OCR
Oxford Cambridge and RSA

F

Wednesday 25 May 2016 – Afternoon

GCSE GATEWAY SCIENCE
SCIENCE B

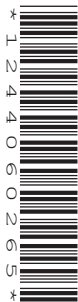**B711/01**   Science modules B1, C1, P1 (Foundation Tier)

Duration: 1 hour 15 minutes

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. If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.
* Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

* The 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.

Turn over

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

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

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

3

BLANK PAGE

Question 1 begins on page 4

PLEASE DO NOT WRITE ON THIS PAGE

Answer **all** the questions.

SECTION A – Module B1

1 This question is about drugs.

(a) Finish the sentences about drugs.

Choose words from this list.

<div align="center">

depressants   **pain killers**   **stimulants**

performance enhancers   **hallucinogens**

</div>

Drugs that slow down brain activity are called ....

Drugs that distort what you see or hear are called ....

[2]

(b) Women are advised to drink no more than **14 units** of alcohol each week.

Look at the table.

Drink	Amount	Units of alcohol
beer	one pint	2.3
gin and tonic	one measure	1.0
cider	one pint	2.6
wine	one glass	3.0
whisky	one measure	1.0

Connie writes down all the alcoholic drink she has in one week.

Monday – one glass of wine
Tuesday – none
Wednesday – none
Thursday – two glasses of wine
Friday – two glasses of wine, one measure of whisky
Saturday – two gin and tonics
Sunday – one glass of wine

Connie has drunk more than the advised amount.

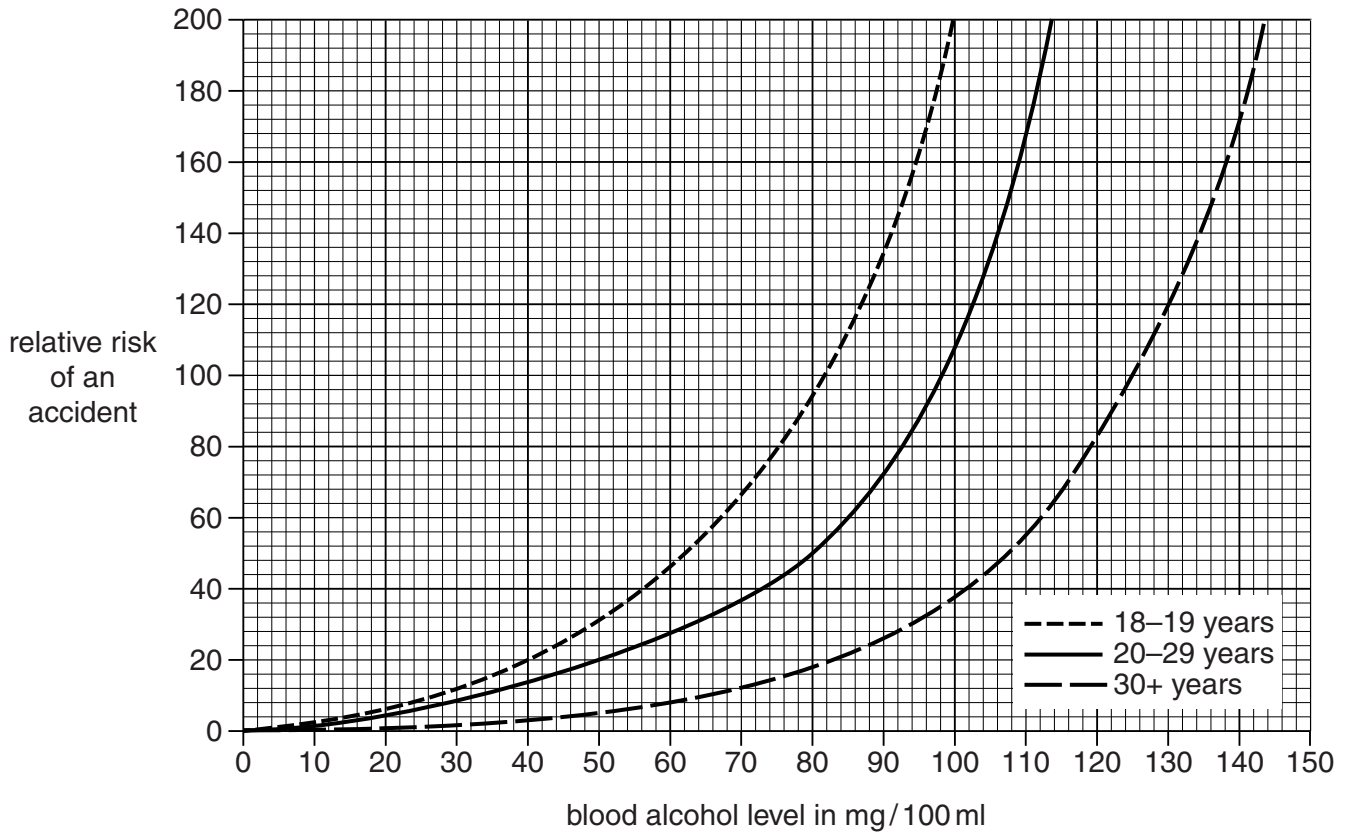Calculate by how much she is over the advised amount.

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

(c) Connie is concerned about drinking alcohol.

She researches the effects of alcohol and finds this graph below.

It shows the relative risk of having an accident if you drink alcohol and drive.

Connie writes down some conclusions about the graph.

Put ticks (✓) next to **two** conclusions that best match the graph.

20–29 year olds reduce the relative risk of an accident by 30 if they have blood alcohol level of 50 mg / 100 ml instead of 80 mg / 100 ml. ☐

Only those aged 18–19 will have an accident with a blood alcohol level of 10 mg / 100 ml. ☐

People over 30 are 20 times better drivers than people in other age groups. ☐

People with a blood alcohol level of 150 mg / 100 ml are at least 200 times more likely to have an accident than people with no alcohol in their blood. ☐

The lower the blood alcohol level the more likely you are to have an accident. ☐

[2]

[Total: 6]

2 This question is about insulin.

(a) Write down the name of the organ in the body that makes insulin.

.... [1]

(b) Jim is a 14 year old boy who has Type 1 diabetes.

Jim needs medical treatment for his Type 1 diabetes.

He injects insulin into his body.

Describe how insulin travels around the body.

.... [1]

(c) The more carbohydrate Jim eats, the more insulin he needs.

Explain why.

....

....

.... [2]

(d) Jim thinks he inherited Type 1 diabetes from his father.

   (i) Inherited characteristics are controlled by genes.

   Write down the part of the cell that contains genes.

   .... [1]

   (ii) Characteristics can be controlled by genes and by the environment.

   Put a ⬭ring⬭ around one characteristic controlled by **both** genes and the environment.
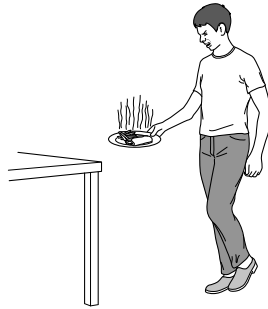
   colour blindness

   cystic fibrosis

   eye colour

   intelligence

   [1]

   [Total: 6]

3 Polio is an illness caused by a virus.
In 1988 a campaign started to rid the world of polio.
The campaign wanted to vaccinate children all over the world.

Look at the table below.
It shows the number of reported polio cases for different areas of the world in 1996 and 2011.

Area of the world	Number of polio cases	
	1996	**2011**
Africa	1949	397
America	0	0
Eastern Mediterranean region	532	297
Europe	193	0
South East Asia	1203	1
Western Pacific region	197	21

(a) Describe the patterns in the data and suggest reasons for these patterns.

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

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.... **[6]**

(b) When polio viruses enter the body white blood cells try to destroy them.
Write down **two** ways white blood cells can destroy viruses.

....

....

.... **[2]**

[Total: 8]

Turn over

4 Benny is cooking his tea.

He lifts a hot plate of food.

The plate is very hot.

Benny holds onto the plate until he can slowly put it down.

(a) Benny's response to the hot plate is **not** a reflex action.

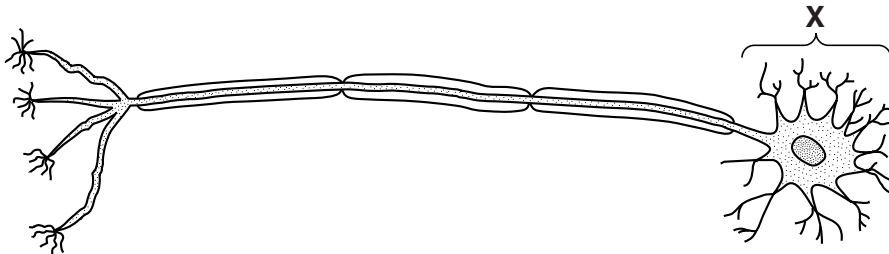Explain why his response is not a reflex action.

....

....

.... **[2]**

(b) The hot plate is a stimulus.

How does the brain receive information about this stimulus?

....

....

.... **[2]**

(c) Motor neurones are part of Benny's nervous system.

Look at the diagram below of a motor neurone.

Write down the name of part **X**.

.... **[1]**

[Total: 5]

SECTION B – Module C1

5 This question is about carbon compounds.

Look at the displayed formulas below.
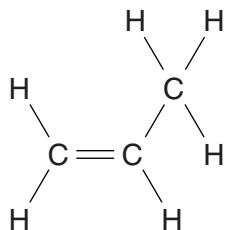
A
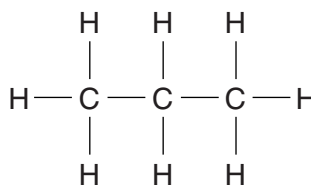
B
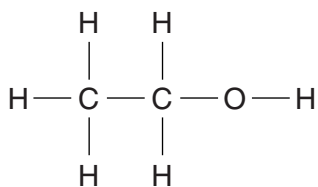
C
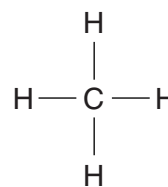
D

(a) Which displayed formula contains a total of **11 atoms**?

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

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

(b) Which compound is **not** a hydrocarbon?

Explain your answer.

....

.... **[2]**

(c) Molecules of compound **A** can join together to make a polymer called poly(propene).

What is the **name** of compound **A**?

.... **[1]**

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

.... **[1]**

[Total: 5]

6 This question is about crude oil.

(a) Crude oil is separated into useful products called fractions.

(i) What is the name of the process that is used to separate crude oil?

.... [1]

(ii) Diesel is one fraction separated from crude oil.

Write down the names of **two other** fractions that are separated from crude oil.

....

.... [2]

(b) Carbon monoxide gas is formed by the incomplete combustion of diesel in car engines.

(i) Write down one problem caused by carbon monoxide.

.... [1]

(ii) What part of a car removes carbon monoxide from the exhaust gases?

Choose from the list.

antioxidant

catalytic converter

catalytic cracker

engine

.... [1]

(c) Crude oil is often transported in large ships called oil tankers.

These oil tankers sometimes spill crude oil.

Crude oil spills cause environmental problems.

Write about **two** of these problems.

....

....

.... [2]

[Total: 7]

7 This question is about fuels.

(a) Butane burns in oxygen.

Carbon dioxide and water are made.

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

.... [1]

(b) Combustion of butane releases energy.

What type of useful energy is released?

Choose from the list.

chemical

electrical

heat

kinetic

answer .... [1]

Turn over for the remainder of question 7

(c) Look at the information below about some fuels.

Fuel	State at room temperature	Availability	Energy released in kJ/g	Is carbon dioxide released?	Cost of 1 kg in £
coal	solid	good	33	yes	0.3
ethanol	liquid	limited	30	yes	0.8
hydrogen	gas	limited	122	no	5.0
methane	gas	good	56	yes	1.3

A factory owner decides to use methane as a fuel to heat a new factory.

Using the information in the table, write about the **advantages** and **disadvantages** of her choice.

Write down **two other** factors, not in the table, that she would need to consider when choosing which fuel to use.

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

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.... **[6]**

[Total: 8]

8 This question is about chemical changes.

Four substances, **A**, **B**, **C** and **D** are added to four different test tubes of acid.

Look at the table. It shows the results of the experiments.

Substance	Observations	Temperature at start in °C	Temperature at end in °C
A	stays a white solid	19	19
B	colourless gas given off	23	18
C	solution stays colourless	19	24
D	stays a grey solid	18	18

(a) Two of the substances react with acid to produce a **chemical change**.

Which two?

.... and ....

Explain your answer.

....

....

....

.... **[3]**

(b) A chemical change happens when cakes rise.

Baking powder is added to flour to make the cake rise.

Baking powder contains a chemical with the formula $NaHCO_3$.

Write down the **names** of the **elements** in $NaHCO_3$.

....

.... **[2]**

[Total: 5]

Turn over

SECTION C – Module P1

9 This question is about waves.

(a) Look at the list.

It shows waves from the electromagnetic spectrum.

infrared

microwave

radio

ultraviolet

visible

Complete the sentences using words from the list.

(i) Sending text messages on mobile phones uses .... signals.

[1]

(ii) TV remote controls use .... radiation. **[1]**

(iii) The wave with the highest frequency is .... **[1]**

(b) All electromagnetic waves travel in a vacuum.

Put a tick (✓) in the box next to the correct statement about electromagnetic waves in a vacuum.

Waves with a high frequency travel faster than waves with a low frequency. ☐

Waves with a long wavelength travel faster than waves with a short wavelength. ☐

Waves all travel at the same speed in a vacuum. ☐

Waves in a vacuum have the same speed as waves in glass and air. ☐

[1]

[Total: 4]

10 This question is about two different signals.

Look at the information showing what happens to these signals when noise is added to them.

Name the types of signals shown by **A** and **B** and describe how they change when noise is added to them.

Explain why it is easier to remove noise from signal **A**.

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

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.... **[6]**

[Total: 6]

Turn over

11 The condition of the ozone layer near the South Pole concerns scientists.

Scientists have been measuring the mean amount of ozone in the upper atmosphere.

Look at their results below from 1970 to 2005.
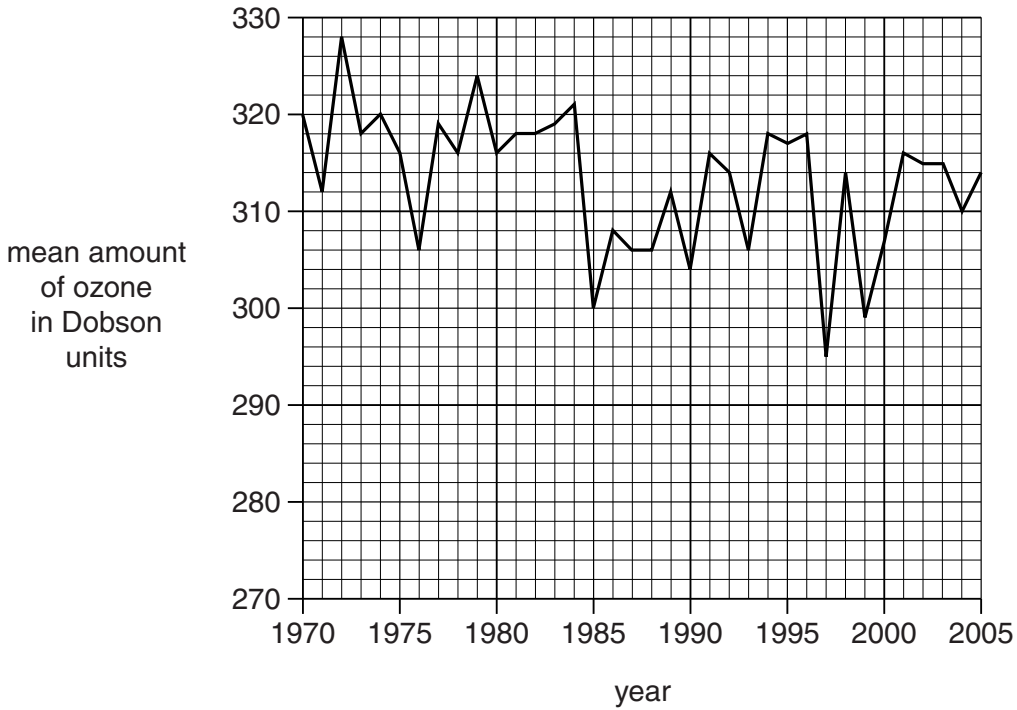
(a) Scientists predicted that the amount of ozone in 1997 was the lowest they were likely to record.

(i) Is this prediction correct?

....

Explain your answer.

....

.... **[1]**

(ii) What should the scientists do to check their prediction?

....

.... **[1]**

(b) The ozone layer protects the Earth from ultraviolet radiation (UV).

(i) Use the graph to find out the year that the ozone layer gave the most protection from ultraviolet radiation.

Most protection from UV was in the year .... **[1]**

(ii) Too much exposure to UV can cause sunburn.

Write down **two** other health problems caused by too much exposure to UV.

....

.... **[2]**

[Total: 5]

Question 12 begins on page 18

Turn over

12 Lyndsay and Kevin buy a new house.

The house has an energy performance certificate.

Very energy efficient - lower running costs	
(92 plus) **A**	
(81-91) **B**	
(69-80) **C**	**70**
(55-68) **D**	
(39-54) **E**	
(21-38) **F**	
(1-20) **G**	
Not energy efficient - higher running costs	
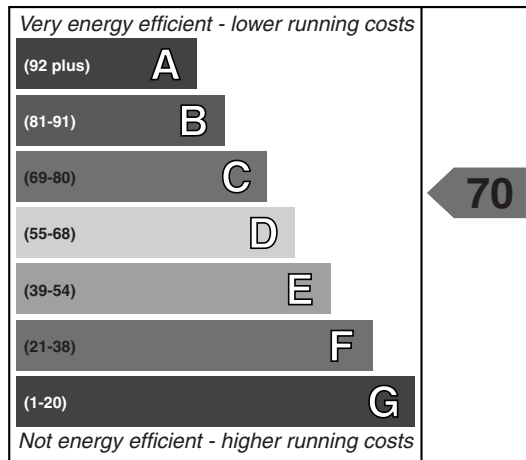
(a) The energy efficiency of their house is 70.

The efficiency is calculated when the heating is on for 9 hours a day.

All house efficiency measurements are made using this time.

Suggest why.

....

.... **[1]**

(b) Lyndsay and Kevin want to check the energy efficiency of their house.

Write down **two** measurements they use to calculate the energy efficiency of their house.

....

....

.... **[2]**

(c) Here are three different ways to increase the energy efficiency of Lyndsay and Kevin's house.

How to increase energy efficiency	Cost to install in £	Saving on energy bills each year in £
Cavity wall insulation	1400	400
Low energy light bulbs for whole house	20	10
Thermostat for heating	35	100

(i) One of the ways to increase efficiency is to add cavity wall insulation.

Lyndsay thinks this is a good idea because they will be living in the house for at least 5 years.

Use the information in the table to show that Lyndsay is correct.

....

....

....

.... **[2]**

(ii) Kevin thinks the cost of cavity wall insulation is expensive.

He wants to spend £55 on low energy light bulbs and a thermostat.

Which will save more money after 5 years

- cavity wall insulation

- low energy light bulbs and a thermostat?

answer ....

Explain your answer.

....

....

.... **[2]**

[Total: 7]

13 Gemstones are cut into shapes to make them reflect as much light as possible.

The more light they reflect, the more they sparkle.

Look at the diagrams below of three different shaped gemstones.

shape **A**   shape **B**   shape **C**
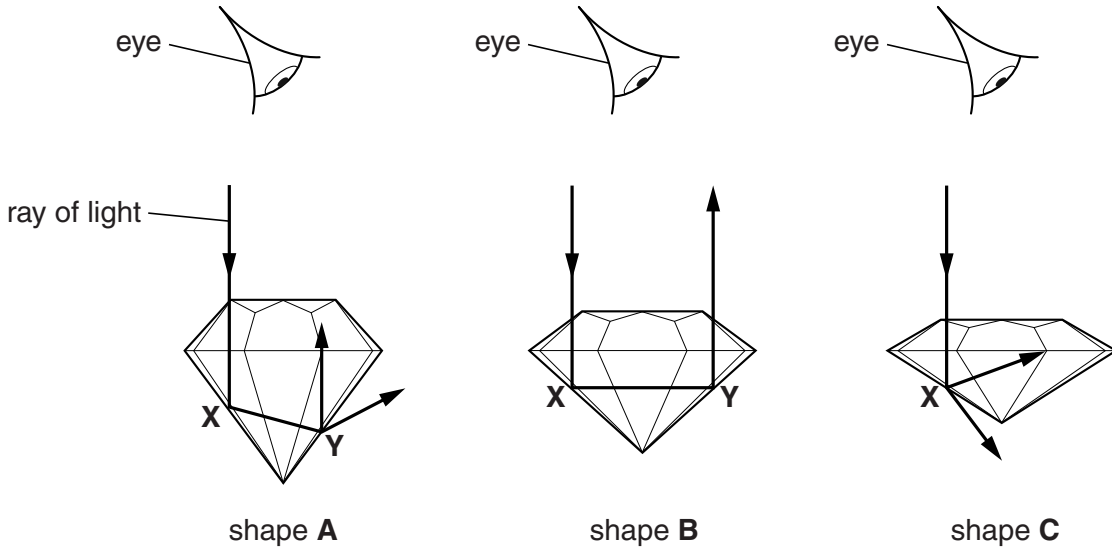
Describe what happens to the ray of light in each diagram **and** use this to explain which gemstone sparkles the most when looked at from above.

The description for shape **A** has been done for you.

In shape **A** the ray of light passes through the gemstone and is reflected at **X** and then at **Y** it is reflected and refracted.

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.... **[3]**

[Total: 3]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margins.

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The Periodic Table of the Elements

Key

| relative atomic mass |
| **atomic symbol** |
| name |
| atomic (proton) number |

Example:
| 1 |
| **H** |
| hydrogen |
| 1 |

Group 1	Group 2											Group 3	Group 4	Group 5	Group 6	Group 7	Group 0
																	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

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.