



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

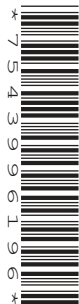
CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



COMBINED SCIENCE

0653/31

Paper 3 (Core)

October/November 2018

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 **18** printed pages and **2** blank pages.



2

- 1 (a) The list shows some processes that occur in living organisms.

breathing digestion excretion growth movement
reproduction sensitivity

State **two** processes shown in the list which are **not** characteristics of all living things.

1.

2.

[2]

- (b) Fig. 1.1 shows a palisade cell which is found in the leaf of a plant.

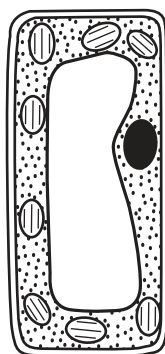


Fig. 1.1

- (i) On Fig. 1.1 use a label line and the correct name to show **one** structure that is present in **all** plant cells but is absent from animal cells. [2]

- (ii) Describe the pathway taken by water in the plant, from the soil to the palisade cells.

.....
.....
.....
.....[3]

3

(c) Fig. 1.2 shows a plant growing in front of a large rock.



Fig. 1.2

- (i) The leaves of the plant in Fig. 1.2 turn towards the light.

Name the plant's response to light.

.....[1]

- (ii) The leaves of the plant in Fig. 1.2 are separated from each other as much as possible and do not overlap.

Suggest **and** explain why this is an advantage for the plant.

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

- 2 (a) Complete the following sentences using words from the list.

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

atoms compounds covalent elements
ionic ions mixtures molecules

- (i) The smallest parts of an element are [1]
- (ii) All contain atoms joined by sharing pairs of electrons
in bonds. [2]
- (iii) Atoms which lose or gain electrons form particles called
..... [1]
- (iv) Elements in cannot be separated by simple physical
processes.
Substances in can be separated by simple physical
processes. [2]
- (b) A student passes an electric current through aqueous copper chloride using the apparatus shown in Fig. 2.1.

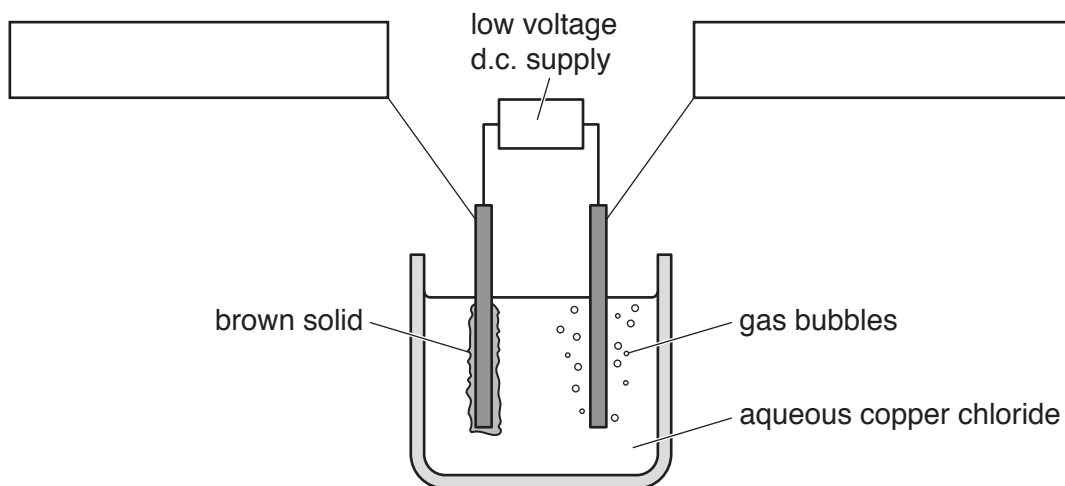


Fig. 2.1

- (i) Complete the labels in Fig. 2.1 by naming the two electrodes. [2]
- (ii) Name the solid and the gas formed in this process.
solid
gas [2]

BLANK PAGE

6

- 3 Fig. 3.1 shows a train made up of a steam engine and a passenger coach.

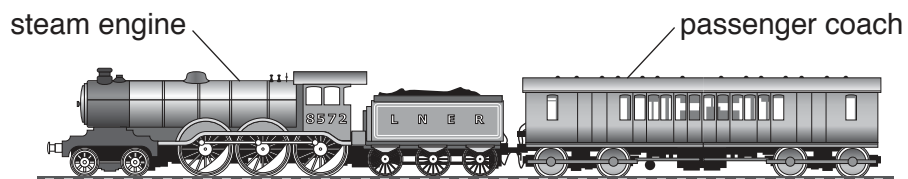


Fig. 3.1

- (a) The train is travelling at a constant speed along a level track. Fig. 3.2 shows the four forces **W**, **X**, **Y** and **Z** acting on the train.

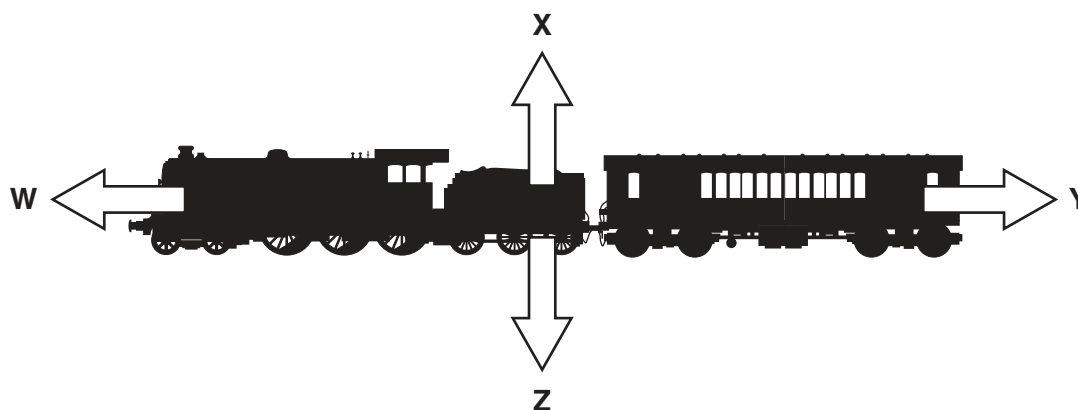


Fig. 3.2

- (i) Name force **Z**.

.....[1]

- (ii) The force arrows on Fig. 3.2 do not show the sizes of the forces.

State whether or not the driver has made force **W** equal in size to force **Y**.

Explain your answer.

.....
[1]

7

(b) Fig. 3.3 shows a speed–time graph of the train as it travels between two stations.

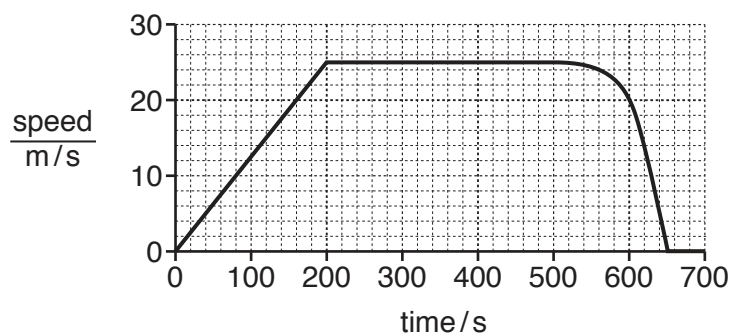


Fig. 3.3

(i) On Fig. 3.3, use the letter **P** to label **one** point in the journey when the train is travelling with changing speed. [1]

(ii) The distance between the two stations is 12.8 km.

State the distance between the stations in metres.

distance = m [1]

(iii) Use your answer to (b)(ii) and information from the graph to calculate the average speed of the train on this journey in m/s.

Show your working.

average speed = m/s [2]

(c) The steam engine is powered by burning coal to boil water. This makes steam that moves the engine.

Complete the energy transfer that moves the train.

..... energy in the coal

→ energy of the train. [2]

(d) State the **original** source of the energy stored in coal.

..... [1]

8

4 Fig. 4.1 shows part of an aquatic food web.

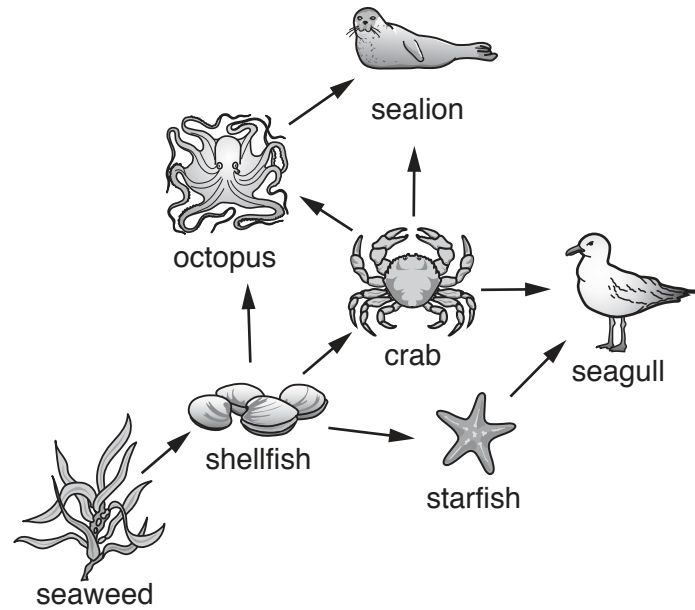


Fig. 4.1

(a) From Fig. 4.1 state the name of

a producer,

.....

a herbivore,

.....

a consumer.

.....

[3]

(b) The food web in Fig. 4.1 is made from interconnected food chains.

Write **two** complete food chains which contain the crab.

1.

2.

[3]

9

(c) The population of crabs reduces suddenly.

Suggest **two** reasons why this causes the octopus population to decrease.

1.

.....

2.

.....

[2]

5 (a) A student makes magnesium sulfate by reacting magnesium with a dilute acid.

(i) Name the acid.

.....[1]

(ii) Describe the pH change of the mixture during the reaction.

.....[1]

(iii) Name **one other** substance that reacts with this acid to make magnesium sulfate.

.....[1]

(iv) The reaction between magnesium and this acid is exothermic.

State what is meant by the term *exothermic*.

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

(b) Another student reacts calcium with excess dilute acid in a beaker.

Calcium sulfate forms as a solid in the beaker.

Suggest the separation method that is used to separate the solid calcium sulfate from the excess acid.

Explain how this separation method removes the solid from the liquid.

method

explanation

.....

.....

[2]

11

(c) Calcium is in Group II of the Periodic Table.

(i) Complete the following sentences using words from the list.

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

good high low poor

Calcium is a electrical conductor.

Calcium has a melting point.

[1]

(ii) State the order of reactivity of calcium, magnesium and sodium.

..... most reactive
.....
.....
..... least reactive

[1]

- 6 Fig. 6.1 shows a liquid-in-glass thermometer at room temperature.

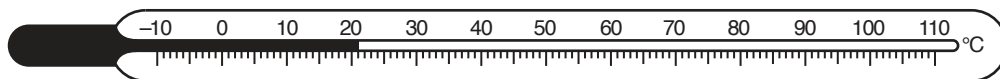


Fig. 6.1

- (a) State the property of a liquid that is used in a thermometer when measuring temperature.

.....[1]

- (b) Table 6.1 gives a list of the melting point and boiling point of five substances that are used in liquid-in-glass thermometers.

Table 6.1

substance	melting point /°C	boiling point /°C
ethanol	−114	78
gallium	30	2403
glycol	−12	198
mercury	−39	357
water	0	100

- (i) Ammonia has a melting point of -78°C and a boiling point of -33°C .

State which substance could be used in a liquid-in-glass thermometer to measure both the melting point and boiling point of ammonia. Explain your answer.

substance

explanation

[2]

- (ii) Explain why a thermometer that uses liquid gallium has to be kept in a warm container, well above room temperature.

.....

.....

.....[2]

13

- (c) An infra-red thermometer measures temperature in a different way. The wavelength of the infra-red radiation emitted by a hot body changes with temperature.

An infra-red thermometer measures the wavelengths of the infra-red radiation emitted and converts these to temperature readings.

- (i) Fig. 6.2 shows a wave motion with the waves moving from left to right.

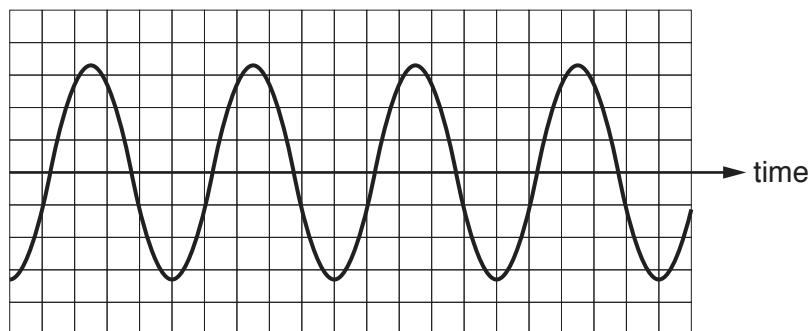


Fig. 6.2

State the number of complete wavelengths shown in Fig. 6.2.

.....[1]

- (ii) The wavelength of the infra-red radiation emitted decreases as the temperature of the hot body increases.

Predict what happens to the frequency of the infra-red radiation as the temperature of the hot body increases.

Explain your answer.

prediction

explanation

.....[2]

- (iii) In the infra-red thermometer, the radiation is focused onto the detector by a thin converging lens.

On Fig. 6.3 complete the ray diagram to show how this happens.

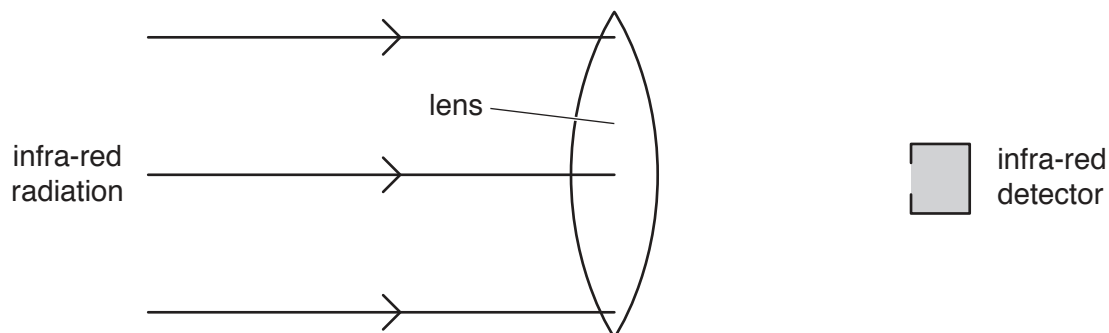


Fig. 6.3

14

- 7 (a) Table 7.1 shows some features of arteries, veins and capillaries.

Place a tick (✓) in the correct boxes in Table 7.1 to show the features of each blood vessel.

Table 7.1

feature	blood vessel		
	artery	vein	capillary
carries blood away from the heart			
contains valves			
walls are one cell thick			
exchange of materials occurs here			

[3]

- (b) A boy starts to play football. Immediately the concentration of the hormone adrenaline in his blood increases.

- (i) Describe **two** effects of adrenaline in the boy's body.

1.

2.

[2]

- (ii) The concentration of adrenaline in the boy's blood decreases after playing football.

Describe how the adrenaline is removed from his blood.

.....

.....[1]

- (c) The boy is 10 years old. It is important that he includes enough calcium and iron in his diet.

- (i) State **one** food which is a good source of calcium.

.....[1]

- (ii) Describe why calcium is important in the body.

.....[1]

- (iii) Describe the symptoms the boy may have if he does not have enough iron in his diet.

.....

.....[1]

BLANK PAGE

16

- 8 Petroleum is separated into more useful substances using the process shown in Fig. 8.1.

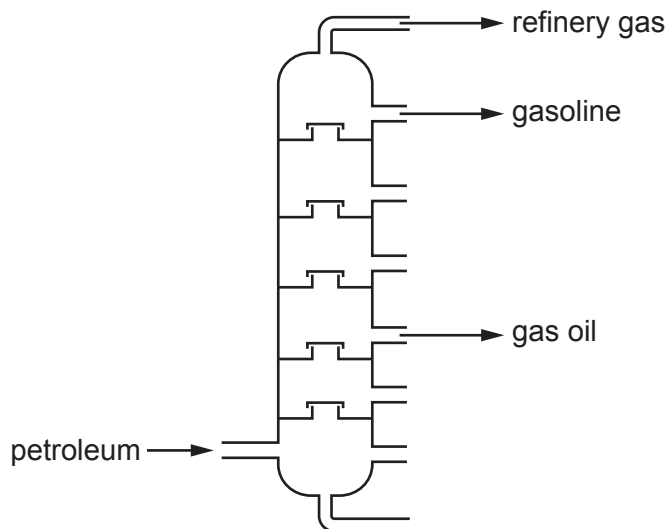


Fig. 8.1

- (a) (i) Name this process.

.....[1]

- (ii) State **one** use for gas oil.

.....[1]

- (b) During the complete combustion of gasoline, the amounts of some gases in the air change.

Name **two** of these gases and describe the change in the amount of each.

gas 1

name

change

gas 2

name

change

[4]

17

(c) The formula of ethanol is $\text{C}_2\text{H}_5\text{OH}$.

Complete the structure of a molecule of ethanol.

Show all of the bonds between the atoms.



[2]

18

9 Fig. 9.1 shows a dishwasher (an electric dishwashing machine).

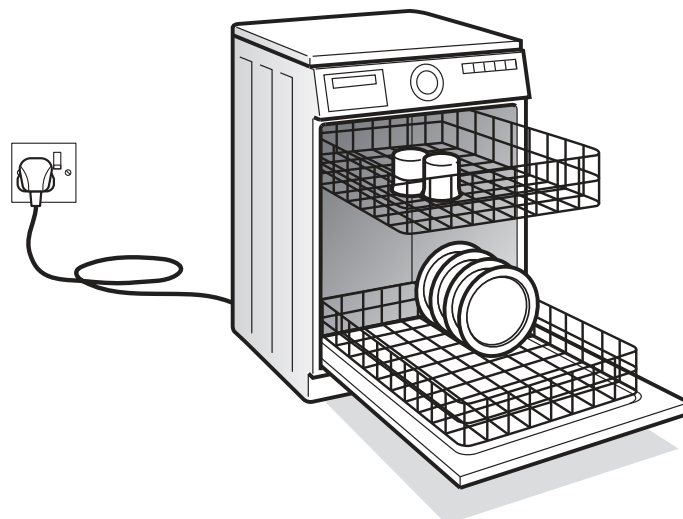


Fig. 9.1

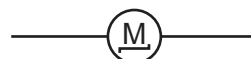
The dishwasher uses electrical energy to power

- a heater to heat the water used,
- a motor to pump the hot water through the machine.

The circuit symbols for a heater and a motor are:



heater



motor

Fig. 9.2 shows part of the circuit diagram for the dishwasher.

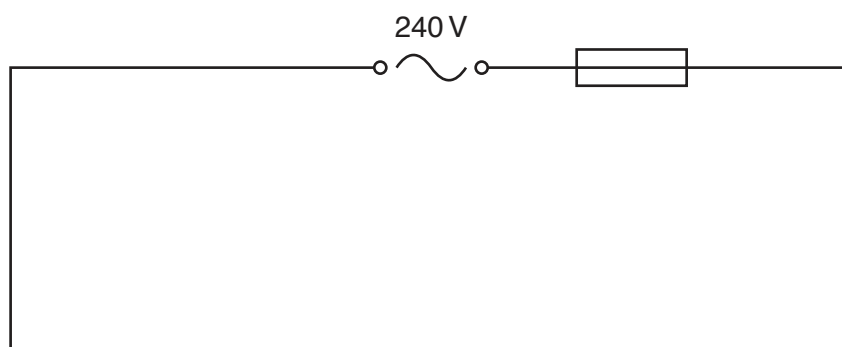


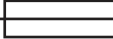
Fig. 9.2

19

- (a) (i) The heater and the motor are connected in parallel.

A switch turns both the heater and the motor on and off.

On Fig. 9.2 complete the circuit diagram for the dishwasher. [3]

- (ii) Name the component in Fig. 9.2 represented by the symbol  and state the reason for including it in the circuit.

component

reason

..... [2]

- (b) When switched on, the resistance of the heater is 24Ω and the resistance of the motor is 4Ω .

- (i) Use the formula $R = \frac{V}{I}$ to calculate the current through the heater.

Show your working and give the unit of your answer.

working

current = unit [3]

- (ii) Put a circle around the likely value of the combined resistance of the heater and motor in this circuit. Give a reason for your choice.

3.4 Ω 28 Ω

reason

..... [1]

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.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

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.

The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
1Hhydrogen1 Key atomic number atomic symbol name relative atomic mass																	
3Li lithium 7	4Be beryllium 9											5B boron 11	6C carbon 12	7N nitrogen 14	8O oxygen 16	9F fluorine 19	10Ne neon 20
11Na sodium 23	12Mg magnesium 24											13Al aluminium 27	14Si silicon 28	15P phosphorus 31	16S sulfur 32	17Cl chlorine 35.5	18Ar argon 40
19K potassium 39	20Ca calcium 40	21Sc scandium 45	22Ti titanium 48	23V vanadium 51	24Cr chromium 52	25Mn manganese 55	26Fe iron 56	27Co cobalt 59	28Ni nickel 59	29Cu copper 64	30Zn zinc 65	31Ga gallium 70	32Ge germanium 73	33As arsenic 75	34Se selenium 79	35Br bromine 80	36Kr krypton 84
37Rb rubidium 85	38Sr strontium 88	39Y yttrium 89	40Zr zirconium 91	41Nb niobium 93	42Mo molybdenum 96	43Tc technetium —	44Ru ruthenium 101	45Rh rhodium 103	46Pd palladium 106	47Ag silver 108	48Cd cadmium 112	49In indium 115	50Sn tin 119	51Sb antimony 122	52Te tellurium 128	53I iodine 127	54Xe xenon 131
55Cs caesium 133	56Ba barium 137	lanthanoids		73Ta tantalum 181	74W tungsten 184	75Re rhenium 186	76Os osmium 190	77Ir iridium 192	78Pt platinum 195	79Au gold 197	80Hg mercury 201	81Tl thallium 204	82Pb lead 207	83Bi bismuth 209	84Po polonium —	85At astatine —	86Rn radon —
87Fr francium —	88Ra radium —	89–103 actinoids	104Rf rutherfordium —	105Db dubnium —	106Sg seaborgium —	107Bh bohrium —	108Hs hassium —	109Mt meitnerium —	110Ds darmstadtium —	111Rg roentgenium —	112Cn copernicium —	Flerovium Fl —		114 Flerovium Fl —	116Lv livermorium —		

lanthanoids

57La lanthanum 139	58Ce cerium 140	59Pr praseodymium 141	60Nd neodymium 144	61Pm promethium —	62Sm samarium 150	63Eu europium 152	64Gd gadolinium 157	65Tb terbium 159	66Dy dysprosium 163	67Ho holmium 165	68Er erbium 167	69Tm thulium 169	70Yb ytterbium 173	71Lu lutetium 175
--------------------------	-----------------------	-----------------------------	--------------------------	-------------------------	-------------------------	-------------------------	---------------------------	------------------------	---------------------------	------------------------	-----------------------	------------------------	--------------------------	-------------------------

actinoids

89Ac actinium —	90Th thorium 232	91Pa protactinium 231	92U uranium 238	93Np neptunium —	94Pu plutonium —	95Am americium —	96Cm curium —	97Bk berkelium —	98Cf californium —	99Es einsteinium —	100Fm fermium —	101Md mendelevium —	102No nobelium —	103Lr lawrencium —
-----------------------	------------------------	-----------------------------	-----------------------	------------------------	------------------------	------------------------	---------------------	------------------------	--------------------------	--------------------------	-----------------------	---------------------------	------------------------	--------------------------

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