



# Cambridge IGCSE™

## CHEMISTRY

0620/23

Paper 2 Multiple Choice (Extended)

October/November 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 A sample of a gas occupies  $340\text{ cm}^3$  at room temperature and pressure.

The temperature and pressure are both increased, but the volume occupied by the gas remains  $340\text{ cm}^3$ .

Which row describes what happens to the particle speed and the average distance between the particles in the gas when the temperature and pressure are both increased?

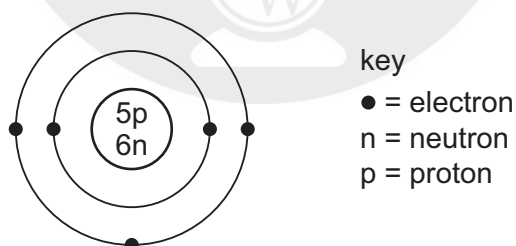
|                                       | particle speed | average distance between particles |
|---------------------------------------|----------------|------------------------------------|
| A                                     | unchanged      | unchanged                          |
| B                                     | unchanged      | increased                          |
| <input checked="" type="checkbox"/> C | increased      | unchanged                          |
| D                                     | increased      | increased                          |

- 2 Which statements about the rate of diffusion of the gases ammonia, carbon monoxide, nitrogen and oxygen are correct?

- 1 Nitrogen and carbon monoxide will diffuse at the same rate.
- 2 Oxygen will diffuse slowest because it is an element, whereas the others are compounds.
- 3 Ammonia will diffuse fastest.

A 1 and 2      ☒ B 1 and 3      C 1 only      D 2 and 3

- 3 The structure of an atom of element X is shown.



What is element X?

- ☒ A boron  
B carbon  
C sodium  
D sulfur



4 Which statement explains why isotopes of an element have the same chemical reactions?

- A They have different numbers of neutrons.
- B They have ions with different numbers of electrons.
- ☒ C They have the same number of outer shell electrons.
- D They have the same number of protons.

5 Magnesium reacts with oxygen to form magnesium oxide.

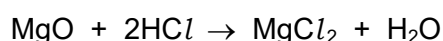
What happens to magnesium atoms and oxygen atoms during this reaction?

- A Magnesium and oxygen share two electrons.
- B Magnesium gains two electrons and oxygen loses two electrons.
- C Magnesium loses one electron and oxygen gains one electron.
- ☒ D Magnesium loses two electrons and oxygen gains two electrons.

6 Which row about the properties of both diamond and silicon(IV) oxide is correct?

|                                       | conductor of electricity | type of molecule |
|---------------------------------------|--------------------------|------------------|
| A                                     | yes                      | giant covalent   |
| B                                     | yes                      | simple covalent  |
| <input checked="" type="checkbox"/> C | no                       | giant covalent   |
| D                                     | no                       | simple covalent  |

7 The equation represents the reaction between solid magnesium oxide and dilute hydrochloric acid to form magnesium chloride and water.



Which row shows the state symbols for hydrochloric acid, magnesium chloride and water?

|                                       | HCl  | MgCl <sub>2</sub> | H <sub>2</sub> O |
|---------------------------------------|------|-------------------|------------------|
| <input checked="" type="checkbox"/> A | (aq) | (aq)              | (l)              |
| B                                     | (aq) | (l)               | (l)              |
| C                                     | (l)  | (aq)              | (aq)             |
| D                                     | (l)  | (l)               | (aq)             |



8 Which substance is a mixture?

- ☒ A air  
☐ B graphite  
☐ C oxygen  
☐ D water

9 The number of moles of atoms X, Y and Z, in a compound, are shown.

| atom | moles |
|------|-------|
| X    | 0.6   |
| Y    | 1.2   |
| Z    | 0.3   |

X 0.6  
Y 1.2  
Z 0.3  
2 4 1

What is the formula of the compound?

- ☐ A  $XY_2Z_4$     ☐ B  $XY_4Z_2$     ☐ C  $X_2YZ_4$     ☒ D  $X_2Y_4Z$

10 1.0 mol of silver nitrate,  $AgNO_3$ , contains  $1.2 \times 10^{24}$  ions.

$5 \times 0.25 \times N_A \rightarrow 6.022 \times 10^{23}$

How many ions are there in 0.25 mol of iron(III) oxide,  $Fe_2O_3$ ?

- ☐ A  $1.5 \times 10^{23}$     ☐ B  $3.0 \times 10^{23}$     ☒ C  $7.5 \times 10^{23}$     ☐ D  $3.0 \times 10^{24}$

11 Concentrated aqueous magnesium bromide is electrolysed using carbon electrodes.

Which equations represent the reactions occurring at each electrode?

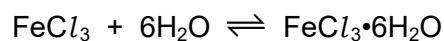
|                                    | positive electrode                       | negative electrode                       |
|------------------------------------|------------------------------------------|------------------------------------------|
| <input checked="" type="radio"/> A | $2Br^-(aq) \rightarrow Br_2(aq) + 2e^-$  | $2H^+(aq) + 2e^- \rightarrow H_2(g)$     |
| <input type="radio"/> B            | $2H^+(aq) + 2e^- \rightarrow H_2(g)$     | $2O^{2-}(aq) \rightarrow O_2(aq) + 4e^-$ |
| <input type="radio"/> C            | $Mg^{2+}(aq) + 2e^- \rightarrow Mg(s)$   | $2Br^-(aq) \rightarrow Br_2(aq) + 2e^-$  |
| <input type="radio"/> D            | $2O^{2-}(aq) \rightarrow O_2(aq) + 4e^-$ | $Mg^{2+}(aq) + 2e^- \rightarrow Mg(s)$   |

12 Aqueous copper(II) sulfate is electrolysed using carbon electrodes.

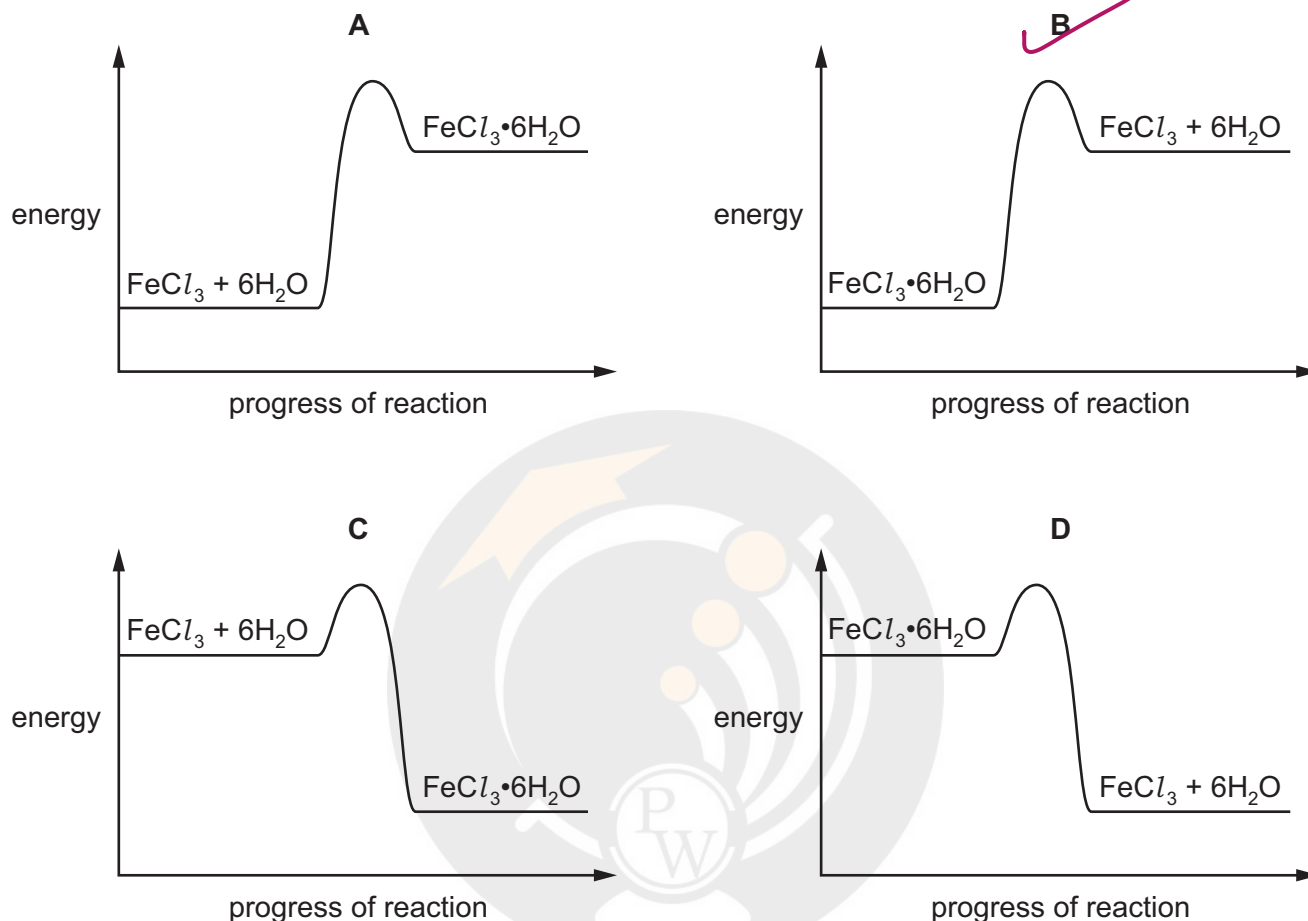
Which statement is correct?

- ☐ A Bubbles of hydrogen gas are formed at the anode.  
☐ B Bubbles of oxygen gas are formed at the cathode.  
☐ C Copper is deposited at the anode.  
☒ D The blue colour of the solution fades.

- 13 When water is added to anhydrous iron(III) chloride,  $\text{FeCl}_3$ , hydrated iron(III) chloride,  $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ , is formed and energy is given out.

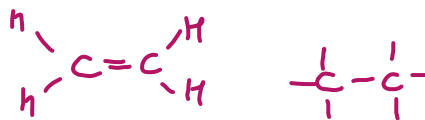
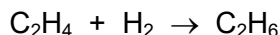


Which reaction pathway diagram represents the formation of anhydrous iron(III) chloride in the reverse reaction?





- 14 Ethene reacts with hydrogen. The equation is shown.



The bond energies are shown.

| bond | bond energy in kJ/mol |
|------|-----------------------|
| C–C  | +350                  |
| C=C  | +610                  |
| C–H  | +410                  |
| H–H  | +436                  |

$$4 \times 410 + 1 \times 436 - 350 - 6 \times 410$$
$$1640 + 436 - 350 - 2460$$
$$-124$$

What is the energy change for the reaction?

- A –560 kJ/mol    **B –124 kJ/mol**    C +486 kJ/mol    D +5496 kJ/mol

- 15 Statements about four different acids are listed.

- A 0.0100 mol/dm<sup>3</sup> solution of hydrochloric acid has a pH of 2.
- A 0.0100 mol/dm<sup>3</sup> solution of ethanoic acid has a pH of 3.4.
- Hydrobromic acid, HBr, is a strong acid.
- Ethanoic acid is a slightly stronger acid than trimethylethanoic acid.

What are the pH values of 0.0100 mol/dm<sup>3</sup> HBr and 0.0100 mol/dm<sup>3</sup> trimethylethanoic acid?

|          | pH of 0.0100 mol/dm <sup>3</sup> HBr | pH of 0.0100 mol/dm <sup>3</sup> trimethylethanoic acid |
|----------|--------------------------------------|---------------------------------------------------------|
| A        | 2                                    | 3.3                                                     |
| <b>B</b> | 2                                    | 3.5                                                     |
| C        | 3.4                                  | 3.3                                                     |
| D        | 3.4                                  | 3.5                                                     |

- 16 Anhydrous cobalt(II) chloride is blue and turns pink when water is added.

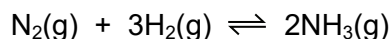
How is this reaction reversed?

- A adding dilute acid  
B filtering  
**C heating**  
D cooling



- 17 The reaction between hydrogen and nitrogen is reversible.

The forward reaction is exothermic.



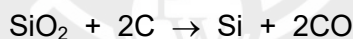
Which change to the conditions would increase the yield of ammonia?

- A add a catalyst
  - ☒ B increase the pressure
  - C increase the temperature
  - D reduce the concentration of nitrogen
- 18 Ethanol can be turned into ethanoic acid by passing it over hot copper(II) oxide.



What is this type of reaction?

- A precipitation
  - ☒ B redox
  - C thermal decomposition
  - D neutralisation
- 19 When heated strongly, silicon(IV) oxide reacts with carbon.



Which term describes what happens to silicon(IV) oxide?

- A thermal decomposition
  - B neutralisation
  - C oxidation
  - ☒ D reduction
- 20 Which statement about aqueous weak acids is correct?
- A Weak acids are always dilute aqueous solutions.
  - B Weak acids dissociate fully in aqueous solution.
  - C When a weak acid is added to blue litmus paper, it stays blue.
  - ☒ D When a weak acid is added to solid magnesium, effervescence is seen.

21 Which oxides are basic?

1 calcium oxide

2 sodium oxide

3 iron(II) oxide

☒ A 1, 2 and 3      ☐ B 1 and 2 only      ☐ C 2 and 3 only      ☐ D 3 only

22 Zinc oxide is an amphoteric oxide.

Zinc oxide is added to excess dilute hydrochloric acid.

Zinc oxide is added to excess aqueous sodium hydroxide.

Which row describes the observations made in these reactions?

|                                    | excess dilute hydrochloric acid | excess aqueous sodium hydroxide |
|------------------------------------|---------------------------------|---------------------------------|
| <input checked="" type="radio"/> A | colourless solution forms       | colourless solution forms       |
| <input type="radio"/> B            | colourless solution forms       | no visible change               |
| <input type="radio"/> C            | fizzing                         | colourless solution forms       |
| <input type="radio"/> D            | fizzing                         | no visible change               |

23 Which row shows properties of an element that is in the same group of the Periodic Table as lithium?

|                                    | electrical conductivity | density in g/cm <sup>3</sup> |
|------------------------------------|-------------------------|------------------------------|
| <input checked="" type="radio"/> A | high                    | 0.97                         |
| <input type="radio"/> B            | high                    | 8.93                         |
| <input type="radio"/> C            | low                     | 0.07                         |
| <input type="radio"/> D            | low                     | 3.12                         |

24 The elements in Group VII include chlorine, bromine and iodine.

Which statements are correct?

1 Iodine is more dense than chlorine.

2 Iodine displaces chlorine from a solution containing chloride ions.

3 Bromine is a diatomic non-metal.

4 Chlorine gas is darker in colour than bromine vapour.

☐ A 1 and 2      ☒ B 1 and 3      ☐ C 2 and 4      ☐ D 3 and 4



25 Cobalt is a transition element.

What is a property of cobalt?

- ☒ A It can form coloured compounds.
- ☐ B It is a poor electrical conductor.
- ☐ C It has a low density.
- ☐ D It has a low melting point.

26 Which metal has variable oxidation numbers?

- ☐ A aluminium
- ☐ B calcium
- ☒ C copper
- ☐ D sodium

27 Which statement about alloys is correct?

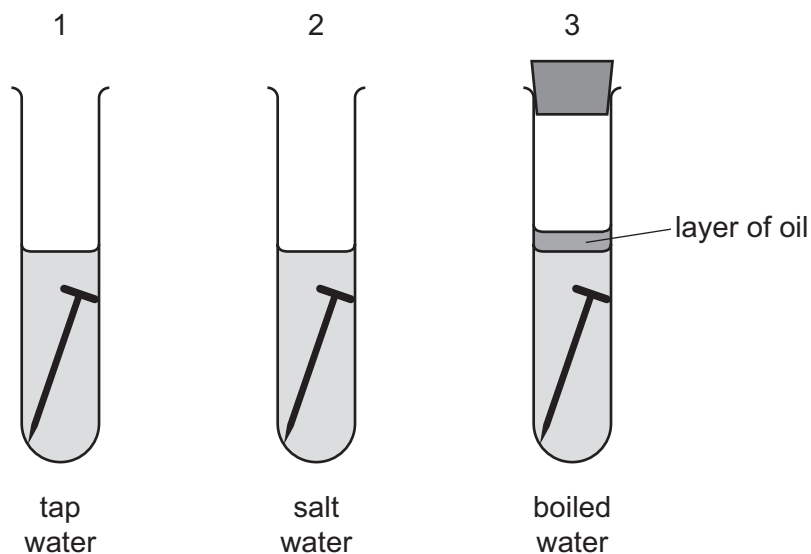
- ☐ A Alloys are pure metal elements.
- ☐ B At least two or more metals react together to make alloys.
- ☒ C Alloys can be harder and stronger than a pure metal.
- ☐ D Steel is **not** an alloy because it can contain the non-metal carbon.

28 A metal M is between sodium and magnesium in the reactivity series.

Which reactions occur with M and its oxide?

|                                       | M reacts with steam | M can be extracted by heating its oxide with carbon |
|---------------------------------------|---------------------|-----------------------------------------------------|
| A                                     | no                  | no                                                  |
| B                                     | no                  | yes                                                 |
| <input checked="" type="checkbox"/> C | yes                 | no                                                  |
| D                                     | yes                 | yes                                                 |

29 The diagrams show experiments to investigate rusting of iron nails.



In which test-tubes do the nails rust?

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

30 Which equation represents a reaction that takes place when iron is extracted from its ore in the blast furnace?

- A  $\text{CaO} + \text{SiO}_2 \rightarrow \text{CaSiO}_3$**   
 B  $\text{CaO} + \text{CO}_2 \rightarrow \text{CaCO}_3$   
 C  $2\text{CO} \rightarrow \text{C} + \text{CO}_2$   
 D  $2\text{Fe} + 3\text{CO}_2 \rightarrow \text{Fe}_2\text{CO}_3 + 3\text{CO}$

31 Some uses of water are listed.

- 1 for drinking
- 2 in chemical reactions
- 3 in swimming pools
- 4 in washing

For which uses is it necessary to chlorinate the water?

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



32 Oxides of nitrogen are formed in car engines and are a source of air pollution.

To decrease this pollution, catalytic converters are fitted to car exhausts.

What happens to the oxides of nitrogen in the catalytic converter?

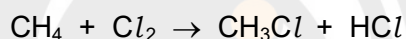
- A combustion
- B cracking
- C oxidation
- ☒ D reduction

33 Which pair of compounds are structural isomers of each other?

- A  $\text{CH}_3\text{CH}_2\text{CH}_3$  and  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
- B  $\text{CH}_2=\text{CHCH}_3$  and  $\text{CH}_3\text{CH}=\text{CH}_2$
- C  $\text{CH}_2(\text{OH})\text{CH}_2\text{CH}_3$  and  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- ☒ D  $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$  and  $\text{CH}_3\text{COOCH}_2\text{CH}_3$

4 C H<sub>8</sub>

34 Methane reacts with chlorine in sunlight.



Which statements about this reaction are correct?

- 1 It is a substitution reaction.
- 2 It is an addition reaction.
- 3 It is a photochemical reaction.
- 4 It is catalysed by nickel.

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

35 Propene reacts with bromine to give one product only.

What is the formula of the product?

- A  $\text{CH}_3\text{CH}_2\text{CHBr}_2$
- B  $\text{CH}_2\text{BrCH}_2\text{CH}_2\text{Br}$
- ☒ C  $\text{CH}_3\text{CHBrCH}_2\text{Br}$
- D  $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$





36 Ethanol can be manufactured by fermentation or by the catalytic addition of steam to ethene.

Which statements describe an advantage of manufacturing ethanol by fermentation?

- 1 The yield of ethanol is low.
- 2 The method uses a batch process.
- 3 The process takes place at a lower temperature.
- 4 The ethanol is made from a renewable source.

A 1 and 2

B 1 and 3

C 2 and 4

☒ D 3 and 4

37 A compound with the formula  $\text{CH}_3\text{COOC}_2\text{H}_5$  is formed from ethanol in two separate reactions.

reaction 1 Ethanol reacts to form ethanoic acid.

reaction 2 Ethanoic acid and ethanol react together to form  $\text{CH}_3\text{COOC}_2\text{H}_5$ .

Which row describes reaction 1 and reaction 2?

|                                       | reaction 1 | reaction 2      |
|---------------------------------------|------------|-----------------|
| <input checked="" type="checkbox"/> A | oxidation  | ester formation |
| B                                     | oxidation  | addition        |
| C                                     | reduction  | ester formation |
| D                                     | reduction  | addition        |

38 The flow diagram shows how poly(ethene) may be made from petroleum.



What are stages 1, 2 and 3?

|                                       | 1                       | 2                       | 3                       |
|---------------------------------------|-------------------------|-------------------------|-------------------------|
| A                                     | cracking                | polymerisation          | fractional distillation |
| B                                     | cracking                | fractional distillation | polymerisation          |
| <input checked="" type="checkbox"/> C | fractional distillation | cracking                | polymerisation          |
| D                                     | fractional distillation | polymerisation          | cracking                |

39  $R_f$  values are used to identify unknown substances using paper chromatography.

Which statements about  $R_f$  values are correct?

- 1  $R_f$  values are always less than 1.0.
- 2  $R_f$  value = distance travelled by solvent  $\div$  distance travelled by unknown substance.
- 3 The higher the  $R_f$  value, the further the unknown substance travels.
- 4  $R_f$  values are **not** affected by the solubility of the unknown substance.

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

40 The results of some tests on an aqueous solution of substance X are listed.

- 1 A cream precipitate is produced when adding aqueous silver nitrate.
- 2 Adding aqueous sodium hydroxide produces a green precipitate which dissolves in excess alkali.
- 3 Adding aqueous ammonia produces a green precipitate which is insoluble in excess ammonia.

What is substance X?

- A** chromium(III) bromide  
B chromium(III) chloride  
C iron(II) bromide  
D iron(II) chloride



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## The Periodic Table of Elements

| Group                      |                             |                                                                                             |                                 |                             |                              |                             |                              |                              |                                |                               |                               |                              |                             |                             |                               |                              |                            |                         |
|----------------------------|-----------------------------|---------------------------------------------------------------------------------------------|---------------------------------|-----------------------------|------------------------------|-----------------------------|------------------------------|------------------------------|--------------------------------|-------------------------------|-------------------------------|------------------------------|-----------------------------|-----------------------------|-------------------------------|------------------------------|----------------------------|-------------------------|
| I                          | II                          |                                                                                             |                                 |                             |                              |                             |                              |                              |                                |                               |                               | III                          | IV                          | V                           | VI                            | VII                          | VIII                       |                         |
| 3<br>Li<br>lithium<br>7    | 4<br>Be<br>beryllium<br>9   | <div>Key</div> <div>atomic number<br/>atomic symbol<br/>name<br/>relative atomic mass</div> |                                 |                             |                              |                             |                              |                              |                                |                               |                               | 1<br>H<br>hydrogen<br>1      |                             |                             |                               |                              |                            | 2<br>He<br>helium<br>4  |
|                            |                             |                                                                                             |                                 |                             |                              |                             |                              |                              |                                |                               |                               |                              |                             |                             |                               |                              |                            |                         |
| 11<br>Na<br>sodium<br>23   |                             |                                                                                             |                                 |                             |                              |                             | 12<br>Mg<br>magnesium<br>24  | 13<br>Al<br>aluminium<br>27  | 14<br>Si<br>silicon<br>28      | 15<br>P<br>phosphorus<br>31   | 16<br>S<br>sulfur<br>32       | 17<br>Cl<br>chlorine<br>35.5 |                             |                             |                               |                              |                            | 18<br>Ar<br>argon<br>40 |
| 19<br>K<br>potassium<br>39 | 20<br>Ca<br>calcium<br>40   | 21<br>Sc<br>scandium<br>45                                                                  | 22<br>Ti<br>titanium<br>48      | 23<br>V<br>vanadium<br>51   | 24<br>Cr<br>chromium<br>52   | 25<br>Mn<br>manganese<br>55 | 26<br>Fe<br>iron<br>56       | 27<br>Co<br>cobalt<br>59     | 28<br>Ni<br>nickel<br>59       | 29<br>Cu<br>copper<br>64      | 30<br>Zn<br>zinc<br>65        | 31<br>Ga<br>gallium<br>70    | 32<br>Ge<br>germanium<br>73 | 33<br>As<br>arsenic<br>75   | 34<br>Se<br>selenium<br>79    | 35<br>Br<br>bromine<br>80    | 36<br>Kr<br>krypton<br>84  |                         |
| 37<br>Rb<br>rubidium<br>85 | 38<br>Sr<br>strontium<br>88 | 39<br>Y<br>yttrium<br>89                                                                    | 40<br>Zr<br>zirconium<br>91     | 41<br>Nb<br>niobium<br>93   | 42<br>Mo<br>molybdenum<br>96 | 43<br>Tc<br>technetium<br>— | 44<br>Ru<br>ruthenium<br>101 | 45<br>Rh<br>rhodium<br>103   | 46<br>Pd<br>palladium<br>106   | 47<br>Ag<br>silver<br>108     | 48<br>Cd<br>cadmium<br>112    | 49<br>In<br>indium<br>115    | 50<br>Sn<br>tin<br>119      | 51<br>Sb<br>antimony<br>122 | 52<br>Te<br>tellurium<br>128  | 53<br>I<br>iodine<br>127     | 54<br>Xe<br>xenon<br>131   |                         |
| 55<br>Cs<br>caesium<br>133 | 56<br>Ba<br>barium<br>137   | 57–71<br>lanthanoids                                                                        | 72<br>Hf<br>hafnium<br>178      | 73<br>Ta<br>tantalum<br>181 | 74<br>W<br>tungsten<br>184   | 75<br>Re<br>rhenium<br>186  | 76<br>Os<br>osmium<br>190    | 77<br>Ir<br>iridium<br>192   | 78<br>Pt<br>platinum<br>195    | 79<br>Au<br>gold<br>197       | 80<br>Hg<br>mercury<br>201    | 81<br>Tl<br>thallium<br>204  | 82<br>Pb<br>lead<br>207     | 83<br>Bi<br>bismuth<br>209  | 84<br>Po<br>polonium<br>—     | 85<br>At<br>astatine<br>—    | 86<br>Rn<br>radon<br>—     |                         |
| 87<br>Fr<br>francium<br>—  | 88<br>Ra<br>radium<br>—     | 89–103<br>actinoids                                                                         | 104<br>Rf<br>rutherfordium<br>— | 105<br>Db<br>dubnium<br>—   | 106<br>Sg<br>seaborgium<br>— | 107<br>Bh<br>bohrium<br>—   | 108<br>Hs<br>hassium<br>—    | 109<br>Mt<br>meitnerium<br>— | 110<br>Ds<br>darmstadtium<br>— | 111<br>Rg<br>roentgenium<br>— | 112<br>Cn<br>copernicium<br>— | 113<br>Nh<br>nihonium<br>—   | 114<br>Fl<br>flerovium<br>— | 115<br>Mc<br>moscovium<br>— | 116<br>Lv<br>livermorium<br>— | 117<br>Ts<br>tennessine<br>— | 118<br>Og<br>oganeson<br>— |                         |

lanthanoids

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

actinoids

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