Candidate forename		Candidate surname	

Centre number						Candidate number				

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
GENERAL CERTIFICATE OF SECONDARY EDUCATION

B621/02

GATEWAY SCIENCE

SCIENCE B

UNIT 1 Modules B1 C1 P1
(Higher Tier)

THURSDAY 13 JANUARY 2011: Morning
DURATION: 1 hour

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 (CW/SW) 11MEP01097 39930/3

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.**
- **A list of physics equations is printed on page three.**
- **The Periodic Table is provided on the back page.**
- **The total number of marks for this paper is 60.**

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 B1

1 This question is about a disease called malaria.

Malaria is spread by mosquitoes.

Mosquitoes are insects with piercing mouth parts which they can use to feed on the blood of humans.

(a) (i) Malaria is caused by microscopic protozoa called *Plasmodium* living in human blood.

***Plasmodium* is carried from human to human by mosquitoes.**

Draw straight lines to connect each ORGANISM to its ROLE in the spread of malaria.

ORGANISM	ROLE
human	vector
Plasmodium	host
mosquito	parasite

[2]

(ii) How do mosquitoes spread malaria from one human to another?

_____

_____ **[1]**

(b) Malaria causes a fever.

During a fever the body temperature is very high and this may cause death.

How can a high body temperature cause death?

_____ [1]

(c) *Plasmodium* can be controlled by a drug called quinine.

Quinine binds to *Plasmodium* DNA.

(i) DNA contains chemicals called bases.

How many different types of base are found in DNA?

_____ [1]

(ii) The spread of malaria can be reduced by blocking the life cycle of mosquitoes.

Female mosquitoes feed on human blood when producing eggs.

The eggs can be laid in stagnant water.

Use this information to suggest TWO ways of reducing the spread of malaria.

1 _____

_____

2 _____

_____ [2]

[Total: 7]

2 Iasu is five years old. He lives in an African country called Ethiopia.

Iasu suffers from a disorder called kwashiorkor.

He is much smaller than a healthy child of his age.

His diet is missing protein needed for growth.

(a) (i) Proteins from animals are called 'FIRST CLASS proteins'.

Explain why first class proteins are important in balanced diets.

_____ [1]

(ii) The recommended daily average (RDA) intake for protein can be calculated.

Iasu has a body mass of 16.0 kg.

Calculate Iasu's RDA intake for protein using the formula

RDA in g = 0.75 × body mass in kg

Show your working.

_____

_____

Iasu's RDA = _____ g [1]

(b) Sickle cell anaemia is another disorder that occurs in Africa.

Sickle cell anaemia is caused by a MUTATION.

What is a mutation?

_____ **[1]**

[Total: 3]

3 Steve is a 23 year old white male.

He has many different characteristics.

(a) (i) Steve is 1.90 m tall and has a mass of 89.0 kg.

Steve's height and mass can be used to calculate his body mass index (BMI).

Calculate Steve's body mass index (BMI) using the formula

$$\text{BMI} = \frac{\text{mass in kg}}{(\text{height in m})^2}$$

Show your working.

_____

_____

Steve's BMI = _____ [2]

(ii) People with a BMI in the range of 18.5 to 25 are described as being NORMAL.

What word is used to describe someone with a BMI below 18.5?

_____ **[1]**

(b) Steve's genes control many of his characteristics including eye colour, blood group and skin colour.

The information for these characteristics is stored in his DNA.

How does DNA CONTROL the function of cells?

_____

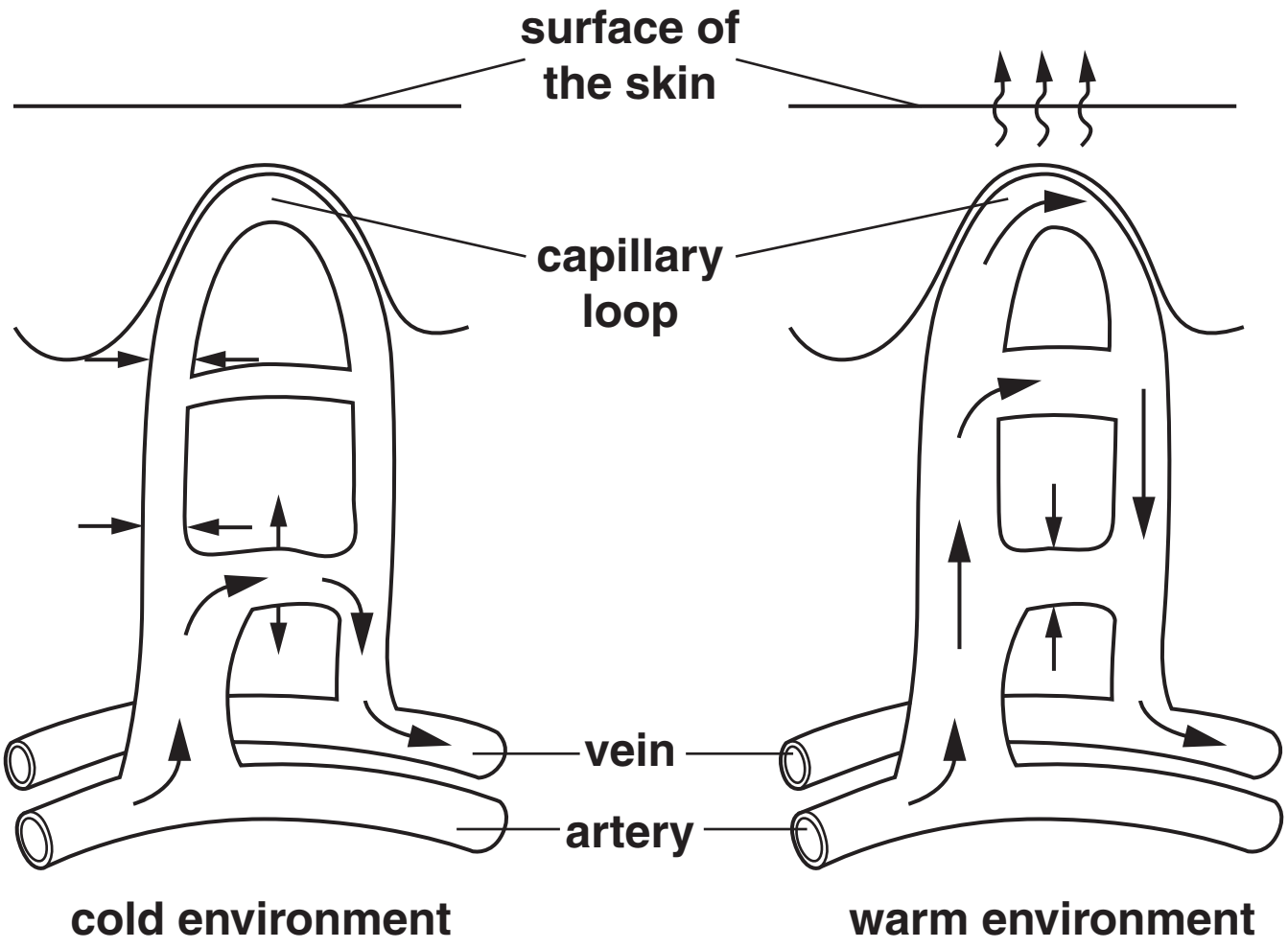
_____

_____ **[2]**

[Total: 5]

4 This question is about controlling body temperature.

Look at the diagram.



The diagram shows changes in the skin when the body is in different environments.

(a) These changes help people cool down if they are getting too warm.

Describe how.

In your answer include

- **how the blood vessels change**
- **how these changes help the body cool down.**

_____

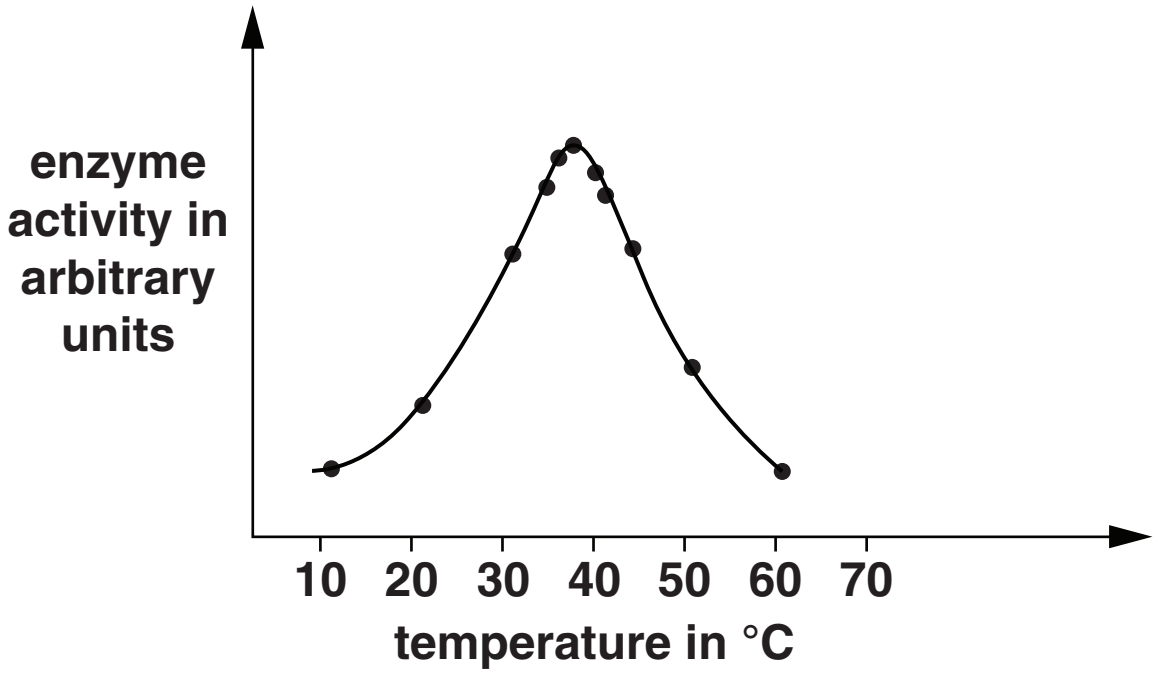
_____

_____

_____ **[2]**

(b) Body cells contain important substances called enzymes.

Look at the graph.



It is important to keep body temperature close to 37 °C.

Explain why.

_____

_____ **[1]**

(c) Sometimes the body temperature is HIGHER THAN NORMAL.

How does the brain detect that the body temperature is higher than normal?

_____ **[1]**

(d) The control of body temperature is an example of NEGATIVE FEEDBACK.

What is meant by negative feedback?

_____

_____ **[1]**

[Total: 5]

SECTION B – MODULE C1

5 Look at the food label found on a box of cake-mix.

INGREDIENTS: **Wheat flour, Cane juice, Sugar, Vanilla flavouring, Sodium hydrogencarbonate, Cornstarch, Sea salt, Citric acid (E300)**

The cake-mix contains sodium hydrogencarbonate.

The sodium hydrogencarbonate makes the cake rise.

Sodium hydrogencarbonate breaks down when heated.

Sodium carbonate, carbon dioxide and water are made.

(a) (i) Write a WORD equation for this reaction.

_____ **[1]**

(ii) Carbon dioxide is made in this reaction.

What is the chemical test for carbon dioxide?

test _____

result _____ **[2]**

(b) Some soft drinks in cans taste better if they are cooled.

Some cans have a spot on them that turns blue when the drink is cold.

These cans use a new type of packaging.

What is the name of this TYPE of packaging?

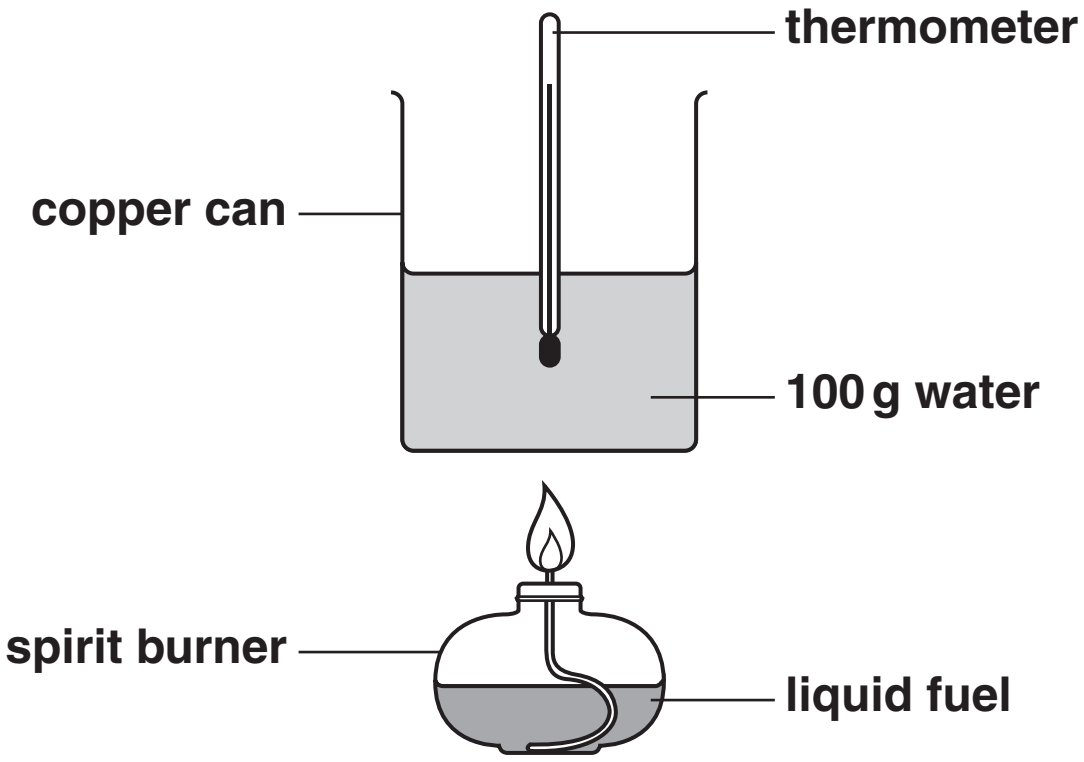
_____ **[1]**

[Total: 4]

6 Zoe and Olivia test three fuels.

Look at the diagram.

It shows the apparatus they use to measure the energy given out by the fuels.



(a) Look at the table. It shows their results.

fuel	temperature of water at start in °C	temperature of water at end in °C	mass of fuel burned in grams
meths	18	38	1.1
propanol	22	42	0.9
petrol	16	36	0.6

Which fuel gives out the MOST energy for each gram of fuel used?

_____

Explain your answer.

_____

_____ **[3]**

(b) Look at the results for petrol.

Burning 0.6 g of petrol transfers 8400 J of energy.

Calculate the energy transferred PER GRAM of petrol.

_____

_____

answer _____ J/g **[1]**

(c) When petrol burns, some bonds are broken and new bonds are made.

Burning petrol is an exothermic reaction.

Explain why. Use ideas about breaking and making bonds.

_____

_____

_____

_____

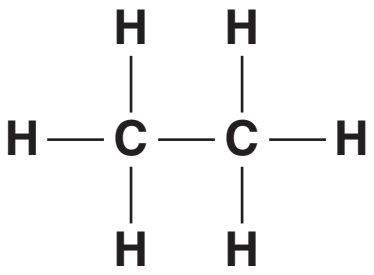
_____

_____

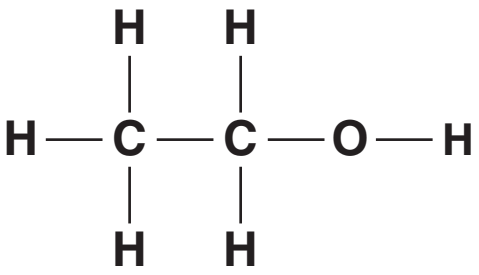
_____ **[3]**

[Total: 7]

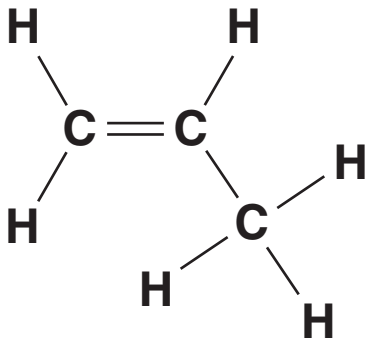
7 Look at the displayed formulas of some compounds.



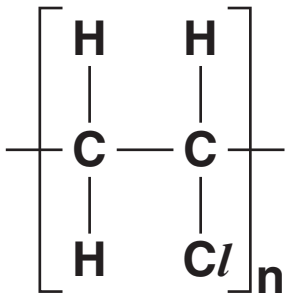
ETHANE



ETHANOL



PROPENE



POLY(CHLOROETHENE)

(a) Propene is an UNSATURATED hydrocarbon.

(i) What is meant by unsaturated?

_____ **[1]**

(ii) Bromine water can be used to test for unsaturation.

Bromine water is added to the hydrocarbon.

What would you SEE when bromine water is added to an unsaturated hydrocarbon?

_____ **[1]**

(b) Poly(chloroethene) is a polymer. It is made by POLYMERISATION.

(i) What are the conditions needed for polymerisation?

_____

_____

_____ **[2]**

(ii) Draw the displayed formula of the MONOMER, chloroethene.

[1]

[Total: 5]

8 Look at the table. It shows information about some fuels.

fuel	energy value in megajoules per kg	availability	cost in £ per kg	state
A	48.0	good	£1.30	liquid
B	49.0	limited	£0.80	liquid
C	89.5	good	£0.33	solid
D	37.0	good	£1.30	gas

(a) Which fuel is best for powering a car?

_____

Explain your answer.

_____

_____

_____ **[2]**

(b) Methane, CH_4, is a fuel.

Methane burns in oxygen, O_2.

Carbon dioxide and water are made.

Write a BALANCED SYMBOL equation for this reaction.

_____ **[2]**

[Total: 4]

SECTION C – MODULE P1

9 Britain is going digital.

(a) Television signals are changing from ANALOGUE to DIGITAL.

Draw labelled diagrams to show the difference between analogue and digital signals.

analogue signal **digital signal**

[2]

(b) Digital signals allow more information to be transmitted.

Describe how this is possible.

_____

_____ **[1]**

[Total: 3]

10 Microwaves have many uses.

(a) Microwaves are used to cook food.

Look at the statements about microwaves.

Put ticks (✓) in the boxes next to the TWO correct statements.

STATEMENT	
Microwaves do not pass through glass and plastic.	☐
Microwaves are reflected by glass and plastic surfaces.	☐
Microwaves are reflected by metal surfaces.	☐
Microwaves cook from the centre of the food.	☐
Microwaves penetrate about one centimetre into the food.	☐

[2]

(b) Microwaves are also used to transmit mobile phone signals.

It is not always easy to receive a good signal.

Write down one way in which mobile phone companies try to AVOID signal loss.

_____

_____ **[1]**

[Total: 3]

11 Houses can be insulated in different ways.

(a) Marie has fibreglass put in her loft.

This reduces energy loss.

(i) Explain why fibreglass reduces energy loss by CONDUCTION.

_____

_____

_____ **[2]**

(ii) Marie pays £250 for the fibreglass in her loft.

She will save £50 every year on her energy bills.

Calculate the payback time.

_____

_____

answer _____ years [1]

(b) Cavity wall insulation helps to reduce energy loss by CONVECTION.

Describe HOW ENERGY IS TRANSFERRED by convection.

In your answer, use ideas about

- **density**
- **air movement.**

A diagram may help your answer.

_____

_____

_____ **[2]**

[Total: 5]

12 (a) Diane wants to get a sun tan.

(i) Diane uses sun block to protect herself from the sun.

She knows that she can safely spend 15 minutes in the sun without sun block.

She uses sun block with a sun protection factor (SPF) of 20.

How many minutes can she safely spend in the sun using this sun block?

_____

_____

answer _____ minutes [1]

(ii) Diane's friend, James, has darker skin than Diane.

Because of this he has LESS chance of getting skin cancer.

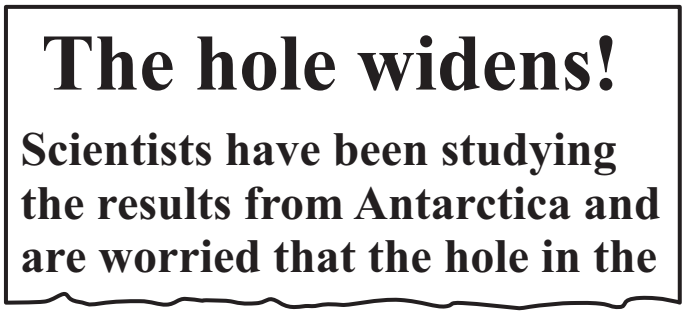
Explain why.

_____

_____ **[1]**

(b) Some scientists are worried about part of our atmosphere becoming thinner.

Newspapers have dramatic headlines.



(i) Which part of our atmosphere causes scientists to be worried?

_____ **[1]**

(ii) What does this layer do?

_____ **[1]**

(iii) What causes the layer to become thinner?

_____ **[1]**

[Total: 5]

13 This question is about uses of light.

(a) Signalling lamps can be used to send messages.

Light messages must be sent using a code.

Describe how light signals are used to send messages in Morse code.

_____

_____ **[2]**

(b) CD players use laser light to extract information from a compact disc (CD).

(i) How does a CD store information?

_____ **[1]**

(ii) How is the information recovered using laser light?

_____ **[1]**

[Total: 4]

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.