



--

--	--	--	--	--

--	--	--	--

0653/22

May/June 2013

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electrical calculators may be used.

You may lose marks if you do not show your working or if you do not use appropriate units.

A copy of the Periodic Table is printed on page 20.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

This document consists of **20** printed pages.

- 1 (a) Fig. 1.1 shows some of the elements in Group 1 of the Periodic Table.

Li
Na
K

Fig. 1.1

- (i) Name the gas which is given off when the metals in Fig. 1.1 react with water.

..... [1]

- (ii) Describe how the rate of reaction between water and the metals in Fig. 1.1 changes as you go down the group.

.....
 [1]

- (b) Fig. 1.2 shows some of the elements in Group 7 of the Periodic Table.

Cl
Br
I

Fig. 1.2

- (i) Describe how the melting point of the elements in Fig. 1.2 changes as you go down the group.

.....
 [1]

- (ii) A solution of potassium bromide is colourless and a solution of chlorine is almost colourless.

Describe and explain briefly what would be seen when these solutions are mixed.

what would be seen

explanation

.....
 [3]

- (c) Phosphorus is a non-metallic, solid element.

One form of phosphorus is white, has the chemical formula P_4 and has to be kept under water.

Fig. 1.3 shows a bottle containing phosphorus.

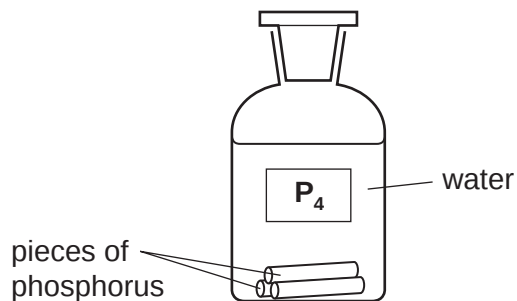


Fig. 1.3

- (i) Suggest why white phosphorus has to be stored under water.

.....

.....

..... [2]

- (ii) Explain the meaning of the chemical formula P_4 .

.....

.....

..... [2]

For
Examiner's
Use

- 2 (a) Fig. 2.1 shows a child's toy. As the ball falls, the toy elephant moves across the table.

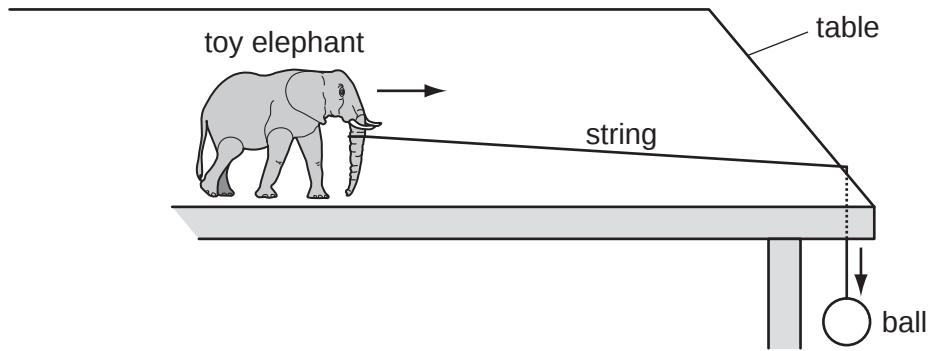


Fig. 2.1

- (i) Name the main force that opposes the motion of the toy elephant.

..... [1]

- (ii) State the unit used to measure forces.

..... [1]

- (iii) Choose words from the list below to complete the sentences. You may use each word once, more than once or not at all.

chemical electrical gravitational potential kinetic
light sound thermal

The useful energy transfer for the toy is energy
to energy.

The energy wasted by the toy is energy. [2]

- (iv) The toy elephant travels 1.2 metres in 3 seconds.

Calculate the average speed of the elephant.

State the formula that you use and show your working.

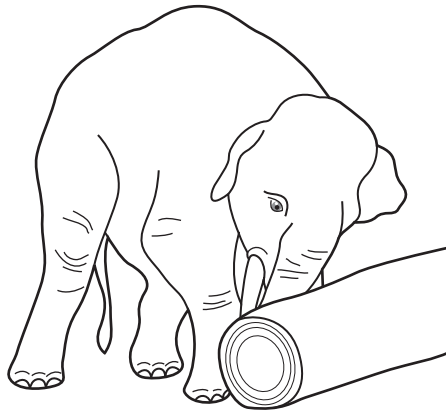
formula

working

..... m/s [2]

- (b) An elephant of mass 5000 kg exerts a constant force to push a tree trunk along at a steady speed of 1.5 m/s.

For
Examiner's
Use



State the **two** quantities that would need to be measured to calculate the work done by the elephant.

..... and [2]

- (c) An elephant can communicate with other elephants using infrasound. This is a very low frequency vibration which it is usually impossible for a human to hear.

- (i) Suggest a possible frequency for this vibration and explain why you chose your answer.

frequency Hz

explanation

..... [2]

- (ii) State the meaning of the term *frequency*.

.....

..... [1]

- 3 (a) Four sets of pea seeds were placed in Petri dishes containing either damp soil or damp filter paper. They were left in different conditions, shown in Table 3.1.

For
Examiner's
Use

Table 3.1

set	conditions		
A	damp soil	cold	dark
B	damp filter paper	warm	light
C	damp filter paper	warm	dark
D	damp soil	cold	light

Predict which sets of seeds will germinate.

Explain your answer.

prediction

explanation

.....

..... [3]

- (b) A pea seed was planted in a pot. When the seed had grown into a young plant, the pot was placed on its side in a room where light was coming from all sides.

Fig. 3.1 shows the young pea plant three days after the pot had been placed on its side.

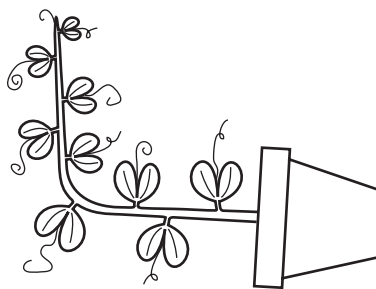


Fig. 3.1

- (i) Which **two** terms describe the response of the plant shown in Fig. 3.1?

Circle the correct answers.

geotropism

photosynthesis

phototropism

sensitivity

transpiration

[2]

- (ii) Suggest how this response will help the plant to reproduce sexually when it has grown to maturity.

*For
Examiner's
Use*

.....

.....

.....

..... [2]

4 Fig. 4.1 shows a microwave oven.

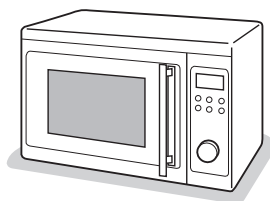


Fig. 4.1

(a) Microwaves cook food by transferring energy to the food.

(i) Choose words from the list to complete the sentences below. You may use each word once, more than once or not at all.

chemical	conduction	convection
potential	radiation	thermal

Microwaves are absorbed by the outer layers of food.

The microwave energy is transferred to water and fat molecules in these layers, increasing the energy of these layers.

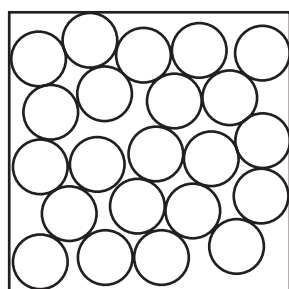
..... energy is mostly transferred to the centre of solid food by [2]

(ii) State **one** use for microwaves other than cooking.

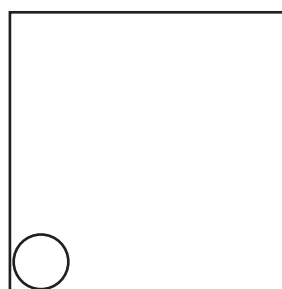
..... [1]

(b) Water can be heated in a microwave oven. The microwave oven is made of solids. The water is a liquid.

Complete Fig. 4.2 to show the arrangement of particles in a solid. The diagram for a liquid has been done for you.



liquid



solid

[2]

Fig. 4.2

- 5 (a) (i) Explain why hydrogen and carbon are described as elements, but hydrocarbons such as methane and ethane are described as compounds.

For
Examiner's
Use

.....

 [2]

- (ii) Name the fossil fuel found in the Earth that is the main source of methane.

..... [1]

- (iii) Name **one** type of fossil fuel that is a solid. [1]

- (iv) Methane is used as a fuel because it reacts very quickly with oxygen, releasing heat.

Name the **two** compounds that are formed when methane undergoes complete combustion.

1

2 [2]

- (b) Magnesium metal also reacts quickly with oxygen, releasing heat.

- (i) Name the compound which is formed when magnesium reacts with oxygen.

..... [1]

(ii) Fig. 5.1 shows diagrams of a magnesium atom and an oxygen atom.

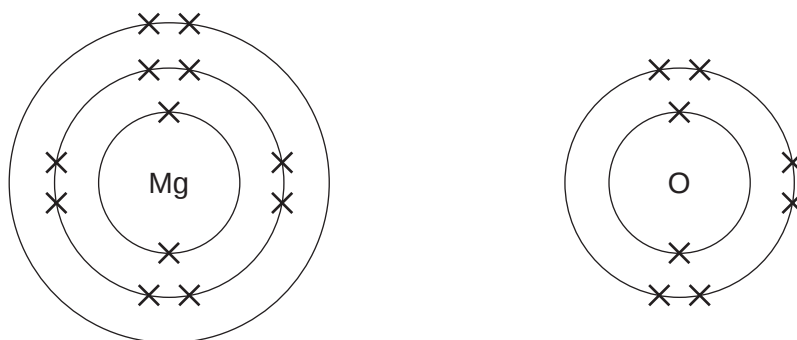


Fig. 5.1

When magnesium reacts with oxygen, the atoms shown in Fig. 5.1 first change into electrically charged atoms known as ions.

Describe what happens when these atoms change into ions.

magnesium

.....

oxygen

..... [2]

For
Examiner's
Use

- 6 Fig. 6.1 shows a food chain. The arrows show how energy flows from one organism to another, along the chain.

For
Examiner's
Use

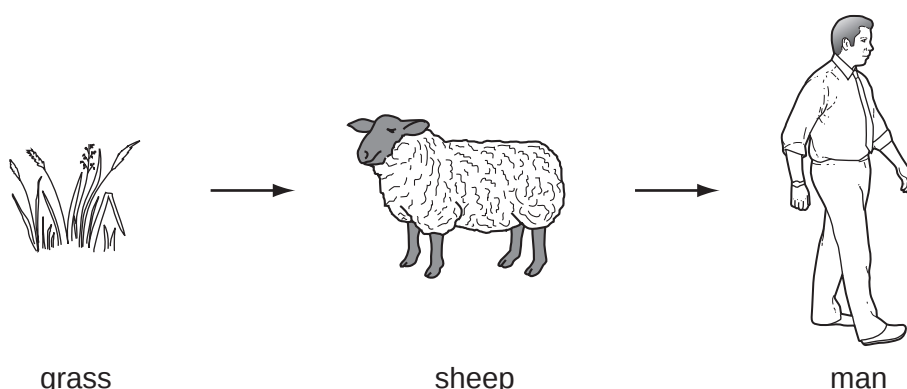


Fig. 6.1

- (a) Energy enters the food chain as sunlight. Plant leaves use this energy to make food.

(i) Name the substance in the leaves of a plant that absorbs this energy.

..... [1]

(ii) Name the **two** raw materials that the plant uses to make food.

1 2 [2]

(iii) Name the gas released from plant leaves during this process.

..... [1]

- (b) A sheep is a herbivore.

Define the term *herbivore*.

.....
 [2]

- (c) Meat from the sheep contains protein.

Describe the importance of protein in the diet.

.....

 [2]

- (d) The cells in the man's body use respiration to release useful energy from nutrients that he has absorbed.

For
Examiner's
Use

- (i) Tick the processes in the list below that use energy.

the diffusion of oxygen from the lungs into the blood

☐

the passage of nerve impulses along a nerve cell

☐

muscle contraction

☐

protein synthesis

☐

[1]

- (ii) A person living in a very cold climate generally needs to eat more than a person living in a hot climate.

Explain why.

.....

.....

.....

[2]

- 7 (a) The diagrams below show the circuit symbols for three components of an electric torch (flashlight).

For
Examiner's
Use

- (i) On the line below each diagram, state the name of the component.



..... [3]

- (ii) Using **only** these symbols, draw a circuit diagram for a torch.

[1]

- (b) Torches are usually powered by electrical cells. They can also be powered by energy from the Sun (solar energy).

Solar energy is a renewable energy resource.

- (i) Name **one** other renewable energy resource.

..... [1]

- (ii) Name **one** non-renewable energy resource.

..... [1]

- (iii) Energy is transferred from the Sun to the Earth by radiation.

Explain why energy cannot be transferred from the Sun to the Earth by conduction.

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

(c) A ray of light from the torch is reflected by a mirror. This is shown in Fig. 7.1.

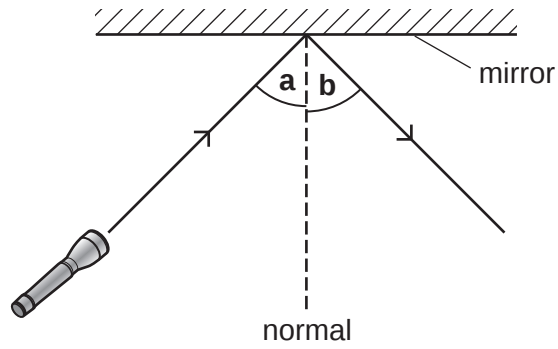


Fig. 7.1

Angle **a** has a value of 45° .

Name angle **b** and write down its value.

name

value $^\circ$

[2]

For
Examiner's
Use

- 8 (a) A student added a solution of the same dilute acid to each of the test-tubes **P** to **S** shown in Fig. 8.1.

For
Examiner's
Use

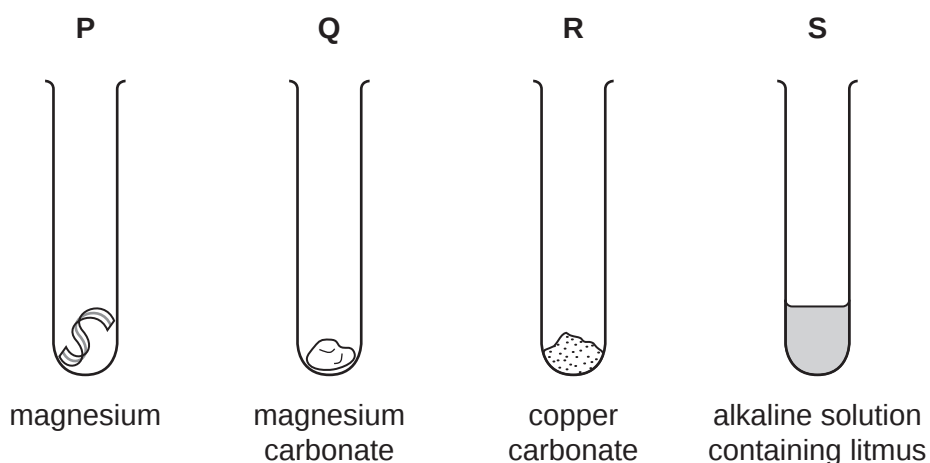


Fig. 8.1

Complete Table 8.1 by matching the test-tubes, **P**, **Q**, **R** and **S**, with the observations which are made when the dilute acid reacts with the contents.

One of the observations applies to more than one of the test-tubes. You may use each letter once, more than once or not at all.

Table 8.1

observations	test-tube(s)
Hydrogen gas is given off.	
A blue solution is formed.	
Carbon dioxide gas is given off.	

[3]

- (b) The student used the apparatus shown in Fig. 8.2 to investigate neutralisation reactions involving three acids, **A**, **B** and **C**.

For
Examiner's
Use

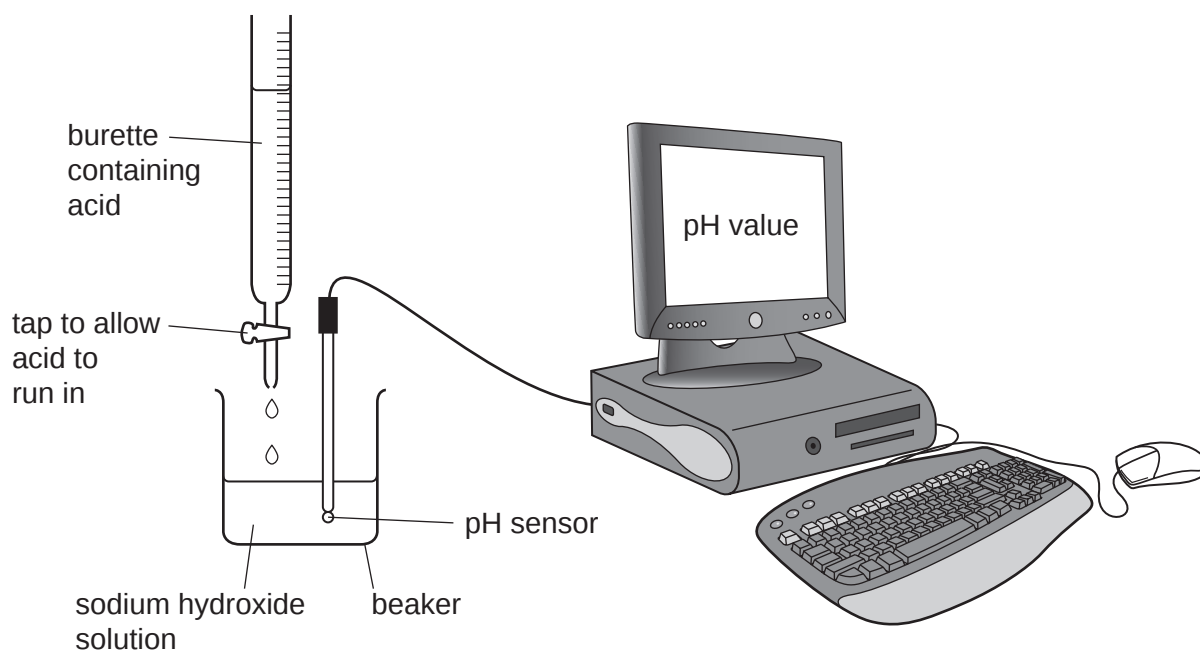


Fig. 8.2

25.0 cm³ of the same solution of the alkali, sodium hydroxide, were placed into each of three beakers.

Acid was slowly added to each of the beakers in turn, and the pH values of the mixtures were displayed on the computer screen.

Some of the measurements from the three experiments are shown in Table 8.2.

Table 8.2

acid	source of acid	volume required to neutralise the alkali / cm ³
A	sample taken from an acidic lake	42.0
B	sample taken from a car battery	15.0
C	acid from a chemical laboratory	60.0

- (i) Suggest a possible pH value of the alkali before any acid was added.

..... [1]

- (ii) Describe briefly what the student would observe when the acid had neutralised the alkali.

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

- (iii) State, with a reason, which acid, **A**, **B** or **C**, had the highest concentration.

acid

reason

[1]

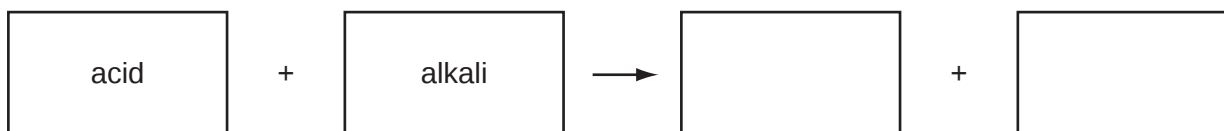
- (iv) The student noticed that, in all three experiments, the temperature of the mixture increased as the acid was added.

Suggest why the temperature increased.

.....

[1]

- (v) Complete the general word equation for the reaction which occurs between an acid and an alkali.



[2]

- 9 Fig. 9.1 shows a section through a small blood vessel.

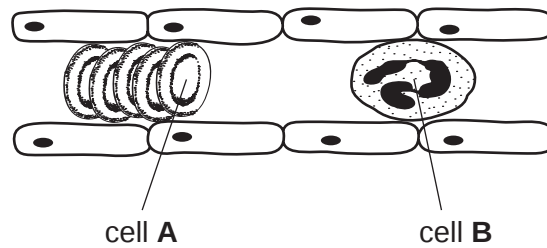


Fig. 9.1

- (a) Cell A is a red blood cell.

- (i) Outline **two** ways in which this cell differs from a liver cell.

- 1 [2]
2

- (ii) Describe the function of a red blood cell.

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

- (b) Describe the function of cell B.

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

- (c) Complete the sentences about the functions of blood plasma, using words from the list. You may use each word once, more than once, or not at all.

For
Examiner's
Use

adrenaline	enzymes	insoluble	small intestine
soluble	stomach	starch	vitamins

Blood plasma transports nutrients such as sugars.

These nutrients enter the blood in the

Blood plasma also transports hormones such as [3]

DATA SHEET
The Periodic Table of the Elements

Group																		
I	II											III	IV	V	VI	VII	0	
												1 H Hydrogen 1						
7 Li Lithium 3	9 Be Beryllium 4																	
23 Na Sodium 11	24 Mg Magnesium 12																	
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	64 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	101 Ru Ruthenium 44	101 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	127 Te Tellurium 52	131 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		Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89																
58-71 Lanthanoid series																		
90-103 Actinoid series																		
175 Lu Lutetium 71																		
173 Yb Ytterbium 70																		
169 Tm Thulium 69																		
167 Er Erbium 68																		
165 Ho Holmium 67																		
162 Dy Dysprosium 66																		
159 Tb Terbium 65																		
157 Gd Gadolinium 64																		
152 Eu Europium 63																		
150 Sm Samarium 62																		
144 Nd Neodymium 60																		
141 Pr Praseodymium 59																		
140 Ce Cerium 58																		
238 U Uranium 92																		
232 Th Thorium 90																		
239 Pu Plutonium 94																		
244 Am Americium 95																		
254 Cm Curium 96																		
264 Bk Berkelium 97																		
277 Lr Lawrencium 103																		
102 No Nobelium 102																		
101 Md Mendelevium 101																		
100 Fm Fermium 100																		
99 Es Einsteinium 99																		
98 Cf Californium 98																		
96 Cm Curium 96																		
95 Am Americium 95																		
94 Pu Plutonium 94																		
93 Np Neptunium 93																		
92 U Uranium 92																		
91 Pa Protactinium 91																		
90 Th Thorium 90																		
89 Ac Actinium 89																		
88 Ra Radium 88																		
87 Fr Francium 87																		
86 Rn Radon 86																		
85 At Astatine 85																		
84 Po Polonium 84																		
83 Bi Bismuth 83																		
82 Pb Lead 82																		
81 Tl Thallium 81																		
80 Hg Mercury 80																		
79 Au Gold 79																		
78 Pt Platinum 78																		
77 Ir Iridium 77																		
76 Os Osmium 76																		
75 Re Rhenium 75																		
74 W Tungsten 74																		
73 Ta Tantalum 73																		
72 Hf Hafnium 72																		
71 Lu Lutetium 71																		
70 Yb Ytterbium 70																		
69 Tm Thulium 69																		
68 Er Erbium 68																		
67 Ho Holmium 67																		
66 Dy Dysprosium 66																		
65 Tb Terbium 65																		
64 Gd Gadolinium 64																		
63 Eu Europium 63																		
62 Sm Samarium 62																		
61 Pm Promethium 61																		
60 Nd Neodymium 60																		
59 Pr Praseodymium 59																		
58 Ce Cerium 58																		
57 La Lanthanum 57																		
56 Ba Barium 56																		
55 Cs Caesium 55																		
54 Xe Xenon 54																		
53 I Iodine 53																		
52 Te Tellurium 52																		
51 Sb Antimony 51																		
50 Sn Tin 50																		
49 In Indium 49																		
48 Cd Cadmium 48																		
47 Ag Silver 47																		
46 Pd Palladium 46																		
45 Rh Rhodium 45																		
44 Ru Ruthenium 44																		
43 Tc Technetium 43																		
42 Mo Molybdenum 42																		
41 Nb Niobium 41																		
40 Zr Zirconium 40																		
39 Y Yttrium 39																		
38 Sr Strontium 38																		
37 Rb Rubidium 37																		
36 Kr Krypton 36																		
35 Br Bromine 35																		
34 Se Selenium 34																		
33 As Arsenic 33																		
32 Ge Germanium 32																		
31 Ga Gallium 31																		
30 Zn Zinc 30																		
29 Cu Copper 29																		
28 Ni Nickel 28																		
27 Co Cobalt 27																		
26 Fe Iron 26																		
25 Mn Manganese 25																		
24 Cr Chromium 24																		
23 V Vanadium 23																		
22 Ti Titanium 22																		
21 Sc Scandium 21																		
20 Ca Calcium 20																		
19 K Potassium 19																		
18 Ar Argon 18																		
17 Cl Chlorine 17																		
16 S Sulfur 16																		
15 P Phosphorus 15																		
14 Si Silicon 14																		
13 Al Aluminium 13																		
12 C Carbon 6																		
11 B Boron 5																		
10 Ne Neon 10																		
9 F Fluorine 9																		
8 O Oxygen 8																		
7 N Nitrogen 7																		
6 C Carbon 6																		
5 B Boron 5																		
4 He Helium 2																		
3 Li Lithium 3																		
2 H Hydrogen 1																		
1 H Hydrogen 1																		

a

X

b

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

Key

a	X	b
---	---	---

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.