



# Cambridge IGCSE™

## CHEMISTRY

0620/12

Paper 1 Multiple Choice (Core)

October/November 2022

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.

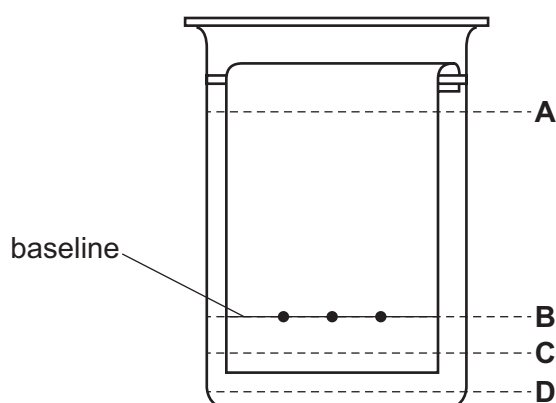
## INFORMATION

- 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.

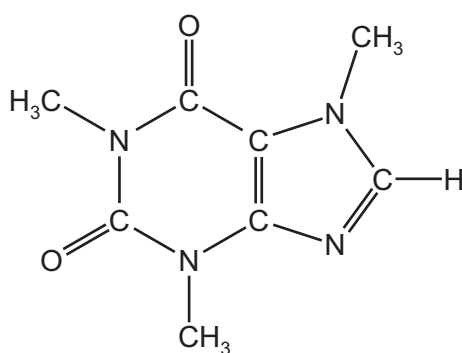


- 1 Which statement describes the particles in a liquid?
- A** They are close together but have no regular arrangement.  
**B** They are densely packed in a regular order.  
**C** They move freely at high speed and are widely spaced.  
**D** They vibrate but do not move from a fixed position.
- 2 The apparatus used in a chromatography experiment is shown.
- Which line shows the starting depth of the solvent in the beaker?



- 3 Filtration is used to separate mixtures.
- Which type of mixture is separated by filtration?
- A** an insoluble solid from a liquid  
**B** a liquid solvent from a solution  
**C** a dissolved solid from a solution  
**D** a liquid from a mixture of liquids
- 4 How many neutrons are present in one atom of  $^{35}_{17}\text{Cl}$ ?
- A** 17                      **B** 18                      **C** 35                      **D** 52
- 5 Which statement about an alloy is correct?
- A** It is a compound made of two or more elements, one of which is a metal.  
**B** It is a layer of a metal plated onto another metal.  
**C** It is a mixture of a metal with one or more other elements.  
**D** It is a single element.

- 6 Which statement about compounds is correct?
- A** Covalent compounds are less volatile than ionic compounds.  
**B** Covalent compounds conduct electricity when they are solid.  
**C** Ionic compounds conduct electricity when molten.  
**D** Ionic compounds are insoluble in water.
- 7 Which statement explains why diamond is used in cutting tools?
- A** It has no free electrons.  
**B** It has a high melting point.  
**C** It is colourless.  
**D** It is hard.
- 8 Caffeine is a stimulant found in coffee.

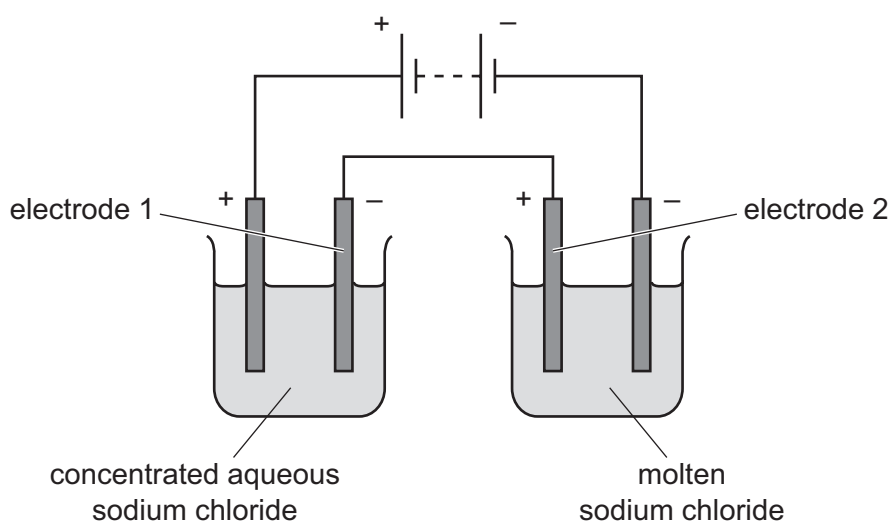


caffeine

Which formula represents caffeine?

- A**  $C_7H_{10}N_4O_2$       **B**  $C_8H_{10}N_3O_2$       **C**  $C_8H_{10}N_4O_2$       **D**  $C_8H_{11}N_4O_2$
- 9 What is the relative formula mass of ammonium sulfate,  $(NH_4)_2SO_4$ ?
- A** 63                      **B** 114                      **C** 118                      **D** 132

- 10 The electrolysis of concentrated aqueous sodium chloride and molten sodium chloride is shown.



What are the products at electrodes 1 and 2?

|          | electrode 1 | electrode 2 |
|----------|-------------|-------------|
| <b>A</b> | chlorine    | chlorine    |
| <b>B</b> | hydrogen    | chlorine    |
| <b>C</b> | hydrogen    | sodium      |
| <b>D</b> | sodium      | sodium      |

- 11 When an acid is added to an alkali, the temperature of the reaction mixture rises.

Which words describe this reaction?

- A** decomposition and endothermic
- B** decomposition and exothermic
- C** neutralisation and endothermic
- D** neutralisation and exothermic

12 Some properties of four fuels are shown.

Which fuel is a gas at room temperature and makes two products when it burns in a plentiful supply of air?

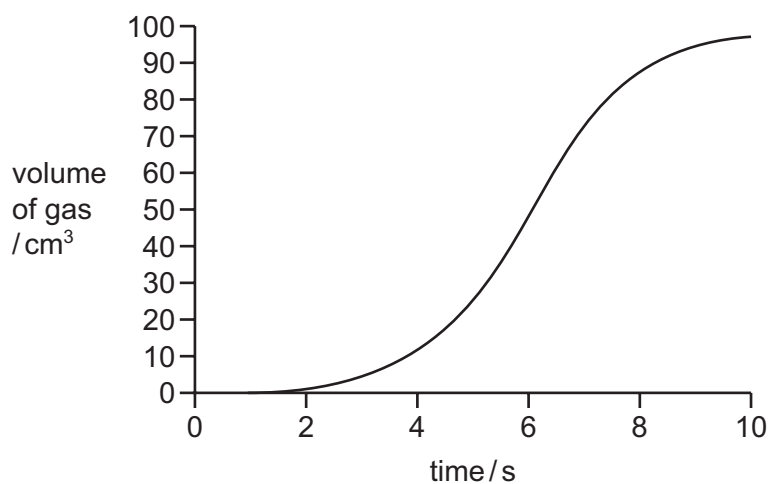
|          | fuel     | formula                         | melting point / °C | boiling point / °C |
|----------|----------|---------------------------------|--------------------|--------------------|
| <b>A</b> | hydrogen | H <sub>2</sub>                  | −259               | −253               |
| <b>B</b> | methane  | CH <sub>4</sub>                 | −182               | −164               |
| <b>C</b> | octane   | C <sub>8</sub> H <sub>18</sub>  | −57                | 126                |
| <b>D</b> | wax      | C <sub>31</sub> H <sub>64</sub> | 60                 | 400                |

13 Which process is a physical change?

- A** burning wood
- B** cooking an egg
- C** melting an ice cube
- D** rusting iron

14 The volume of gas given off in a chemical reaction is measured over time.

The results are shown.



At which time is the rate of reaction greatest?

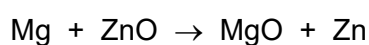
- A** 0 s
- B** 4 s
- C** 6 s
- D** 10 s

15 Which row describes the colours of the named salts?

|          | hydrated<br>copper(II) sulfate | hydrated<br>cobalt(II) chloride | anhydrous<br>copper(II) sulfate | anhydrous<br>cobalt(II) chloride |
|----------|--------------------------------|---------------------------------|---------------------------------|----------------------------------|
| <b>A</b> | blue                           | blue                            | white                           | pink                             |
| <b>B</b> | blue                           | pink                            | white                           | blue                             |
| <b>C</b> | white                          | blue                            | blue                            | pink                             |
| <b>D</b> | white                          | pink                            | blue                            | white                            |

16 When magnesium is heated with zinc oxide a reaction occurs.

The equation is shown.



Which substance is oxidised?

- A** magnesium
- B** magnesium oxide
- C** zinc
- D** zinc oxide

17 X and Y are oxides of two different elements.

- X reacts with water to produce aqueous solution Z.
- Z turns universal indicator paper blue.
- An aqueous solution of Y reacts with sodium carbonate to produce carbon dioxide gas.

Which statement is correct?

- A** X and Y are both the oxides of metals.
- B** X and Y are both the oxides of non-metals.
- C** X is the oxide of a metal and Y is the oxide of a non-metal.
- D** X is the oxide of a non-metal and Y is the oxide of a metal.

- 18** Copper(II) sulfate is made by reacting excess insoluble solid M and solution N.

Which row identifies M and N and the method used to extract crystals of copper(II) sulfate from the mixture?

|          | M                    | N              | method                                                              |
|----------|----------------------|----------------|---------------------------------------------------------------------|
| <b>A</b> | copper               | sodium sulfate | crystals are filtered out from the mixture                          |
| <b>B</b> | copper               | sulfuric acid  | mixture is filtered and the filtrate evaporated until crystals form |
| <b>C</b> | copper(II) carbonate | sulfuric acid  | mixture is filtered and the filtrate evaporated until crystals form |
| <b>D</b> | copper(II) oxide     | sulfuric acid  | mixture is filtered and the residue dried                           |

- 19** Which row shows the observation when a few drops of aqueous P is added to concentrated aqueous Q?

|          | P                                  | Q                   | observation       |
|----------|------------------------------------|---------------------|-------------------|
| <b>A</b> | acidified potassium manganate(VII) | sodium sulfite      | purple solution   |
| <b>B</b> | sodium hydroxide                   | zinc chloride       | white precipitate |
| <b>C</b> | ammonia                            | potassium carbonate | fizzing           |
| <b>D</b> | barium chloride                    | iron(III) sulfate   | brown precipitate |

- 20** Which statement about the Periodic Table is correct?

- A** Elements in the same group have the same number of electron shells.
- B** Elements are arranged in order of increasing proton number.
- C** Metals are on the right and non-metals are on the left.
- D** The most reactive elements are at the bottom of every group.

- 21** Elements J and K are in the same period in the Periodic Table.

J reacts with acids to produce a salt and hydrogen.

K reacts with sodium to form an ionic compound.

Which statement about J and K is correct?

- A** An atom of J has more electrons than an atom of K.
- B** J and K are both metals.
- C** J and K are both non-metals.
- D** J is to the left of K in the Periodic Table.

- 22** Part of the Periodic Table is shown.

Which element has a high density, a high melting point and forms a brown oxide?

A simplified periodic table grid is shown. The grid is composed of several rows and columns of squares. The elements are marked as follows:

- A** is in the top-left corner (row 1, column 1).
- B** is in the middle row (row 4), column 6.
- C** is in the bottom row (row 5), column 1.
- D** is in the second row from the bottom (row 4), column 10.

There are also empty squares in the top row (column 2), the middle row (column 1), and the bottom row (columns 2 through 10).

- 23** Gas G has 10 electrons. Gas H has eight more electrons than gas G. Both gases are monoatomic.

Which statement about G and H is correct?

- A** Both gases are in the same group of the Periodic Table.
- B** Both gases are in the same period of the Periodic Table.
- C** Both gases are very reactive.
- D** Gas G has a higher atomic mass than gas H.

- 24** Which property is correct for all metals?

- A** They are good conductors of electricity.
- B** They are hard.
- C** They have high melting points.
- D** They react with dilute acids.

**25** Silver is below copper in the reactivity series.

Which row describes the reactions of silver?

|          | reaction with steam            | reaction with dilute hydrochloric acid |
|----------|--------------------------------|----------------------------------------|
| <b>A</b> | no reaction                    | no reaction                            |
| <b>B</b> | no reaction                    | reacts to produce hydrogen gas         |
| <b>C</b> | reacts to produce hydrogen gas | no reaction                            |
| <b>D</b> | reacts to produce hydrogen gas | reacts to produce hydrogen gas         |

**26** Which types of reaction do hematite and limestone undergo in the blast furnace?

|          | hematite              | limestone             |
|----------|-----------------------|-----------------------|
| <b>A</b> | reduction             | reduction             |
| <b>B</b> | reduction             | thermal decomposition |
| <b>C</b> | thermal decomposition | reduction             |
| <b>D</b> | thermal decomposition | thermal decomposition |

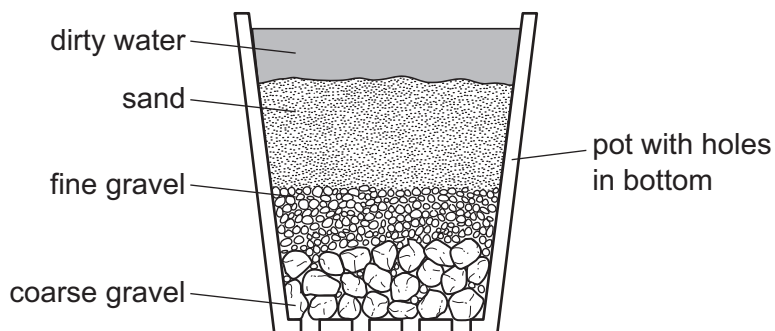
**27** Some properties and uses of different metals are shown.

|   | metal           | property                      | use               |
|---|-----------------|-------------------------------|-------------------|
| 1 | aluminium       | low density                   | aircraft          |
| 2 | copper          | good conductor of electricity | electrical wiring |
| 3 | copper          | poor conductor of heat        | cooking utensils  |
| 4 | stainless steel | corrodes easily               | cutlery           |

Which rows link a use of the metal to its stated property?

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

28 The diagram shows a stage in the purification of dirty water.



Which process does this apparatus show?

- A chlorination
  - B condensation
  - C distillation
  - D filtration
- 29 Which substance in polluted air damages stonework and kills trees?
- A carbon dioxide
  - B carbon monoxide
  - C lead compounds
  - D sulfur dioxide
- 30 Ammonium nitrate,  $\text{NH}_4\text{NO}_3$ , is a fertiliser and is added to fields to help crops grow.

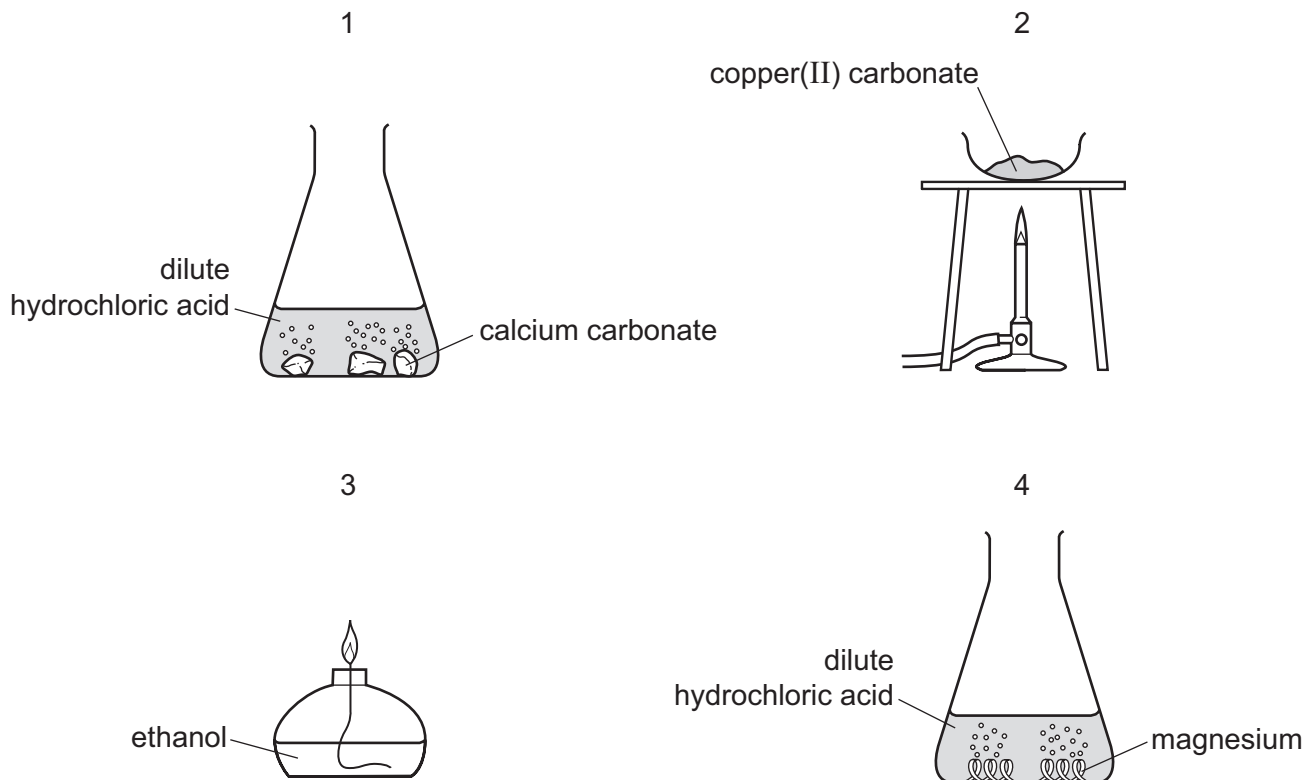
Slaked lime,  $\text{Ca}(\text{OH})_2$ , is an alkali and is added to fields to reduce the acidity of the soil.

Ammonium nitrate and slaked lime should not be added to a field at the same time because they react with each other to form a gas, Z.

What is Z?

- A ammonia
- B hydrogen
- C nitrogen
- D oxygen

31 Four reactions are shown.



Which reactions produce water?

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

32 Which element has an oxide that is used as a food preservative?

- A** helium  
**B** hydrogen  
**C** iron  
**D** sulfur

33 Which substance gives off carbon dioxide on heating?

- A** lime  
**B** limestone  
**C** limewater  
**D** slaked lime

**34** Which statement about both ethane and ethanol is correct?

- A** They are hydrocarbons.
- B** They contain oxygen.
- C** They contain the same number of atoms.
- D** They produce water when burned.

**35** Fuel oil and naphtha are two fractions obtained from petroleum.

What are the major uses of these fractions?

|          | fuel oil  | naphtha          |
|----------|-----------|------------------|
| <b>A</b> | jet fuel  | making chemicals |
| <b>B</b> | jet fuel  | making roads     |
| <b>C</b> | ship fuel | making chemicals |
| <b>D</b> | ship fuel | making roads     |

**36** Which homologous series of compounds reacts to form an addition polymer?

- A** alcohols
- B** alkanes
- C** alkenes
- D** carboxylic acids

**37** What is the total number of shared electrons in ethane,  $C_2H_6$ ?

- A** 6                      **B** 7                      **C** 12                      **D** 14

**38** Which process produces ethanol from glucose?

- A** catalytic addition
- B** cracking
- C** fermentation
- D** polymerisation

39 Which statement about unsaturated hydrocarbons is correct?

- A  $\text{CH}_3\text{CH}_2\text{CH}=\text{CHCH}_3$  is an unsaturated hydrocarbon.
- B Ethene has more hydrogen atoms per molecule than ethane.
- C Unsaturated hydrocarbons have double bonds between carbon and hydrogen atoms.
- D Unsaturated hydrocarbons turn aqueous bromine from colourless to brown.

40 An organic compound X contains two carbon atoms in each molecule.

X reacts with aqueous sodium carbonate to give carbon dioxide.

What is compound X?

- A ethanol
- B ethane
- C  $\text{CH}_2=\text{CH}_2$
- D  $\text{CH}_3\text{COOH}$

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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 | 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

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