THIS IS A NEW SPECIFICATION

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F

Tuesday 12 June 2012 – Morning

GCSE GATEWAY SCIENCE
SCIENCE B

B711/01 Science modules B1, C1, P1 (Foundation Tier)

B722230612

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)

Duration: 1 hour 15 minutes

B711101

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- 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).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- A list of equations can be found on page 2.
- The Periodic Table can be found on the back page.
- 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 **75**.
- This document consists of **32** pages. Any blank pages are indicated.

EQUATIONS

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

$$\text{efficiency} = \frac{\text{useful energy output } (\times 100\%)}{\text{total energy input}}$$

wave speed = frequency × wavelength

power = voltage × current

energy supplied = power × time

$$\text{average speed} = \frac{\text{distance}}{\text{time}}$$

distance = average speed × time

$$s = \frac{(u + v)}{2} \times t$$

$$\text{acceleration} = \frac{\text{change in speed}}{\text{time taken}}$$

force = mass × acceleration

weight = mass × gravitational field strength

work done = force × distance

$$\text{power} = \frac{\text{work done}}{\text{time}}$$

power = force × speed

$$KE = \frac{1}{2}mv^2$$

momentum = mass × velocity

$$\text{force} = \frac{\text{change in momentum}}{\text{time}}$$

GPE = mgh

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

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Question 1 begins on page 4.

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Answer **all** the questions.

Section A – Module B1

1 Bethany is a scientist.

Look at the list of Bethany's characteristics.

blood group O
body mass of 60 kg
1.65 m tall
has pierced ears
speaks English

(a) Write down **two** characteristics that are a result of **both** environmental and inherited factors.

Choose your answers from the list.

1 .....

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

(b) Bethany is testing some common foods to find their protein content.

Proteins are made of lots of small molecules joined together.

Write down the name of these molecules.

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

(c) Look at the table.

It shows the daily protein intake for different age groups in four countries.

Protein deficiency is a problem in some countries.

name of country	type of country	average protein intake in grams per person per day	
		6 to 10 years	11 to 18 years
Ghana	developing	14.9	36.5
Mexico	developing	18.2	40.2
United Kingdom	developed	25.8	45.8
USA	developed	27.3	52.6

Explain how a lack of protein affects a person and **suggest** why their protein intake depends on age and location.

Use the table to help you.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

[Total: 9]

2 Malaria is an infectious disease.

(a) (i) Which type of pathogen causes malaria?

Put a (ring) around the correct answer.

bacteria **fungi** **protozoa** **virus**

[1]

(ii) One symptom of malaria is a high fever.

Paracetamol is a drug that can be used to reduce fever.

A boy has a temperature of 41 °C.

How much is this above **normal** core body temperature?

..... °C **[1]**

(iii) Describe **one other** use of paracetamol and the effect it has on the body.

.....

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

(b) Malaria is common in many African countries.

Sickle cell anaemia is a disorder also found in these countries.

(i) What name is given to types of disorder like sickle cell anaemia?

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

(ii) Read the information on a new treatment for sickle cell anaemia.

> Severe sickle cell anaemia can be treated with a medicine called hydroxyurea.
>
> Doctors are studying the long-term effects of hydroxyurea on people who have sickle cell anaemia.
>
> In an early study, eight children were all given the drug.
>
> Most of the children showed improved growth and general health.
>
> This suggests that hydroxyurea helps to improve the health of people with sickle cell anaemia.

Use the information in the article to answer the question.

Doctors are **not** convinced that hydroxyurea helps to improve the health of people with sickle cell anaemia.

Explain why.

.....

.....

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

[Total: 7]

3 Coronary heart disease (CHD) is one of the UK's biggest killers.

88 000 people died from CHD in 2008.

Since 2000, health authorities have been trying to lower the death rate from CHD.

Look at the table.

death rates from CHD per 100 000 population				
year	age 55–64		age 65–74	
	men	women	men	women
2000	291	84	823	347
2001	271	79	763	328
2002	250	72	707	304
2003	238	66	660	275
2004	219	57	599	250
2005	204	54	558	225
2006	194	52	500	207
2007	188	49	471	187
2008	175	47	443	179

(a) (i) Describe the trend in death rates between the years 2000 and 2008.

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

(ii) Write down one difference between the two age groups.

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

(iii) In 2008 the total number of deaths per 100 000 population in the 55–64 age group was 222.

Calculate the percentage of these deaths that were men.

answer .....%

What does the result tell you?

.....

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

(b) Scientists have discovered a new drug.

They think it will help lower the death rate from CHD.

The main cause of CHD is a build up of fat in the arteries.

The new drug is **not** classed as an antibiotic.

Explain why.

.....

.....

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

[Total: 6]

4 This question is about the nervous system.

(a) Describe how nerve impulses travel along nerves.

.....

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

(b) Look at the picture.

Andrew is paralysed from the waist down because of spinal damage.

Impulses can travel from a stimulus below Andrew's waist to his central nervous system but he cannot respond.

Explain why Andrew cannot respond.

.....

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

[Total: 3]

Section B – Module C1

5 Coal, oil and natural gas are non-renewable fuels.

Two scientists estimate how many years it will be before these fuels run out.

Look at the table.

fuel	how many years before the fuel will run out	
	estimate of scientist A	estimate of scientist B
coal	143	417
natural gas	61	167
oil	43	43

(a) Which fossil fuel do the scientists think will run out first?

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

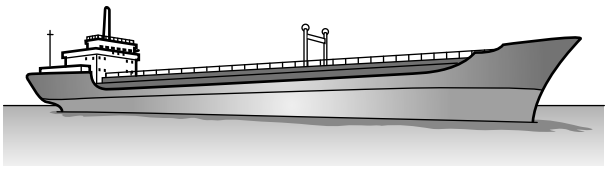
(b) Both scientists used evidence to make their estimates.

Suggest why the two sets of estimates are not the same.

.....

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

(c) Crude oil is often transported across the sea in large ships.



Sometimes these ships have an accident and crude oil spills into the sea.

Write about environmental problems this could cause.

.....

.....

.....

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

[Total: 4]

6 Crude oil contains a mixture of hydrocarbons.

Look at the table. It gives information about some of these hydrocarbons.

hydrocarbon	**molecular formula**	**melting point in °C**	**boiling point in °C**
propane	C_3H_8	–188	–42
butane	C_4H_{10}	–138	0
hexane	C_6H_{14}	–95	69
decane	$C_{10}H_{22}$	–30	174
hexadecane	$C_{16}H_{34}$	18	287

(a) Which hydrocarbon has a molecule with a total of **14 atoms**?

Choose from the table.

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

(b) Larger hydrocarbon molecules contain more carbon atoms.

How does **melting point** change as the molecules get larger?

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

(c) Petrol has a boiling range from 40 °C to 110 °C.

Which hydrocarbon is found in petrol?

Choose from the table.

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

[Total: 3]

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Question 7 begins on page 14.

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7 Simon investigates baking powder.

He finds it contains sodium hydrogencarbonate, $NaHCO_3$.

Sodium hydrogencarbonate breaks down when heated.

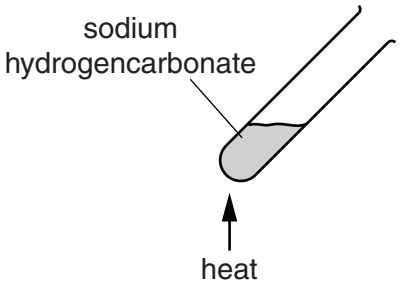
(a) Look at the balanced symbol equation. It is not finished.

Finish the equation by writing in the missing formula.

$2NaHCO_3 \rightarrow Na_2CO_3 + CO_2 +$ ..... **[1]**

(b) Simon heats a 1.00 g sample of sodium hydrogencarbonate for one minute.

Look at the diagram. It shows the apparatus he uses.



He measures the mass of the solid left in the test tube.

Simon repeats the experiment four more times.

Each time he heats the sodium hydrogencarbonate for a different number of minutes.

Look at the table of his results.

time of heating in minutes	1	2	3	4	5
mass of solid left in test tube in grams	0.87	0.73	0.66	0.63	0.63

(i) Simon wants to show that carbon dioxide is made in the reaction.

Describe how Simon can show that carbon dioxide is made.

.....

.....

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

(ii) After the first minute the mass of solid in the test tube decreases.

After four minutes the mass has stopped decreasing.

Suggest a reason for **each** of these observations.

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

[Total: 5]

8 Some solvents are used to remove nail varnish.

Stowmarket Synthetics make solvents.

Phil is a research chemist. He finds out information about four solvents.

solvent	is it poisonous?	is it flammable?	will it dissolve	
			red nail varnish?	black nail varnish?
A	yes	yes	yes	yes
B	no	yes	yes	yes
C	no	no	no	no
D	no	yes	no	yes

(a) Which solvent would be the most suitable for use as a nail varnish remover?

answer .....

Explain your answer.

.....

.....

.....

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

(b) Phil also wants to use the solvent in a perfume.

He thinks it would be useful to know more information about the solvent.

Write about **two** more pieces of information he should find out about the solvent.

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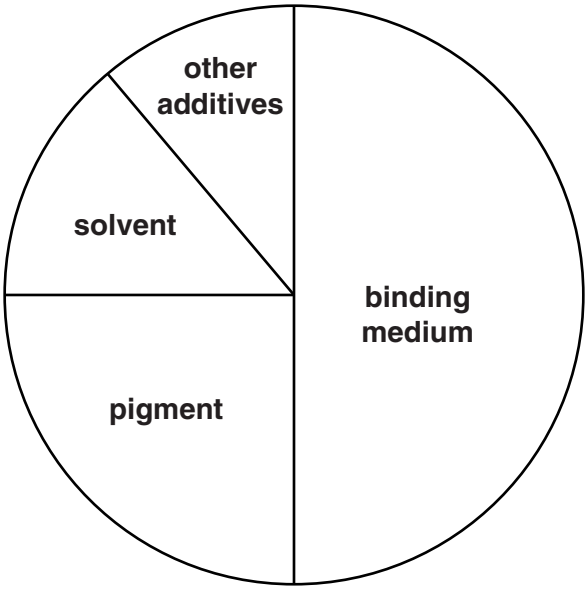
..... **[2]**

[Total: 4]

9 Paints contain several ingredients.

Look at the pie chart of the ingredients of a paint.



(a) What is the percentage of the ingredient that sticks the paint to a surface?

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

(b) Some pigments are **thermochromic**.

Write down one use of a thermochromic pigment and explain why it is suitable for this use.

.....

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

[Total: 3]

10 Plastics contain polymer molecules.

Many shopping bags are made from polymers (plastics).

Poly(ethene) is often used to make plastic shopping bags.

These shopping bags need to be disposed of after use.

One of the properties of poly(ethene) is that it is non-biodegradable.

Suggest, with reasons, **other** properties needed by poly(ethene) so that it can be used to make a plastic shopping bag and write about the disposal of these bags.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

[Total: 6]

Section C – Module P1

11 (a) Nihal takes a black and white **thermogram** picture of his house.

Explain what the thermogram shows and why it is useful.

.....

.....

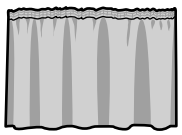
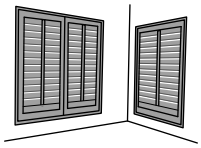
.....

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

Turn over for the remainder of question 11

(b) Nihal wants to reduce the heat loss from the windows.

Look at the information about the materials he could add to the windows.

material added to window	picture of the material	reduction in heat loss
lightweight curtains		2%
heavyweight curtains		20%
wooden shutters		45%

All the materials use the same property of **air** to reduce heat loss from his house.

Explain how the materials reduce heat loss and why the percentage reduction is different for each material.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

(c) Nihal decides to add curtains to all the windows.

type of curtain	cost to fit in £	saving on fuel bills per year in £	payback time in years
lightweight curtains	130	10	
heavyweight curtains	2000	100	

(i) Calculate the **payback time** for **both** types of curtain.

Write your answers in the table. **[1]**

(ii) Nihal expects to keep the curtains for 25 years.

Use this information to **explain** which type of curtain would be the **best** to fit.

.....

.....

.....

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

[Total: 11]

12 Mobile phones use microwave radiation.

(a) Scientific studies look at the **effects** of mobile phone microwave radiation.

(i) Results from these studies are published.

Explain why scientists publish their results.

.....

.....

.....

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

(ii) Four scientists look at the effects of mobile phone microwave radiation.

Here are their results.

name of scientist	number of people in the study	number of people reporting possible effects
Ethan	1000	15
Jayden	17000	20
Kiera	18000	20
Maisie	30000	30

One conclusion is that

- Ethan's results show 1.5% of the people reported possible effects. However, the number of people in the study is too low for it to be accurate.

Use the **data** in the table to suggest **another** conclusion.

.....

.....

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

(b) Annabel likes to text on her mobile phone.

Her parents worry about the length of time she spends using her mobile phone.

Write about some of the health **concerns** they may have.

.....

.....

.....

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

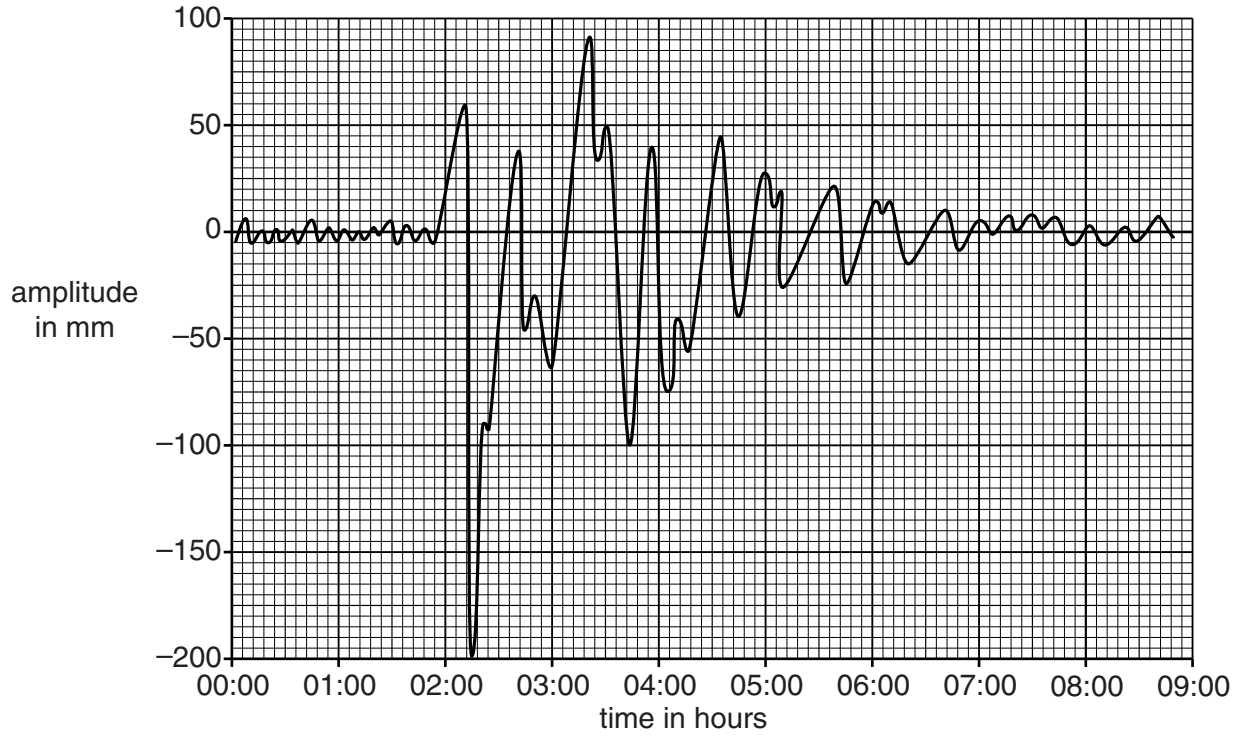
[Total: 5]

13 Earthquakes produce shock waves.

(a) Write down the **name** of the equipment used to **detect** earthquakes.

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

(b) Look at the recording of shock waves.



Different sized shock waves were recorded.

(i) What is the **amplitude** of the largest shock wave?

..... mm **[1]**

(ii) What **time** is it recorded at?

..... hours **[1]**

(c) The **two** types of seismic waves are **P waves** and **S waves**.

Which type of wave will be seen first on the recording and why?

type of wave .....

reason .....

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

[Total: 4]

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Question 14 begins on page 26.

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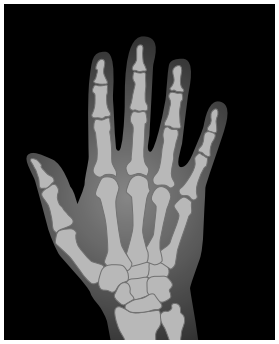
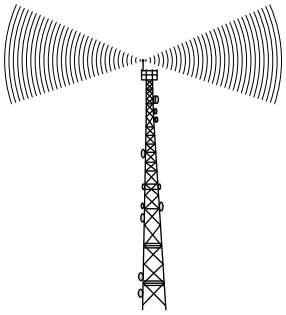
14 This question is about the **electromagnetic spectrum**.

Look at the diagrams.

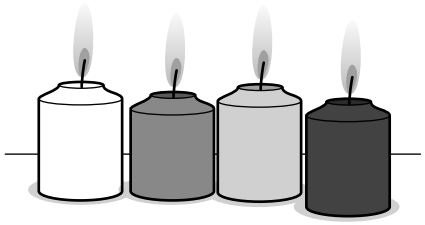


X-ray of a hand



radio mast

microwave oven



candles giving off visible light

ultraviolet light showing a hand print

(a) The diagrams show five different types of electromagnetic wave being used.

Put the five types of electromagnetic wave in the table to show **increasing** frequency.

Two have been done for you.

frequency in Hz	order of frequency	type of electromagnetic wave
10^6	lowest ↓	
10^{10}		microwave
10^{15}		
10^{16}		ultraviolet
10^{18}	highest	

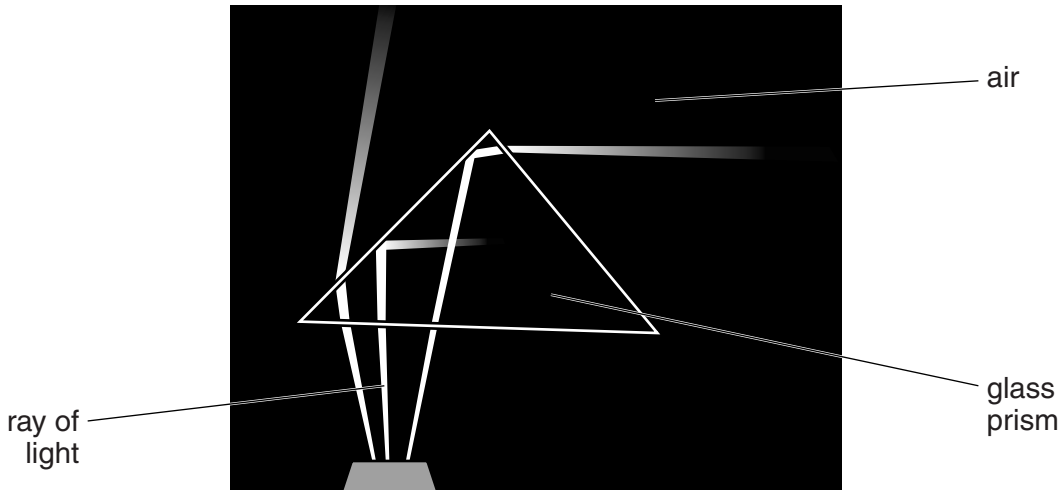
[1]

(b) Infrared waves have a frequency **between** visible light and microwaves.

Use the data in the table to estimate the frequency of infrared waves.

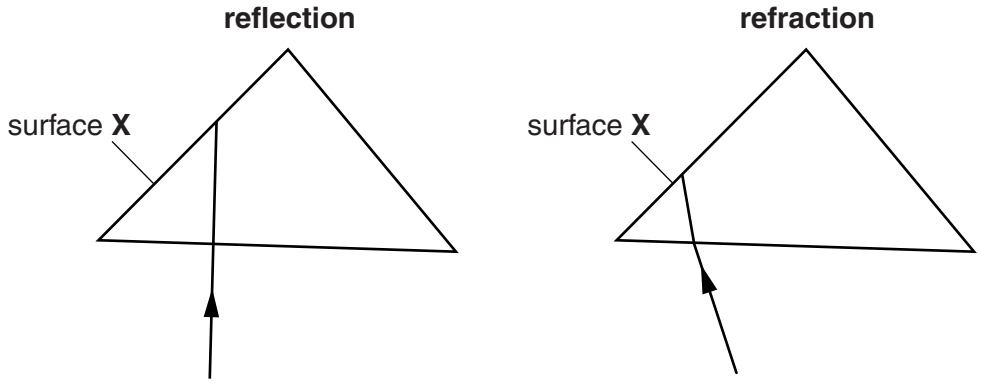
answer ..... Hz **[1]**

(c) Look at the picture of a prism.



Rays of light are being reflected **and** refracted.

Complete the diagrams to show where reflection and refraction happen at surface **X** and explain why refraction happens.



explanation .....

.....

..... **[3]**

[Total: 5]

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.