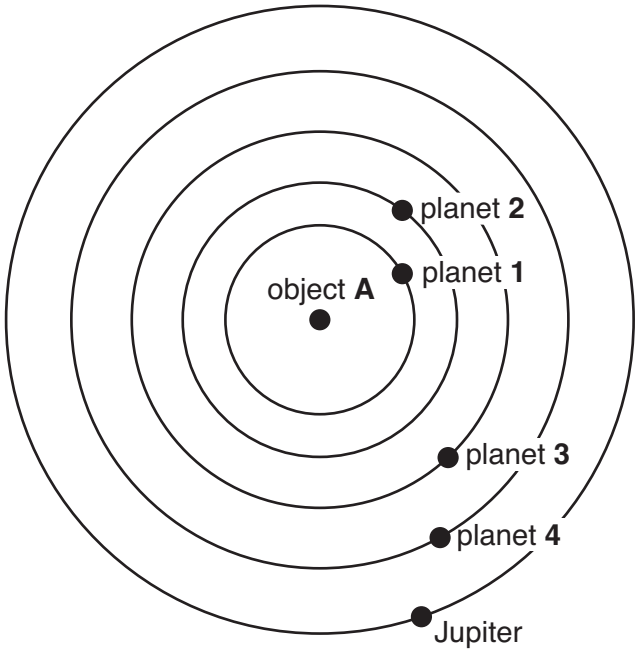
PLEASE DO NOT WRITE ON THIS PAGE

Question 13 starts on page 18.

13 This question is about objects in our Solar System.

Look at the diagram.

It shows **some** of the planets in our Solar System.



(a) The **asteroid belt** is between Jupiter and planet **4**.

What is the name of planet **4**?

.....[1]

(b) Asteroids are rocks. They have never formed into another planet.

Complete the following sentences about asteroids.

Asteroids are left over from the formation of the ..... .

The large ..... force of Jupiter stops them forming into a planet.

[2]

(c) Planets and asteroids orbit the Sun.

Comets also orbit the Sun. The shape of a comet's orbit is highly **elliptical**.

The speed of the comet changes in its orbit.

Explain how the speed changes and why.

.....

.....

.....[2]

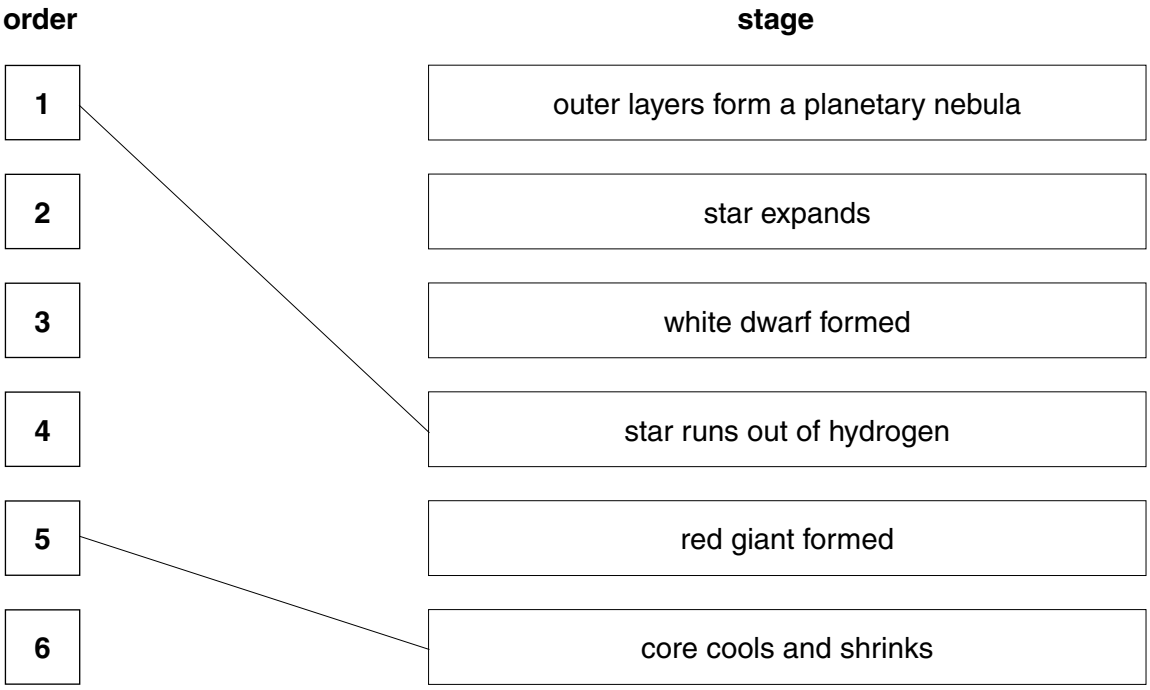
(d) Object **A** is the Sun. It is a **medium-weight** star.

Billions of years in the future the Sun will die.

Here are some of the **stages** of the death of a medium-weight star.

They are **not** in the correct **order**.

(i) Draw a straight line from each numbered box to the correct stage. Two have been done for you.



[3]

(ii) When the Sun runs out of hydrogen, the process that produced the Sun's energy will stop.

What is the name of this process?

.....[1]

(iii) Not all stars die in this way.

What does the end of a star depend on?

.....[1]

[Total: 10]

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