Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

A216/01

TWENTY FIRST CENTURY SCIENCE

ADDITIONAL SCIENCE A

UNIT 2: Modules B5 C5 P5
(Foundation Tier)

WEDNESDAY 24 JUNE 2009: Morning
DURATION: 40 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

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)

READ INSTRUCTIONS OVERLEAF

DC (AC/CGW) OV91052 16050/1

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **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.**
- **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 total number of marks for this paper is 42.**
- **A list of physics equations is printed on pages 4 and 5.**
- **The periodic Table is printed on page 35.**

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TWENTY FIRST CENTURY SCIENCE EQUATIONS

USEFUL RELATIONSHIPS

EXPLAINING MOTION

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

momentum = mass × velocity

change of momentum = resultant force × time for which it acts

work done by a force = force × distance moved by the force

change in energy = work done

change in GPE = weight × vertical height difference

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times [\text{velocity}]^2$$

ELECTRIC CIRCUITS

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

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$

energy transferred = power × time

power = potential difference × current

$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}} \times 100\%$$

THE WAVE MODEL OF RADIATION

wave speed = frequency × wavelength

Answer ALL the questions.

1 Erupting volcanoes give out a mixture of gases.

(a) The information below shows some gases given out by a volcano.

(i) Draw straight lines to join the NAME of each gas to its FORMULA.

NAME	FORMULA
carbon dioxide	H_2S
hydrogen sulfide	CO
carbon monoxide	SO_2
sulfur dioxide	CO_2

[2]

(ii) Only one of these gases is normally present in the atmosphere.
Name the gas.

_____ **[1]**

(b) Mary knows two important things about gases in the air.

- **the size of the particle**
- **the type of particle.**

Put a (ring) around the best term in each pair.

Gases in the air are made

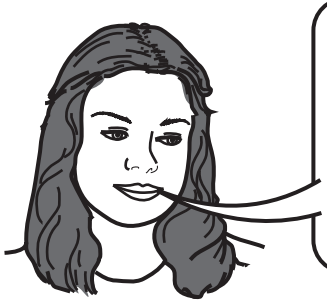
of LARGE SMALL particles.

The particles are

MOLECULES GIANT STRUCTURES. [1]

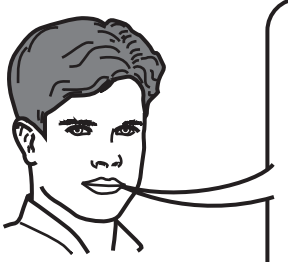
(c) Some of the gases from a volcano are sulfur compounds.

Mary asks her friends if sulfur is in living things.



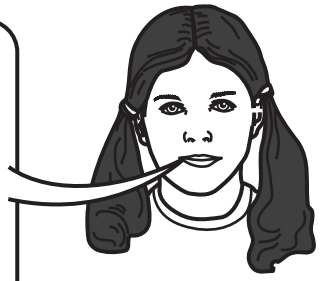
SU
Living things don't contain sulfur.

JIM
Living things contain small amounts of sulfur.



MIKE
Living things contain large amounts of sulfur.

KATE
Living things only contain sulfur if they have been poisoned.



Who gives the BEST answer?

answer _____ **[1]**

[Total: 5]

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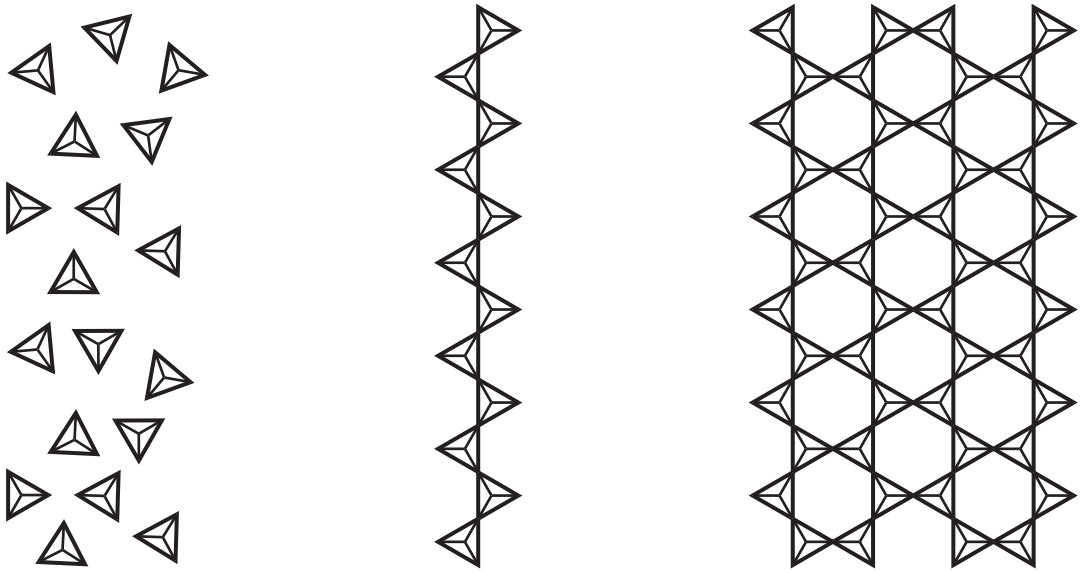
2 Volcanic lava can be runny or it can be stiff.

Volcanoes with stiff lava often explode dangerously.

Lava is made of silicon compounds.

The more links there are within a compound, the stiffer the lava.

(a) Here are some of the particles of different silicon compounds in molten lava.

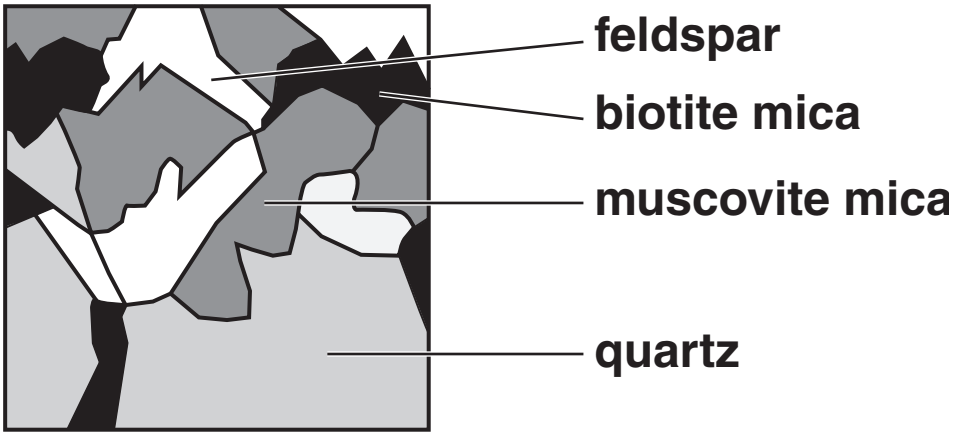


A **B** **C**

Which compound, A, B, or C, is most likely to be in runny lava?

answer _____ [1]

(b) Molten rock sometimes cools to form granite.



(i) Granite contains crystals of different minerals.

Only one of these minerals is mainly made of silicon dioxide.

The other minerals are more complicated compounds of silicon.

Put a (ring) around the ONE mineral that is mainly made of silicon dioxide.

BIOTITE MICA

FELDSPAR

MUSCOVITE MICA

QUARTZ

[1]

(ii) Here are some statements about silicon dioxide.

Put a tick (✓) in the box next to each of the <u>TWO</u> correct statements.

It is soft.	☐
It has a low boiling point.	☐
It has a high melting point.	☐
It does not dissolve in water.	☐
It conducts electricity when solid.	☐

[2]

[Total: 4]

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3 Mark finds this table in a text book.
It shows that different parts of the Earth's crust have different compositions.

	percentage in mantle	percentage in oceanic crust	percentage in continental crust
iron compounds	8	9	7
silicon compounds	45	49	60
calcium compounds	3	11	6
aluminium compounds	3	16	15
magnesium compounds	38	9	3

(a) Use a word from this list to complete the sentence.

ALUMINIUM

CALCIUM

IRON

MAGNESIUM

SILICON

The continental crust has the highest percentage of _____ compounds. [1]

(b) The compounds are not spread evenly, but often occur in deposits.

Some of these deposits contain magnesium carbonate.

Magnesium can be extracted from magnesium carbonate.

The first stage is to heat the magnesium carbonate to make magnesium oxide.

$$MgCO_3(s) \longrightarrow MgO(s) + CO_2(g)$$

(i) Give the formula of one chemical in the equation which is a solid.

answer _____

Give the formula of one chemical in the equation which is a gas.

answer _____ **[1]**

(ii) The magnesium then needs to be extracted from the magnesium oxide.

Mark knows that carbon will take the oxygen away from many metal oxides.

Complete the sentence.

Choose a word from this list.

DISSOLVES

EVAPORATES

NEUTRALISES

REDUCES

When carbon takes oxygen away from a metal oxide, it _____ the metal oxide. **[1]**

(c) Mark finds that the reaction does not work with carbon and magnesium oxide.

Put a tick (✓) in the box next to the most likely reason for this.

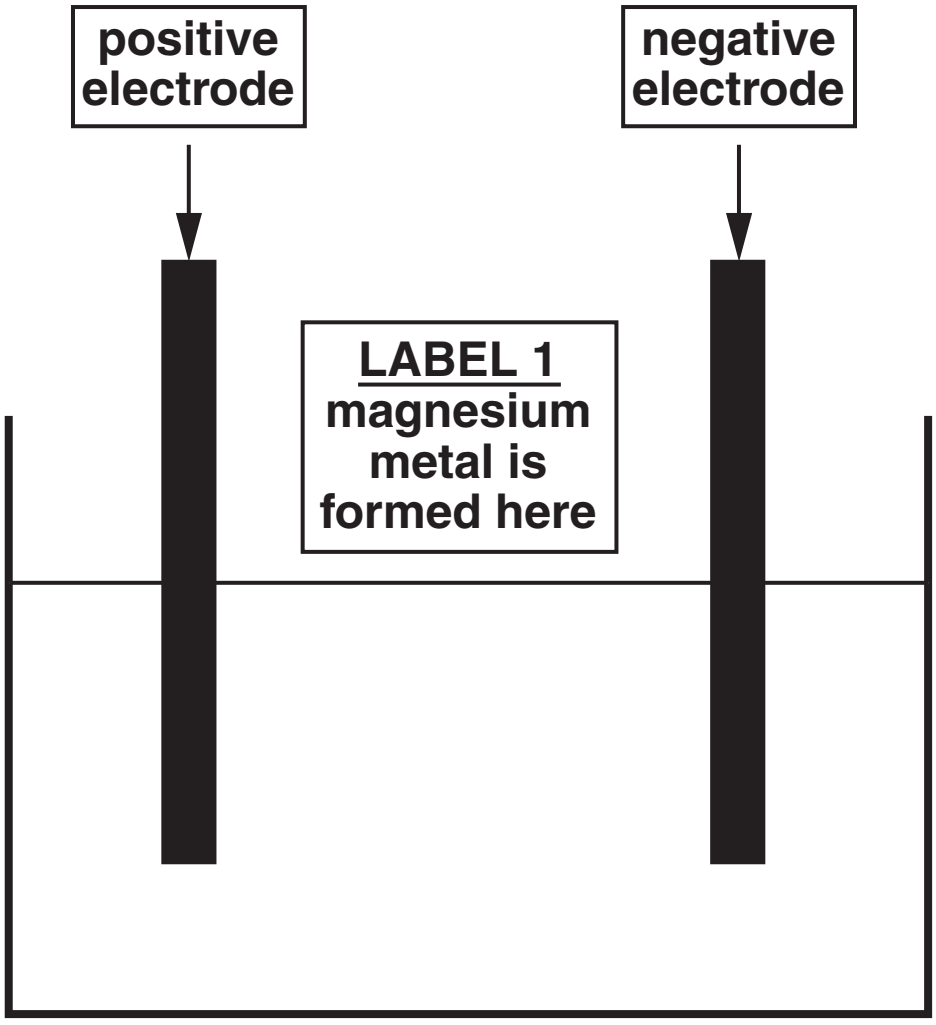
The magnesium is too reactive to be extracted this way.	☐
The magnesium oxide has too high a melting point.	☐
The magnesium oxide is too dense.	☐
The magnesium oxide is too hot.	☐

[1]

(d) He finds out that magnesium can be extracted by electrolysis.

One way might be to electrolyse molten magnesium oxide.

Complete labels 1 and 2 by drawing arrows to the correct parts of the diagram. [2]



[Total: 6]

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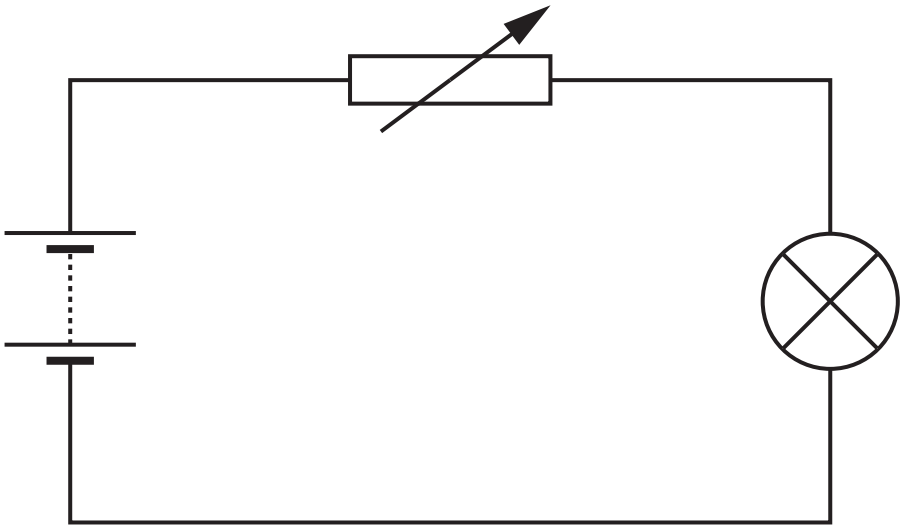
4 Sylvia sets up this circuit.



(a) Sylvia decides to measure the potential difference <u>ACROSS THE LAMP</u>.

Draw on the circuit diagram to show how she connects a voltmeter.

Use the correct symbol. [1]

(b) The voltmeter across the lamp reads 4 V. Sylvia asks her friends what this means.

ALAN

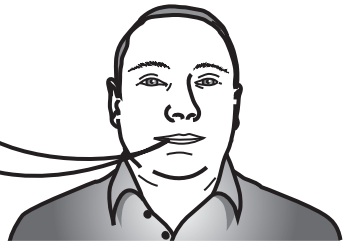
It tells you about the energy lost by charge on its way through the lamp.

BESS

It's the rate at which charge passes through the lamp.

CARLO

It tells you how much energy there is in the battery.



DAVINA

It's the amount of charge in the lamp.

Who has the <u>BEST</u> answer?

answer _____ [1]

(c) (i) Sylvia adjusts the variable resistor.

These four sentences explain why the brightness of the lamp changes.

They are in the WRONG order.

A The lamp gets dimmer.

B The power of the lamp decreases.

C The current in the resistor decreases.

D The resistance of the circuit increases.

Put the sentences in the CORRECT order. The last one has been done for you.

			A

[1]

(ii) Complete the sentences for the variable resistor.

Choose words from this list.

DECREASES

INCREASES

STAYS THE SAME

Sylvia adjusts the variable resistor.

The current in the variable resistor decreases.

The voltage across the variable resistor

_____ .

The voltage across the battery

_____ **[1]**

[Total: 4]

5 Brian has an electric toothbrush.

He connects it to the mains supply through a transformer.

(a) Complete the sentence about the transformer.

Choose words from the list.

COPPER

IRON

PLASTIC

WOOD

A transformer is two coils of wire wound on a core made of _____ . [1]

(b) The transformer is connected to the mains supply.

What is the voltage of the UK mains supply?

Put a (ring) around the correct answer.

13 V 50 V 230 V [1]

(c) How does the transformer work?

Put a (ring) around the correct word in each pair.

The transformer produces a lower

VOLTAGE CURRENT than the mains supply.

The current in one coil makes

A MAGNETIC AN ELECTRIC field through the

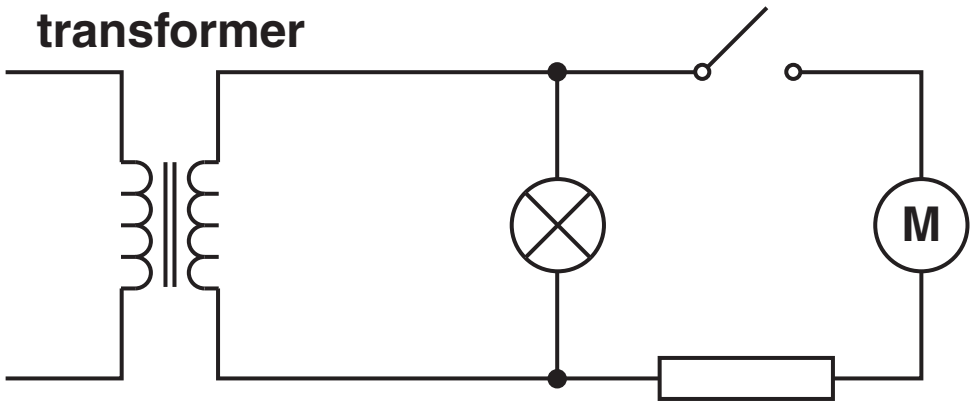
other coil. Changes in that field induce a

VOLTAGE CHARGE in the other coil.

This is because the mains supply provides

ALTERNATING DIRECT voltage. **[2]**

(d) Here is the circuit diagram for Brian's toothbrush.



The circuit includes a switch to turn on the motor in the toothbrush.

Put a (ring) around the switch. **[1]**

[Total: 5]

6 Joe tests a circuit from his computer.

He needs to be careful. The chips in the circuit are easily damaged by static electricity.

(a) The sentences describe how Joe becomes charged as he walks across the floor towards his circuit.

They are in the WRONG order

A Joe sets off towards the circuit.

B This makes Joe electrically charged.

C His shoes rub against the floor as he walks.

D This transfers electrons from Joe to the floor.

Put the sentences in the correct order. The last one has been done for you.

			B

[1]

(b) Electrons are transferred from Joe to the floor.

Use straight lines to join the START and END of the sentences.

START	END
Joe now has …	… opposite charges.
The electrons have …	… a positive charge.
Joe and the floor end up with …	… a negative charge.

[2]

(c) Joe gets rid of any static electricity by touching a metal water pipe.

Which statement below explains this?

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

Metals contain no electrons at all. ☐

Metals and people always have different charge. ☐

Metals have lots of electrons which are firmly held. ☐

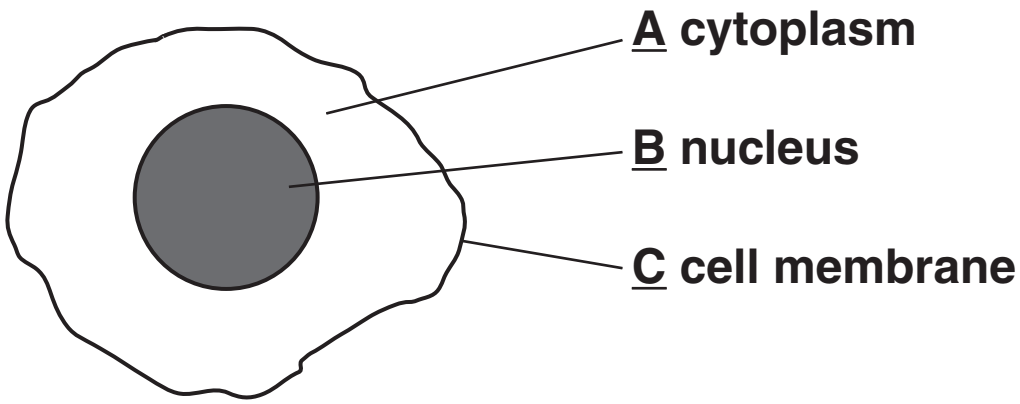
Metals have lots of electrons which can move freely. ☐

[1]

[Total: 4]

7 Cells contain the genetic code for making proteins.

Look at this diagram of a cell.



(a) (i) Which part of the cell, A, B, or C, contains the genetic code?

answer _____ [1]

(ii) In which part of the cell, A, B or C, are proteins made?

answer _____ [1]

(b) The genetic code is made of DNA.

Which of these statements is the best description of DNA?

Put a tick (✓) in the box next to the <u>BEST</u> description.

a ladder with rungs made from amino acids	☐
two strands twisted into a double helix	☐
a protein molecule that can copy itself	☐
a bundle of tightly wrapped fibres	☐

[1]

[Total: 3]

8 (a) The cell cycle can be divided into CELL GROWTH and MITOSIS.

Here are some statements about the cell cycle.

A The number of organelles increases.

B DNA molecules split into two strands.

C The cell divides and becomes two separate cells.

D Copies of the chromosomes separate.

E The newly formed DNA strands are copied.

Put the letters A, B, C, D and E into the correct column of the table to show where in the cell cycle the processes take place.

CELL GROWTH	MITOSIS

[3]

(b) MEIOSIS is another way that cells can divide.

Here are some statements about the results of mitosis and meiosis.

Put ONE tick (✓) in each row in the correct box.

STATEMENT	TRUE FOR MITOSIS	TRUE FOR MEIOSIS	TRUE FOR BOTH
number of chromosomes in daughter cells decreases			
daughter cells are identical to parent cell			
can produce gametes			
the number of cells increases			
daughter cells are identical to each other			

[4]

[Total: 7]

9 Many plants can be grown from seeds or from cuttings.

(a) Why are cuttings preferred by some gardeners?

Put a tick (✓) in the box next to the <u>BEST</u> answer.

They can be grown in a greenhouse. ☐

The features of the new plant are known. ☐

They are more expensive than buying seeds. ☐

There is more variety in the plants that grow. ☐

[1]

(b) Which cells in a plant can develop into any other kind of plant cell?

Put a (ring) around the correct answer.

PHLOEM CELLS

ROOT HAIR CELLS

UNSPECIALISED CELLS

XYLEM CELLS

[1]

(c) When a cutting is taken, it can be dipped into a powder.

This helps it to develop roots.

(i) What does this powder contain?

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

nutrients ☐

hormones ☐

enzymes ☐

[1]

(ii) How is the cutting able to produce new leaves, roots and flowers?

Put a tick (✓) in the box next to the <u>BEST</u> answer.

All plant cells can change from one type to another. ☐

There are always some unspecialised cells in the plant. ☐

All the cells in a plant are identical. ☐

Plant stems contain all the different types of plant cell. ☐

[1]

[Total: 4]

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.