

Thursday 24 May 2012 – Morning

**GCSE GATEWAY SCIENCE
SCIENCE B**

B622/02 Unit 2 Modules B2 C2 P2 (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)

Duration: 1 hour



Candidate forename		Candidate surname	
Centre number		Candidate number	

MODIFIED LANGUAGE

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

- 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 **20** pages. Any blank pages are indicated.

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 B2

- 1** The photograph shows an island fox.

These foxes live on a number of small islands off the coast of California.



- (a)** In which class of vertebrates is the fox classified?

How can you tell this from the photograph?

class

reason **[2]**

(b) Read this information about the island fox.

The island fox lives on six small islands.
The foxes on each island are all slightly different.
For example, on one island they have more bones in their tail than the foxes on other islands.
However, all the foxes are part of the same species.

Recently, the foxes have almost disappeared on the two most northern islands.
At first, biologists could not find why the foxes died.
Finally, a golden eagle feather was found beside a dead fox.

In the past, bald eagles lived on the islands and killed other birds.
Bald eagles did not prey on the island fox.
The bald eagles on the northern islands disappeared due to the effects of a pesticide.
Golden eagles were then attracted to the northern islands once the bald eagles were gone.
It was easy for the golden eagles to catch the island foxes.

Finish the following sentence.

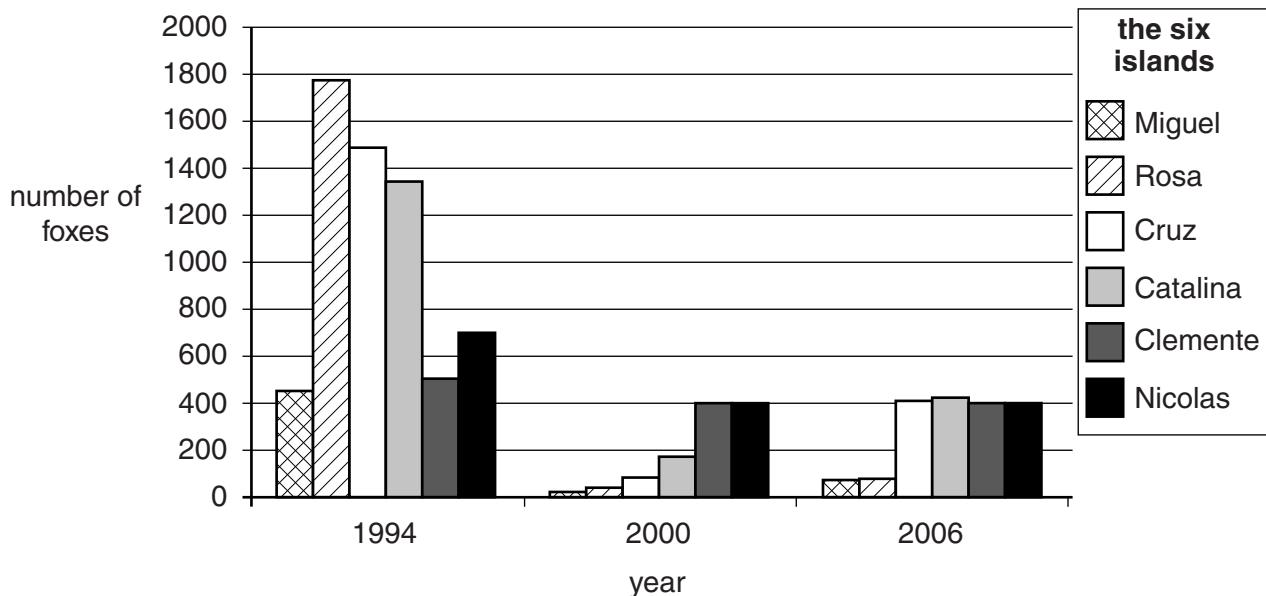
Choose the correct word from this list.

class community ecosystem population species

The foxes on each island form a separate [1]

(c) The graph shows changes in the number of foxes on the six different islands.

Use the graph and the information in (b) to answer the questions.



- (i) What are the names of the two northern islands?

..... and [1]

- (ii) Explain how you can tell this from the graph.

.....
 [1]

- (iii) Put ticks (✓) next to **any** conservation methods that could be used to help the fox.

captive breeding of foxes

☐

shooting bald eagles

☐

captive breeding of golden eagles

☐

capturing golden eagles and releasing them a long distance away

☐

[1]

- (d) Scientists have found that some of the foxes on the southern islands have died from a virus spread from a dog.

However, they think that fairly soon all the foxes on the southern islands will be resistant to this virus.

Use ideas about natural selection to explain how an entire group of foxes can become resistant to a virus.

.....

 [3]

[Total: 9]

- 2 The photograph shows part of a mistletoe plant.



Mistletoe plants have green leaves and they live attached to the branches of trees, such as apple trees.

- (a) Mistletoe plants can photosynthesise.

Write the word equation for photosynthesis.

..... [2]

- (b) Mistletoe is described as a partial parasite as it obtains some sugar from the apple tree.

What word is used to describe an organism that a parasite feeds on?

..... [1]

- (c) Some scientists investigate two different species of mistletoe growing on a tree.

They provide **the tree** with carbon dioxide that contains radioactive carbon.

The tree produces sugar.

They measure how much of this sugar stays in the tree, and how much sugar is passed into the mistletoe.

They also measure the chlorophyll content of the mistletoe.

The results are shown in the table.

species of mistletoe	chlorophyll content in mg/g of tissue	sugar containing radioactive carbon content in mg/g of tissue	
		in tree	in mistletoe
dwarf mistletoe	0.4	306	120
eastern mistletoe	0.9	420	2

- (i) Which species of mistletoe is likely to cause most damage to the tree that it grows on?

Explain your answer.

species

reason

..... [1]

- (ii) Suggest an explanation for the difference in the chlorophyll content of the two types of mistletoe.

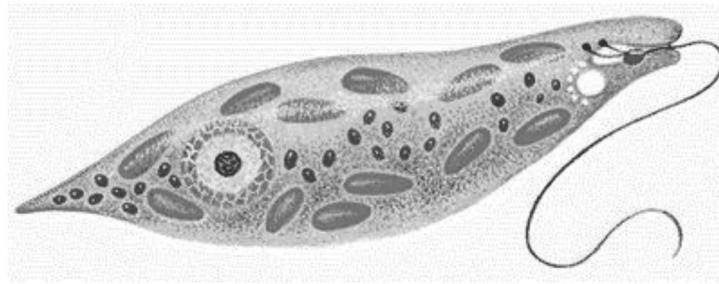
.....

.....

..... [2]

[Total: 6]

- 3 *Euglena* is a small single-celled organism.



- (a) Write down why it is difficult to classify *Euglena*.

.....
 [1]

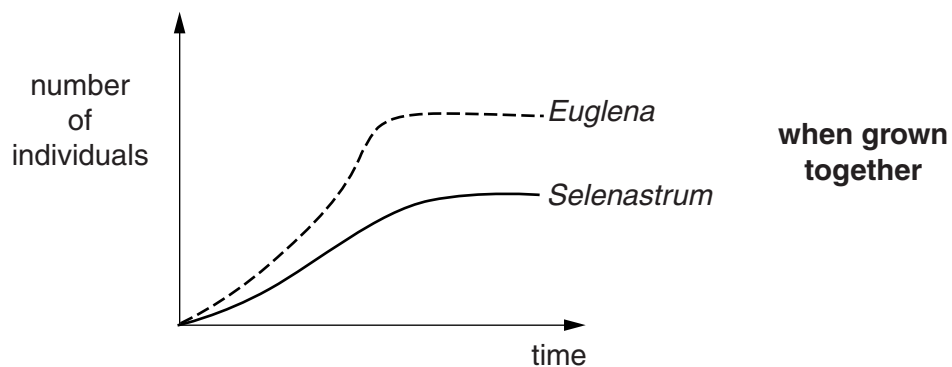
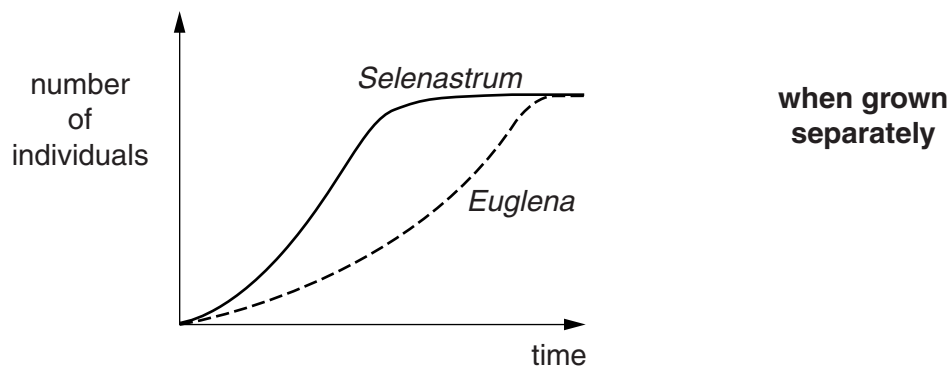
- (b) Scientists investigate the growth of *Euglena* and another single-celled organism called *Selenastrum*.

They grow cultures of the two organisms separately.

Then they grow the cultures together.

They count the number of organisms over several days.

The graphs show the results.



- (i) Put ticks (✓) in the table to show the best description of the results of each experiment.

Only tick **two** boxes.

description	when grown separately	when grown together
<i>Euglena</i> reproduces more slowly than <i>Selenastrum</i> but produces the same number of individuals eventually.		
<i>Euglena</i> reproduces faster than <i>Selenastrum</i> but produces the same number of individuals eventually.		
<i>Euglena</i> reproduces faster than <i>Selenastrum</i> and exists in larger numbers throughout the experiment.		
<i>Euglena</i> reproduces more slowly than <i>Selenastrum</i> and exists in smaller numbers throughout the experiment.		

[2]

- (ii) Complete these sentences to explain the results of the experiment.

Euglena and *Selenastrum* are similar organisms and have similar requirements.

They occupy a similar ecological

When grown together, *Euglena* will *Selenastrum* for the same resources.

[2]

[Total: 5]

Section B – Module C2

- 4 This question is about pigments in paints.

Pigments give paints their colour.

Look at the table. It shows some information about some pigments used in paints.

pigment	colour	effect of light	effect of increasing the temperature	type of paint made
A	green	colour fades	no change	emulsion
B	red	keeps its colour	changes to yellow	emulsion
C	yellow	absorbs light and later gives off light	no change	oil based
D	blue	keeps its colour	no change	oil based

- (a) Write down one use for a paint made using pigment **B**.

..... [1]

- (b) Pigments **A** and **B** are used to make an emulsion paint.

What is the **solvent** used in an emulsion paint?

..... [1]

- (c) Pigment **C** is a **phosphorescent** pigment.

Modern phosphorescent pigments are better than pigments used 50 years ago.

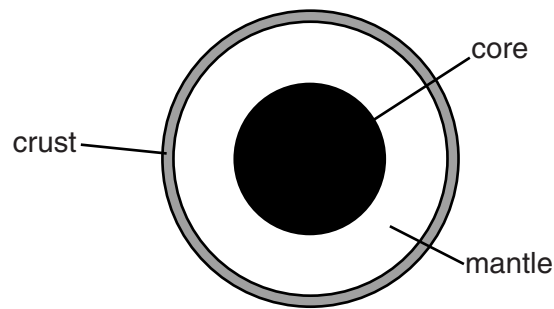
Explain why.

.....

 [2]

[Total: 4]

5 Look at the diagram of the Earth.



(a) The tectonic plates are found on top of the mantle.

Explain why.

.....
 [1]

(b) The outer part of the Earth includes the crust and the outer part of the mantle.

What is this outer part of the Earth called?

..... [1]

(c) The outer part of the Earth is divided into tectonic plates.

What makes the tectonic plates move?

.....
 [1]

(d) Volcanoes happen at tectonic plate boundaries.

Geologists study volcanoes.

Write down **two** reasons why geologists study volcanoes.

1
 2 [2]

[Total: 5]

6 Epoxy glues are used to stick surfaces together.

Epoxy glues come in two parts

- resin
- hardener.



A chemical reaction happens when the resin and hardener are mixed.

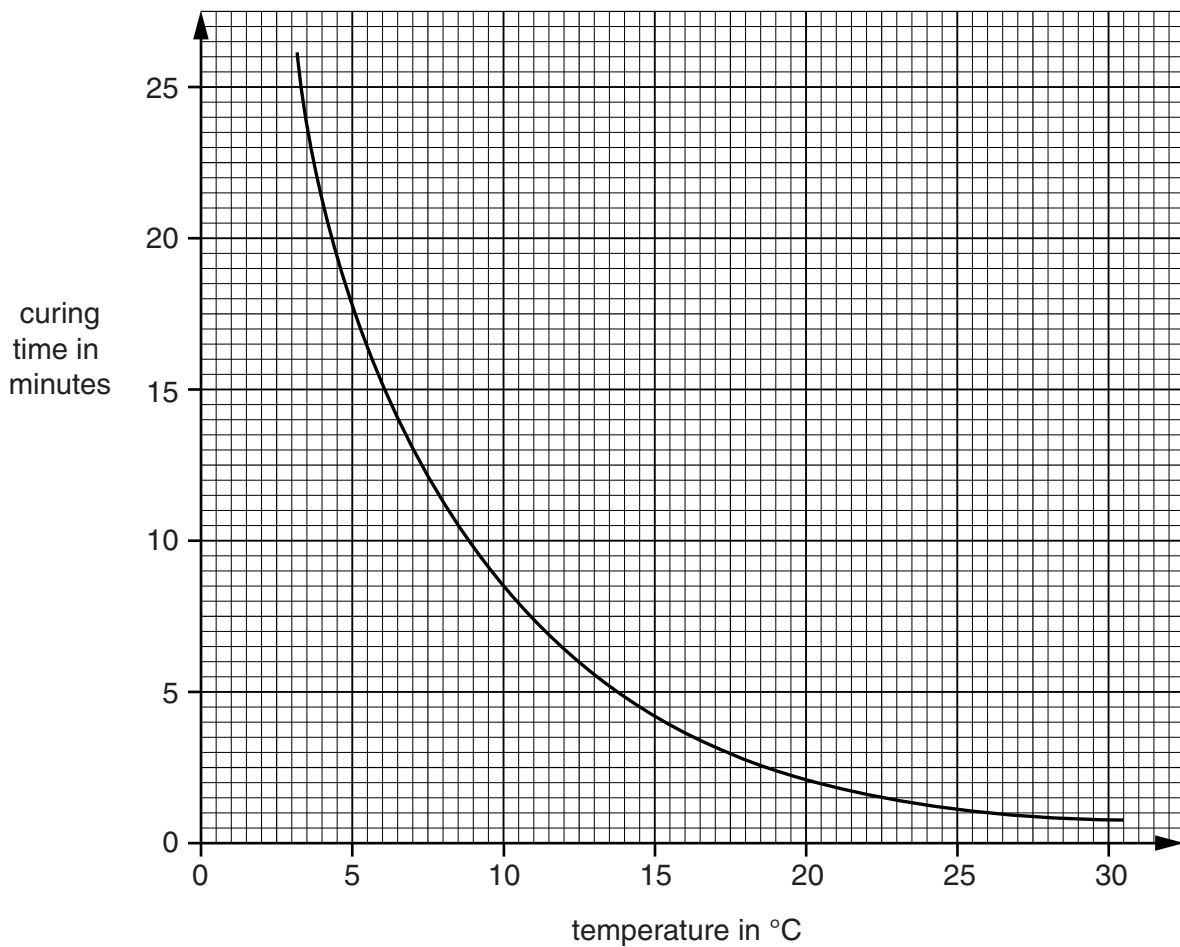
This reaction is called **curing**.

When curing finishes, the glue sets hard.

The time it takes for this to happen is called the **curing time**.

Look at the graph. It shows the effect of temperature on the curing time.

The mixture contains 5% hardener.



- (a) What is the temperature needed for a curing time of 5 minutes?

..... °C

[1]

- (b) The rate of the reaction increases as the temperature increases.

At a higher temperature the particles of resin and hardener have more energy and move faster.

Explain how this makes the reaction faster.

.....

.....

..... [2]

- (c) A second mixture of hardener and resin is used at a temperature of 5 °C.

This mixture contains 10% hardener.

This mixture has a higher concentration of hardener than the first mixture.

Suggest the **curing time** of this second mixture.

.....

..... [1]

[Total: 4]

7 Look at the table. It gives information about some metals and alloys.

metal	appearance	melting point in °C	relative strength	relative conductivity of heat	observation after being left in moist air
copper	shiny red/brown	1083	4.8	5.7	tarnishes very slowly
aluminium	dull light grey	660	2.6	10.5	has protective oxide layer
brass	shiny yellow	710	4.5	3.2	tarnishes
zinc	dull light grey	420	4.3	1.0	tarnishes
lead	dull dark grey	328	1.5	5.9	tarnishes
iron	dull dark grey	1535	8.2	0.3	rusts

(a) Which metal is best for making an attractive pan to heat water on an open fire?

.....

Explain your choice.

.....

.....

.....

..... [3]

(b) Car bodies can be made from aluminium or iron.

- (i) One advantage of using iron is that it is cheaper than aluminium, so the car is cheaper to make.

Write down one **other** advantage of using **iron** rather than aluminium to make car bodies.

Explain your answer. Use the table to help you.

advantage of iron

explanation

..... [2]

- (ii) Write down one advantage of using **aluminium** rather than iron to make car bodies.

Explain your answer. Use the table to help you.

advantage of aluminium

explanation

..... [2]

[Total: 7]

Section C – Module P2

- 8 (a) The picture shows two wind turbines on the island of Madeira.



Finish the sentence.

When the Sun warms the air, convection currents are produced. This produces wind.

Wind turbines transfer the energy of the wind into electricity. [1]

- (b) (i) Describe one advantage of using wind turbines to generate electricity.

.....

- (ii) Describe one disadvantage of using wind turbines to generate electricity.

.....

[2]

- (c) Solar energy can be harnessed in other ways.

Finish the sentences by choosing the best words from this list.

fibres	glass	images	lenses
mirrors	prisms	sound	wood

In a building will allow passive solar heating to happen.

In a solar furnace, curved can reflect light from the sun to a focus. [2]

[Total: 5]

- 9 Coal and oil are fossil fuels. They can be burned to release energy as heat.

Biomass can also be burned to release energy as heat.

Fuel rods in a nuclear reactor release energy as heat.

- (a) (i) Write down the name of a **nuclear** fuel.

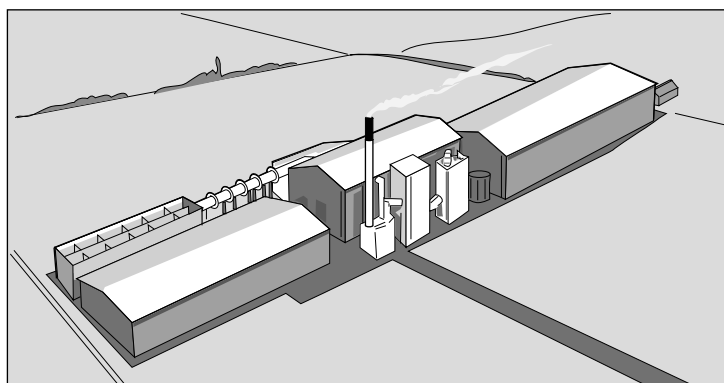
..... [1]

- (ii) The waste from a nuclear power station emits ionising radiation.

This can damage living cells in humans.

What can this damage to living cells cause? [1]

- (b) (i) The 38 MW power station in Ely is the largest straw-burning power station in the world.



The power station generates electricity continuously.

Calculate the **energy** generated in **kWh** in one week.

The equations on page 2 may help you.

.....

answer kWh [2]

- (ii) Biomass can produce fuel for a power station **without being burned**.

Describe how.

.....
 [1]

[Total: 5]

10 People have been exploring space for many years.

(a) Asteroids are rocks which orbit the Sun between Mars and Jupiter.

They are left over from the formation of the Solar System.

Why was the asteroid belt formed near Jupiter?

.....
 [1]

(b) The first spacecraft was launched in 1957. It was **unmanned**.

(i) Explain two **disadvantages** of using unmanned spacecraft to explore distant parts of the Solar System.

.....

 [2]

(ii) Information can be sent back by an unmanned spacecraft orbiting a planet.

Write down **two different** examples of information that might be sent back.

.....

 [2]

(c) Most of the scientific community think that the Universe began with a “Big Bang”.

Explain how the observations of light from stars support this “Big Bang” theory.

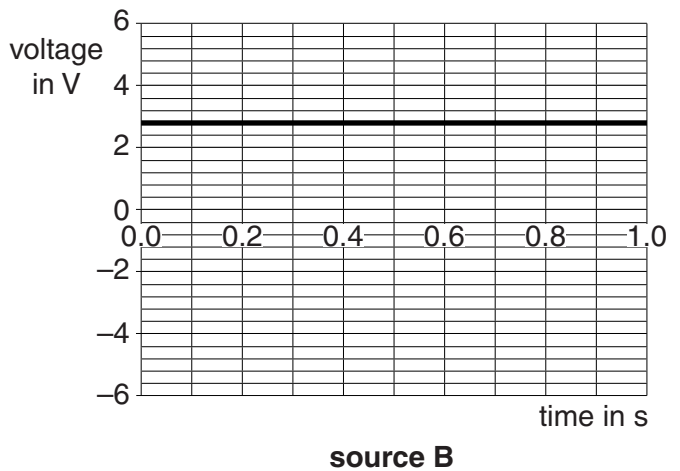
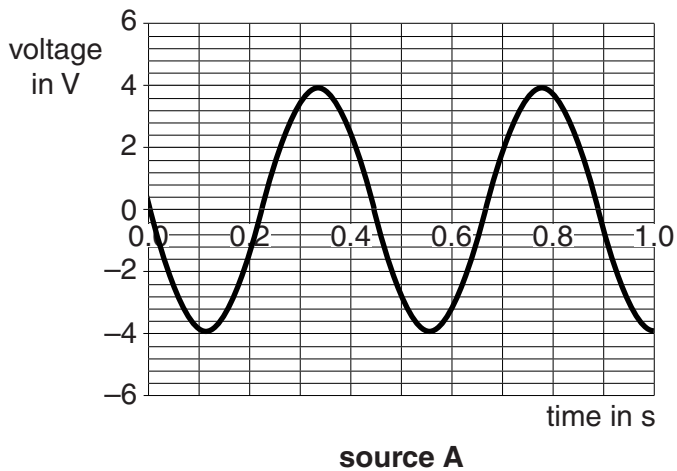
.....

 [2]

[Total: 7]

11 Michael connects two different sources of electricity to a data-logger.

The data-logger prints out **voltage-time** graphs.



(a) What is the maximum voltage from the AC supply?

..... [1]

(b) Michael makes a simple AC generator in the laboratory.

Describe what he must do to produce AC from his generator.

.....

.....

..... [2]

[Total: 3]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2	3	4	5	6	7	0
7 Li lithium 3	9 Be beryllium 4	<div>Key</div> <div>relative atomic mass atomic symbol name atomic (proton) number</div>					4 He helium 2
23 Na sodium 11	24 Mg magnesium 12	11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
39 K potassium 19	40 Ca calcium 20	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
85 Rb rubidium 37	88 Sr strontium 38	56 Fe iron 26	55 Mn manganese 25	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	84 Kr krypton 36
133 Cs caesium 55	137 Ba barium 56	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	54 Mn manganese 25	86 Xe xenon 54
[223] Fr francium 87	[226] Ra radium 88	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	98 Tc technetium 43	[222] Rn radon 86
<div>Elements with atomic numbers 112-116 have been reported but not fully authenticated</div>							
<div>Elements with atomic numbers 112-116 have been reported but not fully authenticated</div>							

* 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.