



# Cambridge IGCSE™

## COMBINED SCIENCE

Paper 2 Multiple Choice (Extended)

0653/23

May/June 2023

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.

### 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.

1 What is a characteristic of all living things?

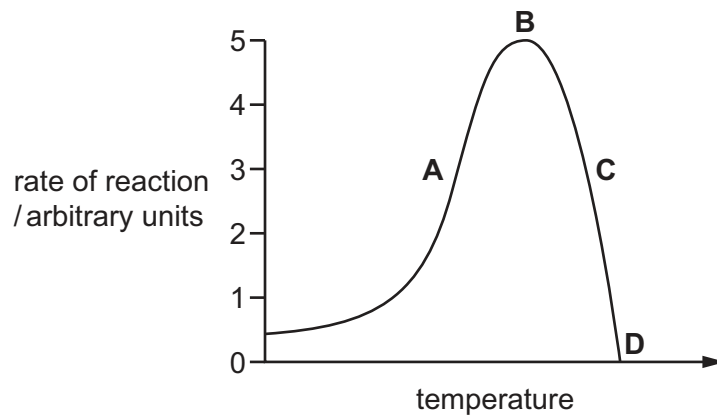
- A egestion
- B ingestion
- C nutrition
- D photosynthesis

2 Which structure is found only in plant cells?

- A cell membrane
- B cytoplasm
- C large vacuole
- D nucleus

3 The graph shows how the rate of an enzyme-controlled reaction varies with temperature.

At which labelled point does the enzyme have the least kinetic energy?



4 In plants, which energy transfer occurs in chlorophyll during photosynthesis?

- A chemical to light
- B heat to chemical
- C light to chemical
- D chemical to heat

5 Which row matches the part of the alimentary canal to its function?

|          | part of the alimentary canal | function of part |
|----------|------------------------------|------------------|
| <b>A</b> | anus                         | absorption       |
| <b>B</b> | oesophagus                   | digestion        |
| <b>C</b> | mouth                        | ingestion        |
| <b>D</b> | small intestines             | egestion         |

6 The list gives two ways in which an environment changes.

- 1 humidity increases
- 2 temperature increases

Which changes cause an increase in the rate of transpiration of plants?

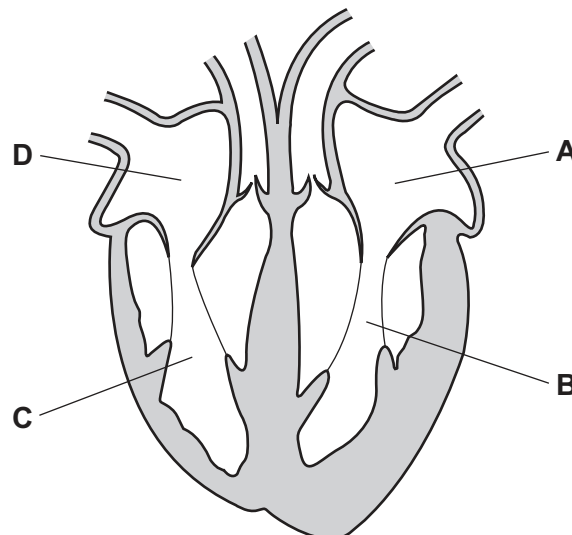
|          | 1 | 2 |
|----------|---|---|
| <b>A</b> | ✓ | ✓ |
| <b>B</b> | ✓ | x |
| <b>C</b> | x | ✓ |
| <b>D</b> | x | x |

key

✓ = increase in rate of transpiration

x = decrease in rate of transpiration

7 From which chamber does the blood leave the heart to travel to the organs of the body?



8 Which processes require energy?

- 1 growth
- 2 maintenance of body temperature
- 3 protein synthesis

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

9 What is caused by the secretion of adrenaline?

|          | blood glucose concentration | pulse rate | pupil size |
|----------|-----------------------------|------------|------------|
| <b>A</b> | decreases                   | decreases  | increases  |
| <b>B</b> | decreases                   | increases  | decreases  |
| <b>C</b> | increases                   | decreases  | decreases  |
| <b>D</b> | increases                   | increases  | increases  |

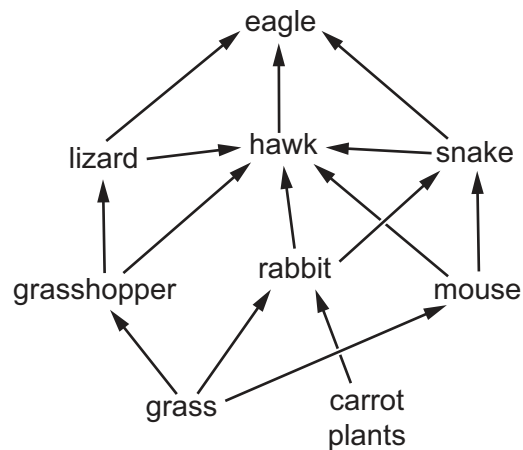
10 Which definition of asexual reproduction is correct?

- A** production of genetically different offspring from one parent
- B** production of genetically different offspring from two parents
- C** production of genetically identical offspring from one parent
- D** production of genetically identical offspring from two parents

11 Which row shows the correct information about a human female gamete?

|          | contains an energy store | can swim |
|----------|--------------------------|----------|
| <b>A</b> | ✓                        | ✗        |
| <b>B</b> | ✓                        | ✓        |
| <b>C</b> | ✗                        | ✓        |
| <b>D</b> | ✗                        | ✗        |

12 The diagram shows part of a food web.



Which row shows the numbers of different types of consumers present in this food web?

|          | primary consumers | secondary consumers | tertiary consumers | quaternary consumers |
|----------|-------------------|---------------------|--------------------|----------------------|
| <b>A</b> | 2                 | 3                   | 3                  | 1                    |
| <b>B</b> | 2                 | 2                   | 1                  | 0                    |
| <b>C</b> | 3                 | 3                   | 1                  | 2                    |
| <b>D</b> | 3                 | 3                   | 2                  | 1                    |

13 Eutrophication typically occurs as the result of nitrates and other ions accumulating in bodies of water. Eutrophication involves the five processes listed.

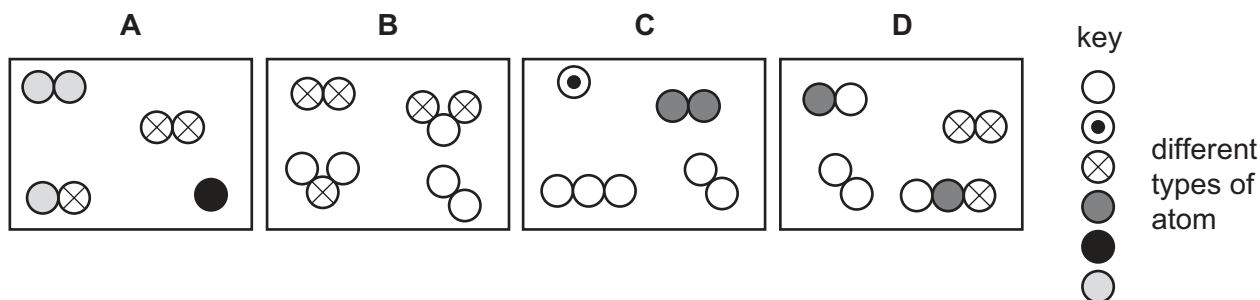
- 1 death of organisms that require dissolved oxygen
- 2 increased aerobic respiration by decomposers
- 3 increased decomposition after death of producers
- 4 increased growth of producer organisms
- 5 reduction of amount of dissolved oxygen in water

Which sequence of processes is correct?

- A** 1 → 3 → 2 → 4 → 5
- B** 4 → 3 → 2 → 5 → 1
- C** 1 → 2 → 4 → 3 → 5
- D** 4 → 5 → 3 → 2 → 1

14 The diagrams show four different mixtures of gases.

Which diagram represents a mixture containing **only** elements?

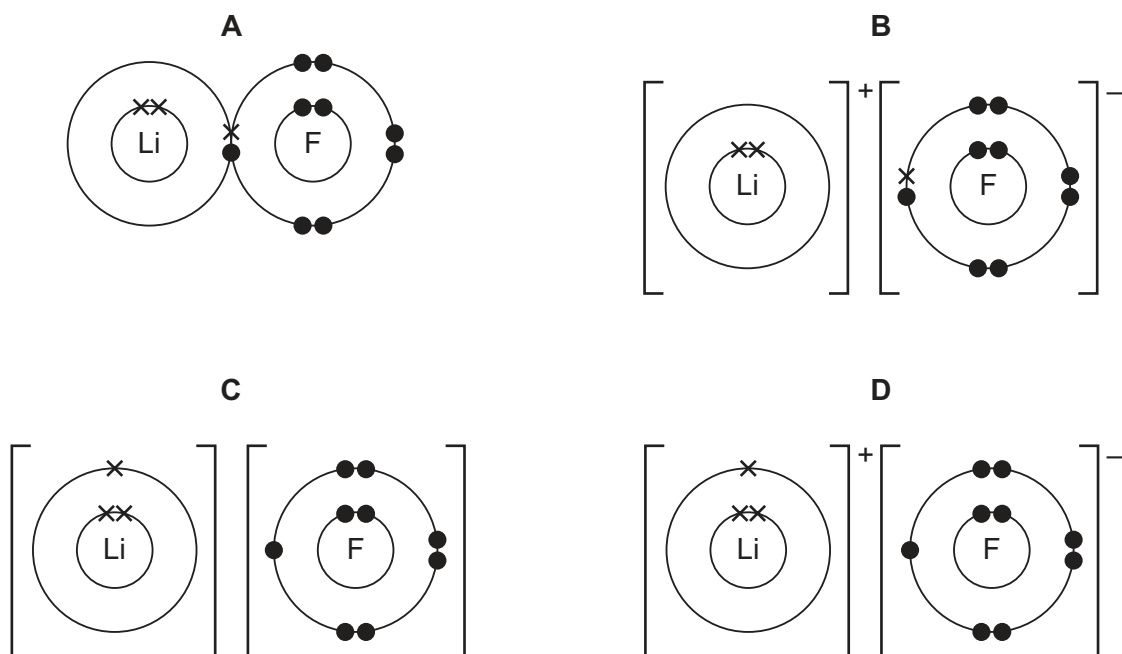


15 The nucleon number of an atom of chlorine is 35.

Which statement about this atom is correct?

- A** It contains the same number of neutrons as electrons.
- B** It contains the same number of protons as neutrons.
- C** It contains the same number of protons as electrons.
- D** The numbers of protons, neutrons and electrons are all different from each other.

16 Which dot-and-cross diagram represents lithium fluoride,  $\text{LiF}$ ?



- 17 Aqueous sodium sulfate reacts with aqueous barium chloride to make barium sulfate and sodium chloride.

What is the ionic equation for this reaction?

- A  $\text{Ba}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{aq})$
- B  $\text{Ba}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{s})$
- C  $\text{Na}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{NaCl}(\text{s})$
- D  $\text{Na}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{NaCl}(\text{aq})$

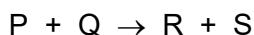
- 18 Dilute sulfuric acid is electrolysed using inert electrodes.

The concentration of two ions decreases during this process.

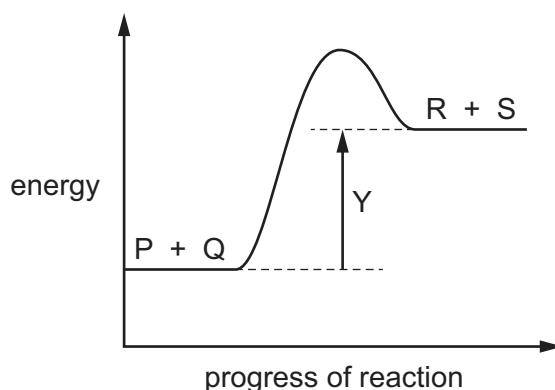
What are these ions?

- A hydrogen ions and oxide ions
- B hydrogen ions and hydroxide ions
- C hydroxide ions and sulfate ions
- D oxide ions and sulfate ions

- 19 Substances P and Q react together.



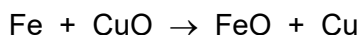
The energy level diagram for this reaction is shown.



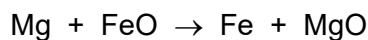
Which statement about this reaction is correct?

- A Arrow Y represents the activation energy.
- B The energy given out forming the bonds in R and S is less than the energy used to break the bonds in P and Q.
- C The reaction is exothermic.
- D The temperature increases when P reacts with Q because R and S have more energy than P and Q.

- 20 Iron displaces copper from copper oxide.



Magnesium displaces iron from iron oxide.



Which statement about these reactions is correct?

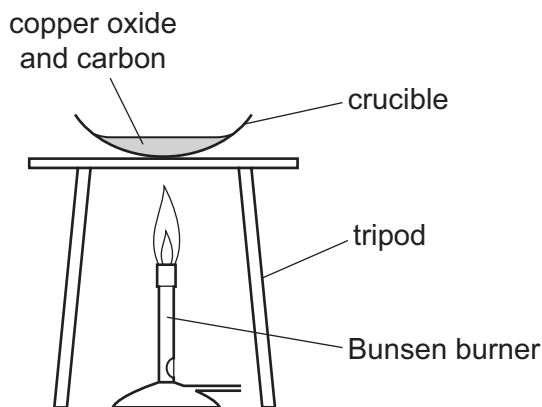
- A Copper oxide and iron oxide are being oxidised.
  - B Iron is a stronger oxidising agent than copper.
  - C Magnesium and iron are being reduced.
  - D Magnesium is a stronger reducing agent than iron.
- 21 Which two substances both react with dilute sulfuric acid to make the salt magnesium sulfate?
- A magnesium carbonate and magnesium chloride
  - B magnesium chloride and magnesium nitrate
  - C magnesium oxide and magnesium carbonate
  - D magnesium oxide and magnesium nitrate
- 22 The results of two tests on a white solid are shown.

|   | test                         | result                   |
|---|------------------------------|--------------------------|
| 1 | add aqueous sodium hydroxide | white precipitate formed |
| 2 | add dilute hydrochloric acid | colourless gas formed    |

What is the white solid?

- A iron(II) carbonate
  - B iron(II) chloride
  - C zinc carbonate
  - D zinc chloride
- 23 Which statement explains how a greater number of outer-shell electrons affects the metallic character of an element?
- A The element is more metallic because electrons are lost less easily.
  - B The element is more metallic because electrons are lost more easily.
  - C The element is less metallic because electrons are lost less easily.
  - D The element is less metallic because electrons are lost more easily.

24 Copper oxide is heated with carbon as shown.



Which statement about this experiment is correct?

- A A pink-brown solid is formed.
- B Carbon is placed underneath the copper oxide so that the air can react with the hot copper oxide.
- C Carbon reacts with the air to form carbon dioxide which then reacts with the copper oxide.
- D Copper is more reactive than carbon.

25 Some gases in air are listed.

- 1 carbon dioxide
- 2 oxygen
- 3 methane
- 4 sulfur dioxide

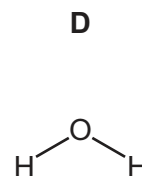
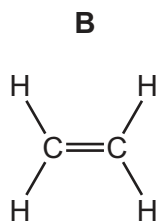
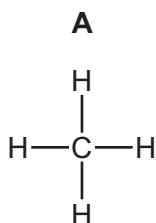
Which gases cause an enhanced greenhouse effect when their concentration in the air increases?

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

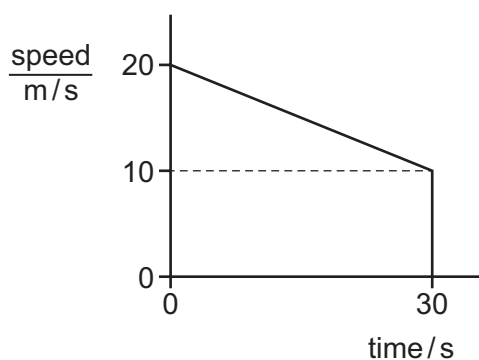
26 Which statement about all alkanes is correct?

- A They contain the same number of carbon atoms.
- B They have different chemical properties.
- C They have the same general formula.
- D They have the same melting point.

- 27 Which structure represents a molecule that is **not** formed during cracking of large alkane molecules?

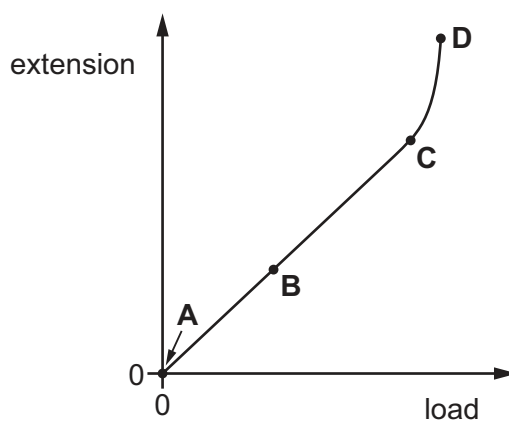


- 28 The diagram shows the speed–time graph for a moving object.



What is the distance travelled by the object in 30 s?

- A** 150 m      **B** 300 m      **C** 450 m      **D** 600 m
- 29 Which statement about mass and weight is correct?
- A** Mass and weight are different types of force.
- B** The mass of an object depends on the strength of the gravitational field in which it is placed.
- C** The mass of an object is the same on the Moon as it is on the Earth.
- D** The unit of weight is the kilogram.
- 30 The diagram shows an extension–load graph for a spring.
- Which labelled point shows the limit of proportionality for the spring?



- 31 A block of metal has a mass of 2.0 kg. The area of contact between the block and a horizontal surface is  $100 \text{ cm}^2$ .

The gravitational field strength is  $10 \text{ N/kg}$ .

What is the pressure on the surface due to the block?

- A  $0.020 \text{ N/cm}^2$     B  $0.20 \text{ N/cm}^2$     C  $5.0 \text{ N/cm}^2$     D  $50 \text{ N/cm}^2$

- 32 An object has speed  $v$  and kinetic energy  $E$ .

What is the mass of the object?

- A  $\frac{E}{v}$     B  $\frac{2E}{v}$     C  $\frac{E}{v^2}$     D  $\frac{2E}{v^2}$

- 33 The generator in a power station is rotated by a turbine. Steam from boiling water rotates the turbine.

Which energy source is used to produce electricity in this way?

- A hydroelectric energy  
B nuclear fission  
C tidal energy  
D wind energy

- 34 Which statement describes the molecules in a gas?

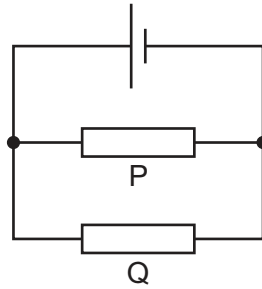
- A They are close together and move about quickly.  
B They are close together and move about slowly.  
C They are far apart and move about quickly.  
D They are far apart and move about slowly.

- 35 A student investigates the rate of evaporation of water.

Which changes produce the greatest increase in the rate of evaporation of the water?

- A doubling its temperature and doubling its surface area  
B doubling its temperature and halving its surface area  
C halving its temperature and doubling its surface area  
D halving its temperature and halving its surface area

- 36 Two resistors P and Q are connected in parallel to a cell, as shown.



The resistance of resistor P is greater than the resistance of resistor Q.

Which row gives the relationship between the currents in P and Q, and between the potential differences across P and Q?

|          | current          | potential difference (p.d.) |
|----------|------------------|-----------------------------|
| <b>A</b> | P greater than Q | P different to Q            |
| <b>B</b> | P greater than Q | P the same as Q             |
| <b>C</b> | Q greater than P | P different to Q            |
| <b>D</b> | Q greater than P | P the same as Q             |

- 37 A sound wave passes through air.

Which type of wave is a sound wave and in which direction do the air particles vibrate?

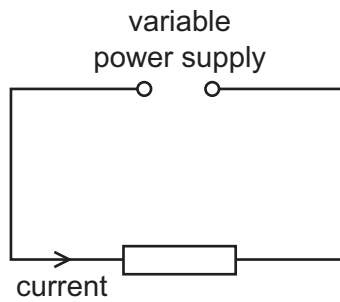
|          | type of wave | direction of vibration          |
|----------|--------------|---------------------------------|
| <b>A</b> | longitudinal | parallel to wave direction      |
| <b>B</b> | longitudinal | perpendicular to wave direction |
| <b>C</b> | transverse   | parallel to wave direction      |
| <b>D</b> | transverse   | perpendicular to wave direction |

- 38 The speed of light  $c$  in a vacuum is  $3.0 \times 10^8 \text{ m/s}$ .

Which row relates other speeds to  $c$ ?

|          | speed of light in glass | speed of infrared waves in a vacuum |
|----------|-------------------------|-------------------------------------|
| <b>A</b> | equal to $c$            | equal to $c$                        |
| <b>B</b> | equal to $c$            | different from $c$                  |
| <b>C</b> | different from $c$      | equal to $c$                        |
| <b>D</b> | different from $c$      | different from $c$                  |

- 39 A variable power supply is connected to a resistor and there is a current in the resistor.



The potential difference (p.d.) across the resistor is decreased.

The temperature of the resistor does not change.

What happens to the current in the resistor and what happens to the resistance of the resistor?

|          | current   | resistance     |
|----------|-----------|----------------|
| <b>A</b> | decreases | increases      |
| <b>B</b> | decreases | stays the same |
| <b>C</b> | increases | decreases      |
| <b>D</b> | increases | stays the same |

- 40 An electric heater has a label stating this information: 240 V, 2400 W, 10 A.

What is written on a fuse with a rating that is appropriate for use with this heater?

- A** 5 A                      **B** 13 A                      **C** 230 V                      **D** 250 V



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# The Periodic Table of Elements

Group

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

lanthanoids

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

actinoids

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

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