



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

**CHEMISTRY****0620/12**

Paper 1 Multiple Choice (Core)

**May/June 2016****45 Minutes**

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

**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 20.

Electronic calculators may be used.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

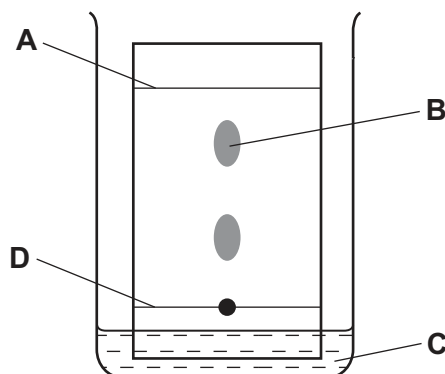
This document consists of **17** printed pages and **3** blank pages.

## 2

- 1 In which changes do the particles move further apart?



- A** W and X      **B** W and Z      **C** X and Y      **D** Y and Z
- 2 In the chromatography experiment shown, which label represents the solvent front?



- 3 One of the instructions for an experiment reads as follows.

Quickly add 50 cm<sup>3</sup> of acid.

What is the best piece of apparatus to use?

- A** a burette  
**B** a conical flask  
**C** a measuring cylinder  
**D** a pipette
- 4 Two statements about diamond are given.
- 1 Diamond has a giant three-dimensional covalent structure of carbon atoms.
  - 2 Diamond is one of the hardest substances known.

Which is correct?

- A** Both statements are correct and statement 1 explains statement 2.  
**B** Both statements are correct but statement 2 does not explain statement 1.  
**C** Statement 1 is correct but statement 2 is incorrect.  
**D** Statement 2 is correct but statement 1 is incorrect.

## 3

- 5 The table shows the electronic structure of four atoms.

| atom | electronic structure |
|------|----------------------|
| W    | 2,8,1                |
| X    | 2,8,4                |
| Y    | 2,8,7                |
| Z    | 2,8,8                |

Which two atoms combine to form a covalent compound?

- A** W and X      **B** W and Y      **C** X and Y      **D** X and Z
- 6 An atom of element Q contains 19 electrons, 19 protons and 20 neutrons.

What is Q?

- A** calcium  
**B** potassium  
**C** strontium  
**D** yttrium
- 7 Lithium is in Group I of the Periodic Table. Nitrogen is in Group V of the Periodic Table.

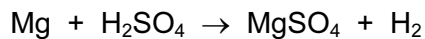
Lithium reacts with nitrogen to form the ionic compound lithium nitride.

What happens to the electrons when lithium atoms and nitrogen atoms form ions?

|          | lithium atoms                                                    | nitrogen atoms                                                          |
|----------|------------------------------------------------------------------|-------------------------------------------------------------------------|
| <b>A</b> | each lithium atom loses one electron to form a $\text{Li}^+$ ion | each nitrogen atom gains three electrons to form an $\text{N}^{3-}$ ion |
| <b>B</b> | each lithium atom loses one electron to form a $\text{Li}^+$ ion | each nitrogen atom gains five electrons to form an $\text{N}^{5-}$ ion  |
| <b>C</b> | each lithium atom gains one electron to form a $\text{Li}^-$ ion | each nitrogen atom loses three electrons to form an $\text{N}^{3+}$ ion |
| <b>D</b> | each lithium atom gains one electron to form a $\text{Li}^-$ ion | each nitrogen atom loses five electrons to form an $\text{N}^{5+}$ ion  |

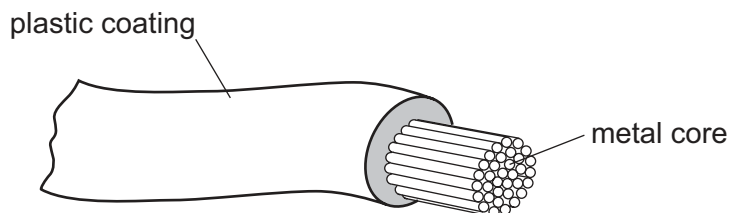
4

- 8 The equation shows the reaction between magnesium and sulfuric acid.  
[A<sub>r</sub>: H, 1; O, 16; Mg, 24; S, 32]



In this reaction, which mass of magnesium sulfate is formed when 6 g of magnesium react with excess sulfuric acid?

- A** 8                      **B** 24                      **C** 30                      **D** 60
- 9 The diagram shows an electrical cable.



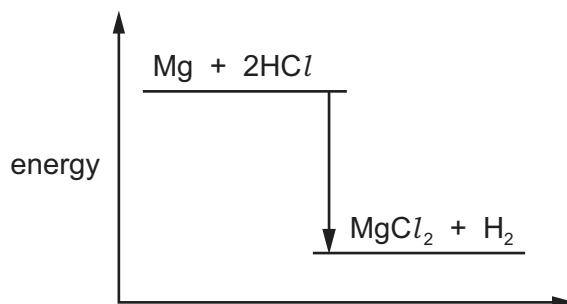
Which statement about the substances used is correct?

- A** The coating is plastic because it conducts electricity well.  
**B** The core is copper because it conducts electricity well.  
**C** The core is copper because it is cheap and strong.  
**D** The core is iron because it is cheap and strong.
- 10 What are the products at the electrodes when dilute sulfuric acid is electrolysed using inert electrodes?

|          | anode          | cathode  |
|----------|----------------|----------|
| <b>A</b> | hydrogen       | oxygen   |
| <b>B</b> | oxygen         | hydrogen |
| <b>C</b> | sulfur         | oxygen   |
| <b>D</b> | sulfur dioxide | hydrogen |

5

11 The energy level diagram for the reaction between magnesium and hydrochloric acid is shown.

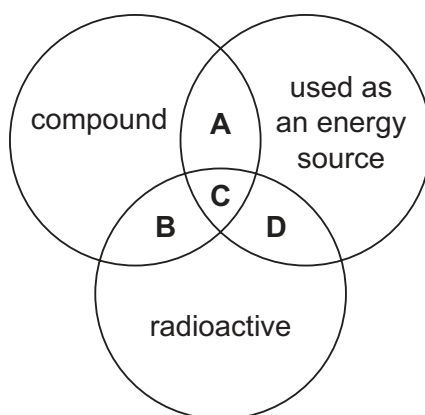


Which statement about the reaction is **not** correct?

- A Energy is given out during the reaction.
- B The products are at a lower energy level than the reactants.
- C The reaction is endothermic.
- D The temperature increases during the reaction.

12 The diagram shows some properties that substances may have.

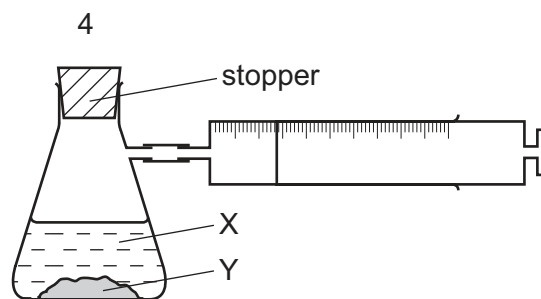
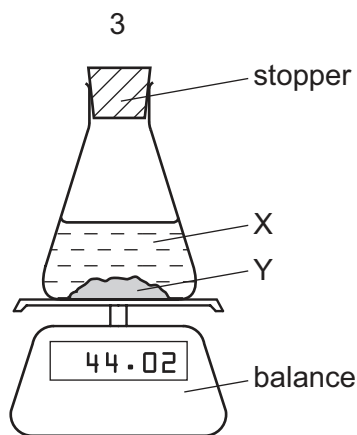
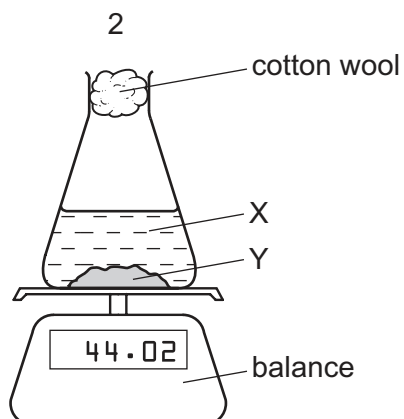
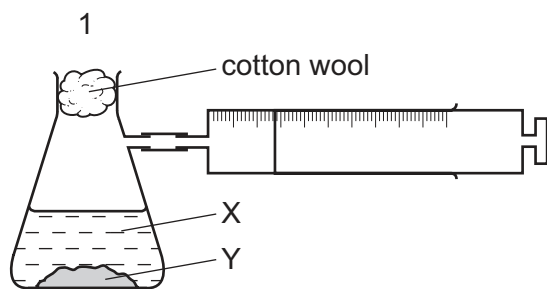
To which labelled part of the diagram does <sup>235</sup>U belong?



6

13 A liquid X reacts with solid Y to form a gas.

Which two diagrams show suitable methods for investigating the rate (speed) of the reaction?



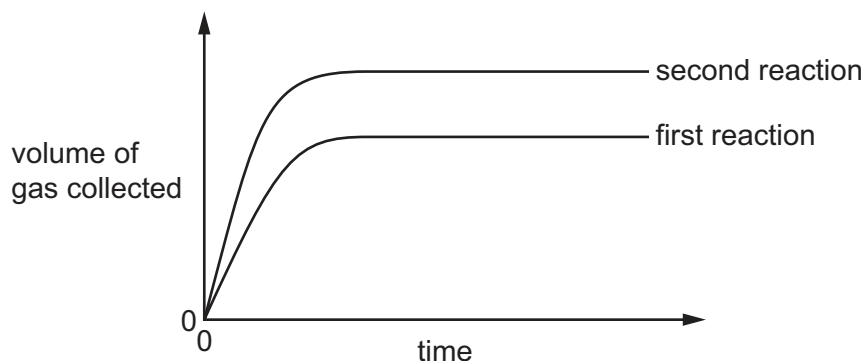
A 1 and 3

B 1 and 4

C 2 and 3

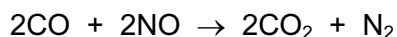
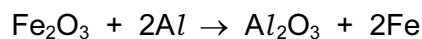
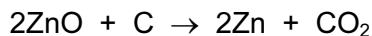
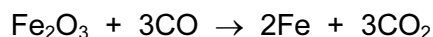
D 2 and 4

- 14 The results of two separate reactions between excess calcium carbonate and hydrochloric acid are shown.



Which statement explains the differences between the reactions?

- A More calcium carbonate was used in the second reaction.
  - B The same volume of more concentrated acid was used in the second reaction.
  - C The second reaction was allowed to react for longer.
  - D The temperature was higher in the second reaction.
- 15 The equations below all show redox reactions.



Which oxide is oxidised in these reactions?

- A  $\text{Fe}_2\text{O}_3$
  - B CO
  - C ZnO
  - D NO
- 16 In which reaction is the colour change from blue to white?
- A heating hydrated cobalt(II) chloride
  - B heating hydrated copper(II) sulfate
  - C adding water to anhydrous cobalt(II) chloride
  - D adding water to anhydrous copper(II) sulfate

**17** Which statements are properties of an acid?

- 1 reacts with ammonium sulfate to form ammonia
- 2 turns red litmus blue

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

**18** Part of the Periodic Table is shown.

Which element forms an acidic oxide?

A blank periodic table grid is shown. The grid is composed of squares representing elements. The following positions are labeled with letters in black boxes:

- A**: Located in the top row, 13th column (Aluminum).
- B**: Located in the 2nd row, 2nd column (Carbon).
- C**: Located in the 2nd row, 17th column (Chlorine).
- D**: Located in the 2nd row, 20th column (Calcium).

The rest of the grid is empty.

**19** What is the correct sequence of steps for the preparation of a pure sample of copper(II) sulfate crystals from copper(II) oxide and sulfuric acid?

- A** dissolving → crystallisation → evaporation → filtration
- B** dissolving → evaporation → filtration → crystallisation
- C** dissolving → filtration → crystallisation → evaporation
- D** dissolving → filtration → evaporation → crystallisation

20 The following tests are carried out on an aqueous solution of salt X.

| test                                                                                   | observation                                                |
|----------------------------------------------------------------------------------------|------------------------------------------------------------|
| sodium hydroxide solution is added                                                     | a green precipitate is formed which dissolves in excess    |
| a small piece of aluminium foil is then added to the mixture and the mixture is heated | a gas is given off which turns damp, red litmus paper blue |

What is X?

- A aluminium nitrate
- B ammonium sulfate
- C chromium(III) nitrate
- D iron(II) nitrate

21 Where in the Periodic Table is the metallic character of the elements greatest?

|   | left or right side of a period | at the top or bottom of a group |
|---|--------------------------------|---------------------------------|
| A | left                           | bottom                          |
| B | left                           | top                             |
| C | right                          | bottom                          |
| D | right                          | top                             |

22 Rubidium is a Group I metal.

Which statement about rubidium is **not** correct?

- A It has a higher melting point than lithium.
- B It has one electron in its outer shell.
- C It reacts vigorously with water.
- D It reacts with chlorine to form rubidium chloride,  $\text{RbCl}$ .

**23** The table gives information about four elements, P, Q, R and S.

|   | melting point<br>in °C | electrical conductivity<br>of element when solid | density in g/cm <sup>3</sup> | colour of iodide<br>of element |
|---|------------------------|--------------------------------------------------|------------------------------|--------------------------------|
| P | 98                     | good                                             | 0.97                         | white                          |
| Q | −39                    | good                                             | 13.53                        | red                            |
| R | 1410                   | poor                                             | 2.33                         | colourless                     |
| S | 1535                   | good                                             | 7.87                         | green                          |

Which elements could be transition elements?

- A** P, Q and S      **B** Q and S only      **C** R and S only      **D** S only

**24** Part of the Periodic Table is shown.

Which element is a gas that does **not** form a compound with potassium?

**25** Which property is **not** considered a typical metallic property?

- A** good conductor of heat
- B** low melting point
- C** malleable (can be hammered into shape)
- D** strong

26 Some chemical properties of three metals W, X and Y and their oxides are shown.

| metal | reaction with steam | reaction with dilute hydrochloric acid | reaction of metal oxide with carbon |
|-------|---------------------|----------------------------------------|-------------------------------------|
| W     | reacts              | reacts                                 | reacts                              |
| X     | no reaction         | no reaction                            | reacts                              |
| Y     | reacts              | reacts                                 | no reaction                         |

What is the order of reactivity of these metals, most reactive first?

**A** W → Y → X

**B** X → Y → W

**C** Y → W → X

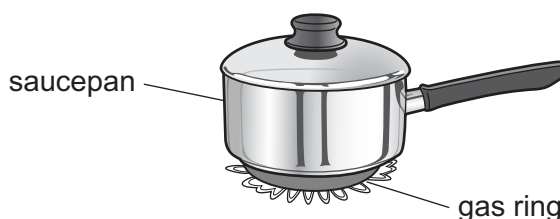
**D** Y → X → W

27 Iron from a blast furnace is treated with oxygen and with calcium oxide to make steel.

Which substances in the iron are removed?

|          | oxygen removes | calcium oxide removes |
|----------|----------------|-----------------------|
| <b>A</b> | carbon         | acidic oxides         |
| <b>B</b> | carbon         | basic oxides          |
| <b>C</b> | iron           | acidic oxides         |
| <b>D</b> | iron           | basic oxides          |

28 Copper is sometimes used to make cooking utensils.



Three properties of copper are given.

- 1 corrosion resistant
- 2 good conductor of electricity
- 3 good conductor of heat

Which properties make copper a suitable metal for making cooking utensils?

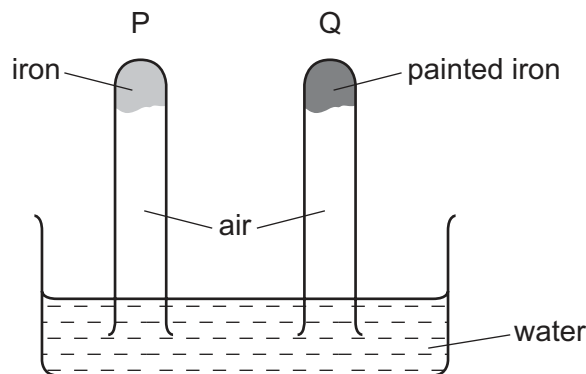
**A** 1 and 3

**B** 1 only

**C** 2 and 3

**D** 2 only

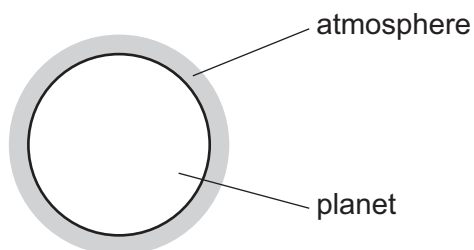
29 The diagram shows an experiment to investigate how paint affects the rusting of iron.



What happens to the water level in tubes P and Q?

|          | tube P    | tube Q    |
|----------|-----------|-----------|
| <b>A</b> | falls     | rises     |
| <b>B</b> | no change | rises     |
| <b>C</b> | rises     | falls     |
| <b>D</b> | rises     | no change |

30 A new planet has been discovered and its atmosphere has been analysed.



The table shows the composition of its atmosphere.

| gas            | percentage by volume |
|----------------|----------------------|
| carbon dioxide | 4                    |
| nitrogen       | 72                   |
| oxygen         | 24                   |

Which gases are present in the atmosphere of the planet in a higher percentage than they are in the Earth's atmosphere?

- A** carbon dioxide and oxygen
- B** carbon dioxide only
- C** nitrogen and oxygen
- D** nitrogen only

31 Which of the following are tests for water?

- 1 It turns anhydrous copper(II) sulfate blue.
- 2 It boils at 100 °C.
- 3 It turns anhydrous cobalt(II) chloride paper blue.

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

32 Sulfur dioxide, carbon monoxide and oxides of nitrogen are common gaseous pollutants found in the air.

Which pollutants contribute to acid rain?

- A** carbon monoxide and sulfur dioxide
- B** oxides of nitrogen and sulfur dioxide
- C** oxides of nitrogen only
- D** sulfur dioxide only

33 Which compound is **not** used as a fertiliser?

- A** ammonium phosphate
- B** ammonium sulfate
- C** calcium carbonate
- D** potassium nitrate

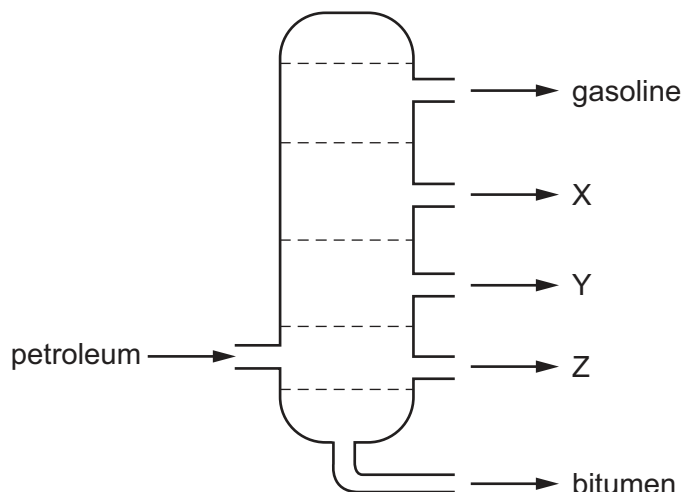
34 Lime (calcium oxide) is used to treat waste water from a factory.

Which substance is removed by the lime?

- A** ammonia
- B** sodium chloride
- C** sodium hydroxide
- D** sulfuric acid

14

35 The diagram shows the separation of petroleum into fractions.



What could X, Y and Z represent?

|          | X                    | Y                    | Z                    |
|----------|----------------------|----------------------|----------------------|
| <b>A</b> | diesel oil           | lubricating fraction | paraffin             |
| <b>B</b> | lubricating fraction | diesel oil           | paraffin             |
| <b>C</b> | paraffin             | lubricating fraction | diesel oil           |
| <b>D</b> | paraffin             | diesel oil           | lubricating fraction |

36 Which compound is **not** an alkane,  $C_nH_{2n+2}$ ?

- A**  $CH_3CH_2CH_2CH_3$
- B**  $(CH_3)_2CHCH_3$
- C**  $CH_3CHCHCH_3$
- D**  $(CH_3)_3CH$

**37** A hydrocarbon W burns to form carbon dioxide and water.

W decolourises bromine water.

What is the name of W and what is its structure?

|          | name of W | structure of W                                                                                                                                              |
|----------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A</b> | ethane    | $\begin{array}{cc} \text{H} & \text{H} \\   &   \\ \text{H}-\text{C} & -\text{C}-\text{H} \\   &   \\ \text{H} & \text{H} \end{array}$                      |
| <b>B</b> | ethane    | $\begin{array}{cc} \text{H} & \text{H} \\ & \diagdown \quad \diagup \\ & \text{C}=\text{C} \\ & \diagup \quad \diagdown \\ \text{H} & \text{H} \end{array}$ |
| <b>C</b> | ethene    | $\begin{array}{cc} \text{H} & \text{H} \\   &   \\ \text{H}-\text{C} & -\text{C}-\text{H} \\   &   \\ \text{H} & \text{H} \end{array}$                      |
| <b>D</b> | ethene    | $\begin{array}{cc} \text{H} & \text{H} \\ & \diagdown \quad \diagup \\ & \text{C}=\text{C} \\ & \diagup \quad \diagdown \\ \text{H} & \text{H} \end{array}$ |

**38** Which term describes the formation of ethanol from glucose?

- A** cracking
- B** distillation
- C** fermentation
- D** polymerisation

39 Ethene forms an addition polymer as shown.



Which terms describe this polymer?

- A a saturated compound called poly(ethane)
  - B a saturated compound called poly(ethene)
  - C an unsaturated compound called poly(ethane)
  - D an unsaturated compound called poly(ethene)
- 40 Which statement about carboxylic acids is **not** correct?
- A Aqueous ethanoic acid has a pH below pH 7.
  - B They contain the functional group  $\text{-COOH}$ .
  - C They produce carbon dioxide when reacted with a metal carbonate.
  - D Methyl orange turns yellow in aqueous ethanoic acid.



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

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

The Periodic Table of Elements

| Group                      |                             |                                                                                             |                             |                                 |                              |                              |                              |                            |                              |                                |                               |                               |                             |                             |                               |                             |                           |                              |                         |
|----------------------------|-----------------------------|---------------------------------------------------------------------------------------------|-----------------------------|---------------------------------|------------------------------|------------------------------|------------------------------|----------------------------|------------------------------|--------------------------------|-------------------------------|-------------------------------|-----------------------------|-----------------------------|-------------------------------|-----------------------------|---------------------------|------------------------------|-------------------------|
| I                          | II                          |                                                                                             |                             |                                 |                              |                              |                              |                            |                              |                                |                               | III                           | IV                          | V                           | VI                            | VII                         | VIII                      |                              |                         |
|                            |                             | <div>1<br/>H<br/>hydrogen<br/>1</div>                                                       |                             |                                 |                              |                              |                              |                            |                              |                                |                               |                               |                             |                             |                               |                             |                           |                              |                         |
|                            |                             | <div>Key</div> <div>atomic number<br/>atomic symbol<br/>name<br/>relative atomic mass</div> |                             |                                 |                              |                              |                              |                            |                              |                                |                               |                               |                             |                             |                               |                             |                           |                              |                         |
| 3<br>Li<br>lithium<br>7    | 4<br>Be<br>beryllium<br>9   |                                                                                             |                             |                                 |                              |                              |                              |                            |                              |                                |                               |                               |                             | 5<br>B<br>boron<br>11       | 6<br>C<br>carbon<br>12        | 7<br>N<br>nitrogen<br>14    | 8<br>O<br>oxygen<br>16    | 9<br>F<br>fluorine<br>19     | 10<br>Ne<br>neon<br>20  |
| 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>— | 114<br>Fl<br>flerovium<br>— |                             | 116<br>Lv<br>livermorium<br>— | —                           |                           |                              |                         |

lanthanoids

actinoids

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