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)

TUESDAY 28 JUNE 2011: 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 (LEO/SW) 11MEP06472 49729/1

INSTRUCTIONS TO CANDIDATES

- **Write your name, centre number and candidate number in the boxes on the first page. 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.**

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 the back page.**

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TWENTY FIRST CENTURY SCIENCE EQUATIONS

USEFUL RELATIONSHIPS

EXPLAINING MOTION

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

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$\text{change of momentum} = \text{resultant force} \times \text{time for which it acts}$$

$$\text{work done by a force} = \text{force} \times \text{distance moved in the direction of the force}$$

$$\text{change in energy} = \text{work done}$$

$$\text{change in GPE} = \text{weight} \times \text{vertical height difference}$$

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

ELECTRIC CIRCUITS

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

$$\frac{\text{voltage across primary coil}}{\text{voltage across secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$$

$$\text{energy transferred} = \text{power} \times \text{time}$$

$$\text{power} = \text{potential difference} \times \text{current}$$

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

THE WAVE MODEL OF RADIATION

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

Answer ALL the questions.

1 When the Romans came to Britain they extracted lead from mines in Somerset.

The chemical symbol for lead is Pb, which comes from its Roman name.

Lead ore contains lead sulfide.

Lead sulfide is a compound of lead and sulfur only.

(a) Put a (ring) around the formula of lead sulfide.

Pbs PBS PbS $PbSO_4$

[1]

(b) Lead ore contains impurities as well as the lead sulfide.

Roman lead ore contained 10 tonnes of lead in every 100 tonnes of ore.

Ores mined today do not have as much lead.

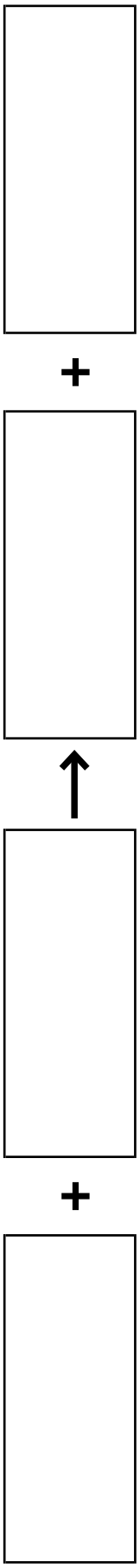
Suggest why modern ores have less lead than Roman ores.

_____

_____ **[2]**

(c) Lead oxide reacts with lead sulfide to make lead and sulfur dioxide.

Fill in the boxes opposite to complete a word equation for this reaction. [1]



(d) Some substances are left over after the lead is extracted.

One of these is silicon dioxide – silicon dioxide is a solid.

Sulfur dioxide is also produced – sulfur dioxide is a gas.

Complete the table about solid silicon dioxide and sulfur dioxide gas.

For EACH description put ONE tick (✓) in the correct column to show whether it is true for SILICON DIOXIDE ONLY, SULFUR DIOXIDE ONLY, BOTH or NEITHER.

description	silicon dioxide only	sulfur dioxide only	both	neither
has a high melting point				
has a low melting point				
has covalent bonds				
has ionic bonds				
is a giant structure				
is a simple molecular compound				
has weak forces between molecules				

[4]

(e) The Romans used lead to line water troughs because it could be bent so easily. They also used it to make heavy weights, and they would fill gaps between stones with melted lead.

Draw lines to link each USE of lead to the PROPERTY that makes it so useful.

USE	PROPERTY
line water troughs	lead has a low melting point
heavy weights	lead is dense
filling gaps in stones	lead is malleable

[2]

(f) World production of lead is about 8500 million tonnes a year.

Of this, about 4000 million tonnes are made from lead ore.

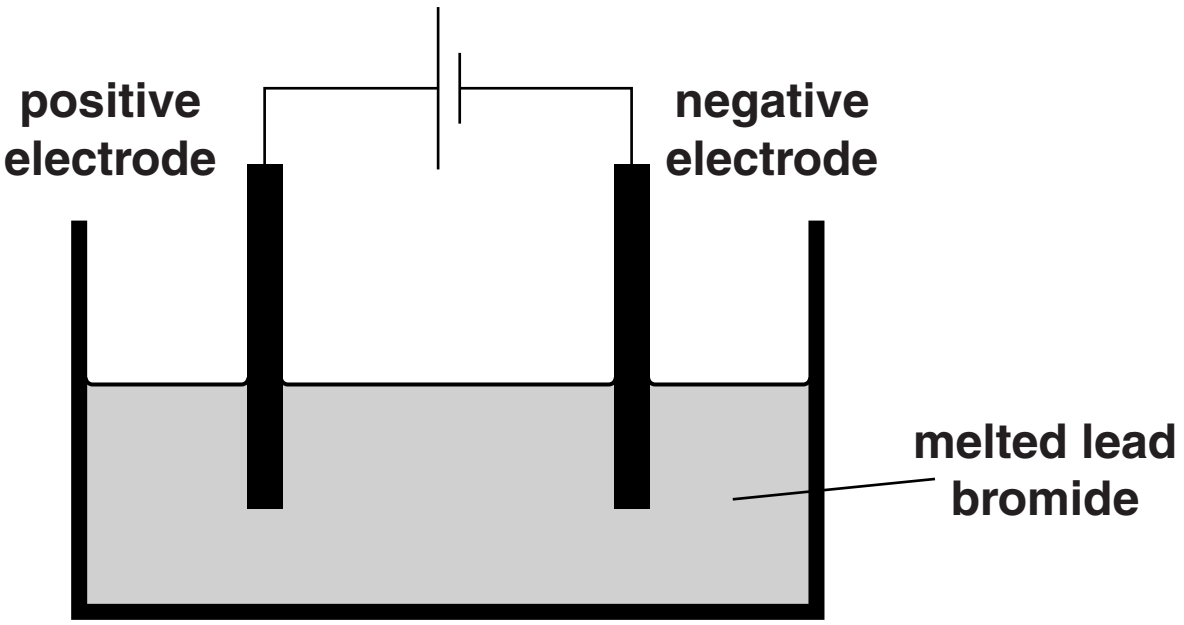
(i) What percentage of the world's lead is made from the ore?

Put a (ring) around the correct answer.

2.125% 47% 50% 53%

[1]

(ii) Mary knows that some compounds can be broken down by electrolysis.



She electrolyses melted lead bromide using carbon electrodes.

The lead bromide breaks down into a gas, bromine, and a dense liquid, lead.

State briefly

- **how will she know that bromine gas is being formed**
- **where will the bromine be formed**
- **where will the lead be formed?**

_____

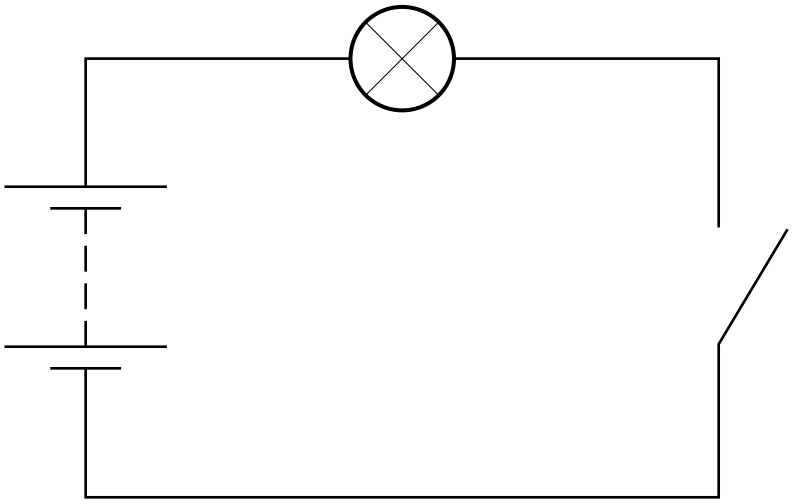
_____

_____

_____ **[3]**

[Total: 14]

2 Jo builds this circuit.



(a) She has a switch in her circuit.

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

(b) Draw straight lines to link each COMPONENT in the circuit to ITS JOB IN THE CIRCUIT.

COMPONENT	ITS JOB IN THE CIRCUIT
lamp	pushes charge around the circuit
switch	heats up as charge flows through it
battery	changes resistance from very large to very low

[2]

(c) Jo presses the switch.

The lamp lights up.

Describe what is happening IN THE CIRCUIT when the lamp lights up.

Use the terms CHARGE and ENERGY in your answer.

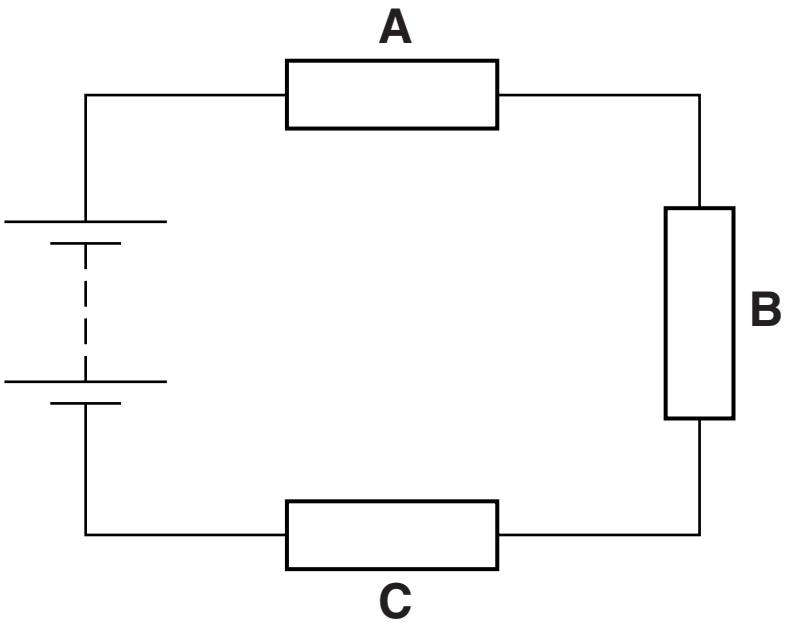
_____

_____

_____ **[2]**

[Total: 5]

3 This circuit has three identical resistors, A, B and C, in series with a battery.



(a) Here are some statements about the circuit.

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

Resistor B has the greatest current. ☐

All three resistors have the same current. ☐

Resistor C has a larger current than resistor A. ☐

[1]

(b) The battery provides a potential difference of 6V.

Which of these is another word for potential difference?

Put a (ring) around the correct word.

current

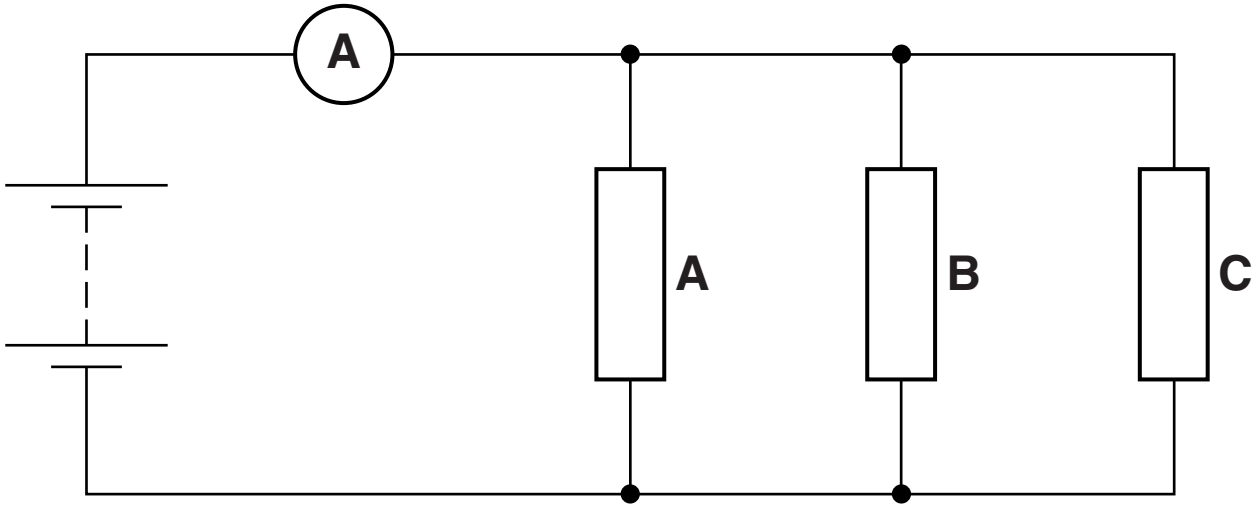
power

resistance

voltage

[1]

(c) The three identical resistors are now connected in parallel to the battery.



The potential difference across the battery is 6V.

(i) What is the potential difference across each resistor?

potential difference = _____ V [1]

(ii) The ammeter in the circuit reads 3A.

Calculate the power provided by the battery when the current is 3 A.

power = _____ W [1]

(d) Complete the sentence below. Choose from these words.

force

power

speed

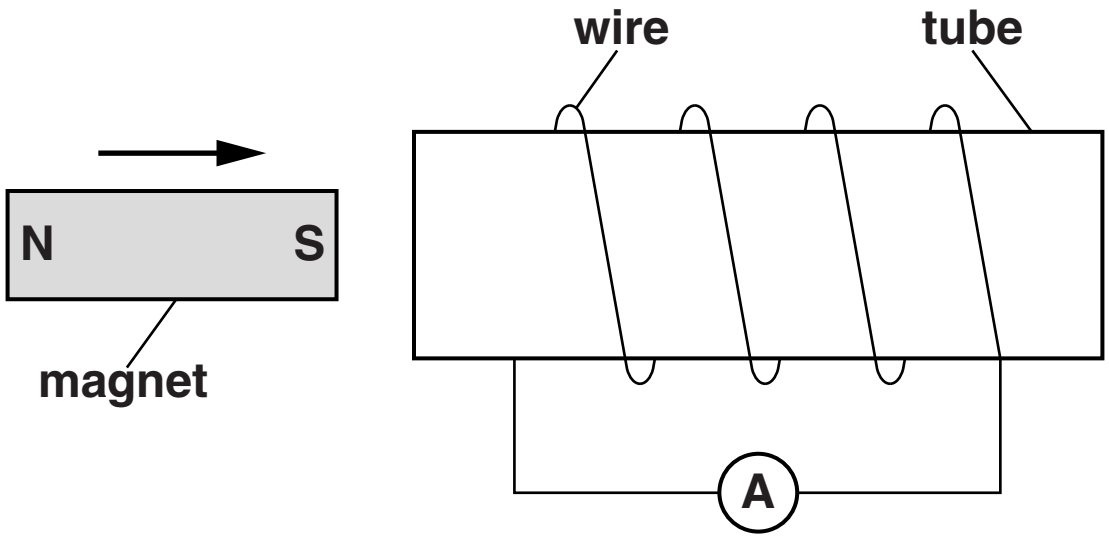
The battery delivers energy to the circuit.

The rate at which it does this is called

_____ . **[1]**

[Total: 5]

4 Pete pushes a magnet into a tube.



(a) There is a coil of wire around the tube.

Complete the sentences. Choose from these words.

charge

current

voltage

power

As the magnet moves into the tube, a

_____ is induced across the ends of

the coil.

This results in a _____ in the ammeter.

[2]

(b) Here are some ways of changing the reading of the ammeter.

Put ticks (✓) in the boxes next to the TWO ways which would INCREASE the reading.

Increase the length of the tube.	☐
Decrease the length of the tube.	☐
Move the magnet more slowly into the tube.	☐
Move the magnet more quickly into the tube.	☐
Increase the number of turns of wire in the coil.	☐
Decrease the number of turns of wire in the coil.	☐

[2]

[Total: 4]

5 An animal cell contains proteins.

(a) DNA carries the instructions to make proteins.

Put a (ring) around the correct words to complete the sentences.

DNA molecules are made of TWO / THREE / FOUR strands.

Each strand contains TWO / THREE / FOUR different bases. [2]

(b) (i) Which part of the cell contains DNA?

_____ [1]

(ii) Which part of the cell makes protein?

_____ [1]

[Total: 4]

6 Labradors and poodles are breeds of dog.

A labrador mates with a poodle and produces a puppy.

The puppy has chromosomes from both the labrador and the poodle.

(a) The labrador has 78 chromosomes in each body cell.

The table shows chromosome numbers in each body cell of the labrador, the poodle and the puppy.

	chromosome in labrador	chromosomes in poodle	chromosomes in puppy
A	**78**	**78**	**156**
B	**78**	**78**	**78**
C	**78**	**46**	**46**
D	**78**	**39**	**39**

Which row, A, B, C or D, is correct?

answer _____ [1]

(b) The puppy cells have chromosomes from both parents.

Explain why the cells have chromosomes from both parents.

Include in your answer

- **what type of cell division produces gametes**
- **what happens to the chromosome number when a gamete is formed**
- **what happens when the gametes fuse.**

_____

_____

_____

_____ **[3]**

[Total: 4]

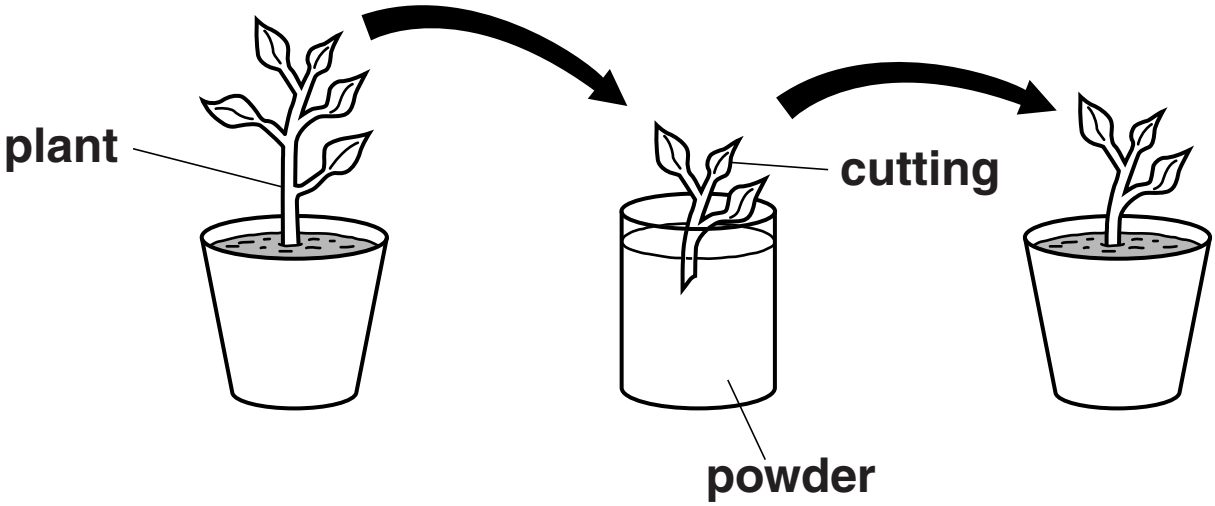
7 Ray grows plants for a garden centre.

He selects a healthy plant and takes a cutting.

He dips the cutting into a special powder.

The cutting grows into a clone of the original plant.

The diagram shows the process.



(a) Explain why he dips the cutting in special powder.

In your answer include

- **what the powder contains**
- **what effect it has on the cutting.**

_____

_____

_____ **[2]**

(b) The cutting makes new cells when it grows.

Some cells can develop into different types of cells.

Draw ONE line from each TYPE OF CELL to its correct PROPERTY.

You should draw THREE lines only.

TYPE OF CELL	PROPERTY
phloem	can develop into different types of cells
meristem	cannot develop into different types of cells
xylem	

[2]

(c) Both plants and animals grow.

Which statement is correct?

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

Animals and plants continue to grow in width and height all their lives. ☐

Animals and plants have some cells which continue to divide by mitosis. ☐

Animals and plants have only specialised cells. ☐

[1]

(d) What happens to chromosomes during mitosis?

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

Spare chromosomes die off. ☐

Chromosomes change their function. ☐

Chromosomes separate. ☐

Chromosomes link together. ☐

[1]

[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.