



Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

0653/12

Paper 1 Multiple Choice (Core)

October/November 2019

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

* 7 2 5 6 0 7 4 0 9 8 *

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

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

Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

DO NOT WRITE IN ANY BARCODES.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 16.

Electronic calculators may be used.

This document consists of **15** printed pages and **1** blank page.

1 Which characteristic of living organisms describes the taking in of materials for energy, growth and development?

- A absorption
- B nutrition
- C photosynthesis
- D respiration

2 What is osmosis?

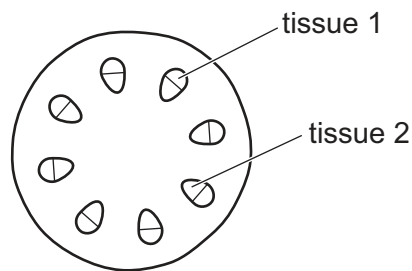
- A the movement of salt across a cell wall
- B the movement of salt across a partially permeable membrane
- C the movement of water across a cell wall
- D the movement of water across a partially permeable membrane

3 Nitrates in the soil are taken up by the roots of a plant.

What are the nitrates used to make?

- A fat
- B glucose
- C protein
- D starch

4 The diagram shows a cross section of a stem.



Which row shows the correct names and functions of the tissues?

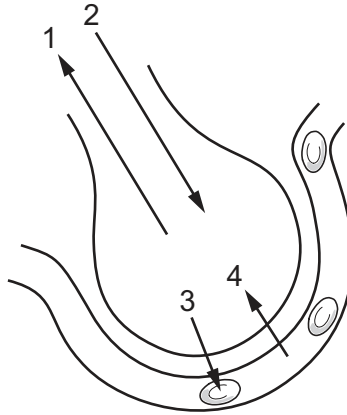
| | tissue 1 | | tissue 2 | |
|----------|----------|----------------|----------|-----------------------|
| | name | function | name | function |
| A | phloem | support only | phloem | transport only |
| B | phloem | transport only | xylem | support and transport |
| C | xylem | transport only | phloem | support and transport |
| D | xylem | support only | xylem | transport only |

5 Which statements about the site of valves are correct?

- 1 present between atria and ventricles
- 2 present between ventricles and arteries
- 3 present between arteries and lungs

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

6 The diagram shows an alveolus and a blood capillary.



Which two arrows represent gas exchange by diffusion only?

A 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

7 Glucose is involved in the reaction in the body shown below.



What are P, Q and R?

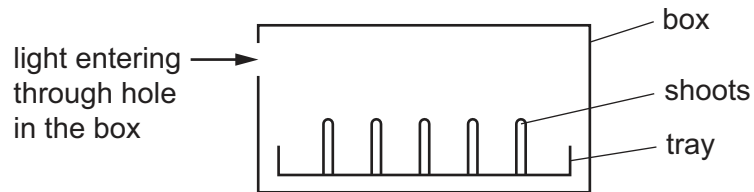
| | P | Q | R |
|----------|----------------|----------------|----------------|
| A | carbon dioxide | oxygen | water |
| B | carbon dioxide | water | oxygen |
| C | oxygen | water | carbon dioxide |
| D | water | carbon dioxide | oxygen |

8 A biologist keeps a potted plant in a laboratory.

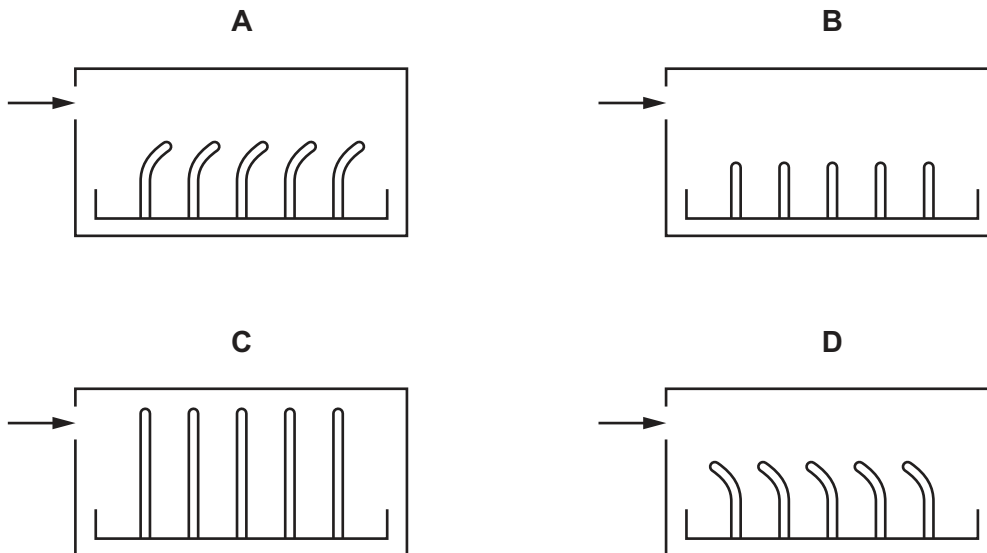
Which feature of the potted plant shows that it is a living organism?

- A It grows larger over time.
- B It has green leaves.
- C The compost in the pot dries after he waters it.
- D The stems contain xylem.

9 The diagram shows the shoots of a tray of seedlings in a box. Light enters the box as shown.



Which diagram shows the phototropic response of the shoots after 48 hours?



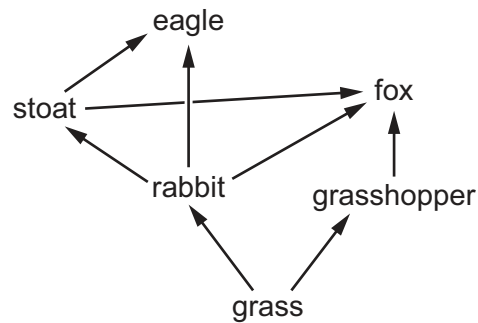
10 Which statement about sexual reproduction is **always** correct?

- A It involves only one parent.
- B It involves the fusion of nuclei.
- C It produces genetically identical offspring.
- D It takes place only in animals.

11 What is the function of the human ovaries?

- A place where the fetus develops
- B release of eggs
- C site of fertilisation
- D transfer of egg to the uterus

12 The diagram shows a food web.



Which statement about this food web is correct?

- A It has five carnivores.
- B It has five consumers.
- C It has one herbivore.
- D It has two producers.

13 Which row shows the effects of deforestation?

| | amount of photosynthesis | concentration of carbon dioxide in atmosphere |
|----------|--------------------------|---|
| A | less | more |
| B | less | less |
| C | more | less |
| D | more | more |

14 Four changes are listed.

- 1 solid carbon dioxide → carbon dioxide gas
- 2 the rusting of iron
- 3 the electrolysis of molten sodium chloride
- 4 the fractional distillation of crude oil

Which row identifies the chemical changes and physical changes?

| | chemical change | physical change |
|----------|-----------------|-----------------|
| A | 1 and 2 | 3 and 4 |
| B | 1 and 4 | 2 and 3 |
| C | 2 and 3 | 1 and 4 |
| D | 3 and 4 | 1 and 2 |

15 A white solid X is formed when magnesium reacts with oxygen.

What is X?

- A** a compound
- B** a mixture
- C** an alloy
- D** an element

16 Which row describes the fluorine atom, ${}^{19}_{9}\text{F}$?

| | number of protons | number of neutrons | number of electrons |
|----------|-------------------|--------------------|---------------------|
| A | 9 | 9 | 10 |
| B | 9 | 10 | 9 |
| C | 10 | 9 | 10 |
| D | 10 | 19 | 9 |

17 The fertiliser ammonium sulfate has the formula $(\text{NH}_4)_2\text{SO}_4$.

How many atoms of each element are present in the formula?

| | number of hydrogen atoms | number of nitrogen atoms | number of oxygen atoms | number of sulfur atoms |
|----------|--------------------------|--------------------------|------------------------|------------------------|
| A | 4 | 1 | 1 | 1 |
| B | 4 | 2 | 4 | 1 |
| C | 8 | 1 | 4 | 1 |
| D | 8 | 2 | 4 | 1 |

18 Element X is a non-metal used in the treatment of the water supply.

It is made during the electrolysis of a metal salt.

What is the colour of X and at which electrode is it made?

| | colour | electrode |
|----------|--------------|-----------|
| A | red | anode |
| B | red | cathode |
| C | yellow-green | anode |
| D | yellow-green | cathode |

19 The initial and the final temperatures of four different reactions are recorded.

Which reaction is the **most** exothermic?

| | initial temperature /°C | final temperature /°C |
|----------|----------------------------|--------------------------|
| A | 19 | 16 |
| B | 20 | 19 |
| C | 22 | 24 |
| D | 24 | 25 |

20 Limestone chips react with dilute hydrochloric acid.

Which change decreases the speed of the reaction?

- A adding a catalyst
- B decreasing the temperature
- C increasing the concentration of hydrochloric acid
- D using limestone powder

21 What are the products of the reaction between dilute hydrochloric acid and copper carbonate?

- A copper chloride + carbon dioxide + water
- B copper chloride + hydrogen carbonate
- C copper oxide + carbon dioxide + water
- D copper oxide + chlorine + water

22 Two non-metallic elements, X and Y, are in the same group of the Periodic Table.

X is higher in the group than Y.

Which row shows the group number that includes elements X and Y and which element is lighter in colour?

| | group number | lighter in colour |
|----------|--------------|-------------------|
| A | I | X |
| B | I | Y |
| C | VII | X |
| D | VII | Y |

23 Which row describes the reactivity and the electronic structure of a noble gas?

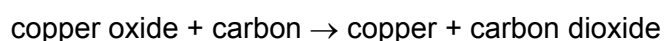
| | reactivity | electronic structure |
|----------|------------|------------------------|
| A | reactive | full outer shell |
| B | reactive | incomplete outer shell |
| C | unreactive | incomplete outer shell |
| D | unreactive | full outer shell |

24 Which statement about alloys is correct?

- A They are made from metals because metals are poor electrical conductors.
- B They are mixtures of compounds that contain metals.
- C They have all the same properties as the metals from which they are made.
- D They have different properties to the metals from which they are made.

25 Copper oxide reacts with carbon.

The equation is shown.



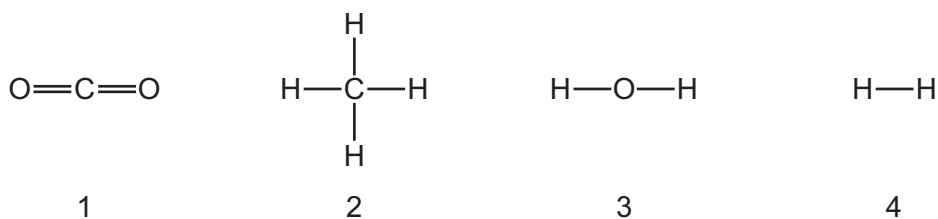
What is the role of carbon in this reaction?

- A It is a catalyst.
- B It is an electrolyte.
- C It neutralises the copper oxide.
- D It reduces the copper oxide.

26 What is the composition of clean air?

- A 78% nitrogen, 21% carbon dioxide and small amounts of other gases
- B 78% nitrogen, 21% oxygen and small amounts of other gases
- C 78% oxygen, 21% carbon dioxide and small amounts of other gases
- D 78% oxygen, 21% nitrogen and small amounts of other gases

27 Which two substances are formed during the complete combustion of hydrocarbons?

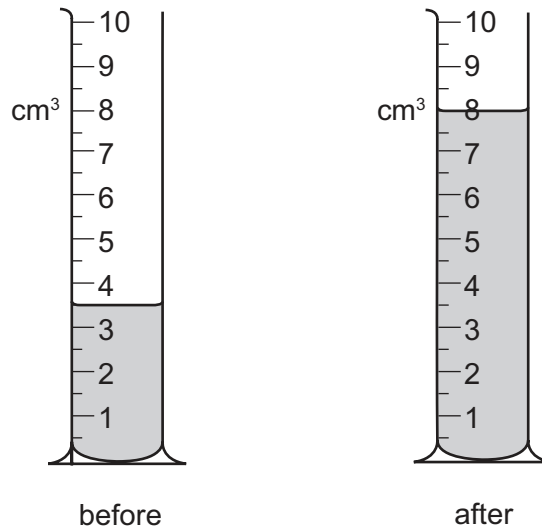


- A 1 and 3
- B 1 and 4
- C 2 and 3
- D 2 and 4

28 A measuring cylinder contains liquid.

More liquid is now poured into the measuring cylinder.

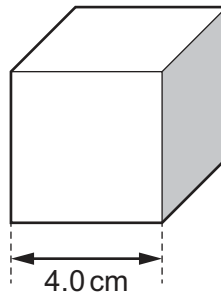
The diagrams show the measuring cylinder before and after the liquid is poured into it.



What volume of liquid is **poured** into the measuring cylinder?

- A** 3.5 cm³ **B** 4.0 cm³ **C** 4.5 cm³ **D** 8.0 cm³

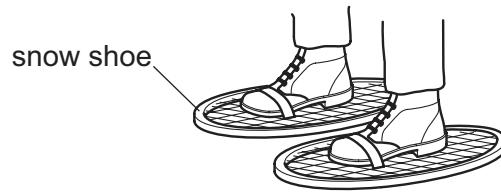
29 A solid metal cube of side 4.0 cm has a mass of 640 g.



What is the density of the metal?

- A** 10 g/cm³ **B** 40 g/cm³ **C** 160 g/cm³ **D** 2560 g/cm³

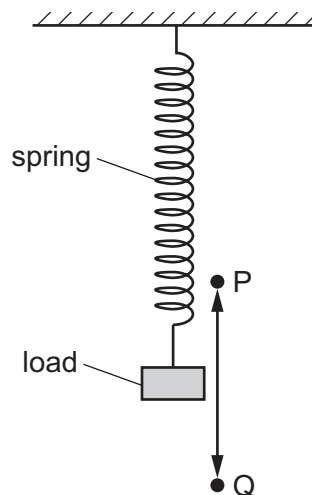
- 30 A man walking on snow in normal shoes sinks into the snow. The man puts on snow shoes and does not sink into the snow.



Which row explains why this happens?

| | area of contact with snow | weight of man |
|----------|---------------------------|---------------|
| A | decreased | decreased |
| B | decreased | unchanged |
| C | increased | decreased |
| D | increased | unchanged |

- 31 The diagram shows a load attached to a spring.



The load is pulled down and then released so that it oscillates between point P (highest point) and point Q (lowest point).

Which form of energy does the load have at point P?

- A** gravitational potential energy only
- B** kinetic energy only
- C** kinetic energy and gravitational potential energy
- D** neither kinetic energy nor gravitational potential energy

32 A girl runs up some stairs.

Which two quantities need to be known to calculate the power she produces?

- A her weight and the height of the stairs
- B her weight and the time she takes to run up the stairs
- C the work she does and the height of the stairs
- D the work she does and the time she takes to run up the stairs

33 A liquid is evaporating but **not** boiling.

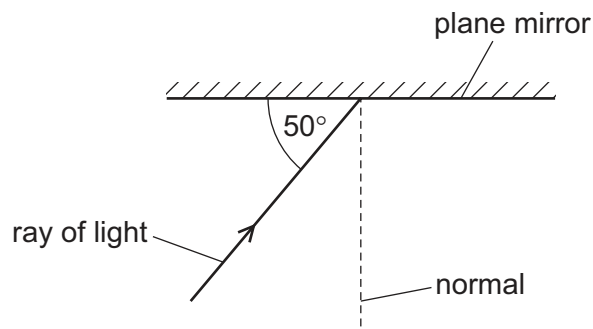
Which statement about evaporation of the liquid is correct?

- A Bubbles of vapour are formed beneath the surface of the liquid during evaporation.
- B Evaporation only takes place at a specific temperature.
- C Evaporation only takes place from the surface of the liquid.
- D The temperature of the liquid increases during evaporation.

34 Which row describes the separation and motion of the molecules in solids and gases?

| | solids | gases |
|---|--|--|
| A | close together and changing positions | close together and changing positions |
| B | close together and changing positions | far apart and moving freely |
| C | close together and vibrating about fixed positions | close together and vibrating about fixed positions |
| D | close together and vibrating about fixed positions | far apart and moving freely |

35 The diagram shows light striking a plane mirror.



What is the angle of reflection of the ray when it is reflected from the mirror?

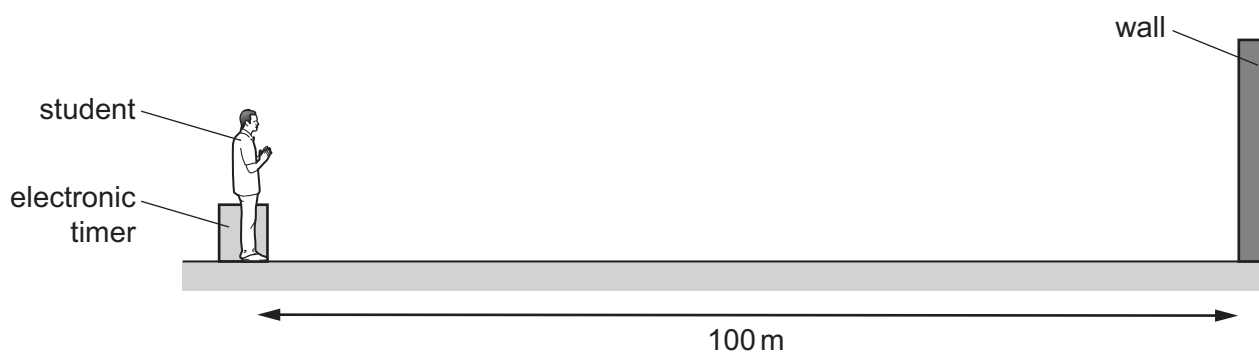
- A 40°
- B 50°
- C 80°
- D 100°

- 36 Gamma rays and microwaves are both regions of the electromagnetic spectrum.

How do the speed and frequency of gamma rays in a vacuum compare with the speed and frequency of microwaves in a vacuum?

| | speed of gamma rays | frequency of gamma rays |
|----------|-----------------------------|-----------------------------|
| A | greater than for microwaves | greater than for microwaves |
| B | greater than for microwaves | smaller than for microwaves |
| C | the same as for microwaves | greater than for microwaves |
| D | the same as for microwaves | smaller than for microwaves |

- 37 A student measures the speed of sound. He claps his hands and the sound reflects from a wall that is 100 m away from him.



An electronic timer next to the student detects the echo of the sound 0.60 s after it is made.

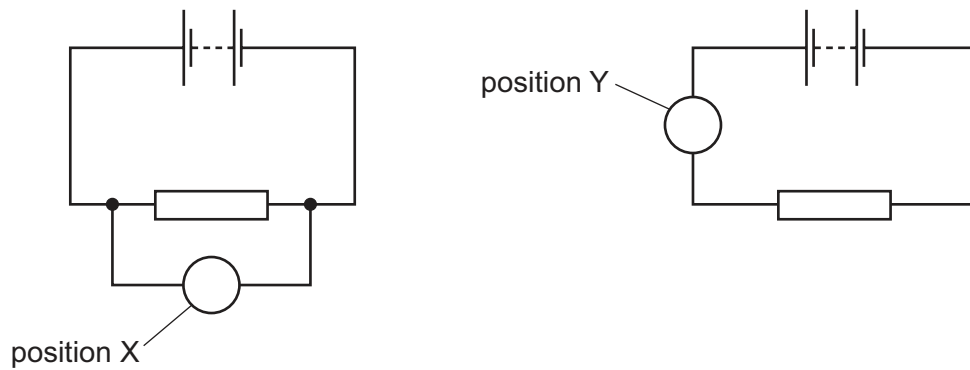
Which calculation gives the speed of sound?

- A** $\frac{200}{0.30}$ m/s **B** $\frac{200}{0.60}$ m/s **C** $\frac{100}{0.60}$ m/s **D** $\frac{100}{1.2}$ m/s
- 38 A plastic rod becomes positively charged when it is rubbed with a cloth.

What happens during the charging process?

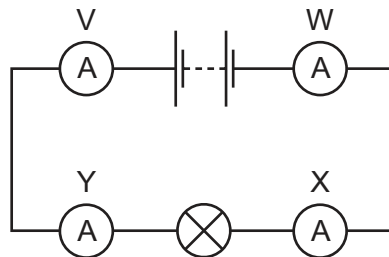
- A** Electrons and protons move from the rod to the cloth, but more electrons move than protons.
B Electrons move from the rod to the cloth and protons move from the cloth to the rod.
C Only protons move, from the cloth to the rod.
D Only electrons move, from the rod to the cloth.

- 39 A student wants to measure the potential difference across a resistor. The circuits show two different positions in which a meter can be connected.



What meter is used, and where is it connected in the circuit?

- A an ammeter in position X
 - B an ammeter in position Y
 - C a voltmeter in position X
 - D a voltmeter in position Y
- 40 Four ammeters V, W, X and Y are connected in the circuit shown.



Which ammeters have the same reading as each other?

- A V and W only
- B V and Y only
- C X and Y only
- D V, W, X and Y

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The Periodic Table of Elements

| | | Group | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| I | II | III | IV | V | VI | VII | VIII | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 Li lithium 7 | 4 Be beryllium 9 | 11 Na sodium 23 | 12 Mg magnesium 24 | 19 K potassium 39 | 20 Ca calcium 40 | 37 Rb rubidium 85 | 55 Cs caesium 133 | 87 Fr francium — | 1 H hydrogen 1 | 2 He helium 4 | 5 B boron 11 | 6 C carbon 12 | 7 N nitrogen 14 | 8 O oxygen 16 | 9 F fluorine 19 | 10 Ne neon 20 | 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 | 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 | 31 Ga gallium 70 | 32 Ge germanium 73 | 33 As arsenic 75 | 34 Se selenium 79 | 35 Br bromine 80 | 36 Kr krypton 84 | 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 | 49 In indium 115 | 50 Sn tin 119 | 51 Sb antimony 122 | 52 Te tellurium 128 | 53 I iodine 127 | 54 Xe xenon 131 | 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 | 81 Tl thallium 204 | 82 Pb lead 207 | 83 Bi bismuth 209 | 84 Po polonium — | 85 At astatine — | 86 Rn radon — | 88 Ra radium — | 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 — | 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 — | 113 Nh nihonium — | 114 Fl flerovium — | 115 Lv livermorium — | 116 Ts tennessine — | 117 Og oganesson — |

Key

atomic number
atomic symbol
name
relative atomic mass

| | | | | | | | | | | | | | | | |
|-------------|------------------------------|----------------------------|---------------------------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------------------------|----------------------------|-------------------------------|------------------------------|---------------------------|-------------------------------|------------------------------|------------------------------|
| 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 dm³ at room temperature and pressure (r.t.p.).