



# Cambridge IGCSE™

## COMBINED SCIENCE

0653/22

Paper 2 Multiple Choice (Extended)

May/June 2025

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet  
Soft clean eraser  
Soft pencil (type B or HB is recommended)

### INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall =  $9.8 \text{ m/s}^2$ ).

### INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Any blank pages are indicated.



## 2

1 Movement is a characteristic of all living organisms.

Which two other characteristics of living organisms provide the energy for movement?

- A excretion and nutrition
- B growth and sensitivity
- C nutrition and respiration
- D respiration and growth

2 Which plant cell structure matches its function?

|   | structure     | function                      |
|---|---------------|-------------------------------|
| A | cell membrane | provides strength and support |
| B | chloroplast   | absorbs light energy          |
| C | ribosome      | provides protection           |
| D | vacuole       | site of chemical reactions    |

3 Which row describes osmosis?

|   | osmosis is the net movement of water molecules through a partially permeable membrane |                                                       |
|---|---------------------------------------------------------------------------------------|-------------------------------------------------------|
|   | from                                                                                  | to                                                    |
| A | a dilute solution with a higher water potential                                       | a concentrated solution with a lower water potential  |
| B | a concentrated solution with a higher water potential                                 | a dilute solution with a lower water potential        |
| C | a dilute solution with a lower water potential                                        | a concentrated solution with a higher water potential |
| D | a concentrated solution with a lower water potential                                  | a dilute solution with a higher water potential       |

3

- 4 The table shows the results of tests carried out on different food samples.

| food sample | ethanol emulsion test | biuret test | Benedict's solution test |
|-------------|-----------------------|-------------|--------------------------|
| 1           | x                     | ✓           | x                        |
| 2           | ✓                     | x           | x                        |
| 3           | x                     | ✓           | ✓                        |
| 4           | ✓                     | x           | ✓                        |

key

✓ = positive result

x = negative result

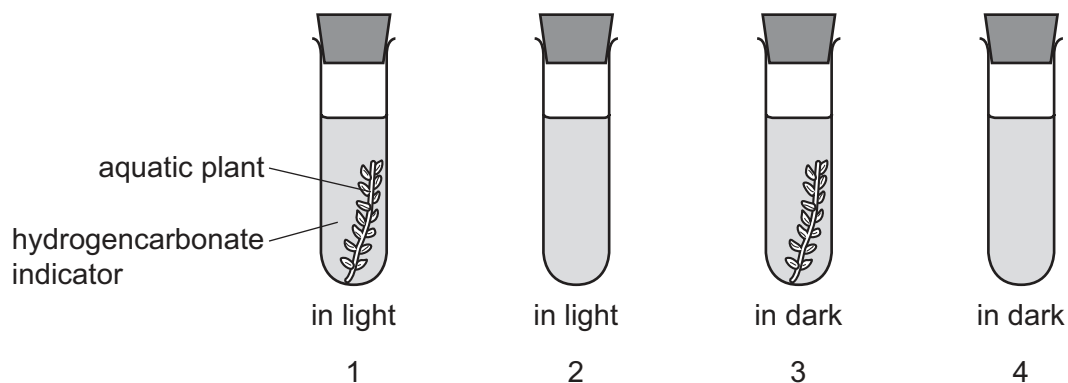
Which food samples contain reducing sugar?

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

- 5 Which statement describes enzyme action in humans?

- A** Enzymes become denatured at 0 °C.  
**B** The activity of enzymes always increases with an increasing temperature.  
**C** The enzyme active site and its substrate are the same shape.  
**D** There are more-frequent effective collisions when the temperature increases from 20 °C to 30 °C.

- 6 Four tubes that contain red hydrogencarbonate indicator are set up as shown. After five hours, the colour of the hydrogencarbonate indicator is recorded.



Which row shows the colour of the hydrogencarbonate indicator in each tube after five hours?

|          | 1      | 2      | 3      | 4      |
|----------|--------|--------|--------|--------|
| <b>A</b> | purple | red    | red    | red    |
| <b>B</b> | purple | red    | yellow | red    |
| <b>C</b> | red    | yellow | red    | purple |
| <b>D</b> | yellow | red    | purple | red    |

4

- 7 A diet provides the correct energy requirements for a person but is **not** balanced.

What are possible effects of this diet?

- 1 constipation
- 2 obesity
- 3 scurvy

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

- 8 What is a function of hydrochloric acid in the stomach?

- A** to help absorption of all food in the stomach
- B** to kill microorganisms in the ingested food
- C** to prevent chemical digestion
- D** to prevent the stomach contents being too acidic

- 9 Which statement explains why root hair cells have a long, thin shape?

- A** They are squeezed into this shape as they grow between soil particles.
- B** It is the most efficient shape for taking up food such as glucose.
- C** It provides a large surface area for diffusion of water.
- D** The narrow diameter allows them to gain carbon dioxide from between soil particles.

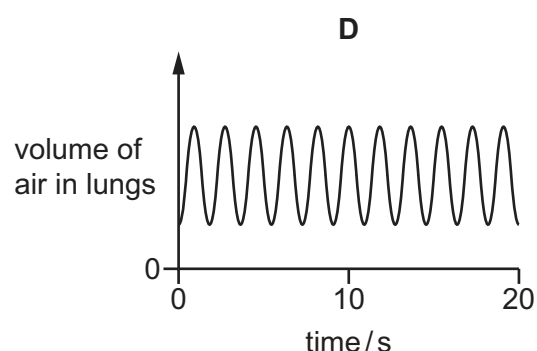
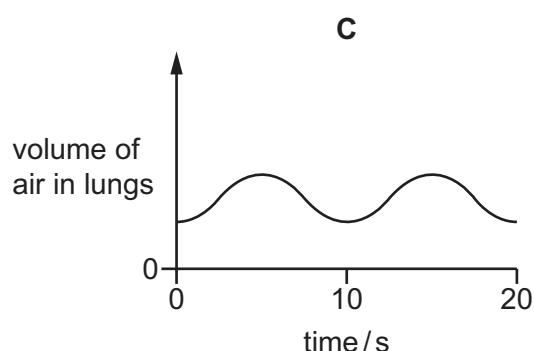
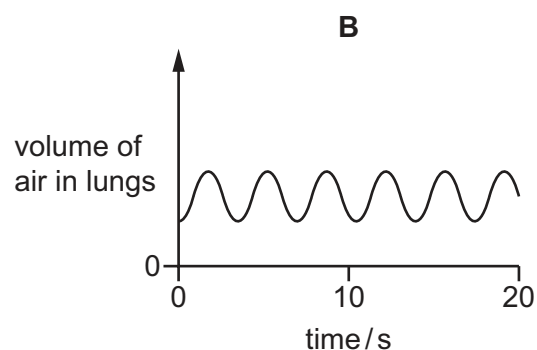
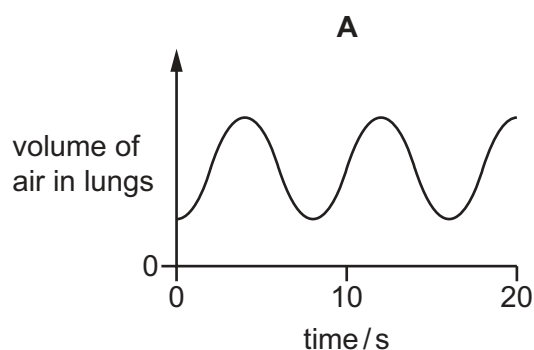
- 10 Which row describes viruses?

|          | are<br>pathogens | have a<br>protein coat | contain<br>genetic material |
|----------|------------------|------------------------|-----------------------------|
| <b>A</b> | ✓                | ✓                      | ✓                           |
| <b>B</b> | ✓                | x                      | x                           |
| <b>C</b> | x                | ✓                      | x                           |
| <b>D</b> | x                | x                      | ✓                           |

**5**

- 11** The graphs show how the rate and depth of breathing varies when a student does four different activities.

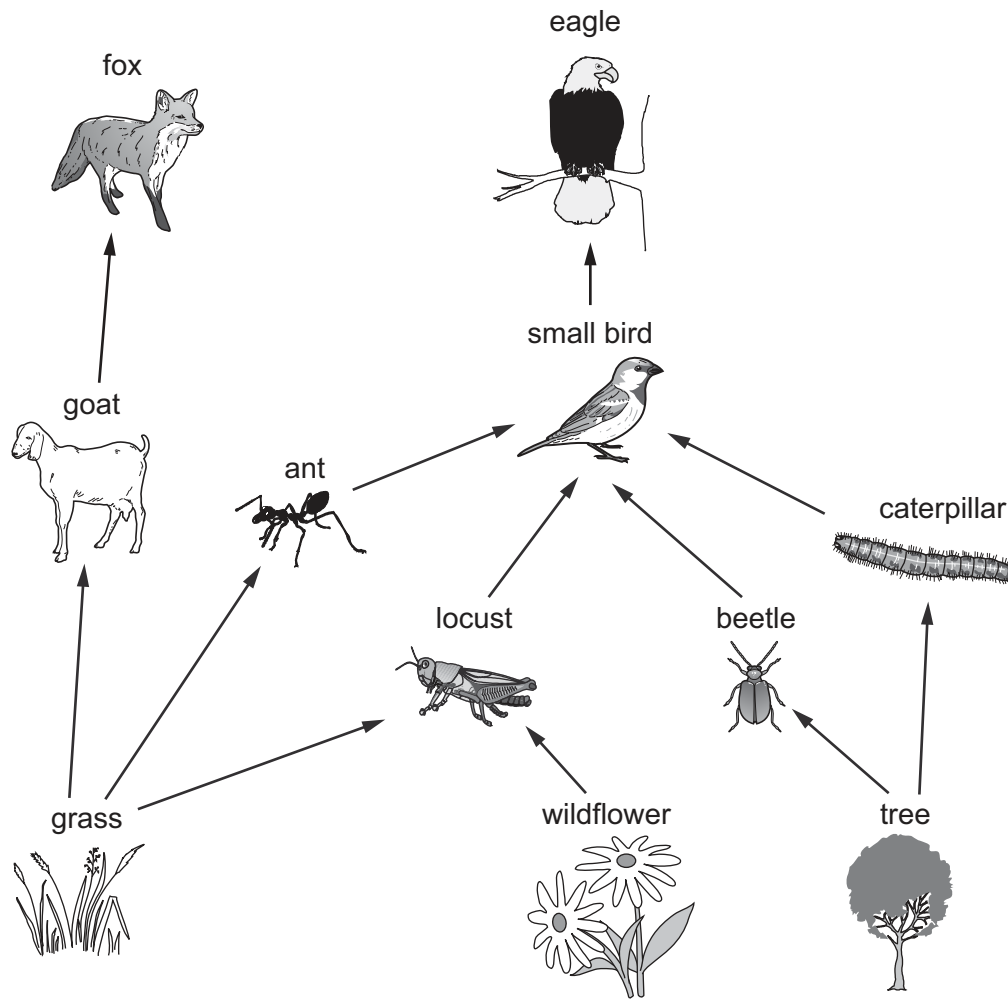
Which graph shows when the student is most active?



- 12** Which statement about the use of antibiotics is correct?

- A** Overuse of antibiotics causes the development of bacteria such as MRSA.
- B** Antibiotics are prescribed for infections caused by viruses and bacteria.
- C** Antibiotics increase reproduction of non-resistant bacteria.
- D** Antibiotics only kill resistant bacteria.

13 The diagram shows a food web.



Which row states the number of species of each category in this food web?

|          | number of primary consumer species | number of secondary consumer species | number of tertiary consumer species |
|----------|------------------------------------|--------------------------------------|-------------------------------------|
| <b>A</b> | 6                                  | 1                                    | 1                                   |
| <b>B</b> | 5                                  | 2                                    | 1                                   |
| <b>C</b> | 5                                  | 2                                    | 2                                   |
| <b>D</b> | 3                                  | 4                                    | 3                                   |

14 The table describes three changes of state, W, X and Y.

| change of state | particle arrangement        | particle motion | energy    |
|-----------------|-----------------------------|-----------------|-----------|
| W               | further apart and random    | faster          | increases |
| X               | closer together and random  | slower          | decreases |
| Y               | closer together and regular | vibration       | decreases |

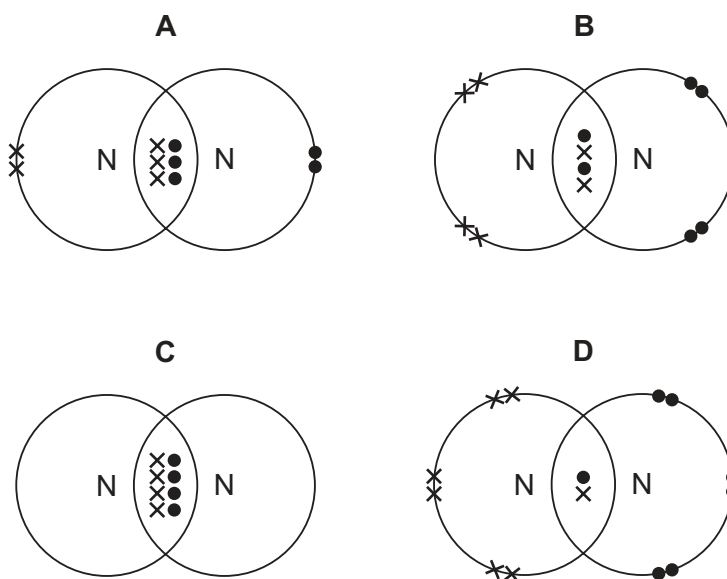
Which statement about the changes of state is correct?

- A W is melting and Y is condensing.
- B X is evaporating and W is condensing.
- C Y is freezing and W is evaporating.
- D W is melting and X is freezing.

15 Which statement describes a substance that contains covalent bonds?

- A It is a coloured compound that contains a transition element.
- B It is a good conductor of electricity when molten.
- C It is a compound formed from two non-metallic elements.
- D It can be broken down by the passage of an electric current.

16 Which dot-and-cross diagram represents the arrangement of outer-shell electrons in a molecule of nitrogen?



17 Which statement explains why a reaction is exothermic?

- A More thermal energy is absorbed by breaking bonds than is released by making bonds.
- B More thermal energy is absorbed by making bonds than is released by breaking bonds.
- C More thermal energy is released by breaking bonds than is absorbed by making bonds.
- D More thermal energy is released by making bonds than is absorbed by breaking bonds.

18 Which statement explains why the rate of a reaction is greater at a higher temperature?

- A The activation energy is higher.
- B More colliding particles have the minimum energy to react.
- C The frequency of collisions between reacting particles decreases.
- D There are more reacting particles per unit volume.

19 Which word equation represents the reaction of an acid with a carbonate?

- A acid + carbonate → salt + carbon dioxide
- B acid + carbonate → salt + carbon dioxide + water
- C acid + carbonate → salt + hydrogen + water
- D acid + carbonate → salt + water

20 Which row describes the physical state of the Group VII elements at room temperature?

|   | chlorine | bromine | iodine |
|---|----------|---------|--------|
| A | gas      | gas     | liquid |
| B | gas      | liquid  | solid  |
| C | liquid   | liquid  | gas    |
| D | liquid   | solid   | solid  |

21 Which statement explains why all Group VIII elements are unreactive?

- A They all have a complete outer shell of electrons.
- B They all have only two electrons in their outer shell.
- C They all have eight electrons in their outer shell.
- D They all have no electrons in their outer shell.

22 Which element does **not** produce a gas when added to dilute hydrochloric acid?

- A copper
- B iron
- C magnesium
- D zinc

23 Which row describes the extraction of iron from its ore?

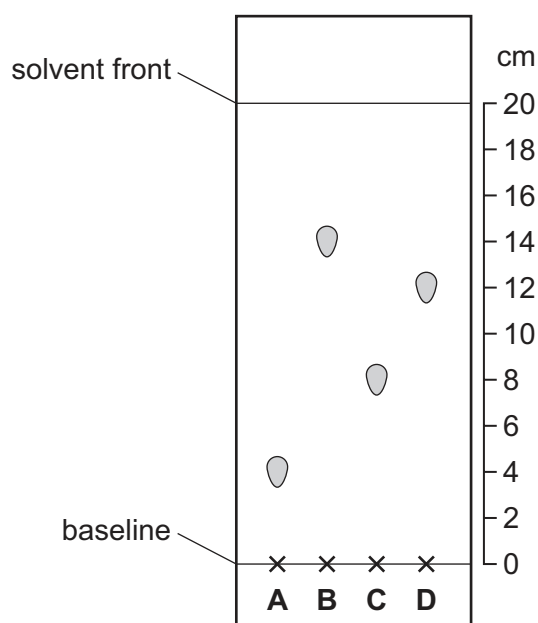
|   | name of ore | method of extraction         |
|---|-------------|------------------------------|
| A | bauxite     | electrolysis                 |
| B | bauxite     | reduction in a blast furnace |
| C | hematite    | electrolysis                 |
| D | hematite    | reduction in a blast furnace |

24 Which process is a physical change?

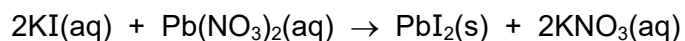
- A combustion of solid carbon
- B cracking of an alkane to give an alkene
- C fractional distillation of petroleum
- D rusting of iron

25 The chromatogram of four different substances is shown.

Which substance has an  $R_f$  value of 0.6?



- 26** Potassium iodide reacts with lead(II) nitrate to produce yellow lead(II) iodide and potassium nitrate.



Which row describes this reaction and how to separate lead(II) iodide from the reaction mixture?

|          | reaction       | separation     |
|----------|----------------|----------------|
| <b>A</b> | neutralisation | chromatography |
| <b>B</b> | neutralisation | filtration     |
| <b>C</b> | precipitation  | chromatography |
| <b>D</b> | precipitation  | filtration     |

- 27** Which row shows an electrolyte and the products of electrolysis for this electrolyte?

|          | electrolyte                          | products                    |
|----------|--------------------------------------|-----------------------------|
| <b>A</b> | concentrated aqueous sodium chloride | sodium and chlorine         |
| <b>B</b> | molten potassium bromide             | hydrogen and bromine        |
| <b>C</b> | molten sodium chloride               | sodium and chlorine         |
| <b>D</b> | dilute sulfuric acid                 | hydrogen and sulfur dioxide |

- 28** The diagram shows the horizontal forces acting on a car of mass 1200 kg.



What is the acceleration of the car?

- A** 0.25 m/s<sup>2</sup>      **B** 0.75 m/s<sup>2</sup>      **C** 1.3 m/s<sup>2</sup>      **D** 4.0 m/s<sup>2</sup>
- 29** A brick of mass 2.0 kg rests on a platform at a height of 15 m above the ground.

The brick falls to the ground.

The gravitational field strength  $g$  is 9.8 N/kg.

What is the speed of the brick as it hits the ground?

- A** 12 m/s      **B** 17 m/s      **C** 150 m/s      **D** 290 m/s

**30** Which process is the source of the energy released from the Sun?

- A** chemical reactions
- B** geothermal heating
- C** nuclear fission
- D** nuclear fusion

**31** What is a property of both solids and liquids?

- A** They always fill a container.
- B** They can flow.
- C** They have a fixed shape.
- D** They have a fixed volume.

**32** Which material is a good thermal conductor?

- A** copper
- B** glass
- C** plastic
- D** wood

**33** A room contains cold air.

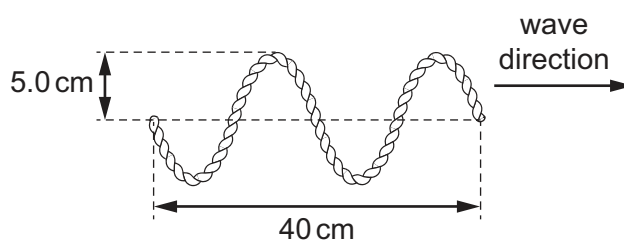
An electric heater is used to warm the air.

Which statement explains why the warm air rises?

- A** Air contracts as it is warmed.
- B** Particles in warm air have less energy than particles in cold air.
- C** The mass of the air particles decreases as the air is warmed.
- D** Warm air is less dense than cold air.

12

- 34** A student vibrates the end of a horizontal rope and sends a wave along the rope. The wave is shown in the diagram.



Which row shows the amplitude of the wave and the wavelength of the wave?

|          | amplitude / cm | wavelength / cm |
|----------|----------------|-----------------|
| <b>A</b> | 5.0            | 10              |
| <b>B</b> | 5.0            | 20              |
| <b>C</b> | 10             | 10              |
| <b>D</b> | 10             | 20              |

- 35** Which description of the image of an object in a plane mirror is correct?

- A** real and smaller than the object
- B** real and the same size as the object
- C** virtual and smaller than the object
- D** virtual and the same size as the object

- 36** What is the speed of infrared waves in a vacuum?

- A** 3.0 m/s
- B** 330 m/s
- C**  $3.0 \times 10^8$  m/s
- D**  $330 \times 10^8$  m/s

13

- 37** Two charged rods, X and Y, are brought, one at a time, close to positively charged rod Z.

Rod Z is repelled by rod X. Rod Z is attracted by rod Y.

Which row shows the charges on rods X and Y?

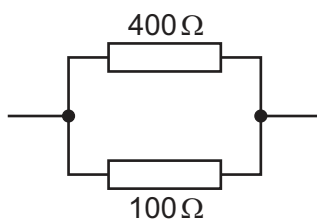
|          | charge on rod X | charge on rod Y |
|----------|-----------------|-----------------|
| <b>A</b> | negative        | negative        |
| <b>B</b> | negative        | positive        |
| <b>C</b> | positive        | negative        |
| <b>D</b> | positive        | positive        |

- 38** There is a current of  $2.0\text{ A}$  in a resistor of resistance  $2.0\ \Omega$ .

How much charge flows through the resistor in  $4.0\text{ s}$ ?

- A**  $0.50\text{ C}$       **B**  $2.0\text{ C}$       **C**  $8.0\text{ C}$       **D**  $16\text{ C}$

- 39** A  $400\ \Omega$  resistor and a  $100\ \Omega$  resistor are connected in parallel.



What is the combined resistance of the two resistors?

- A**  $40\ \Omega$       **B**  $80\ \Omega$       **C**  $250\ \Omega$       **D**  $500\ \Omega$

- 40** An object orbits a planet. The period of the orbit is  $8.0$  hours. The speed of the object is  $2.0\text{ km/s}$ .

What is the radius of the orbit?

- A**  $1.5 \times 10^5\text{ m}$       **B**  $9.2 \times 10^6\text{ m}$       **C**  $2.9 \times 10^7\text{ m}$       **D**  $3.6 \times 10^8\text{ m}$

**BLANK PAGE**

**BLANK PAGE**

---

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 Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at [www.cambridgeinternational.org](http://www.cambridgeinternational.org) after the live examination series.

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

The Periodic Table of Elements

| Group                                |                                       |                                                                                            |                                           |                                       |                                        |                                       |                                        |                                        |                                          |                                         |                                         |                                       |                                       |                                       |                                         |                                        |                                       |                                        |                                   |
|--------------------------------------|---------------------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------|---------------------------------------|----------------------------------------|---------------------------------------|----------------------------------------|----------------------------------------|------------------------------------------|-----------------------------------------|-----------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|-----------------------------------------|----------------------------------------|---------------------------------------|----------------------------------------|-----------------------------------|
| I                                    | II                                    |                                                                                            |                                           |                                       |                                        |                                       |                                        |                                        |                                          |                                         |                                         | III                                   | IV                                    | V                                     | VI                                      | VII                                    | VIII                                  |                                        |                                   |
|                                      |                                       | <div>1<div>Hhydrogen1</div></div>                                                          |                                           |                                       |                                        |                                       |                                        |                                        |                                          |                                         |                                         |                                       |                                       |                                       |                                         |                                        |                                       |                                        |                                   |
|                                      |                                       | <div>Key<div>atomic number<br/>atomic symbol<br/>name<br/>relative atomic mass</div></div> |                                           |                                       |                                        |                                       |                                        |                                        |                                          |                                         |                                         |                                       |                                       |                                       |                                         |                                        |                                       |                                        |                                   |
| 3 <div>Li<br/>lithium<br/>7</div>    | 4 <div>Be<br/>beryllium<br/>9</div>   |                                                                                            |                                           |                                       |                                        |                                       |                                        |                                        |                                          |                                         |                                         |                                       |                                       | 5 <div>B<br/>boron<br/>11</div>       | 6 <div>C<br/>carbon<br/>12</div>        | 7 <div>N<br/>nitrogen<br/>14</div>     | 8 <div>O<br/>oxygen<br/>16</div>      | 9 <div>F<br/>fluorine<br/>19</div>     | 10 <div>Ne<br/>neon<br/>20</div>  |
| 11 <div>Na<br/>sodium<br/>23</div>   | 12 <div>Mg<br/>magnesium<br/>24</div> |                                                                                            |                                           |                                       |                                        |                                       |                                        |                                        |                                          |                                         |                                         |                                       |                                       | 13 <div>Al<br/>aluminium<br/>27</div> | 14 <div>Si<br/>silicon<br/>28</div>     | 15 <div>P<br/>phosphorus<br/>31</div>  | 16 <div>S<br/>sulfur<br/>32</div>     | 17 <div>Cl<br/>chlorine<br/>35.5</div> | 18 <div>Ar<br/>argon<br/>40</div> |
| 19 <div>K<br/>potassium<br/>39</div> | 20 <div>Ca<br/>calcium<br/>40</div>   | 21 <div>Sc<br/>scandium<br/>45</div>                                                       | 22 <div>Ti<br/>titanium<br/>48</div>      | 23 <div>V<br/>vanadium<br/>51</div>   | 24 <div>Cr<br/>chromium<br/>52</div>   | 25 <div>Mn<br/>manganese<br/>55</div> | 26 <div>Fe<br/>iron<br/>56</div>       | 27 <div>Co<br/>cobalt<br/>59</div>     | 28 <div>Ni<br/>nickel<br/>59</div>       | 29 <div>Cu<br/>copper<br/>64</div>      | 30 <div>Zn<br/>zinc<br/>65</div>        | 31 <div>Ga<br/>gallium<br/>70</div>   | 32 <div>Ge<br/>germanium<br/>73</div> | 33 <div>As<br/>arsenic<br/>75</div>   | 34 <div>Se<br/>selenium<br/>79</div>    | 35 <div>Br<br/>bromine<br/>80</div>    | 36 <div>Kr<br/>krypton<br/>84</div>   |                                        |                                   |
| 37 <div>Rb<br/>rubidium<br/>85</div> | 38 <div>Sr<br/>strontium<br/>88</div> | 39 <div>Y<br/>yttrium<br/>89</div>                                                         | 40 <div>Zr<br/>zirconium<br/>91</div>     | 41 <div>Nb<br/>niobium<br/>93</div>   | 42 <div>Mo<br/>molybdenum<br/>96</div> | 43 <div>Tc<br/>technetium<br/>—</div> | 44 <div>Ru<br/>ruthenium<br/>101</div> | 45 <div>Rh<br/>rhodium<br/>103</div>   | 46 <div>Pd<br/>palladium<br/>106</div>   | 47 <div>Ag<br/>silver<br/>108</div>     | 48 <div>Cd<br/>cadmium<br/>112</div>    | 49 <div>In<br/>indium<br/>115</div>   | 50 <div>Sn<br/>tin<br/>119</div>      | 51 <div>Sb<br/>antimony<br/>122</div> | 52 <div>Te<br/>tellurium<br/>128</div>  | 53 <div>I<br/>iodine<br/>127</div>     | 54 <div>Xe<br/>xenon<br/>131</div>    |                                        |                                   |
| 55 <div>Cs<br/>caesium<br/>133</div> | 56 <div>Ba<br/>barium<br/>137</div>   | 57–71 <div>lanthanoids</div>                                                               | 72 <div>Hf<br/>hafnium<br/>178</div>      | 73 <div>Ta<br/>tantalum<br/>181</div> | 74 <div>W<br/>tungsten<br/>184</div>   | 75 <div>Re<br/>rhenium<br/>186</div>  | 76 <div>Os<br/>osmium<br/>190</div>    | 77 <div>Ir<br/>iridium<br/>192</div>   | 78 <div>Pt<br/>platinum<br/>195</div>    | 79 <div>Au<br/>gold<br/>197</div>       | 80 <div>Hg<br/>mercury<br/>201</div>    | 81 <div>Tl<br/>thallium<br/>204</div> | 82 <div>Pb<br/>lead<br/>207</div>     | 83 <div>Bi<br/>bismuth<br/>209</div>  | 84 <div>Po<br/>polonium<br/>—</div>     | 85 <div>At<br/>astatine<br/>—</div>    | 86 <div>Rn<br/>radon<br/>—</div>      |                                        |                                   |
| 87 <div>Fr<br/>francium<br/>—</div>  | 88 <div>Ra<br/>radium<br/>—</div>     | 89–103 <div>actinoids</div>                                                                | 104 <div>Rf<br/>rutherfordium<br/>—</div> | 105 <div>Db<br/>dubnium<br/>—</div>   | 106 <div>Sg<br/>seaborgium<br/>—</div> | 107 <div>Bh<br/>bohrium<br/>—</div>   | 108 <div>Hs<br/>hassium<br/>—</div>    | 109 <div>Mt<br/>meitnerium<br/>—</div> | 110 <div>Ds<br/>darmstadtium<br/>—</div> | 111 <div>Rg<br/>roentgenium<br/>—</div> | 112 <div>Cn<br/>copernicium<br/>—</div> | 113 <div>Nh<br/>nihonium<br/>—</div>  | 114 <div>Fl<br/>flerovium<br/>—</div> | 115 <div>Mc<br/>moscovium<br/>—</div> | 116 <div>Lv<br/>livermorium<br/>—</div> | 117 <div>Ts<br/>tennessine<br/>—</div> | 118 <div>Og<br/>oganesson<br/>—</div> |                                        |                                   |

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

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