Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

8763484363

COMBINED SCIENCE **0653/33**

Paper 3 (Core) **May/June 2019**

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 an HB 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.
Electronic 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 **19** printed pages and **1** blank page.

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1 **(a)** Fig. 1.1 shows the human gas exchange system.

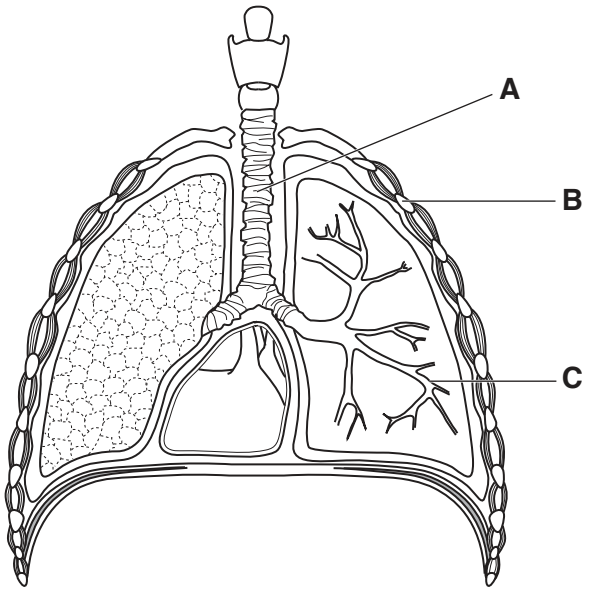


Fig. 1.1

Name structures **A**, **B** and **C** as shown in Fig. 1.1.

A .....

B .....

C .....

[3]

(b) Table 1.1 shows some of the composition of inspired air and of expired air.

Table 1.1

gas	composition of air / %	
	inspired air (breathed in)	expired air (breathed out)
carbon dioxide	0.04	.....
nitrogen	78	78
oxygen	21	16

In Table 1.1 write the percentage of carbon dioxide in expired air. [1]

(c) Oxygen enters the blood at the lungs.

(i) Describe how oxygen is transported in the blood.

.....

.....

..... [2]

(ii) Explain why **all** living cells need a supply of oxygen.

.....

.....

..... [2]

(d) State **two** ways in which the pattern of breathing changes during exercise.

1. .....

2. .....
[2]

[Total: 10]

2 Chlorine, bromine, and iodine are Group VII elements.

(a) These three elements exist as molecules.

Fig. 2.1 shows the physical states of these elements.

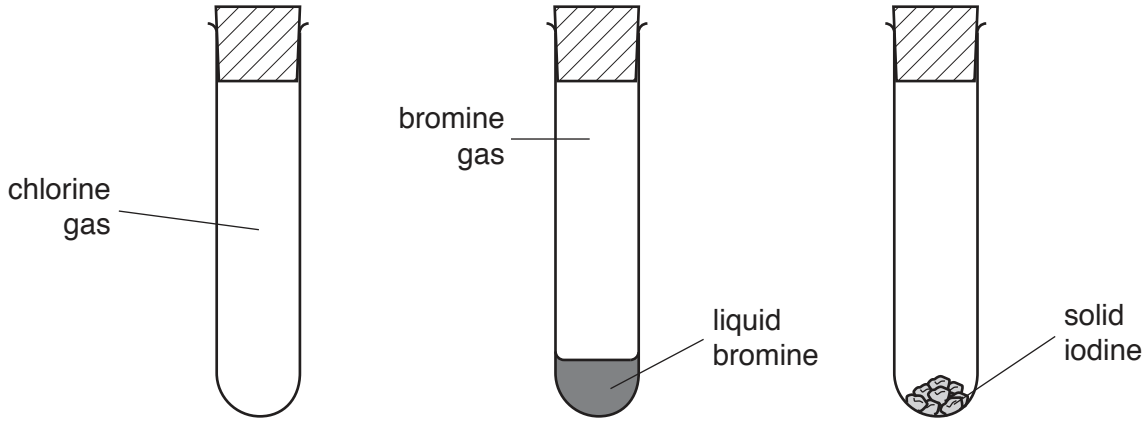


Fig. 2.1

(i) Explain what is meant by the term *molecule*.

Use ideas about atoms in your answer.

.....

..... [1]

(ii) Name the change of state that occurs when liquid bromine turns into bromine gas.

..... [1]

(iii) State whether the change of state that occurs when liquid bromine turns into bromine gas is a physical change or a chemical change.

Explain your answer.

change .....

explanation .....

.....
[1]

(b) Sodium reacts with chlorine in an exothermic reaction.

Sodium chloride, an ionic compound, is formed. This compound contains sodium ions and chloride ions.

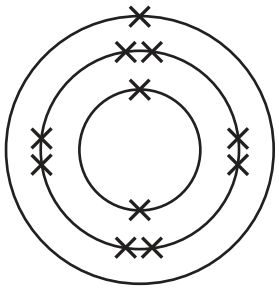
(i) State what is meant by an *exothermic* reaction.

.....

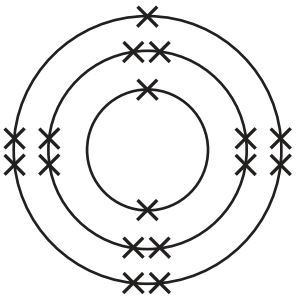
..... [1]

(ii) Fig. 2.2 shows the electronic structure of a sodium atom and of a chlorine atom.

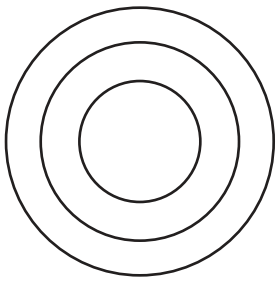
Complete Fig. 2.2 to show the electronic structure of a sodium ion and of a chloride ion.



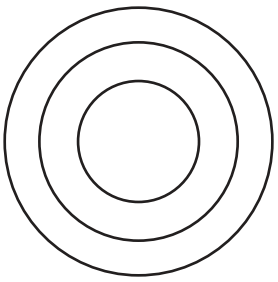
sodium atom



chlorine atom



sodium ion



chloride ion

Fig. 2.2

[2]

(iii) Describe the electrical conductivity of solid sodium chloride and of liquid sodium chloride.

solid .....

liquid .....

[1]

(iv) Suggest the type of chemical bond that forms between carbon atoms and chlorine atoms.

Explain your answer.

type of chemical bond .....

explanation .....

.....

[1]

[Total: 8]

3 Fig. 3.1 shows a boy in a swimming pool.

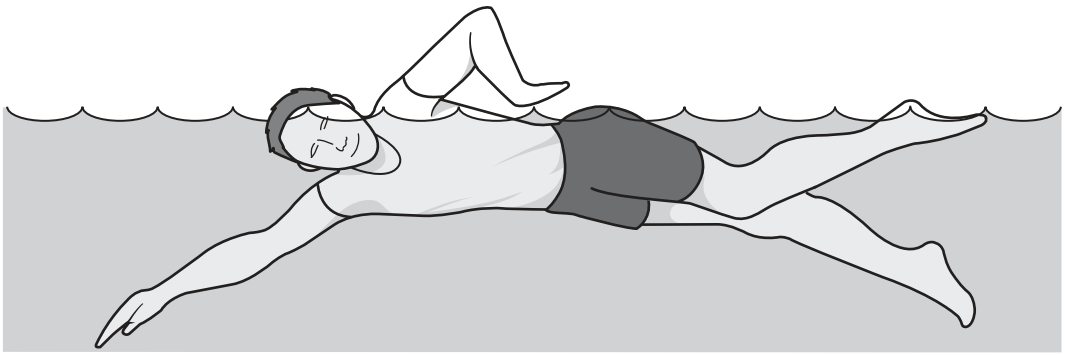


Fig. 3.1

The boy swims a length of the pool.

(a) (i) On Fig. 3.1 draw an arrow to show the frictional force of water resistance on the boy. [1]

(ii) He exerts a force of 40 N to swim at constant speed.

State the value of the frictional force of water resistance.

Give a reason for your answer.

force = ... N

reason .....

.....

[1]

(b) The boy swims at a speed of 0.80 m / s.

Calculate the time taken by the boy to swim 25 m at this speed.

Show your working.

time = ... s [2]

(c) Fig. 3.2 shows a speed–time graph for another swimmer.

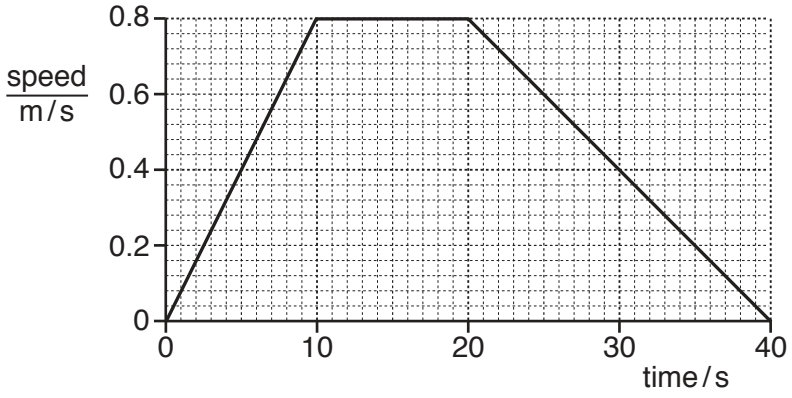


Fig. 3.2

Describe the motion of the swimmer between 10 s and 40 s.

.....

.....

..... [2]

(d) The time taken by the swimmer in **(c)** is measured by an electronic stop-clock. The stop-clock is stopped when the swimmer crosses a beam of infrared radiation.

(i) Suggest **one** reason why X-rays would not be suitable for this purpose.

.....

..... [1]

(ii) Fig. 3.3 shows the electromagnetic spectrum.

On Fig. 3.3 write infrared radiation in its correct place in the spectrum.

	X-rays		visible light			radio waves

Fig. 3.3

[1]

[Total: 8]

4 **(a)** Fig. 4.1 shows some leaves of the plant *Mimosa pudica*.

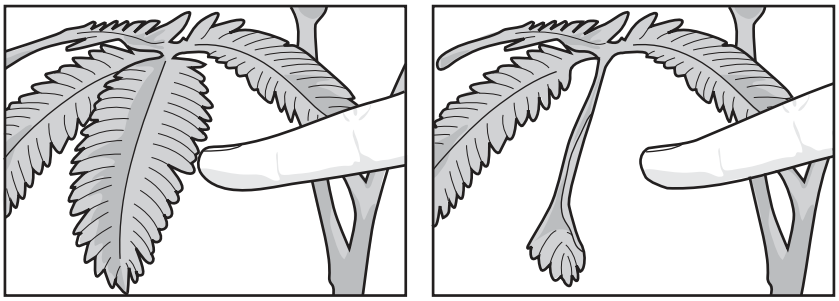


Fig. 4.1

When a person touches a leaf, the leaf closes within three seconds.

(i) State which **two** characteristics of living things are being shown by the leaf after it is touched.

1. .....

2. .....
[2]

(ii) Predict how the rate of photosynthesis is affected by leaves showing the response in Fig. 4.1.

Explain your answer.

prediction .....

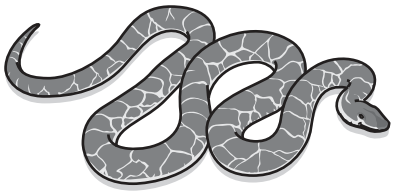
explanation .....

.....
[1]

(b) (i) Fig. 4.2 shows some organisms found in a field.

mouse (primary consumer)

badger (tertiary consumer)



snake (secondary consumer)

wheat (producer)

Fig. 4.2

Draw a food chain of the four organisms. You do not need to include the pictures.

[2]

(ii) Name a carnivore and a herbivore from the organisms shown in **(b)(i)**.

carnivore .....

herbivore .....

[2]

(c) State the principal source of energy for the food chain you wrote in **(b)(i)**.

..... [1]

[Total: 8]

5 **(a)** Calcium hydroxide, a base, is used to control the acidity of soil.

(i) Describe the effect of calcium hydroxide on the pH value of acid soil.

..... [1]

(ii) On Fig. 5.1 complete the word equation for the reaction between calcium hydroxide and dilute sulfuric acid.

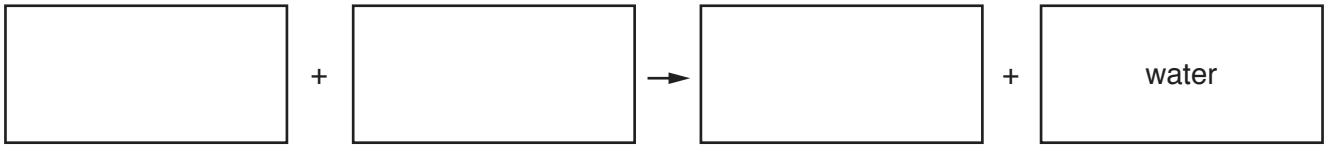


Fig. 5.1

[2]

(iii) Describe the test for aqueous calcium ions, Ca^{2+}.

State the result that shows the presence of calcium ions.

test .....

result .....

.....

[2]

(b) A student makes pure crystals of copper sulfate.

She adds excess copper oxide powder to dilute sulfuric acid.

A blue solution of copper sulfate forms.

(i) Explain why excess copper oxide is used.

.....

..... [1]

(ii) Describe how she separates the unreacted copper oxide powder from the blue solution.

..... [1]

(iii) State **two** processes that she uses to obtain crystals of copper sulfate from the blue solution.

1. .....

2. .....

[2]

[Total: 9]

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6 **(a)** Complete the sentences using words from the list.

Each word may be used once, more than once or not at all.

atoms **boils** **evaporates** **faster** **molecules** **slower**

On a warm day, sea-water ..... as energy from the Sun makes water ..... move ..... and escape from the surface. [2]

(b) Fig. 6.1 shows a cylinder of compressed air (air at high pressure) used by scuba divers in the sea.

Fig. 6.1

The air at high pressure in the cylinder is at the same temperature as the air in the room.

Describe how the arrangement and movement of the gas molecules in the cylinder compares with the arrangement and movement of the gas molecules in air in the room.

arrangement .....

.....

movement .....

.....

[2]

(c) **(i)** State the approximate lowest frequency of human hearing in air. Give the unit of your answer.

frequency = ... unit ..... [2]

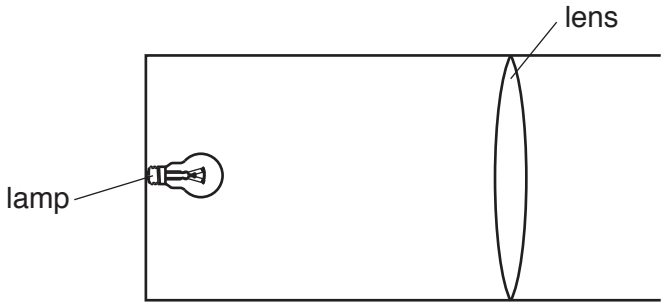
(ii) Scuba divers are said to be able to hear sounds with a higher frequency underwater than humans can normally hear in air.

Suggest a value for a frequency which a scuba diver might be able to hear underwater, but not in air.

..... [1]

(d) Scuba divers use underwater torches (flashlights) when diving in caves.

Fig. 6.2 shows a design for an underwater torch (flashlight) to produce a parallel beam of light using a lamp and a converging lens of focal length 3 cm.



(not to scale)

Fig. 6.2

(i) State the distance that the lens should be placed from the lamp.

Give a reason for your answer.

distance = ... cm

reason .....

.....

[1]

(ii) On Fig. 6.2, draw **two** rays to show how the lamp produces a parallel beam of light. [1]

[Total: 9]

7 **(a)** Fig. 7.1 is a simplified diagram which shows the human alimentary canal.

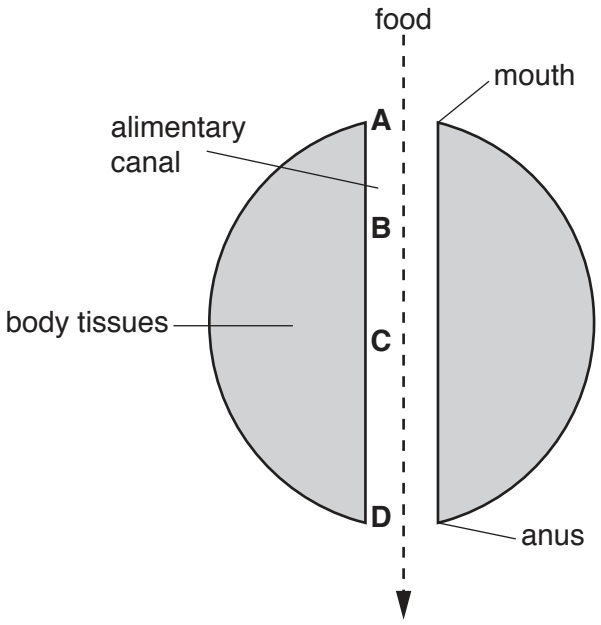


Fig. 7.1

The alimentary canal is a tube going through the body from mouth to anus. The tube is surrounded by body tissues.

The letters **A**, **B**, **C** and **D** show the basic stages of digestion of food.

On Fig. 7.2 the boxes on the left show the letters of the stages of digestion of food as shown in Fig. 7.1.
The boxes in the middle show the names of these stages.
The boxes on the right show descriptions of what is happening to the food.

Draw **one** line to link each letter with its stage, and draw **one** line to link each stage with its description. Stage **B**, digestion, is done for you.

letter of stage	name of stage	description
A	absorption	faeces leave the body
B	digestion	food is taken into the body
C	egestion	insoluble food molecules are broken down
D	ingestion	soluble food molecules enter the blood

Fig. 7.2 [3]

(b) Describe the function of the gall bladder.

.....

..... [1]

(c) **(i)** State what is meant by the term *balanced diet* for humans.

.....

.....

..... [2]

(ii) State why proteins are needed as part of a balanced diet.

..... [1]

(iii) Describe the chemical test for protein, and the colour of the positive result.

chemical test .....

colour of positive result .....
[2]

[Total: 9]

8 **(a)** When zinc oxide is heated with carbon, zinc and carbon dioxide are formed.

(i) State the type of chemical reaction that occurs when zinc loses oxygen.

..... [1]

(ii) Suggest **one** effect on the reaction between zinc oxide and carbon of using a lower temperature.

..... [1]

(iii) Explain why argon, a Group VIII gas, does not react with zinc oxide.

..... [1]

(b) When aluminium oxide is heated with carbon, there is no reaction.

Explain why aluminium oxide does not react with carbon.

Use ideas about the reactivity series in your answer.

.....

..... [1]

(c) **(i)** Name the ore from which aluminium is extracted.

..... [1]

(ii) State the method used to extract aluminium.

..... [1]

(d) Iron is a transition element.

Sodium is a Group I element.

Describe **one** difference and **one** similarity between the physical properties of iron and of sodium.

difference .....

.....

similarity .....

.....

[2]

(e) Recycled metals can cost less than metals extracted from their ores.

Suggest **one other** reason why metals are recycled.

.....

..... [1]

[Total: 9]

9 Fig. 9.1 shows an electricity line supplying a voltage of 11 000 V.

Fig. 9.2 shows a battery which supplies a voltage of 24 V.

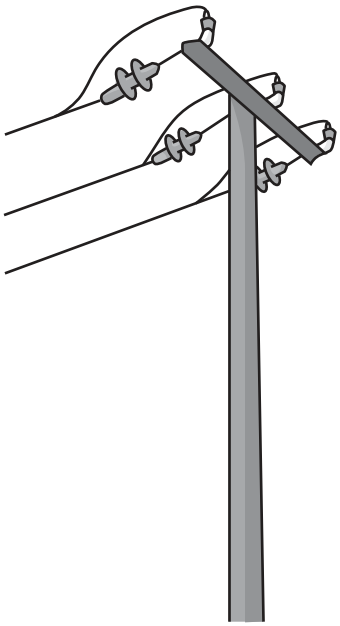


Fig. 9.1

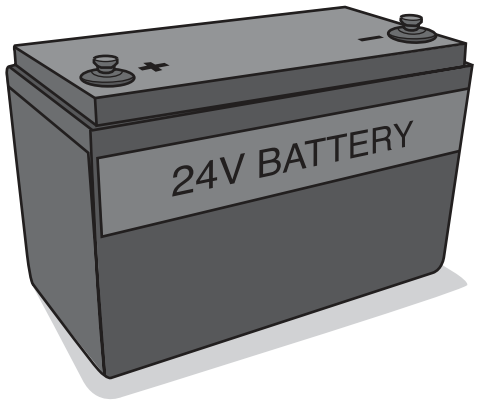


Fig. 9.2

(a) The electricity supply line has a warning notice about the 11 000 V, but there is no warning on the 24 V battery.

(i) State the electromotive force (e.m.f.) of the battery.

e.m.f. = ... [1]

(ii) Suggest why the electricity supply line has a warning notice, but the battery does not.

.....

.....

..... [2]

(b) A man's hand touches a live electric cable at a voltage of 240 V. A current of 0.0050 A flows through his body to the ground, and he receives an electric shock.

(i) Calculate the electrical resistance of the man's body.

Show your working.

resistance = ... Ω [2]

(ii) Explain why he might not have received a shock if he had been wearing rubber gloves.

.....

..... [1]

(c) The battery in Fig. 9.2 is used to power two lamps and an electric motor that drives a vehicle.

The vehicle can be driven by the motor without switching on the lamps.

Fig. 9.3 shows part of the circuit in the vehicle.

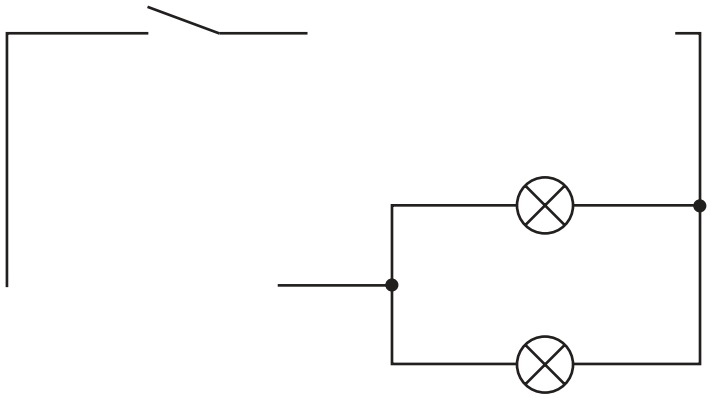


Fig. 9.3

Complete the circuit by adding the correct symbols and connecting wires for:

- the battery
- an electric motor with a switch to control the motor only
- a switch that will turn both lamps on and off but not affect the motor.

The symbol for an electric motor is —(M)— . [4]

[Total: 10]

The Periodic Table of Elements

	Group																	
	I	II									III	IV	V	VI	VII	VIII
							1 H hydrogen 1									2 He helium 4
Key											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
atomic number atomic symbol name relative atomic mass	3 Li lithium 7	4 Be beryllium 9									13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
	11 Na sodium 23	12 Mg magnesium 24									31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
	19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
	37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
	55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	112 Cn copernicium –						
	87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –	114 Fl flerovium –		116 Lv livermorium –			

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).