

**GENERAL CERTIFICATE OF SECONDARY EDUCATION  
GATEWAY SCIENCE  
SCIENCE B**

**B621/02**

Unit 1 Modules B1 C1 P1  
(Higher 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)

**Monday 12 January 2009  
Morning**

**Duration: 1 hour**



Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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**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.

FOR EXAMINER'S USE		
Section	Max	Mark
A	20	
B	20	
C	20	
<b>TOTAL</b>	<b>60</b>	

**EQUATIONS**

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

$$\text{energy} = \text{mass} \times \text{specific heat capacity} \times \text{temperature change}$$

$$\text{energy} = \text{mass} \times \text{specific latent heat}$$

$$\text{fuel energy input} = \text{waste energy output} + \text{electrical energy output}$$

$$\text{power} = \text{voltage} \times \text{current}$$

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

$$\text{energy (kilowatt hours)} = \text{power (kW)} \times \text{time (h)}$$

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

Answer **all** the questions.

**Section A – Module B1**

1 Mark is on holiday in Africa.



He is sitting in the sun and getting hot.

(a) Mark has to maintain a constant body temperature of 37°C.

(i) Which condition could Mark suffer from if he gets too hot?

Choose from the list.

**dehydration**

**emphysema**

**hallucination**

**hypothermia**

answer ..... [1]

(ii) The body controls its internal environment.

Write down the name given to this process.

..... [1]

(b) During his holiday, Mark should take precautions to prevent him from getting malaria.

(i) Suggest **one** precaution he should take.

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

(ii) Write down the name of the **vector** that spreads malaria.

..... [1]

**[Total: 4]**

**Turn over**

2 Deb is following a high protein diet.

(a) Deb has a mass of 80 kg.

(i) Calculate her recommended daily average protein intake (RDA) in grams.

Use the formula

$$\text{RDA in g} = 0.75 \times \text{body mass in kg}$$

You are advised to show your working.

RDA of protein = .....g [1]

(ii) Proteins are made from smaller molecules.

Write down the name of these smaller molecules.

..... [1]

(b) Deb makes sure she eats animal protein because she knows they are **first class proteins**.

Explain why animal proteins are first class proteins.

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

(c) Deb is overweight and concerned about her high blood pressure.

Describe **one** risk of having high blood pressure.

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

[Total: 4]

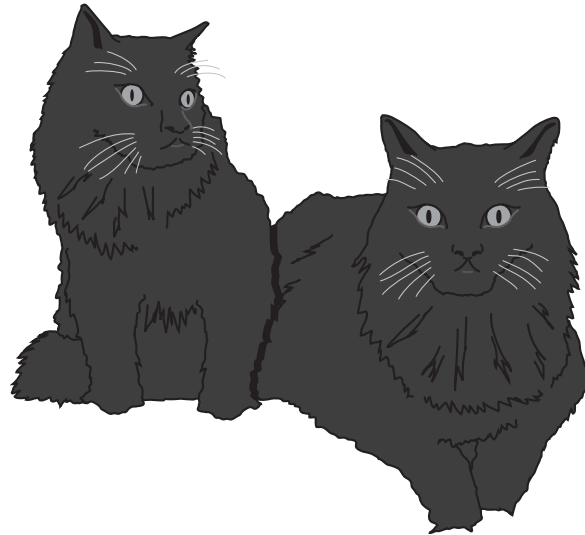
3 This question is about genes and chromosomes.

(a) Chromosomes are made of DNA.

DNA contains bases. Write down the **letters** that represent the **four** bases in DNA.

..... [1]

(b) Look at the picture of cats.



The cats were produced by sexual reproduction. They both have the same parents.

(i) A cat's body cell has 38 chromosomes.

How many chromosomes are in a **sperm** cell of a cat?

..... [1]

(ii) The cats in the picture have black fur. Their mother has white fur and their father has black fur.

Use ideas about genes to explain why the cats in the picture have black fur.

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

(c) When she was older one of the black cats in the picture mated with a cat with white fur.

She had four kittens. Two had black fur and two had white fur.

Draw a fully labelled genetic diagram to explain this.

Use the letters **B** and **b** to represent the alleles for fur colour.

Identify which kittens would be black and which would be white.

[3]

[Total: 7]

4 Brad is a helicopter pilot.



© iStockphoto.com / Sloba Mitic

He knows that he should **not** drink alcohol before he flies.

(a) To which group of drugs does alcohol belong?

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

depressants

hallucinogens

painkillers

stimulants

[1]

(b) Alcohol affects how impulses cross the gap between neurones.

(i) Write down the name given to this gap.

..... [1]

(ii) Describe how an impulse crosses this gap.

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

(c) Long term abuse of alcohol damages the liver cells.

Write down the name given to this damage.

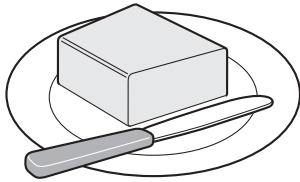
..... [1]

[Total: 5]

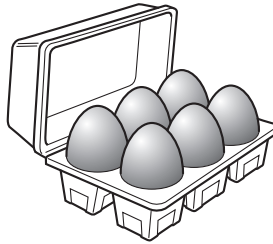
Section B – Module C1

5 This question is about foods.

(a) Look at the list of foods.



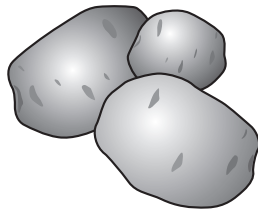
butter



eggs



margarine



potatoes



vitamin C

(i) Which food contains a lot of **protein**?

Choose from the list.

answer ..... [1]

(ii) Which food contains a lot of **carbohydrate**?

Choose from the list.

answer ..... [1]

(b) Chicken must be cooked before it is eaten.

Explain why.

..... [1]



(c) Chicken contains protein molecules.

Explain what happens to the protein molecules when chicken is cooked.

Your answer should include

- what happens to the protein molecules
- the name of the process that changes the protein molecules.

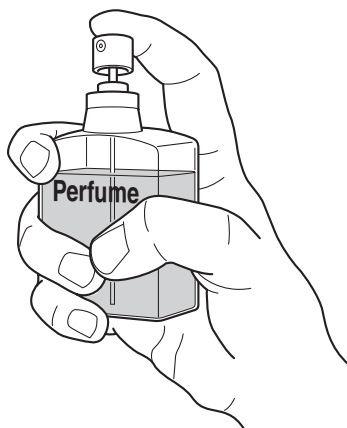
.....

.....

..... [2]

**[Total: 5]**

6 This question is about perfumes.



(a) One property of perfumes is that they evaporate easily.

This means that perfumes change from a liquid to a gas easily.

Why do perfumes need to evaporate easily?

..... [1]

(b) Explain what happens during evaporation.

Your answer should include

- what happens to the perfume particles
- ideas about forces between particles.

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

(c) Perfumes must be tested before they can be used by humans.

Years ago, perfumes were tested on animals.

Write down one **disadvantage** of testing perfumes on animals.

..... [1]

[Total: 4]

7 This question is about polymers.

A polymer called PET has these properties.

- it has a low density
- it has a low melting point
- it won't shatter when it is dropped
- it resists attack by water and acids
- it is flexible

(a) Which use is PET **most** suited to?  
Choose from the list.

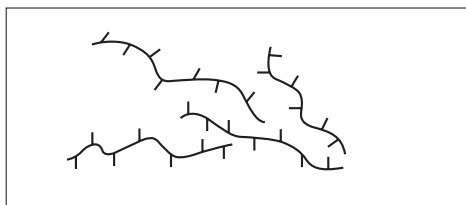
- a cup for hot drinks
- making a CD
- fizzy pop bottles
- a paperweight

answer .....

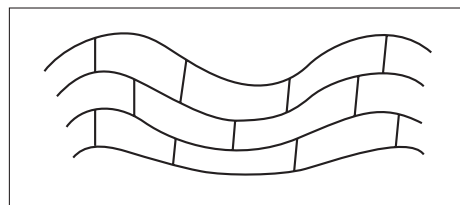
Write down a reason for your answer.

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

(b) Look at the diagrams. They show the structure of two polymers.



polymer A



polymer B

(i) Polymer A has a low melting point.

Suggest why. Use ideas about forces between polymer chains.

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

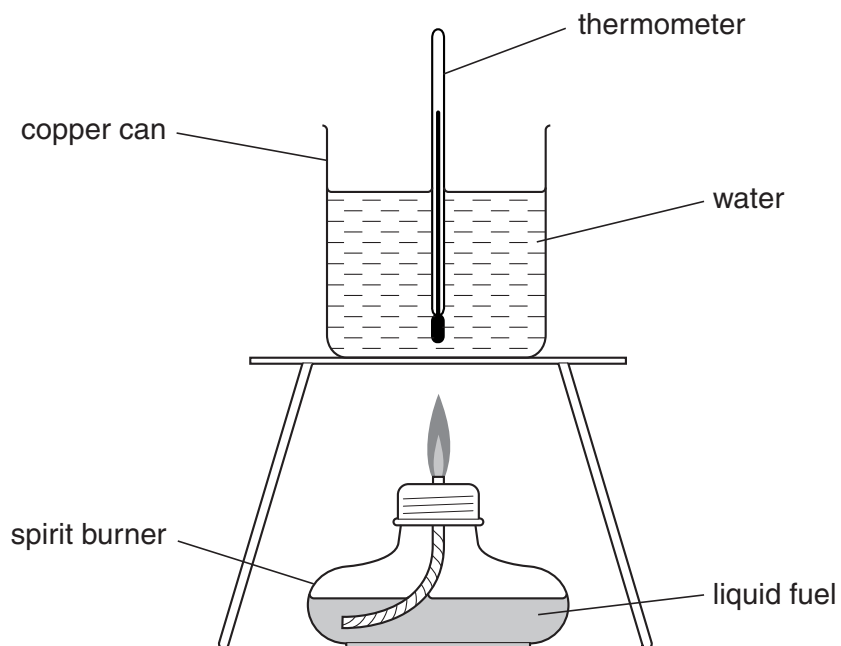
(ii) Polymer B is rigid and cannot be stretched.

Suggest why.

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

8 Nick and Lesley test three fuels.

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



Look at the table. It shows their results.

fuel	mass of fuel burned in grams	temperature at start in °C	temperature at end in °C	temperature change in °C
ethanol	0.8	20	40	20
paraffin	0.5	22	42	20
petrol	1.2	19	39	20

(a) Which fuel gives out **most** energy per gram?

.....

Explain your answer.

.....

..... [2]

- (b) Energy is given out during the combustion (burning) of fuels.

What is the name of the **type** of reaction which gives out heat?

..... [1]

- (c) Look at the results for ethanol.

0.8 g of ethanol burns and heats 100 g of water.

Calculate the amount of energy given out when 0.8 g of ethanol burns.

(Specific heat capacity of water is  $4.2 \text{ J/g } ^\circ\text{C}$ .)

The equations on page 2 may help you.

.....  
 .....  
 .....

answer ..... J [2]

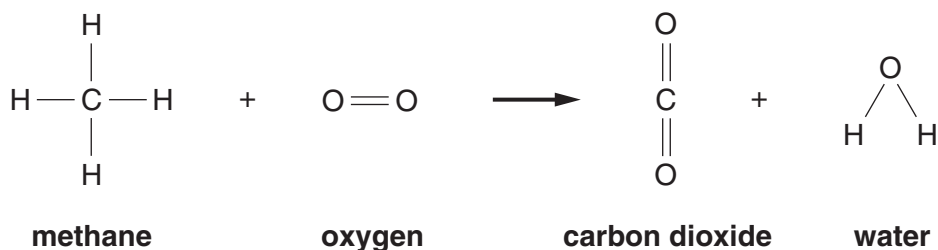
- (d) Ethanol burns in oxygen. Water and carbon dioxide are made.

Write a **word** equation for this reaction.

..... [1]

- (e) Methane is another fuel.

Look at the equation. It shows what happens when methane burns.



Balance the equation. Write your balanced equation below.

[1]

[Total: 7]

Section C – Module P1

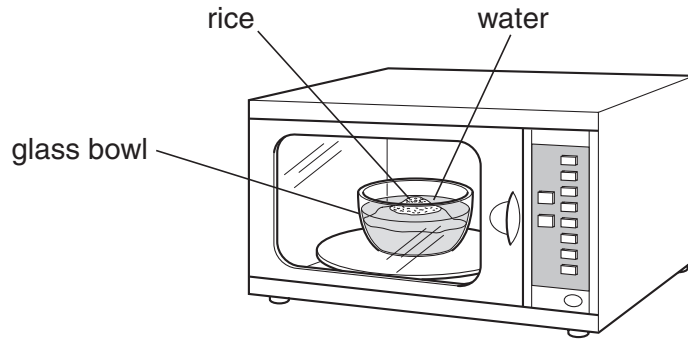
9 This question is about cooking.

(a) Abbie uses microwaves to cook some rice.

She puts the rice into a **glass** bowl.

She adds cold **water** to the rice.

She puts the bowl in the microwave oven.



The oven has **metal** walls on the inside.

(i) Why are the oven walls made of **metal**?

..... [1]

(ii) Why does she use a **glass** bowl?

..... [1]

(b) Abbie cooks a curry in the microwave oven.

The water in the curry absorbs the microwaves.

(i) Explain how this affects the water particles.

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

(ii) How does the centre of the food then get hot?

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

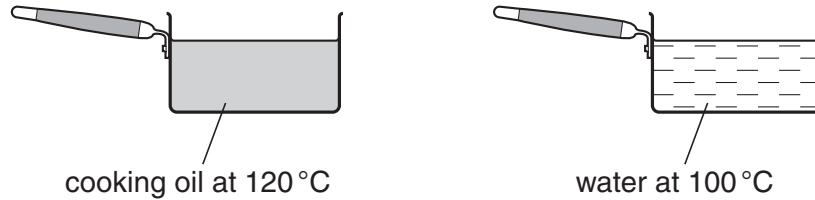
(c) Abbie cooks some food in pans on a hob.

She uses **cooking oil** in one pan. She uses **water** in the other.

The cooking oil and water and are at high temperatures.

They are in identical pans.

Look at the diagram.



She lets them both cool down.

The cooking oil cools to room temperature more quickly.

Look at the information below.

liquid	starting temperature in °C	time taken to cool to room temperature in minutes	mass of liquid in kg	specific heat capacity in J/kg °C
cooking oil	120	25	0.5	860
water	100	60	0.5	4200

Why does the cooking oil cool quicker than the water?

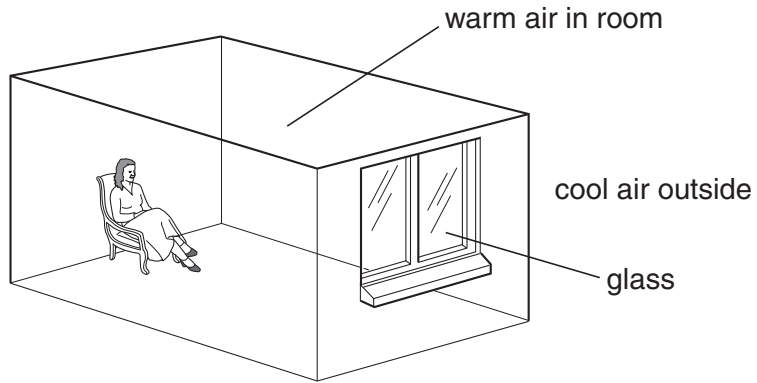
.....

..... [1]

[Total: 5]

10 (a) Emma has single glazing in her house.

Look at the diagram.



The warm air particles in the room bump into the glass.

This energy is transferred to the cool air outside.

Explain how this **conduction** happens.

In your answer write about the movement of particles.

.....

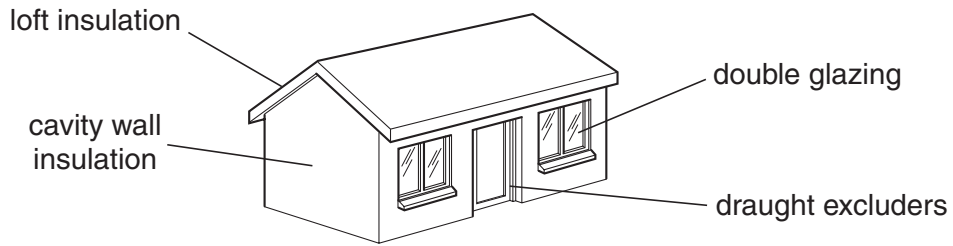
.....

.....

..... [3]



(b) Emma's house costs a lot to heat. She decides to buy some insulation.



She chooses loft insulation and double glazing.

Look at the table.

insulation	cost to fit	money saved each year in fuel bills	payback time
loft insulation	£200		2 years
double glazing	£5000	£250	

(i) She fits **loft insulation**. This saves her money on her fuel bills.

Calculate how much money this saves her in one year.

.....  
 answer £..... [1]

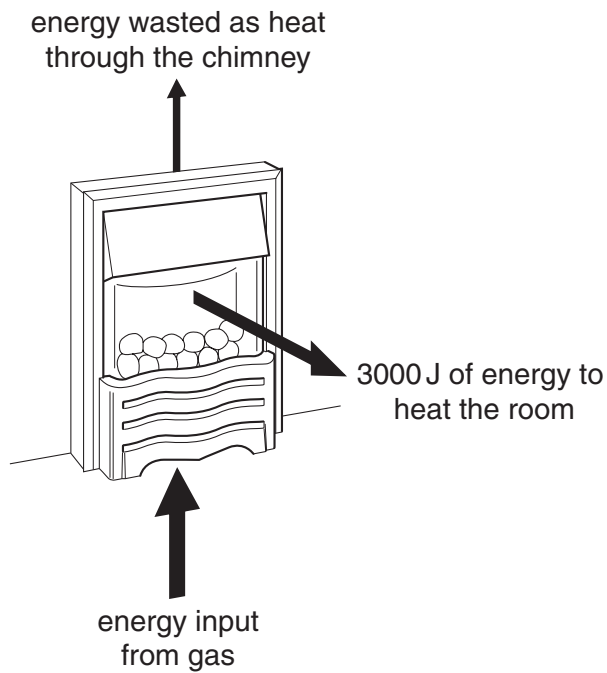
(ii) Calculate the **payback time** for double glazing.

.....  
 answer ..... years [1]

(c) Emma has a gas fire.

Look at the information about the fire.

It shows how many joules of energy are transferred each second.



The **efficiency** of the fire is **75%**.

Calculate the energy **input** for the fire. Use the information in the diagram.

The equations on page 2 may help you.

.....

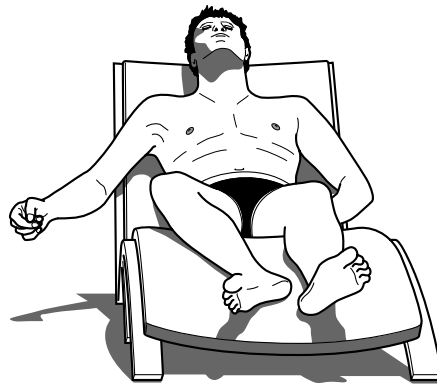
.....

answer ..... joules

[2]

[Total: 7]

11 (a) Mike wants to sunbathe.



Without sun cream he can safely lie in the sunshine for 30 minutes.

Mike wants to sunbathe safely for 6 hours.

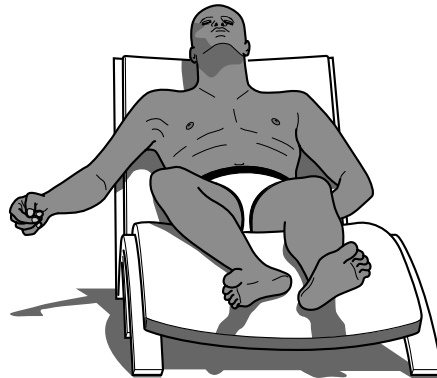
Which factor sun cream should he use?

Choose from      2      3      4      8      12

answer .....

[1]

(b) Rico sunbathes too.



Rico has **darker** skin than Mike. He is less at risk from sunbathing.

Write down two ways that dark skin **reduces** the risk.

1 .....

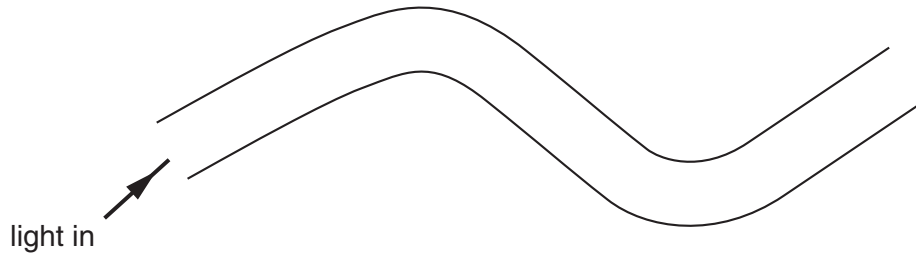
2 .....

[2]

[Total: 3]

12 This question is about communications.

(a) (i) Look at the diagram of an optical fibre.



A ray of light travels in the fibre.

It comes out at the other end.

Describe how the light travels through the fibre.

You may draw on the diagram to help your answer.

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

(ii) Optical fibres are used to transmit information.

Information can be carried by **analogue** or **digital** signals.

Write down one **difference** between analogue and digital signals.

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

(b) Digital signals carry **more information** than analogue signals.

This makes the picture on a digital TV better, with **less interference**.

(i) Explain why **more information** can be carried.

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

(ii) Explain why there is **less interference** on a digital TV.

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

[Total: 5]

END OF QUESTION PAPER

21  
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Q.4 photo

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# The Periodic Table of the Elements

	1	2	3	4	5	6	7	0											
	7 <b>Li</b> lithium 3	9 <b>Be</b> beryllium 4	11 <b>Na</b> sodium 11	12 <b>C</b> carbon 6	13 <b>Al</b> aluminium 13	14 <b>N</b> nitrogen 7	15 <b>P</b> phosphorus 15	16 <b>O</b> oxygen 8	17 <b>F</b> fluorine 9	18 <b>Ar</b> argon 18									
	19 <b>K</b> potassium 19	20 <b>Ca</b> calcium 20	23 <b>Sc</b> scandium 21	24 <b>Ti</b> titanium 22	25 <b>V</b> vanadium 23	26 <b>Cr</b> chromium 24	27 <b>Mn</b> manganese 25	28 <b>Fe</b> iron 26	29 <b>Co</b> cobalt 27	30 <b>Ni</b> nickel 28	31 <b>Cu</b> copper 29	32 <b>Zn</b> zinc 30	33 <b>Ga</b> gallium 31	34 <b>Ge</b> germanium 32	35 <b>As</b> arsenic 33	36 <b>Se</b> selenium 34	37 <b>Br</b> bromine 35	38 <b>Kr</b> krypton 36	
	39 <b>Rb</b> rubidium 37	40 <b>Sr</b> strontium 38	45 <b>Y</b> yttrium 39	48 <b>Zr</b> zirconium 40	51 <b>Nb</b> niobium 41	52 <b>Mo</b> molybdenum 42	55 <b>Tc</b> technetium 43	56 <b>Ru</b> ruthenium 44	59 <b>Rh</b> rhodium 45	65 <b>Pd</b> palladium 46	63.5 <b>Ag</b> silver 47	70 <b>Cd</b> cadmium 48	73 <b>In</b> indium 49	75 <b>Sb</b> antimony 51	77 <b>Te</b> tellurium 52	79 <b>I</b> iodine 53	80 <b>Xe</b> xenon 54	81 <b>Rn</b> radon 86	
	85 <b>Cs</b> caesium 55	88 <b>Ba</b> barium 56	89 <b>La*</b> lanthanum 57	91 <b>Hf</b> hafnium 72	93 <b>Ta</b> tantalum 73	96 <b>W</b> tungsten 74	[98] <b>Re</b> rhenium 75	101 <b>Os</b> osmium 76	103 <b>Ir</b> iridium 77	106 <b>Pt</b> platinum 78	108 <b>Au</b> gold 79	112 <b>Hg</b> mercury 80	115 <b>Tl</b> thallium 81	119 <b>Pb</b> lead 82	122 <b>Bi</b> bismuth 83	127 <b>Po</b> polonium 84	131 <b>At</b> astatine 85	[223] <b>Fr</b> francium 87	[222] <b>Rn</b> radon 86
	[223] <b>Fr</b> francium 87	[226] <b>Ra</b> radium 88	[227] <b>Ac*</b> actinium 89	[261] <b>Rf</b> rutherfordium 104	[262] <b>Db</b> dubnium 105	[266] <b>Sg</b> seaborgium 106	[264] <b>Bh</b> bohrium 107	[277] <b>Hs</b> hassium 108	[268] <b>Mt</b> meitnerium 109	[271] <b>Ds</b> darmstadtium 110	[272] <b>Rg</b> roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated							

1	<b>H</b>	1
	hydrogen	

relative atomic mass
atomic symbol
name
atomic (proton) number

Key

\* 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.