



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

**CHEMISTRY**

**0620/12**

Paper 1 Multiple Choice (Core)

**October/November 2017**

**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 16.

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 **15** printed pages and **1** blank page.

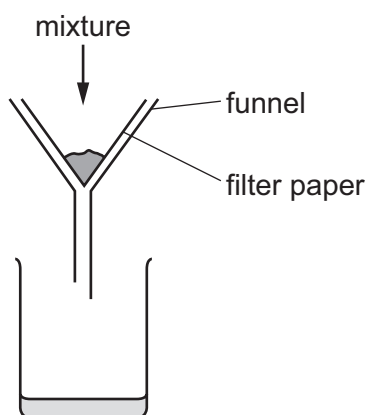
## 2

- 1 The melting points and boiling points of four elements are shown.

| element | melting point/ $^{\circ}\text{C}$ | boiling point/ $^{\circ}\text{C}$ |
|---------|-----------------------------------|-----------------------------------|
| W       | -7                                | 60                                |
| X       | -101                              | -34                               |
| Y       | 114                               | 184                               |
| Z       | 39                                | 688                               |

In which elements do the particles vibrate about fixed positions at  $0^{\circ}\text{C}$ ?

- A** W and X      **B** W and Z      **C** X and Y      **D** Y and Z
- 2 The apparatus used to separate a mixture is shown.



What is the mixture?

- A** aqueous calcium chloride and aqueous calcium nitrate  
**B** calcium carbonate and aqueous calcium chloride  
**C** ethanol and water  
**D** sand and calcium carbonate
- 3 During an experiment a measurement is recorded in  $\text{cm}^3$ .

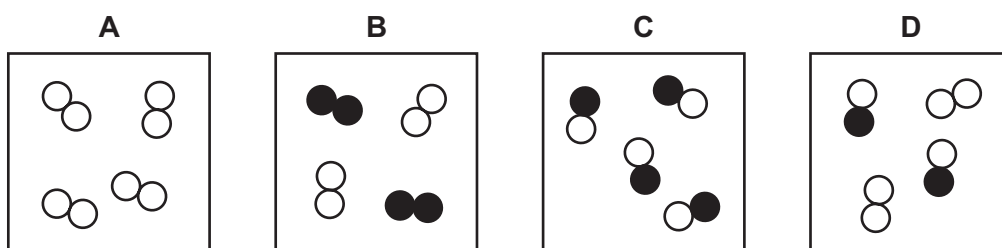
Which apparatus is used?

- A** balance  
**B** measuring cylinder  
**C** stopclock  
**D** thermometer

- 4 Substance Q boils at  $445^{\circ}\text{C}$  and is a yellow solid at room temperature.

Which temperature could be the melting point of pure Q?

- A  $-9^{\circ}\text{C}$   
 B  $72^{\circ}\text{C}$  to  $78^{\circ}\text{C}$   
 C  $116^{\circ}\text{C}$   
 D  $116^{\circ}\text{C}$  to  $126^{\circ}\text{C}$
- 5 Which diagram shows a mixture of an element and a compound?



- 6 Which pair of atoms contains the same number of neutrons?

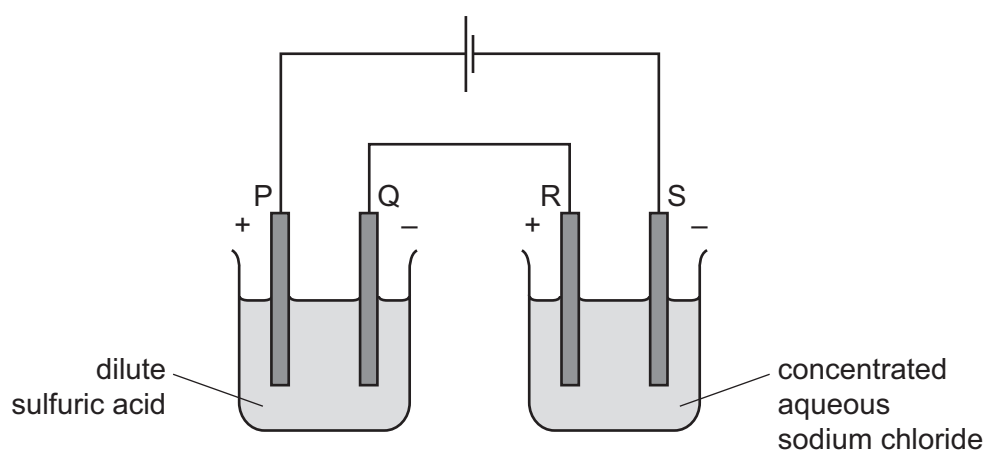
- A  ${}_{27}^{59}\text{Co}$  and  ${}_{28}^{59}\text{Ni}$   
 B  ${}_{29}^{64}\text{Cu}$  and  ${}_{29}^{65}\text{Cu}$   
 C  ${}_{29}^{64}\text{Cu}$  and  ${}_{30}^{65}\text{Zn}$   
 D  ${}_{29}^{65}\text{Cu}$  and  ${}_{30}^{65}\text{Zn}$

- 7 In which row do the properties described match the type of bonding?

|          | melting point | electrical conductivity when liquid | type of bonding |
|----------|---------------|-------------------------------------|-----------------|
| <b>A</b> | high          | does not conduct                    | ionic           |
| <b>B</b> | low           | conducts                            | covalent        |
| <b>C</b> | low           | conducts                            | ionic           |
| <b>D</b> | low           | does not conduct                    | covalent        |

- 8 Which statement explains why graphite is used a lubricant?
- A** All bonds between the atoms are weak.
- B** It conducts electricity.
- C** It has a low melting point.
- D** Layers in the structure can slide over each other.
- 9 What is the relative formula mass of magnesium nitrate,  $\text{Mg}(\text{NO}_3)_2$ ?
- A** 74                      **B** 86                      **C** 134                      **D** 148

- 10 The diagram shows the electrolysis of two solutions using inert electrodes.



Which substance is made at each electrode?

|          | P        | Q        | R        | S        |
|----------|----------|----------|----------|----------|
| <b>A</b> | hydrogen | oxygen   | chlorine | sodium   |
| <b>B</b> | hydrogen | oxygen   | sodium   | chlorine |
| <b>C</b> | oxygen   | hydrogen | chlorine | hydrogen |
| <b>D</b> | oxygen   | hydrogen | hydrogen | chlorine |

11 Two chemical processes are described.

- During the combustion of ethanol, energy is .....1..... .
- During the electrolysis of aqueous sodium chloride, energy is .....2..... .

Which words complete gaps 1 and 2?

|          | 1         | 2         |
|----------|-----------|-----------|
| <b>A</b> | given out | given out |
| <b>B</b> | given out | taken in  |
| <b>C</b> | taken in  | given out |
| <b>D</b> | taken in  | taken in  |

12 Water is added to anhydrous copper(II) sulfate in a test-tube.

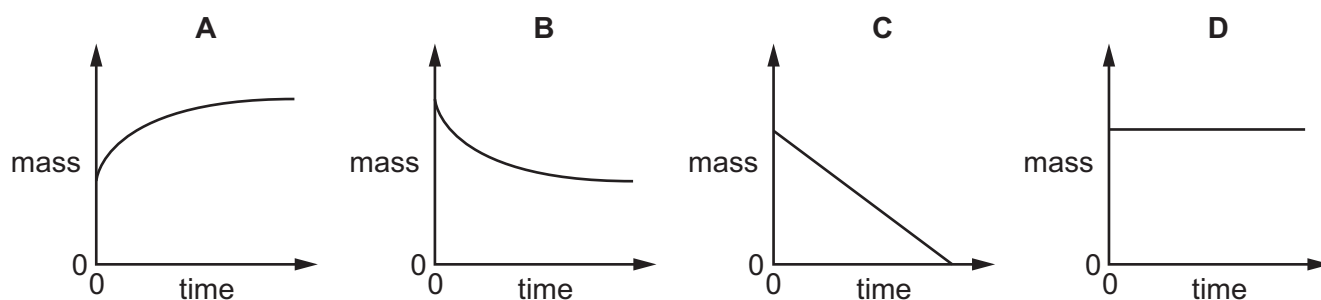
The mixture becomes hot.

Which type of reaction and energy level diagram apply to this reaction?

|          | type of reaction | energy level diagram |
|----------|------------------|----------------------|
| <b>A</b> | endothermic      |                      |
| <b>B</b> | endothermic      |                      |
| <b>C</b> | exothermic       |                      |
| <b>D</b> | exothermic       |                      |

13 The mass of a beaker and its contents is plotted against time.

Which graph represents what happens when sodium carbonate reacts with an excess of dilute hydrochloric acid in an open beaker?



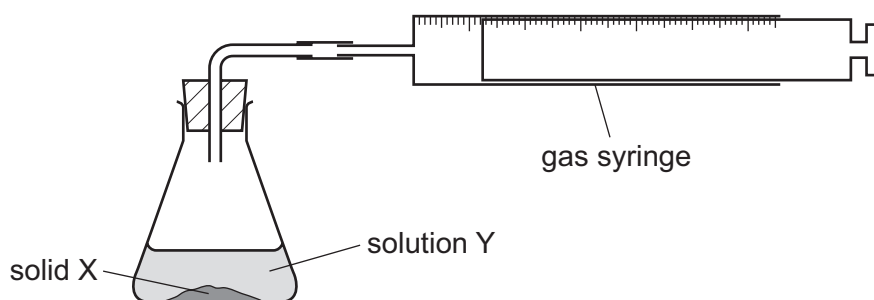
14 When blue copper(II) sulfate is heated, a white solid and water are formed.

The white solid turns blue and gives out heat when water is added to it.

Which terms describe the blue copper(II) sulfate and the reactions?

|          | the blue copper(II) sulfate is | reactions          |
|----------|--------------------------------|--------------------|
| <b>A</b> | a mixture                      | can be reversed    |
| <b>B</b> | a mixture                      | cannot be reversed |
| <b>C</b> | hydrated                       | can be reversed    |
| <b>D</b> | hydrated                       | cannot be reversed |

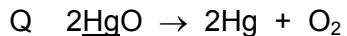
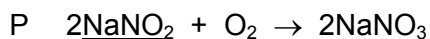
- 15 An experiment was carried out to find the rate of reaction when 1 g of solid X reacts with 100 cm<sup>3</sup> of solution Y.



The experiment took place too quickly for measurements to be made.

Which change could be made to slow down the reaction?

- A add a catalyst
  - B decrease the concentration of solution Y
  - C decrease the particle size of solid X
  - D increase the temperature
- 16 The equations for two reactions P and Q are given.



In which of these reactions does oxidation of the underlined substance occur?

|   | P | Q |
|---|---|---|
| A | ✓ | ✓ |
| B | ✓ | x |
| C | x | ✓ |
| D | x | x |

- 17 What is **not** a typical characteristic of acids?

- A They react with alkalis producing water.
- B They react with **all** metals producing hydrogen.
- C They react with carbonates producing carbon dioxide.
- D They turn blue litmus paper red.

18 Elements Q and R both burn in air.

The oxides formed both dissolve in water.

The solution of the oxide formed from element Q turns Universal Indicator red.

The solution of the oxide formed from element R turns Universal Indicator blue.

What are Q and R?

|   | Q      | R         |
|---|--------|-----------|
| A | carbon | sulfur    |
| B | sodium | magnesium |
| C | sodium | sulfur    |
| D | sulfur | sodium    |

19 Copper(II) sulfate can be prepared by adding excess copper(II) carbonate to sulfuric acid.

Why is an **excess** of copper(II) carbonate added?

- A to ensure all the copper(II) carbonate has reacted
- B to ensure all the sulfuric acid has reacted
- C to increase the rate of reaction
- D to increase the yield of copper(II) sulfate

20 Compound P reacts with hydrochloric acid to produce a gas that turns limewater milky.

What is P?

- A sodium carbonate
- B sodium chloride
- C sodium hydroxide
- D sodium sulfate

21 Which statement about nitrogen and phosphorus is **not** correct?

- A Both are in the same group of the Periodic Table.
- B Both are in the same period of the Periodic Table.
- C Both are non-metals.
- D Both have the same number of electrons in their outer shell.



22 Sodium and rubidium are elements in Group I of the Periodic Table.

Which statement is correct?

- A Sodium atoms have more electrons than rubidium atoms.
- B Sodium has a lower density than rubidium.
- C Sodium has a lower melting point than rubidium.
- D Sodium is more reactive than rubidium.

23 Which properties do the elements chromium, iron and vanadium have in common?

- 1 They all conduct electricity.
- 2 They, or their compounds, can act as catalysts.
- 3 They all form coloured compounds.

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

24 Why is argon gas used to fill electric lamps?

- A It conducts electricity.
- B It glows when heated.
- C It is less dense than air.
- D It is not reactive.

25 What is a property of **all** metals?

- A conduct electricity
- B hard
- C low melting points
- D react with water

26 Which process is used to extract iron from hematite in the blast furnace?

- A electrolysis
- B reduction with carbon monoxide
- C reduction with lime
- D thermal decomposition

27 Some reactions of three metals are listed in the table.

| metal | metal reacts with dilute hydrochloric acid | metal oxide is reduced by carbon |
|-------|--|----------------------------------|
| P     | yes  | yes                              |
| Q     | yes  | no                               |
| R     | no   | yes                              |

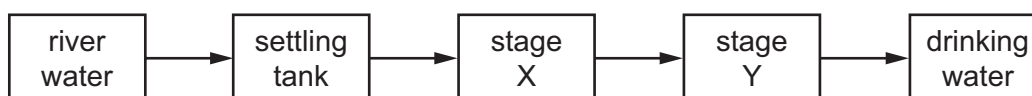
What is the order of reactivity of the metals?

|          | most reactive | → | least reactive |
|----------|---------------|---|----------------|
| <b>A</b> | P             | Q | R              |
| <b>B</b> | P             | R | Q              |
| <b>C</b> | Q             | P | R              |
| <b>D</b> | R             | P | Q              |

28 Which uses of the metals shown are both correct?

|          | aluminium       | copper            |
|----------|-----------------|-------------------|
| <b>A</b> | aircraft bodies | electrical wiring |
| <b>B</b> | car bodies      | aircraft bodies   |
| <b>C</b> | chemical plant  | cooking utensils  |
| <b>D</b> | food containers | chemical plant    |

29 The flow chart shows stages in the treatment of river water to produce drinking water.



What occurs at stages X and Y?

|          | X            | Y            |
|----------|--------------|--------------|
| <b>A</b> | distillation | chlorination |
| <b>B</b> | distillation | filtration   |
| <b>C</b> | filtration   | chlorination |
| <b>D</b> | filtration   | distillation |

30 Which element in Group VI is a component of air?

- A argon
- B nitrogen
- C oxygen
- D sulfur

31 Iron is a metal that rusts in the presence of oxygen and water.

Mild steel is used for .....1..... and is prevented from rusting by .....2..... .

Stainless steel does not rust. It is produced by .....3..... iron with another metal.

Which words complete gaps 1, 2 and 3?

|   | 1          | 2        | 3        |
|---|------------|----------|----------|
| A | car bodies | greasing | covering |
| B | car bodies | painting | mixing   |
| C | cutlery    | greasing | covering |
| D | cutlery    | painting | mixing   |

32 A chemical reaction is carried out on substance X.

A gas is produced that turns red litmus paper blue.

What is this reaction?

- A the reaction of an acid with a metal carbonate
- B the reaction of an acid with an ammonium salt
- C the reaction of an alkali with a metal carbonate
- D the reaction of an alkali with an ammonium salt

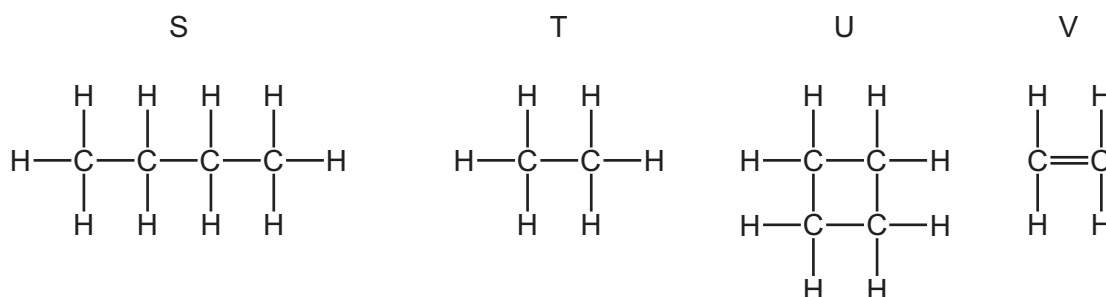
- 33 Some marble chips (calcium carbonate) are heated strongly and substances X and Y are formed.

Substance X is a white solid that reacts with water, giving out heat. Substance Y is a colourless gas.

What are substances X and Y?

|          | X                 | Y              |
|----------|-------------------|----------------|
| <b>A</b> | calcium chloride  | oxygen         |
| <b>B</b> | calcium hydroxide | carbon dioxide |
| <b>C</b> | calcium oxide     | carbon dioxide |
| <b>D</b> | calcium sulfate   | oxygen         |

- 34 The structures of four organic compounds are shown.



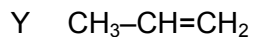
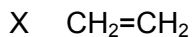
Which compounds are unsaturated?

- A** S only      **B** T and U      **C** U only      **D** V only
- 35 Which statement is **not** correct?
- A** Petroleum is a mixture of hydrocarbons.
- B** The main constituent of natural gas is ethane.
- C** The naphtha fraction of petroleum is used for making chemicals.
- D** When natural gas burns in air, carbon dioxide and water are formed.

- 36 Which equation represents the complete combustion of butane,  $\text{C}_4\text{H}_{10}$ ?

- A**  $2\text{C}_4\text{H}_{10} + 5\text{O}_2 \rightarrow 8\text{C} + 10\text{H}_2\text{O}$
- B**  $2\text{C}_4\text{H}_{10} + 9\text{O}_2 \rightarrow 8\text{CO} + 10\text{H}_2\text{O}$
- C**  $2\text{C}_4\text{H}_{10} + 13\text{O}_2 \rightarrow 8\text{CO}_2 + 10\text{H}_2\text{O}$
- D**  $\text{C}_4\text{H}_{10} + 4\text{O}_2 \rightarrow 4\text{CO}_2 + 5\text{H}_2$

37 X, Y and Z are three hydrocarbons.



What do compounds X, Y and Z have in common?

- 1 They are all alkenes.
- 2 They are all part of the same homologous series.
- 3 They all have the same boiling point.

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

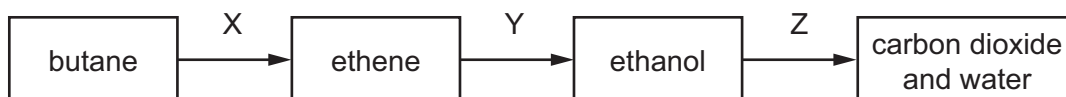
38 The table shows bonds that are present and bonds that are not present in compound X.

| bond |   |
|------|---|
| C–C  | ✓ |
| C=C  | x |
| C–H  | ✓ |
| C–O  | ✓ |
| C=O  | ✓ |
| O–H  | ✓ |

What type of compound is X?

- A** a carboxylic acid  
**B** an alcohol  
**C** an alkane  
**D** an alkene

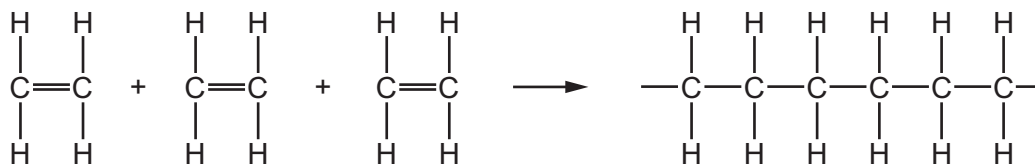
39 The diagram shows a reaction sequence.



Which row names the processes X, Y and Z?

|          | X            | Y            | Z           |
|----------|--------------|--------------|-------------|
| <b>A</b> | cracking     | fermentation | respiration |
| <b>B</b> | cracking     | hydration    | combustion  |
| <b>C</b> | distillation | fermentation | respiration |
| <b>D</b> | distillation | hydration    | combustion  |

40 Molecules of a substance react together as shown.



Which type of reaction has taken place?

- A cracking
- B oxidation
- C polymerisation
- D reduction

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## The Periodic Table of Elements

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

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