THIS IS A NEW SPECIFICATION

OCR
RECOGNISING ACHIEVEMENT

H

Thursday 12 January 2012 – Morning

GCSE GATEWAY SCIENCE
SCIENCE B

B711/02 Science modules B1, C1, P1 (Higher Tier)

B722160112

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

B711102

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 **24** pages. Any blank pages are indicated.

EQUATIONS

energy = mass × specific heat capacity × temperature change

energy = mass × specific latent heat

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

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

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

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

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Question 1 begins on page 4.

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

Section A – Module B1

1 The table shows information about the alcohol in different brands of beer.

brand	volume of beer in can or bottle in ml	units of alcohol in can or bottle
A	440	1.8
B	330	1.6
C	440	1.5
D	275	1.0
E	330	1.7

1 unit = 10 ml of pure alcohol

1 unit is also the amount of alcohol that the average adult can drink and remove from their blood in one hour.

(a) How many ml of alcohol are in one can of **brand A**?

answer ..... ml **[1]**

(b) (i) If an average adult drinks one can of **brand C**, how many **minutes** will it take to remove all the alcohol from the blood?

answer ..... min **[1]**

(ii) Billy drinks a can of **brand C**.

It takes 120 minutes for all the alcohol to be removed from his blood.

This is different from the time it takes an average adult.

Explain why it is different.

.....

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

(c) Billy drinks 100 ml of each brand on different days, one brand per day.

Which brand will take longest to be removed from his blood?

You **must** show your working.

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

(d) Billy is more likely to have an accident while driving if there is alcohol in his blood.

This is because alcohol is a depressant.

Depressants slow down the transmission of nerve impulses.

Explain how depressants slow down the transmission of nerve impulses.

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

[Total: 7]

2 John and Steve are trying to stay fit and healthy.

They eat balanced diets and enjoy playing football.

(a) Regular exercise and eating a balanced diet help reduce high blood pressure.

(i) Write down **one other** way to reduce high blood pressure.

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

(ii) Although John and Steve both eat balanced diets, they do **not** eat exactly the same foods.

Write down and explain **one** medical reason why balanced diets may vary.

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

(b) When they play football, John and Steve sweat.

Explain how sweating works and why it is necessary.

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

(c) John has a bath after his game.

He puts his foot in the bath but quickly pulls it out because the water is too hot.

This is an example of a spinal reflex action.

(i) In this reflex action, what is the receptor?

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

(ii) In this reflex action, what is the effector?

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

[Total: 7]

3 Sam's baby is due to have an MMR (measles, mumps and rubella) vaccine.

(a) Explain how vaccination (immunisation) works.

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

(b) Sam is worried because she has heard that there may be some risks associated with vaccination.

Despite these risks, why do doctors usually recommend that babies are vaccinated?

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

(c) Measles, mumps and rubella can **not** be treated with antibiotics.

Suggest why.

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

[Total: 5]

4 Jane investigates phototropism in wheat seedlings.

She cuts the tips off some of her seedlings.

She leaves the seedlings by the window.

She looks at them again two days later.

seedlings at start

seedlings with some of their tips cut off

light

seedlings after two days

Describe and explain the results that occurred after two days.

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

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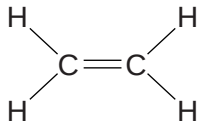
..... **[6]**

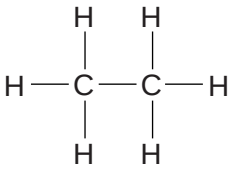
[Total: 6]

Section B – Module C1

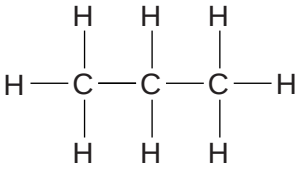
5 Look at the displayed formulas of some carbon compounds.



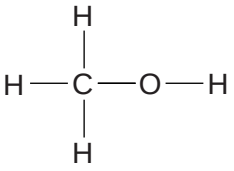
A



B



C



D

(a) Which compound will decolourise bromine water?

Choose from **A**, **B**, **C** or **D**.

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

(b) What is the molecular formula of compound **C**?

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

(c) Compound **A** is ethene.

Draw the displayed formula of the polymer poly(ethene).

[1]

(d) Compound **C** is a **saturated** hydrocarbon.

What is meant by saturated?

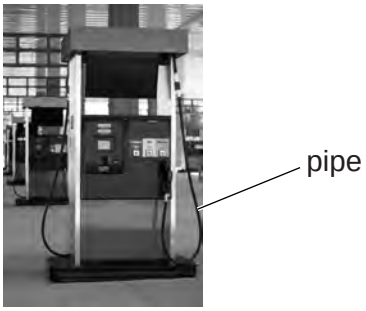
..... **[1]**

[Total: 4]

6 **(a)** Look at the table. It shows some information about polymers.

polymer	melting point in °C	solubility in water	solubility in petrol	is it biodegradable?
A	80	slightly soluble	insoluble	yes
B	90	slightly soluble	soluble	no
C	120	insoluble	insoluble	yes
D	95	insoluble	soluble	no

(i) None of these polymers would be suitable for making the pipe on a petrol pump.



Explain why.

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

(ii) Which property, not in the table, would be necessary for the polymer used to make this pipe?

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

(b) GORE-TEX® fabric is used to make outdoor clothing.

GORE-TEX® fabric is made with nylon laminated with a PTFE membrane.

The PTFE has small holes in it.

GORE-TEX® fabric is waterproof but **also** breathable.

Explain why.

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

[Total: 5]

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Question 7 begins on page 12.

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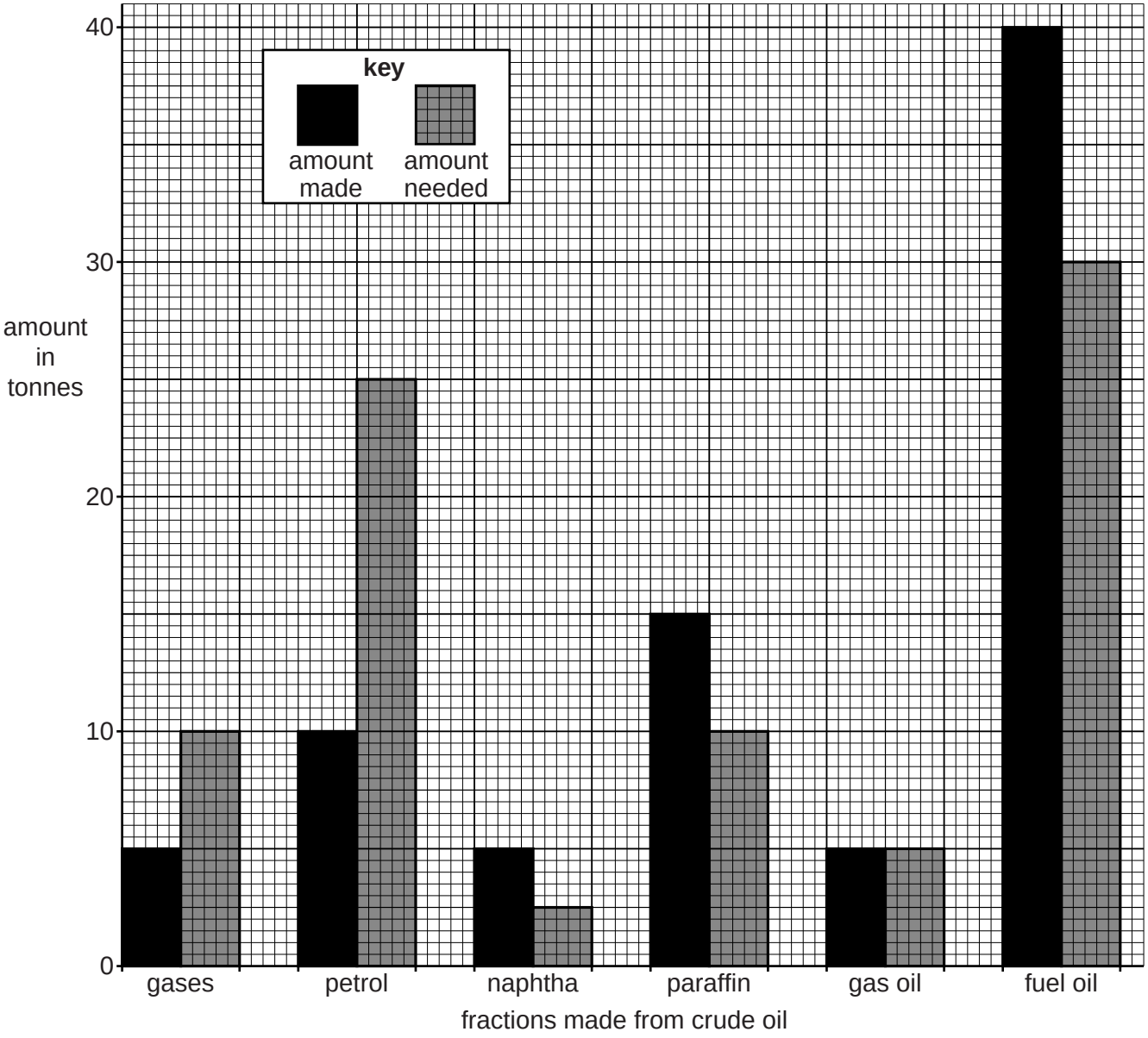
7 Oil refineries separate crude oil into useful fractions.

They do this by fractional distillation.

The bar chart shows the amount of some fractions **made** from 100 tonnes of crude oil.

It also shows the amount of these fractions **needed** for everyday uses.



(a) Look at the amount made and the amount needed for each fraction in the bar chart.

What problems does this give the manager of an oil refinery?

Explain how cracking overcomes these problems. Include an equation for cracking.

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

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

(b) The UK economy needs large amounts of crude oil from overseas.

There are political issues resulting from the need to import crude oil.

Write about these **political** issues.

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

[Total: 8]

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

fuel	energy value in kilojoules per kg	availability	cost in £ per kg	state at room temperature	estimated years of supply left	pollution
A	4800	good	1.30	liquid	20	makes carbon dioxide and some sulfur dioxide
B	4960	limited	0.80	liquid	12	makes carbon dioxide
C	8950	good	0.33	solid	50	makes carbon dioxide and large amounts of sulfur dioxide
D	3700	good	1.30	gas	8	makes carbon dioxide

(a) A new power station plans to use fuel **C**.

Explain the advantages and disadvantages of this choice.

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

(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: 5]

9 Chemical changes happen when potatoes and meat are cooked.

(a) The protein molecules change shape when meat is cooked.

What is the name of this process?

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

(b) Potato is easier to digest when it is cooked.

Explain why.

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

[Total: 3]

Section C – Module P1

10 The Sun is giving out all types of electromagnetic radiation.

The ozone layer absorbs some of this radiation.

(a) Which type of radiation is absorbed by the ozone layer?

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

(b) Scientists have discovered a hole in the ozone layer over Antarctica.

What has caused this hole in the ozone layer?

.....

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

(c) Look at the following information.

- Exposure to sunlight can cause skin cancer.
- To reduce this effect children are often covered in high SPF sunscreen.
- Rickets is a disease caused by a lack of vitamin D.
- Sunlight is used to make vitamin D.

Reduction in the number of skin cancer cases is an advantage of using high SPF sunscreen.

Use the information to suggest one possible **disadvantage** of using high SPF sunscreen.

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

[Total: 3]

11 **(a)** Lasers produce an **intense** beam of light which is coherent.

Explain what is meant by intense **and** coherent.

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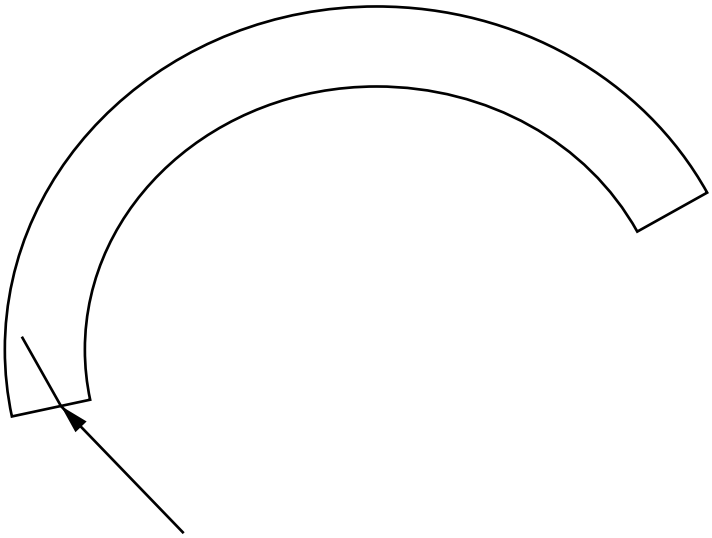
..... **[2]**

(b) Many telephone companies use optical fibres to carry signals over large distances.

Look at the enlarged diagram of an optical fibre.



Continue the ray to show its path along the fibre from one end to the other. **[2]**

(c) Some people think the use of mobile phones is safe.

Others think mobile phones may be harmful to health.

Write about one of the possible health risks from using mobile phones and suggest how this risk can be reduced.

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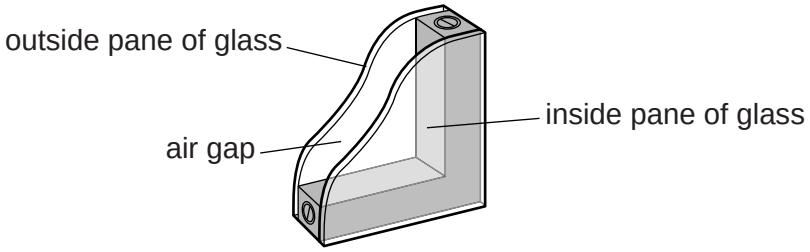
..... **[2]**

[Total: 6]

12 Vicky finds that the energy bills for her house are high.

She knows that double glazing will reduce the energy transfer through her windows.



Look at the information in the table.

type of window	size of air gap in mm	average cost to fit per window in £	total saving for a 3 bed-roomed house in £ each year
P	4	600	170
Q	8	600	196
R	16	600	209
S	20	600	210
T	32	600	210

Describe how the design of double glazed windows reduces energy transfer and use the data to evaluate the effectiveness of increasing the air gap on reducing energy transfer.

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

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

[Total: 6]

13 **(a)** Neil notices that when ice melts, the temperature does not change.

Explain why.

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

(b) Neil is holding a party. He wants to make sure he has enough ice to cool all the drinks.

He investigates how much ice is needed to cool a glass of orange juice.

He adds ice to cool the orange juice from 20°C to 5°C.

temperature of the ice	0°C
original temperature of the orange juice	20°C
mass of orange juice	0.4 kg
specific heat capacity of orange juice	4100 J / kg °C
specific latent heat of water	330 000 J / kg

(i) Calculate the amount of energy transferred from the drink.

.....

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.....

answer ..... J **[2]**

(ii) What mass of ice would need to melt to transfer this amount of energy?

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.....

answer ..... kg **[2]**

[Total: 5]

14 This question is about waves.

(a) The table shows part of the electromagnetic spectrum.

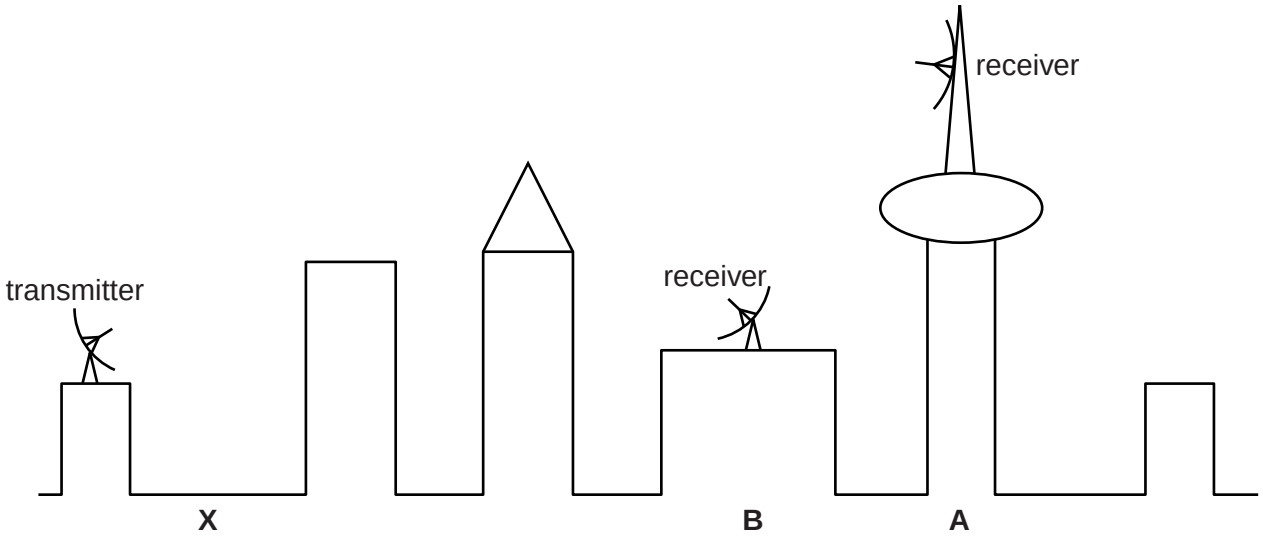
short wavelength ← → long wavelength

gamma rays			visible light		microwaves	

Complete the table by filling in the **other** types of electromagnetic wave. **[2]**

(b) The diagram shows part of the skyline of a city.

The transmitter transmits both microwaves and radio waves to the city.



(i) Microwave signals can be received at the top of building **A**, but not at the top of building **B**.

However, radio waves can be received at the top of both buildings **A** and **B**.

Explain why.

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

(ii) City planners are considering putting another building, as tall as building **A**, at position **X**.

This could have an effect on radio communications throughout the city.

Describe the effect and suggest a possible solution.

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

[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.