Cambridge Assessment International Education

# Cambridge IGCSE™

**CHEMISTRY** **0620/11**

Paper 1 Multiple Choice (Core) **May/June 2020**

**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. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Blank pages are indicated.


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**1** Nitrogen is heated in a balloon, which expands slightly.

Which statements about the molecules of nitrogen are correct?

1 They move further apart.

2 They move more quickly.

3 They remain the same distance apart.

4 Their speed remains unchanged.

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

**2** Which piece of apparatus should be used to measure exactly 21.4 $cm^3$ of water?

**A** 25 $cm^3$ beaker

**B** 25 $cm^3$ pipette

**C** 50 $cm^3$ burette

**D** 50 $cm^3$ measuring cylinder

**3** Which method of separation is used to separate a soluble solid from its solution?

**A** chromatography

**B** condensation

**C** crystallisation

**D** filtration

**4** The atomic number and nucleon number of a potassium atom are shown.

| | potassium atom |
|---|---|
| atomic number | 19 |
| nucleon number | 39 |

How many protons, neutrons and electrons are in a potassium ion, $K^+$?

| | protons | neutrons | electrons |
|---|---|---|---|
| **A** | 19 | 20 | 18 |
| **B** | 19 | 20 | 20 |
| **C** | 20 | 19 | 18 |
| **D** | 20 | 19 | 19 |

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**5** Sodium is in Group I of the Periodic Table.

Chlorine is in Group VII of the Periodic Table.

Sodium and chlorine combine to form a compound.

Which statement about the combination of sodium and chlorine atoms is correct?

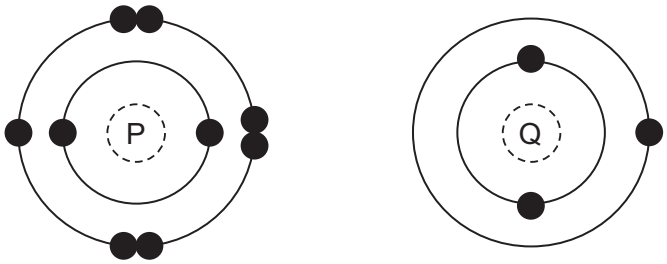
**A** Both sodium and chlorine lose electrons.

**B** Both sodium and chlorine gain electrons.

**C** Sodium loses electrons and chlorine gains electrons.

**D** Sodium gains electrons and chlorine loses electrons.

**6** The electronic structures of two atoms, P and Q, are shown.



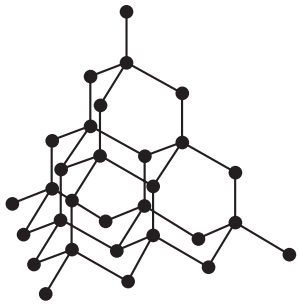

P and Q combine together to form a compound.

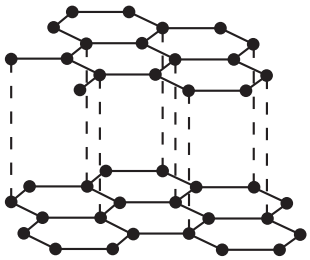
What is the type of bonding in the compound and what is the formula of the compound?

| | type of bonding | formula |
|---|---|---|
| **A** | ionic | PQ |
| **B** | ionic | $PQ_2$ |
| **C** | covalent | $PQ_2$ |
| **D** | covalent | PQ |

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**7** The structures of diamond and graphite are shown.





Which statement about diamond and graphite is correct?

**A** Diamond and graphite have low melting points.

**B** Diamond and graphite have mobile electrons.

**C** Diamond and graphite have layered structures.

**D** Diamond and graphite contain strong covalent bonds between carbon atoms.

**8** Aluminium oxide has the formula $Al_2O_3$.

Which statement about aluminium oxide is correct?

**A** 2 g of aluminium atoms are combined with 3 g of oxygen atoms.

**B** 2 g of aluminium atoms are combined with 3 g of oxygen molecules.

**C** Aluminium oxide has a relative formula mass of 102.

**D** Pure aluminium oxide contains a higher mass of oxygen than of aluminium.

**9** Which products are formed when dilute sulfuric acid undergoes electrolysis?

| | at the anode | at the cathode |
|---|---|---|
| **A** | oxygen | hydrogen |
| **B** | hydrogen | oxygen |
| **C** | sulfur dioxide | hydrogen |
| **D** | oxygen | sulfur dioxide |

**10** Which element is **not** used as a fuel?

**A** carbon

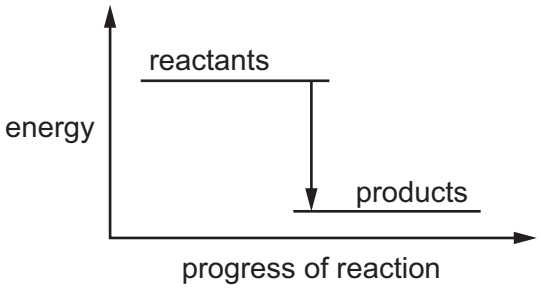
**B** helium

**C** hydrogen

**D** uranium

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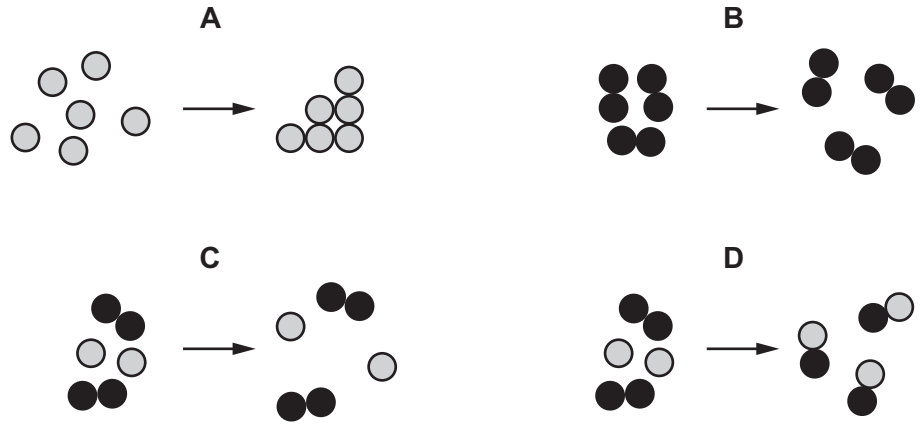
**11** The energy level diagram shows the energy of the reactants and products in a chemical reaction.




Which row correctly describes the energy change and the type of reaction shown?

| | description of energy change | type of reaction |
|---|---|---|
| **A** | energy is given out to the surroundings | endothermic |
| **B** | energy is given out to the surroundings | exothermic |
| **C** | energy is taken in from the surroundings | endothermic |
| **D** | energy is taken in from the surroundings | exothermic |

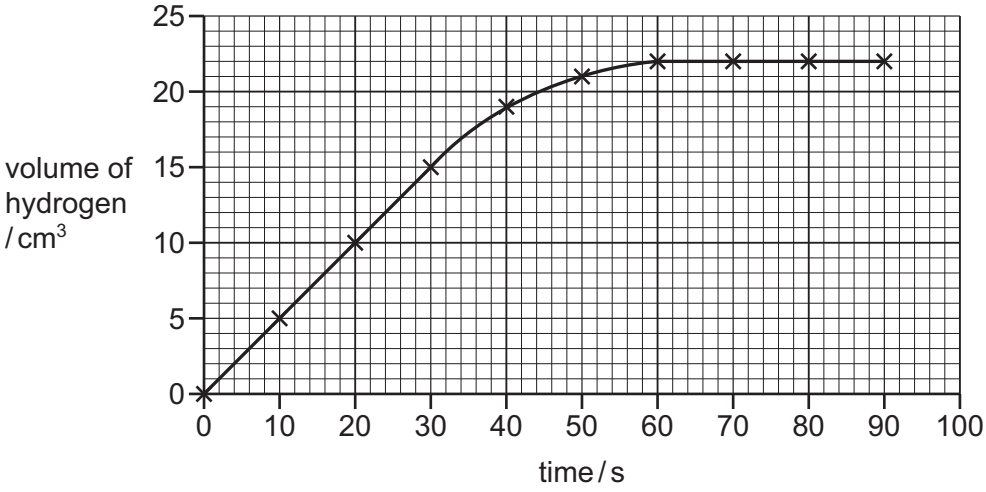
**12** Which diagram represents a chemical change?



**13** The rate of reaction between magnesium and hydrochloric acid is investigated.

The volume of hydrogen given off at different times is measured.

The results are shown.




Which conclusions are correct?

1 The rate is fastest between 0 and 20 seconds.

2 The maximum volume of hydrogen given off is 22 $cm^3$.

3 At 40 seconds, 20 $cm^3$ of hydrogen is given off.

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

**14** Which reaction can be easily reversed?

**A** dissolving zinc in hydrochloric acid

**B** fermenting glucose with yeast

**C** heating hydrated cobalt(II) chloride

**D** the rusting of an iron nail

**15** Carbon reacts with silver oxide to form carbon dioxide and silver.

Which substance is reduced?

**A** carbon

**B** carbon dioxide

**C** silver

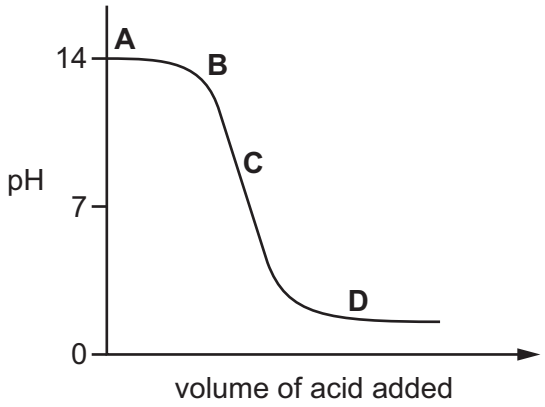
**D** silver oxide

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**16** The graph shows how the pH of a solution changes as an acid is added to an alkali.

$$\text{acid} + \text{alkali} \rightarrow \text{salt} + \text{water}$$

Which letter represents the area of the graph where both acid and salt are present?




**17** Phosphorus is an element in Group V of the Periodic Table.

It burns in air to form an oxide, which dissolves in water to form a solution with a pH of 1.

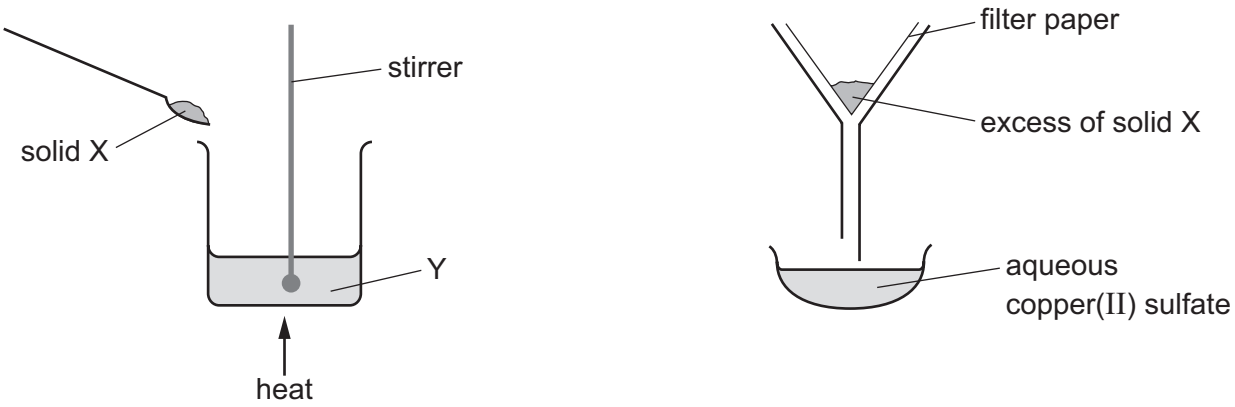
Which row describes this oxide of phosphorus?

| | metal oxide | non-metal oxide | acidic oxide | basic oxide |
|---|---|---|---|---|
| **A** | ✓ | ✗ | ✓ | ✗ |
| **B** | ✓ | ✗ | ✗ | ✓ |
| **C** | ✗ | ✓ | ✓ | ✗ |
| **D** | ✗ | ✓ | ✗ | ✓ |

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**[Turn over**

**18** The apparatus shown is used to prepare aqueous copper(II) sulfate.




What are X and Y?

| | X | Y |
|---|---|---|
| **A** | copper | aqueous iron(II) sulfate |
| **B** | copper(II) chloride | dilute sulfuric acid |
| **C** | copper(II) oxide | dilute sulfuric acid |
| **D** | sulfur | aqueous copper(II) chloride |

**19** Two tests are carried out on substance Z.

test 1 A flame test produces a red flame.

test 2 Z is dissolved in water and dilute nitric acid is added, followed by aqueous silver nitrate. A yellow precipitate is produced.

What is substance Z?

**A** lithium bromide

**B** lithium iodide

**C** sodium bromide

**D** sodium iodide

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**20** The elements in Period 3 of the Periodic Table are shown.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Na | Mg | A*l* | Si | P | S | C*l* | Ar |

Which statements about the elements in Period 3 are correct?

1 Na, Mg and A*l* are metals.

2 S, C*l* and Ar are non-metals.

3 Si, P and S are metals.

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

**21** A Group I metal (lithium, sodium or potassium) is reacted with a Group VII element (chlorine, bromine or iodine).

Which compound is formed when the Group I metal of highest density reacts with the Group VII element of lowest density?

**A** lithium chloride

**B** potassium chloride

**C** potassium iodide

**D** lithium iodide

**22** The properties of the element titanium, Ti, can be predicted from its position in the Periodic Table.

Which row identifies the properties of titanium?

| | can be used as a catalyst | conducts electricity when solid | has low density | forms coloured compounds |
|---|---|---|---|---|
| **A** | ✓ | ✓ | ✓ | ✗ |
| **B** | ✓ | ✓ | ✗ | ✓ |
| **C** | ✓ | ✗ | ✓ | ✓ |
| **D** | ✗ | ✓ | ✓ | ✓ |

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**23** A balloon is filled with helium. Helium is a noble gas and makes the balloon rise up in the air.

The density of air is 1.23 g / $dm^3$.

Which gas is helium?

| | density in g / $dm^3$ | reaction with oxygen |
|---|---|---|
| **A** | 0.0899 | burns rapidly |
| **B** | 0.179 | does not react with oxygen |
| **C** | 1.78 | does not react with oxygen |
| **D** | 3.75 | does not react with oxygen |

**24** Which property is shown by **all** metals?

**A** They are extracted from their ores by heating with carbon.

**B** They conduct electricity.

**C** They form acidic oxides.

**D** They react with hydrochloric acid to form hydrogen.

**25** The properties of four metals, W, X, Y and Z, are shown.

W It does not react with cold water but reacts with steam.

X It does not react with water or dilute acid but the oxide of X is reduced by carbon.

Y The oxide of Y is not reduced by carbon but Y reacts vigorously with cold water.

Z It does not react with water or steam but reacts with dilute acid.

What is the order of reactivity of the elements starting with the most reactive?

| | most reactive → | | | least reactive |
|---|---|---|---|---|
| **A** | X | W | Z | Y |
| **B** | X | Z | W | Y |
| **C** | Y | W | Z | X |
| **D** | Y | Z | W | X |

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**26** Molten iron from the blast furnace contains impurities.

The process of turning the impure iron into steel involves blowing oxygen into the molten iron and adding calcium oxide.

What are the reasons for blowing in oxygen and adding calcium oxide?

| | blowing in oxygen | adding calcium oxide |
|---|---|---|
| **A** | carbon is removed by reacting with oxygen | reacts with acidic impurities making slag |
| **B** | carbon is removed by reacting with oxygen | reacts with slag and so removes it |
| **C** | iron reacts with the oxygen | reacts with acidic impurities making slag |
| **D** | iron reacts with the oxygen | reacts with slag and so removes it |

**27** Which row describes two uses of the named steel?

| | type of steel | uses |
|---|---|---|
| **A** | mild steel | cutlery and car bodies |
| **B** | mild steel | car bodies and chemical plant |
| **C** | stainless steel | cutlery and chemical plant |
| **D** | stainless steel | car bodies and cutlery |

**28** Which statement shows that a liquid is pure water?

**A** It boils at 100 °C.

**B** It has a pH value of 7.

**C** It turns blue cobalt(II) chloride pink.

**D** It turns white copper(II) sulfate blue.

**29** Some gases are present in clean air while other gases are only present in polluted air.

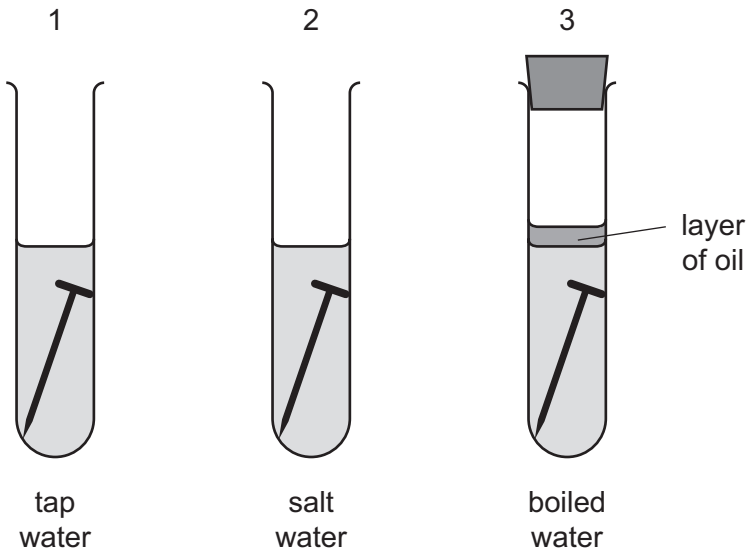
Which row is correct?

| | a gas present in clean air | a gas **only** present in polluted air |
|---|---|---|
| **A** | argon | carbon dioxide |
| **B** | argon | nitrogen dioxide |
| **C** | sulfur dioxide | carbon dioxide |
| **D** | sulfur dioxide | nitrogen dioxide |

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**[Turn over**

**30** The diagrams show experiments to investigate rusting of iron nails.




In which test-tubes do the nails rust?

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

**31** Which mixture contains all of the elements in a typical fertiliser?

**A** ammonium nitrate and calcium phosphate

**B** ammonium phosphate and potassium chloride

**C** potassium nitrate and ammonium chloride

**D** potassium carbonate and ammonium nitrate

**32** Which processes produce methane?

1 complete combustion of carbon-containing compounds

2 decomposition of vegetation

3 digestion in animals

4 respiration in animals

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

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**33** The list shows four methods that were suggested for the formation of carbon dioxide.

1 cracking methane using steam

2 action of heat on a carbonate

3 complete combustion of methane

4 reaction of a carbonate with oxygen

Which methods would result in the production of carbon dioxide?

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

**34** A student suggests three uses of calcium carbonate (limestone).

1 manufacture of cement

2 manufacture of iron

3 treating alkaline soils

Which suggestions are correct?

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

**35** Which list shows the fractions obtained from distilling petroleum, in order of increasing boiling point?

**A** bitumen → diesel oil → fuel oil → lubricating oil

**B** diesel oil → gasoline → naphtha → kerosene

**C** gasoline → naphtha → kerosene → diesel oil

**D** kerosene → lubricating oil → naphtha → refinery gas

**36** Which statement about members of a homologous series is correct?

**A** They are elements with the same chemical properties.

**B** They are compounds with the same functional group.

**C** They are atoms with the same number of outer electrons.

**D** They are molecules with the same boiling point.

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**37** Increasing the number of atoms in one molecule of a hydrocarbon increases the amount of energy released when it burns.

What is the correct order?

| | less energy released → | | more energy released |
|---|---|---|---|
| **A** | ethene | ethane | methane |
| **B** | ethene | methane | ethane |
| **C** | methane | ethane | ethene |
| **D** | methane | ethene | ethane |

**38** Which statements about ethanol are correct?

1 Ethanol is made by reacting steam with ethene at 300 °C.

2 Ethanol is made by fermentation at 55 °C.

3 Ethanol burns to produce carbon dioxide and water.

4 Ethanol contains a carbon-carbon double bond.

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

**39** Some properties of an organic compound J are listed.

- It is a liquid at room temperature.
- It is soluble in water.
- A solution of J reacts with calcium carbonate to form carbon dioxide.
- A solution of J has a pH of 3.

In which homologous series does J belong?

**A** alkane

**B** alkene

**C** alcohol

**D** carboxylic acid

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**40** Which polymers or types of polymer are synthetic?

1 carbohydrates

2 nylon

3 proteins

4 *Terylene*

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

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## The Periodic Table of Elements

| Group | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | II | | | | | | | | | | | III | IV | V | VI | VII | VIII |
| | | | | | | | 1 H hydrogen 1 | | | | | | | | | | 2 He helium 4 |
| 3 Li lithium 7 | 4 Be beryllium 9 | | | | | | | | | | | 5 B boron 11 | 6 C carbon 12 | 7 N nitrogen 14 | 8 O oxygen 16 | 9 F fluorine 19 | 10 Ne neon 20 |
| 11 Na sodium 23 | 12 Mg magnesium 24 | | | | | | | | | | | 13 Al aluminium 27 | 14 Si silicon 28 | 15 P phosphorus 31 | 16 S sulfur 32 | 17 Cl chlorine 35.5 | 18 Ar argon 40 |
| 19 K potassium 39 | 20 Ca calcium 40 | 21 Sc scandium 45 | 22 Ti titanium 48 | 23 V vanadium 51 | 24 Cr chromium 52 | 25 Mn manganese 55 | 26 Fe iron 56 | 27 Co cobalt 59 | 28 Ni nickel 59 | 29 Cu copper 64 | 30 Zn zinc 65 | 31 Ga gallium 70 | 32 Ge germanium 73 | 33 As arsenic 75 | 34 Se selenium 79 | 35 Br bromine 80 | 36 Kr krypton 84 |
| 37 Rb rubidium 85 | 38 Sr strontium 88 | 39 Y yttrium 89 | 40 Zr zirconium 91 | 41 Nb niobium 93 | 42 Mo molybdenum 96 | 43 Tc technetium – | 44 Ru ruthenium 101 | 45 Rh rhodium 103 | 46 Pd palladium 106 | 47 Ag silver 108 | 48 Cd cadmium 112 | 49 In indium 115 | 50 Sn tin 119 | 51 Sb antimony 122 | 52 Te tellurium 128 | 53 I iodine 127 | 54 Xe xenon 131 |
| 55 Cs caesium 133 | 56 Ba barium 137 | 57–71 lanthanoids | 72 Hf hafnium 178 | 73 Ta tantalum 181 | 74 W tungsten 184 | 75 Re rhenium 186 | 76 Os osmium 190 | 77 Ir iridium 192 | 78 Pt platinum 195 | 79 Au gold 197 | 80 Hg mercury 201 | 81 Tl thallium 204 | 82 Pb lead 207 | 83 Bi bismuth 209 | 84 Po polonium – | 85 At astatine – | 86 Rn radon – |
| 87 Fr francium – | 88 Ra radium – | 89–103 actinoids | 104 Rf rutherfordium – | 105 Db dubnium – | 106 Sg seaborgium – | 107 Bh bohrium – | 108 Hs hassium – | 109 Mt meitnerium – | 110 Ds darmstadtium – | 111 Rg roentgenium – | 112 Cn copernicium – | | 114 Fl flerovium – | | 116 Lv livermorium – | | |

**Key**

atomic number
atomic symbol
name
relative atomic mass

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

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