

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

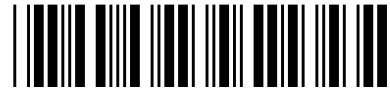
Unit 1 Modules B1 C1 P1
FOUNDATION TIER

TUESDAY 16 JANUARY 2007

F B621/01

Afternoon
Time: 1 hour

Calculators may be used.
Additional materials: Pencil
Ruler (cm/mm)



Candidate
Name

Centre
Number

| | | | | |
|--|--|--|--|--|
| | | | | |
|--|--|--|--|--|

Candidate
Number

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

INSTRUCTIONS TO CANDIDATES

- Write your name, Centre number and candidate number in the boxes above.
- Answer **all** the questions.
- Use blue or black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- Do **not** write in the bar code.
- Do **not** write outside the box bordering each page.
- **WRITE YOUR ANSWER TO EACH QUESTION IN THE SPACE PROVIDED. ANSWERS WRITTEN ELSEWHERE WILL NOT BE MARKED.**

INFORMATION FOR CANDIDATES

- The number of marks for each question 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.

| FOR EXAMINER'S USE | | |
|--------------------|-----------|------|
| Section | Max. | Mark |
| A | 20 | |
| B | 20 | |
| C | 20 | |
| TOTAL | 60 | |

This document consists of **23** printed pages and **1** blank page.

2

EQUATIONS

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

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

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

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

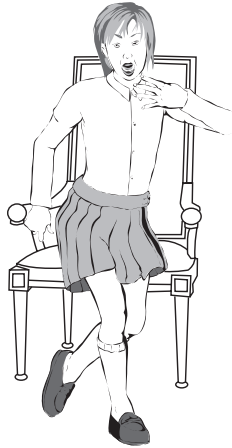
Answer **all** the questions.

Section A

1 Bella is sitting quietly on a chair.

She hears a loud noise.

Without thinking, she jumps up very quickly.



(a) Look at the list.

- ears eyes glands light muscles sound**

Finish the sentences about Bella's response to the loud noise.

Choose from the list.

The **stimulus** is

The **receptors** are found in the

The **effectors** are the

[3]

(b) Bella's response to the noise is a **reflex action**.

Write down **two** facts about the response which show that it is a reflex action.

1

2 [2]

(c) How does the information get from Bella's receptors to her central nervous system (CNS)?

..... [1]

[Total: 6]

2 Many people are very overweight.

(a) One way to lose weight is to eat less sugar.

What does the body use sugar for?

Put a **ring** around the answer in this list.

to provide energy

for growth and repair

to prevent constipation

[1]

(b) People often try different diets to lose weight.


One new idea is called the GI diet.

Every food has a GI number.

The higher the number the faster the sugar level in the blood increases.

THE GI RATING

The Glycaemic Index (GI) measures the rate at which foods raise blood sugar levels. Foods are scored on a scale ranging from 1 to 100.



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| LOW 0 – 54 | |
|--|----------------------------------|
| | Broccoli (10) |
| Images of apples and broccoli have been removed due to copyright restrictions | Peanuts (14) |
| | Low fat yoghurt (33) |
| | Wholemeal spaghetti (37) |
| | Apples and pears (38) |
| | Porridge (42) |
| | Stoneground wholemeal bread (53) |
| MEDIUM 55 – 69 | |
| An image of a pineapple has been removed due to copyright restrictions | Honey (58) |
| | Basmati rice (58) |
| | New potatoes (62) |
| | Muesli (66) |
| | Pineapple (66) |
| HIGH 70 – 100 | |
| Images of bread and doughnuts have been removed due to copyright restrictions | White bread (70) |
| | Short grain white rice (72) |
| | Watermelon (72) |
| | Doughnuts (76) |
| | Cornflakes (84) |
| | Baked potatoes (93) |

5

Liz eats a meal of doughnuts and pineapple.

John eats some low fat yoghurt and honey.

Whose blood sugar level is likely to increase faster?

Explain how you decided on your answer.

Use the figures from the GI rating table.

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

(c) Scientists think that the GI diet might help prevent people from becoming diabetic.

Finish the following sentences about diabetes.

Choose from this list.

insulin

oestrogen

pancreas

stomach

testis

testosterone

Diabetes is caused by lack of the hormone

This hormone is made in the [2]

(d) When food passes through the digestive system sugar passes into the bloodstream.

Describe **where** and **how** this happens.

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

[Total: 7]

3 This diagram shows Grace and some of her characteristics.



| characteristic | Grace |
|-----------------|-----------------|
| gender | female |
| eye colour | blue |
| spoken language | English |
| scars | one on left leg |

(a) Some of Grace's characteristics have been inherited.

Some are caused by her environment.

(i) Write down **one** characteristic that has been **inherited** by Grace.

Choose from the table.

..... [1]

(ii) Write down **one** characteristic caused by Grace's **environment**.

Choose from the table.

..... [1]

(b) Grace's inherited characteristics are controlled by her chromosomes.

Finish the following sentences about Grace's chromosomes.

Choose words from the list.

cytoplasm DNA egg genes
nucleus protein sperm

Grace's chromosomes are long threads of a chemical called

They are found in the of every cell in her body.

Chromosomes carry information in sections called

[3]

(c) Grace is pregnant.

Rick is the father.



The baby will have some of Grace's characteristics.

(i) Explain why the baby will have some of Grace's characteristics.

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

(ii) Explain why the baby will **not** have **all** the same characteristics as Grace.

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

[Total: 7]

8
Section B

4 Many foods contain additives.

An additive is given an E-number.

Look at the table. It gives some information about E-numbers.

| type of food additive | E-number range |
|------------------------------|-----------------------|
| food colour | E101 to E199 |
| preservative | E200 to E299 |
| antioxidant | E300 to E321 |
| emulsifiers and stabilisers | E322 and E400 to E499 |
| sweeteners | E950 to E967 |

Look at part of the food label found on a packet of cake mix.

| |
|---|
| <p>INGREDIENTS</p> <p>sugar, wheat flour, vegetable oil, cornflour, raising agents, whey powder, salt, milk powder, E471, E472, E450a, E153 and E104</p> |
|---|

(a) Which ingredient is in the **smallest** amount?

..... [1]

(b) What type of additive is E153?

..... [1]

(c) One of the raising agents is sodium hydrogencarbonate.

When sodium hydrogencarbonate is heated it breaks down.

It makes sodium carbonate, water and carbon dioxide.

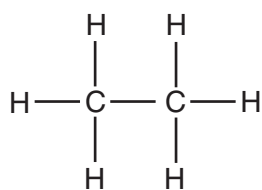
Write down the word equation for the breakdown of sodium hydrogencarbonate.

| | | | | | | |
|-------------------------|---|-------------------------|---|-------------------------|---|-------------------------|
| | → | | + | | + | |
|-------------------------|---|-------------------------|---|-------------------------|---|-------------------------|

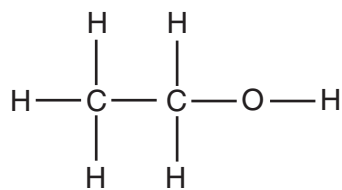
[1]

[Total: 3]

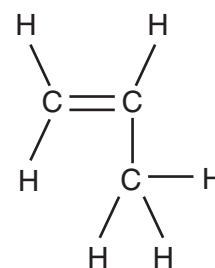
5 Look at the displayed formulae of some compounds.



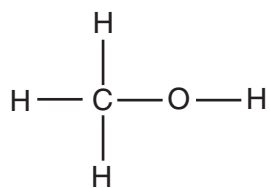
compound **A**



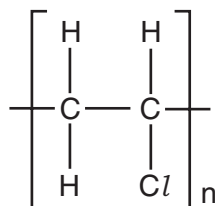
compound **B**



compound **C**



compound **D**



compound **E**

(a) Which one of the compounds has a molecule with 6 atoms?

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

answer [1]

(b) Look at structure **A**.

It is a hydrocarbon.

A hydrocarbon has two elements chemically joined.

Which two elements?

..... and [2]

[Total: 3]

6 Stowmarket Synthetics is a chemical company.

They make nail varnish removers and perfumes.

(a) A nail varnish remover dissolves nail varnish colours.

The lists show some words connected with dissolving.

Draw a straight line from each **word** to the correct **meaning**.

| word | meaning |
|-----------|---|
| insoluble | a liquid that dissolves other substances |
| soluble | a substance that does dissolve |
| solvent | a substance that does not dissolve |

[2]

(b) A perfume must have several properties.

One of these properties is that it must not irritate the skin.

Write down one **other** property that a perfume must have.

.....

..... [1]

[Total: 3]

7 Plastics such as polystyrene are used in packaging and insulation.

(a) Plastics such as polystyrene are often thrown away.

This can cause environmental problems.

Write about some of these problems.

.....

.....

.....

..... [2]

(b) Phil has bought a new greenhouse.

Look at the greenhouse.



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The windows are made from a plastic rather than glass.

One of the properties that makes this plastic suitable for making windows is that it is transparent.

Suggest **two** other properties of this plastic that make it suitable for making windows in a greenhouse.

1

2 [2]

[Total: 4]

8 Look at this railway locomotive.



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The locomotive has a large engine.

The engine burns a fuel to release heat energy.

(a) What is the name of the **type** of chemical reaction that releases heat into the surroundings?

Put a **ring** around the best answer.

conduction

convection

cracking

endothermic

exothermic

[1]

(b) The owner of the locomotive wants to change the fuel the engine burns.

Two of the factors that the locomotive owner needs to consider are

- how much the fuel costs
- how much pollution the fuel makes.

Write about **two other** factors that the locomotive owner needs to consider.

.....

.....

.....

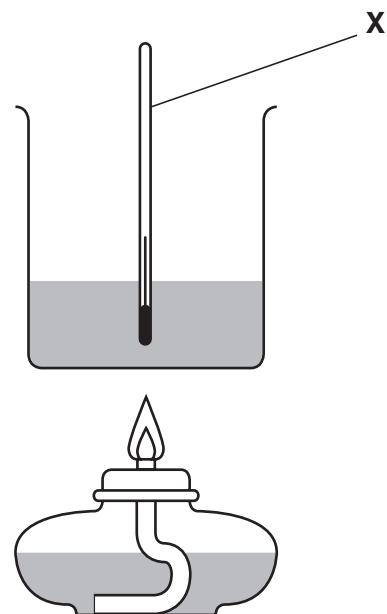
..... [2]

[Total: 3]

9 Alex and Zoe investigate four liquid fuels.

They want to find out which fuel releases most energy.

Look at the apparatus they use.



Each time Alex and Zoe burn 1.0 gram of fuel.

They use the energy released to heat 100 cm³ of water in the copper can.

(a) What is the name of the measuring instrument X?

..... [1]

(b) **Incomplete** combustion takes place. Suggest the colour of the flame.

..... [1]

(c) Look at Alex and Zoe's results.

| fuel | temperature of water at start in °C | temperature of water at finish in °C | temperature change in °C |
|------|-------------------------------------|--------------------------------------|--------------------------|
| A | 18 | 29 | 11 |
| B | 15 | 34 | |
| C | 15 | 25 | 10 |
| D | 19 | 35 | 16 |

(i) What is the temperature change for liquid B?

Put your answer in the table.

[1]

(ii) Which fuel released the **least** amount of energy?

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

answer [1]

[Total: 4]

15
Section C

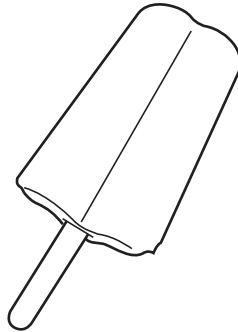
10 This question is about heat energy.

Look at the pictures.

They show some hot and cold objects.



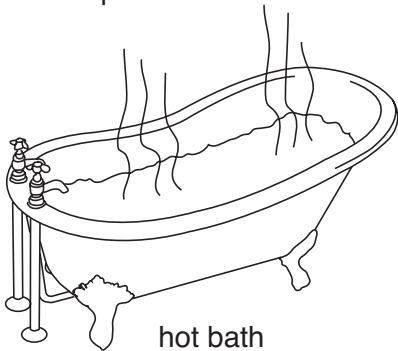
hot cup of coffee



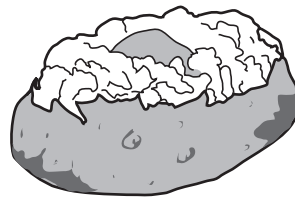
iced lollipop



lemonade with ice cubes



hot bath



baked potato just taken from oven

The temperature around each object is 20 °C.

Some objects will **warm up**.

Some objects will **cool down**.

Finish the table.

Two objects have been done for you.

| objects that warm up | objects that cool down |
|----------------------|------------------------|
| iced lollipop | baked potato |
| | |
| | |

[2]

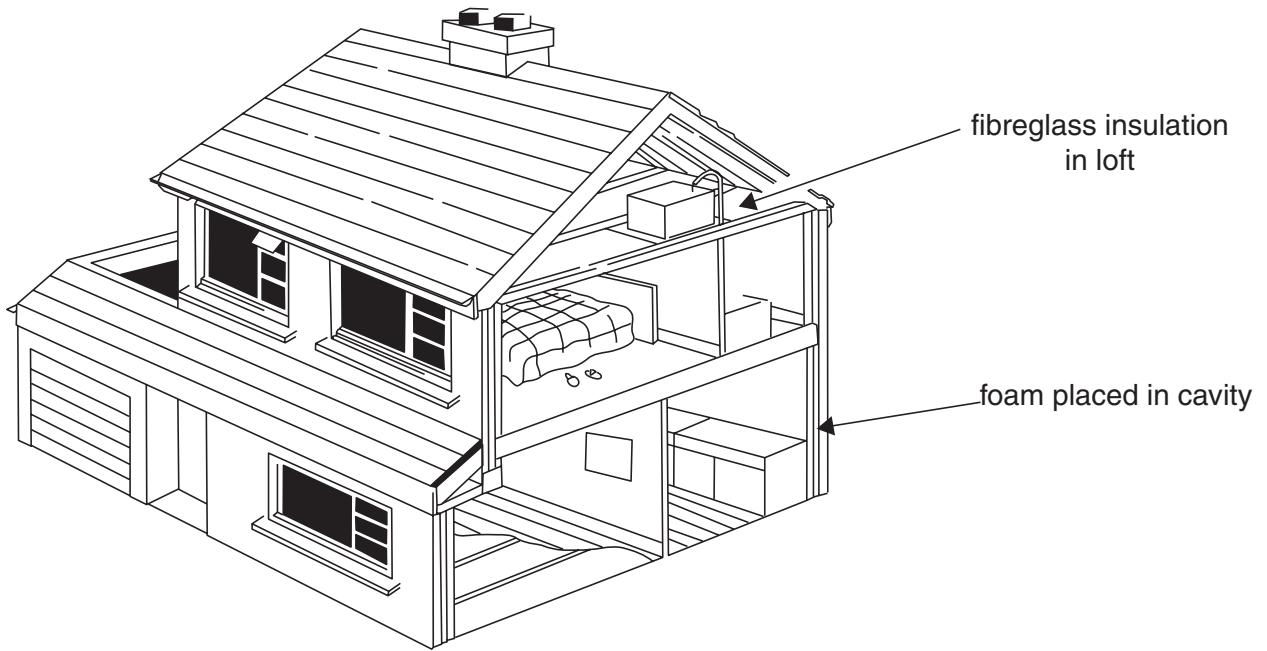
[Total: 2]

11 James has put some insulation in his house.

He has

- put in loft insulation
- put foam into the cavity wall.

Look at the diagram.



His house still loses heat energy in **other** places.

Not much heat energy is lost through the loft or walls.

(a) Suggest one **other** place that heat energy could be lost from James' house.

..... [1]

(b) What else could James do to insulate his house?

..... [1]

(c) James spends £150 on fitting insulation in his loft.

His heating bills go down £75 each year.

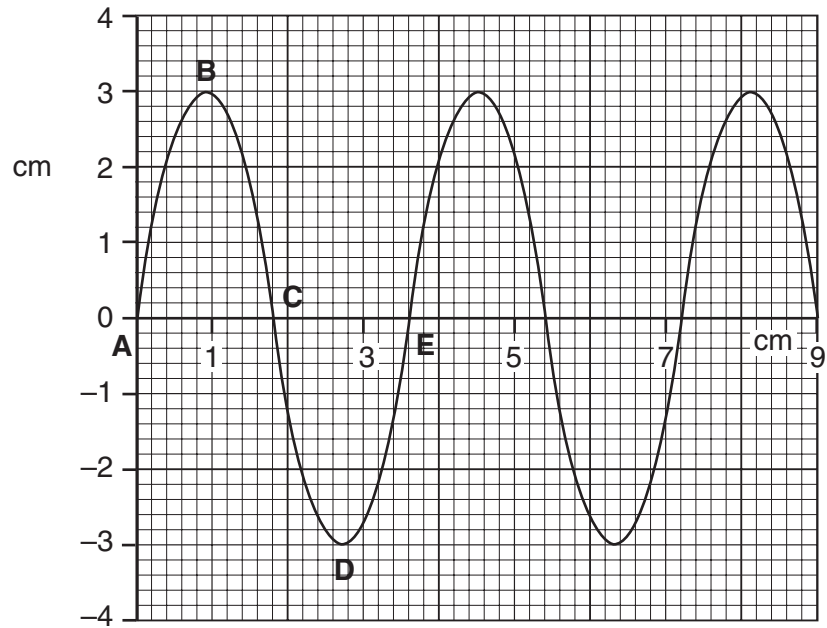
Calculate the pay back time for loft insulation.

.....
 years [2]

[Total: 4]

12 This question is about waves.

Look at the diagram of a wave.



(a) Which letter shows a trough?

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

answer [1]

(b) The diagram is drawn to scale.

What is the wavelength of the wave?

wavelength = cm [1]

[Total: 2]

13 (a) Look at the list of some **electromagnetic** waves.

infrared

radio waves

ultraviolet

X-rays

(i) One of these waves is used in a TV remote control.

Which one?

Choose from the list.

..... [1]

(ii) Paula is sunbathing.



Sunbathing can damage Paula's skin.

One of these electromagnetic waves can damage Paula's skin during sunbathing.

Which one?

Choose from the list.

..... [1]

(b) Suggest **two** things Paula can do to cut down the damage to her skin.

1

2 [2]

[Total: 4]

14 Many scientists think that the Earth is getting warmer.

This is called global warming.

Write about why scientists think that global warming is happening.

.....

.....

.....

..... [2]

[Total: 2]

15 (a) There are two types of signal used to transmit data.

One type is digital.

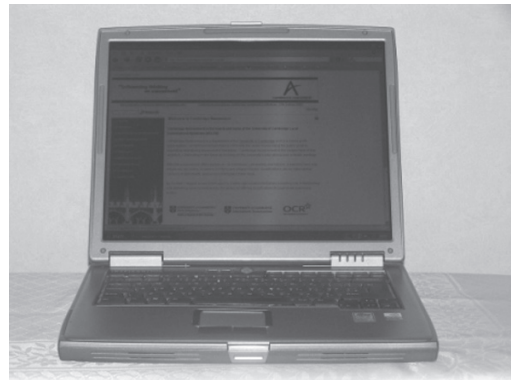
(i) Write down the name of the **other** type of signal used to transmit data.

..... [1]

(ii) Describe what is meant by a digital signal.

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

(b) This computer uses wireless technology.



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(i) Write down **one** sort of wave that is used in wireless technology.

Choose from:

gamma

radio waves

ultrasound waves

ultraviolet waves

X-rays

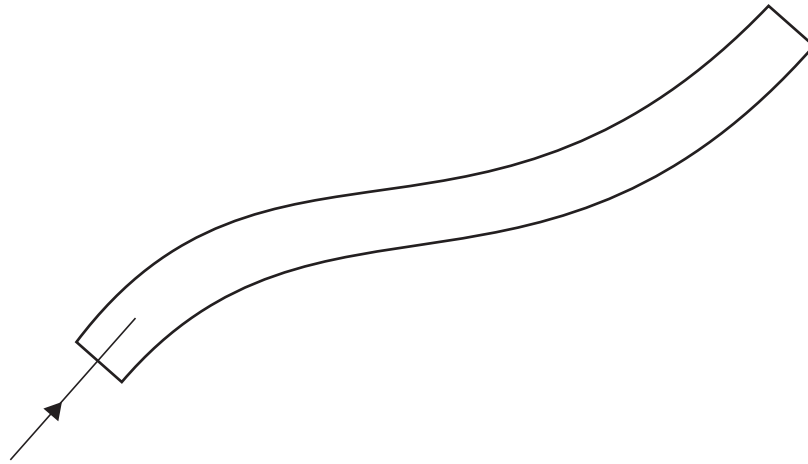
answer [1]

(ii) Suggest **one** advantage of using wireless technology.

..... [1]

(c) Look at the diagram of a piece of optical fibre.

Light goes in at one end and comes out at the other end.



A ray of light is going into the fibre.

Use a ruler to draw its path along the fibre.

[2]

[Total: 6]

END OF QUESTION PAPER

22
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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 | 11 Na sodium 11 | 12 C carbon 6 | 13 Al aluminium 13 | 14 N nitrogen 7 | 15 O oxygen 8 | 16 F fluorine 9 | 17 Ne neon 10 |
| 19 K potassium 19 | 20 Ca calcium 20 | 23 Sc scandium 21 | 24 Ti titanium 22 | 25 V vanadium 23 | 26 Cr chromium 24 | 27 Mn manganese 25 | 28 Fe iron 26 | 29 Co cobalt 27 |
| 37 Rb rubidium 37 | 38 Sr strontium 38 | 39 Y yttrium 39 | 40 Zr zirconium 40 | 41 Nb niobium 41 | 42 Mo molybdenum 42 | 43 Tc technetium 43 | 44 Ru ruthenium 44 | 45 Rh rhodium 45 |
| 55 Cs caesium 55 | 56 Ba barium 56 | 57 La* lanthanum 57 | 72 Hf hafnium 72 | 73 Ta tantalum 73 | 74 W tungsten 74 | 75 Re rhenium 75 | 76 Os osmium 76 | 77 Ir iridium 77 |
| 87 Fr francium 87 | 88 Ra radium 88 | 89 Ac* actinium 89 | 104 Rf rutherfordium 104 | 105 Db dubnium 105 | 106 Sg seaborgium 106 | 107 Bh bohrium 107 | 108 Hs hassium 108 | 109 Mt meitnerium 109 |
| | | | 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 | 210 At astatine 85 | 209 Po polonium 84 | 210 At astatine 85 |
| | | | 115 In indium 49 | 119 Sn tin 50 | 122 Sb antimony 51 | 127 I iodine 53 | 128 Te tellurium 52 | 131 Xe xenon 54 |
| | | | 112 Cd cadmium 48 | 108 Ag silver 47 | 106 Pd palladium 46 | 103 Rh rhodium 45 | 101 Ru ruthenium 44 | 96 Mo molybdenum 42 |
| | | | 65 Zn zinc 30 | 63.5 Cu copper 29 | 59 Ni nickel 28 | 59 Co cobalt 27 | 56 Fe iron 26 | 52 Cr chromium 24 |
| | | | 70 Ga gallium 31 | 73 Ge germanium 32 | 75 As arsenic 33 | 79 Se selenium 34 | 77 Br bromine 35 | 80 Kr krypton 36 |
| | | | 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 |
| | | | 11 B boron 5 | 12 C carbon 6 | 14 N nitrogen 7 | 16 O oxygen 8 | 19 F fluorine 9 | 20 Ne neon 10 |
| | | | 1 H hydrogen 1 | 4 He helium 2 | | | | |

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