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

**COMBINED SCIENCE** **0653/12**

Paper 1 Multiple Choice (Core) **May/June 2019**

**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.

**1** What are the outermost layers of an animal cell and a plant cell?

| | animal cell | plant cell |
|---|---|---|
| **A** | cell membrane | cell membrane |
| **B** | cell membrane | cell wall |
| **C** | cell wall | cell membrane |
| **D** | cell wall | cell wall |

**2** What is a definition of the net movement of molecules by diffusion?

**A** movement down a concentration gradient from a higher to lower concentration

**B** movement down a concentration gradient from a lower to higher concentration

**C** movement up a concentration gradient from a higher to lower concentration

**D** movement up a concentration gradient from a lower to higher concentration

**3** Which row shows the elements contained in a fat molecule?

| | carbon | hydrogen | nitrogen | oxygen |
|---|---|---|---|---|
| **A** | ✓ | ✓ | ✓ | ✓ |
| **B** | ✓ | ✗ | ✓ | ✗ |
| **C** | ✓ | ✓ | ✗ | ✓ |
| **D** | ✗ | ✓ | ✓ | ✓ |

**4** Which two components of cow's milk are essential for strong teeth and bones?

**A** minerals and vitamins

**B** fats and proteins

**C** carbohydrates and vitamins

**D** minerals and water

**5** What is a function of the small intestine?

**A** It cuts food into small pieces.

**B** It provides a large surface area for absorption.

**C** It provides space for the storage of faeces.

**D** It stores food.

**6** What is the route for carbon dioxide passing out of the body?

**A** alveoli → capillaries → bronchioles → bronchi → trachea → larynx

**B** alveoli → capillaries → bronchi → bronchioles → larynx → trachea

**C** capillaries → alveoli → bronchi → bronchioles → trachea → larynx

**D** capillaries → alveoli → bronchioles → bronchi → trachea → larynx

**7** How does adrenaline affect blood glucose concentration and pulse rate?

| | blood glucose concentration | pulse rate |
|---|---|---|
| **A** | decreases | decreases |
| **B** | decreases | increases |
| **C** | increases | decreases |
| **D** | increases | increases |

**8** Diagram 1 shows a growing seedling after the first few days' growth.

The seedling was then rotated, held in the position shown in diagram 2 and placed in the dark for three days.

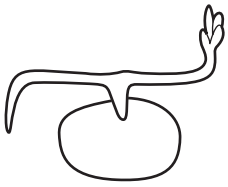


diagram 1

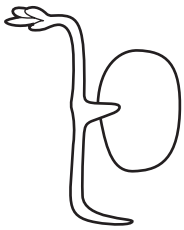
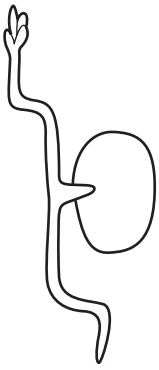


diagram 2

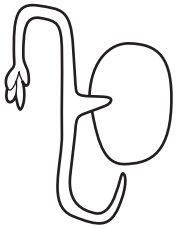
What is the shape of the seedling three days later?

**A**

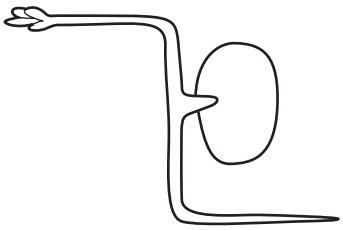
**B**



**C**



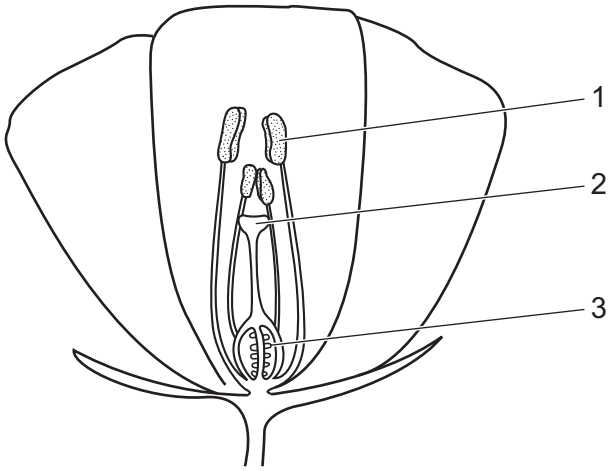
**D**



**9** What are the features of sexual reproduction?

| | fusion of nuclei | nature of offspring |
|---|---|---|
| **A** | no | genetically dissimilar |
| **B** | yes | genetically identical |
| **C** | no | genetically identical |
| **D** | yes | genetically dissimilar |

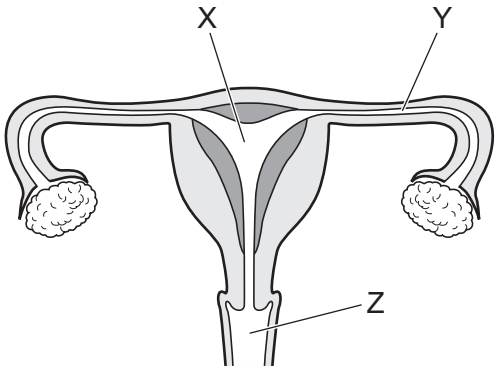
**10** The diagram shows half a flower.




Where are the female and male gametes made?

| | female | male |
|---|---|---|
| **A** | 1 | 2 |
| **B** | 1 | 3 |
| **C** | 2 | 1 |
| **D** | 3 | 1 |

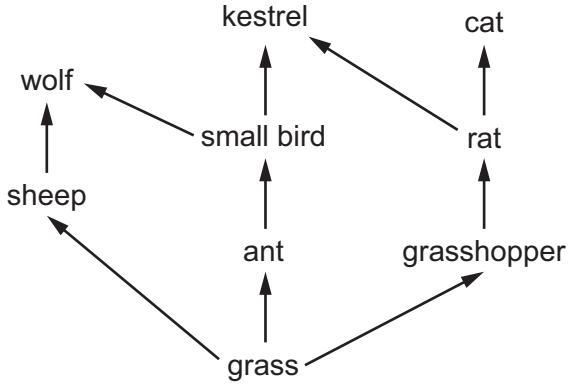
**11** The diagram shows the female reproductive system.




What are the functions of the parts labelled X, Y, and Z?

| | X | Y | Z |
|---|---|---|---|
| **A** | development of fetus | release of female gametes | ring of muscle at opening of uterus |
| **B** | development of fetus | site of fertilisation | receives penis during intercourse |
| **C** | receives penis during intercourse | release of female gametes | ring of muscle at opening of uterus |
| **D** | receives penis during intercourse | site of fertilisation | development of fetus |

**12** The diagram represents several food chains in a food web.

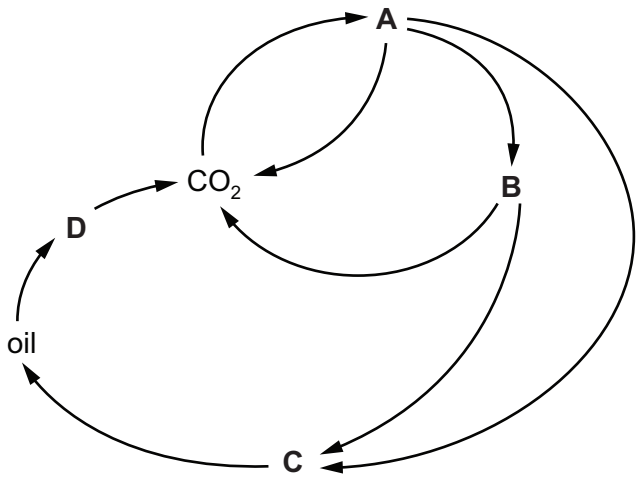



How many different food chains are there in the food web shown?

**A** 3 **B** 4 **C** 5 **D** 9

**13** The diagram represents the carbon cycle.

Which letter represents combustion?




**14** A molecule of hydrogen has the formula $H_2$.

A molecule of a protein contains several different elements.

Which statement about these molecules is correct?

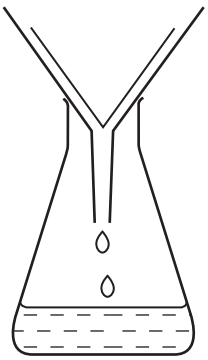
**A** They both contain cations and anions bonded together.

**B** They both contain different types of atom.

**C** They both contain more than one atom bonded together.

**D** They both contain only one type of atom.

**15** The diagram shows apparatus used for filtration.



Why can sugar and salt **not** be separated by using this apparatus?

**A** They are both compounds.

**B** They are both white.

**C** They both dissolve in water.

**D** They both have the same size particles.

**16** Which row about each substance is correct?

| | substance | type of bonding | description of bonds | other information |
|---|---|---|---|---|
| **A** | ammonia | covalent | three shared pairs of electrons | all atoms have full outer electron shells |
| **B** | lithium fluoride | covalent | one shared pair of electrons | both atoms have noble gas electronic structure |
| **C** | potassium iodide | ionic | electron transfer from potassium to iodine | volatile compound |
| **D** | water | ionic | electron transfer from hydrogen to oxygen | non-volatile compound |

**17** The equation for the combustion of ethene is shown.

$$C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$$

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

**A** More oxygen molecules than ethene molecules are used.

**B** The number of carbon dioxide molecules formed is equal to the number of water molecules formed.

**C** The number of carbon dioxide molecules formed is the same as the number of ethene molecules used.

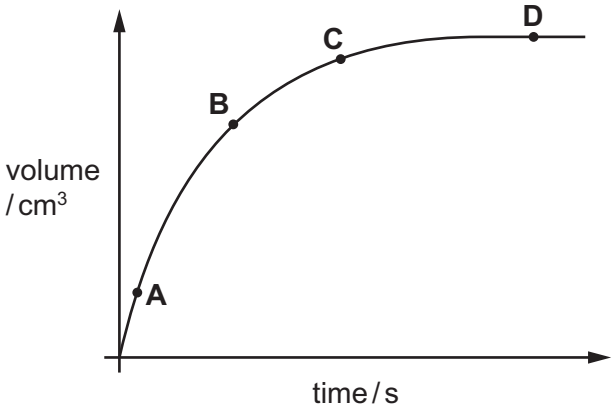
**D** The total number of molecules formed is the same as the total number of molecules used.

**18** Which row identifies the products of electrolysis for the named electrolyte?

| | electrolyte | product at anode | product at cathode |
|---|---|---|---|
| **A** | concentrated aqueous sodium chloride | chlorine | sodium |
| **B** | dilute sulfuric acid | hydrogen | oxygen |
| **C** | dilute sulfuric acid | sulfur dioxide | hydrogen |
| **D** | molten lead(II) bromide | bromine | lead |

**19** The graph shows the volume of hydrogen gas produced when dilute hydrochloric acid reacts with zinc.

At which point is the rate of reaction greatest?




**20** The equations for two redox reactions are shown.

1 $CO + CuO \rightarrow Cu + CO_2$

2 $C + CO_2 \rightarrow 2CO$

Which row is correct?

| | substance being reduced in reaction 1 | substance being oxidised in reaction 2 |
|---|---|---|
| **A** | CuO | C |
| **B** | CO | $CO_2$ |
| **C** | CO | C |
| **D** | CuO | $CO_2$ |

**21** Which aqueous ion gives a white precipitate with aqueous sodium hydroxide and with aqueous ammonia?

**A** $Cu^{2+}$ **B** $Fe^{2+}$ **C** $Fe^{3+}$ **D** $Zn^{2+}$

**22** Which row describes the physical state of the Group VII elements at room temperature?

| | chlorine | bromine | iodine |
|---|---|---|---|
| **A** | gas | gas | liquid |
| **B** | gas | liquid | solid |
| **C** | liquid | liquid | gas |
| **D** | liquid | solid | solid |

**23** Which two elements do **not** form an alloy?

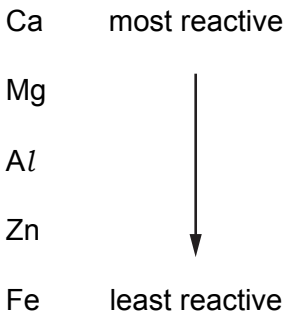
**A** carbon and sulfur

**B** carbon and iron

**C** copper and zinc

**D** silver and gold

**24** Part of the reactivity series is shown.




Which metals can be produced by reduction of their oxide using carbon?

**A** calcium and magnesium

**B** magnesium and aluminium

**C** aluminium and zinc

**D** zinc and iron

**25** Which gas is a greenhouse gas?

**A** argon

**B** carbon monoxide

**C** methane

**D** nitrogen

**26** Which statement shows that petroleum is a mixture?

**A** Petroleum can be burned as a fuel.

**B** Petroleum can be separated into fractions by distillation.

**C** Petroleum is a fossil fuel formed over millions of years.

**D** Petroleum is a thick, black liquid.

**27** Which statement about alkanes is correct?

**A** Alkanes are compounds containing carbon, hydrogen and oxygen.

**B** Alkanes are saturated hydrocarbons.

**C** Ethane is used to make poly(ethene).

**D** Methane is the only alkane that does not contain a double bond.

**28** A vehicle is taken from the Earth to the Moon where the gravitational field strength is weaker.

How do the mass and the weight of the vehicle on the Moon compare with their values on the Earth?

**A** smaller mass and smaller weight

**B** smaller mass and the same weight

**C** the same mass and smaller weight

**D** the same mass and the same weight

**29** Two properties of a gas are its mass and its volume.

Which properties can be changed by a force?

| | mass | volume |
|---|---|---|
| **A** | ✓ | ✓ |
| **B** | ✓ | ✗ |
| **C** | ✗ | ✓ |
| **D** | ✗ | ✗ |

key

✓ = can be changed

✗ = cannot be changed

**30** What energy does an object have because of its position above the surface of the Earth?

**A** chemical potential

**B** gravitational potential

**C** kinetic

**D** thermal

**31** Which mode of transport uses a renewable energy source?

**A** a coal-fired steam train

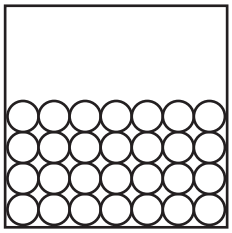
**B** a nuclear-powered submarine

**C** a petrol-engined car

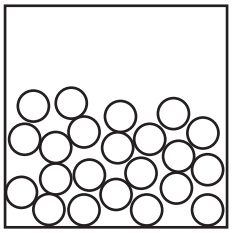
**D** a sailing boat moved by the wind

**32** Which diagram shows the molecular structure of a liquid?

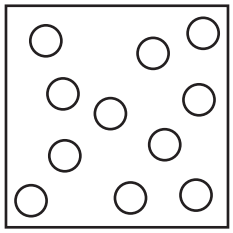
**A**



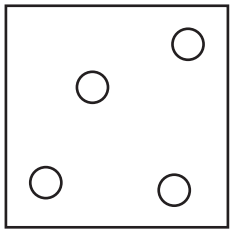
**B**



**C**



**D**



**33** Benzene and glycerine are two substances.

The table gives the melting point and the boiling point of benzene and of glycerine.

| | melting point / °C | boiling point / °C |
|---|---|---|
| benzene | 5.4 | 80 |
| glycerine | 18 | 290 |

At which temperature are both benzene and glycerine liquid?

**A** 0 °C **B** 50 °C **C** 90 °C **D** 300 °C

**34** A solid is heated.

Which two properties of the solid **both** change as a result?

**A** density and volume

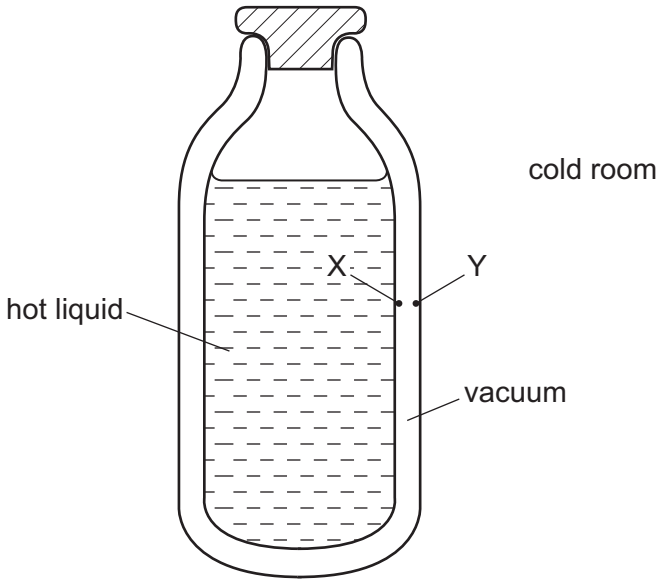
**B** density and weight

**C** mass and volume

**D** mass and weight

**35** The diagram shows a vacuum flask containing a hot liquid in a cold room.

X and Y are points on the inside surfaces of the walls of the flask.




How is thermal energy transferred through the vacuum between X and Y?

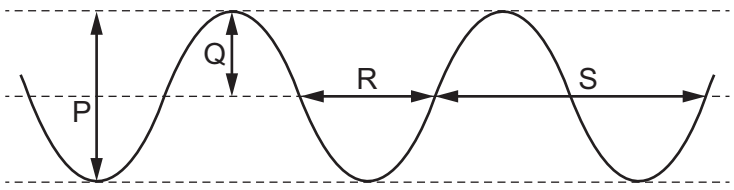
**A** by conduction and convection

**B** by conduction only

**C** by radiation and convection

**D** by radiation only

**36** The diagram represents a wave at one moment.



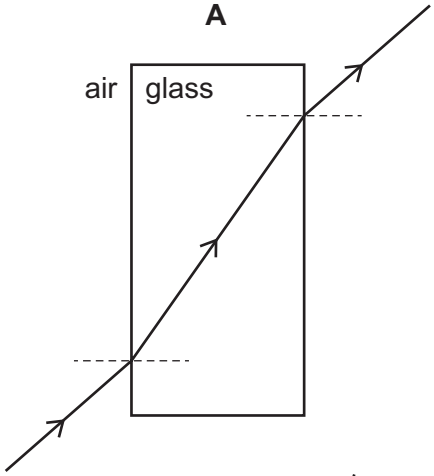

Which labelled arrows represent the amplitude and the wavelength of the wave?

| | amplitude | wavelength |
|---|---|---|
| **A** | P | R |
| **B** | P | S |
| **C** | Q | R |
| **D** | Q | S |

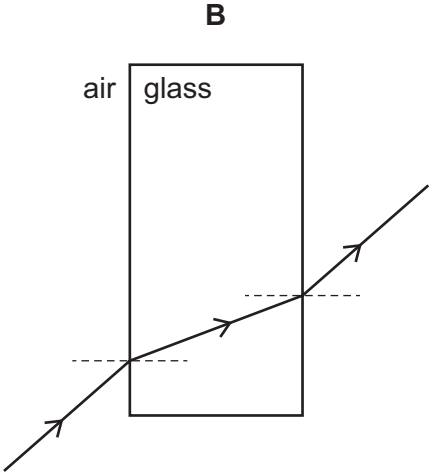
**37** Light passes through a parallel-sided block of glass.

Which diagram shows how the light passes through the block?

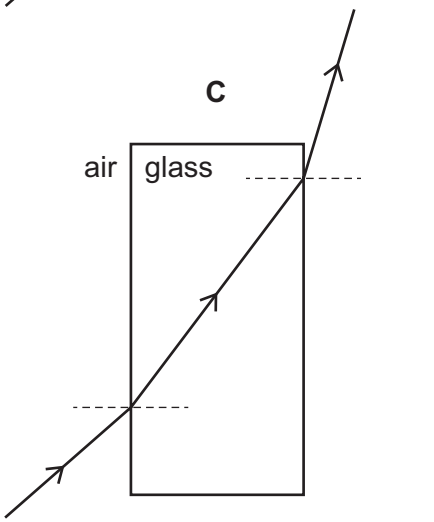
**A**



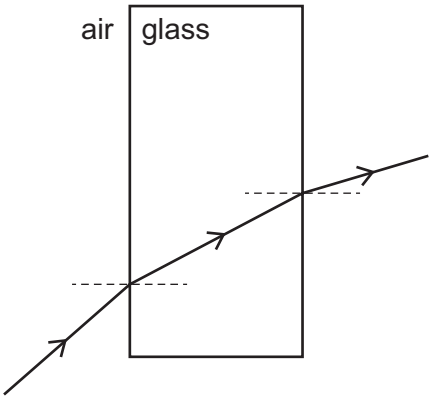

**B**




**C**



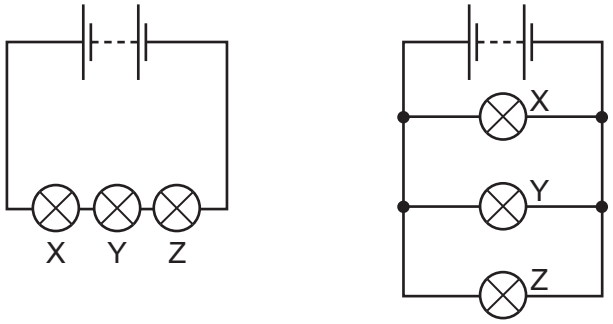

**D**




**38** What is the unit of electromotive force (e.m.f.) and what is used to measure it?

| | unit | measuring instrument |
|---|---|---|
| **A** | newton | newton meter |
| **B** | newton | voltmeter |
| **C** | volt | newton meter |
| **D** | volt | voltmeter |

**39** The diagrams show two ways in which three lamps X, Y and Z may be connected.




circuit 1 circuit 2

Which statement is correct?

**A** If lamp Y breaks in circuit 1, both the other lamps go off.

**B** If lamp Y breaks in circuit 2, both the other lamps go off.

**C** If lamp Y breaks in circuit 1, lamp Z goes off, but lamp X remains on.

**D** If lamp Y breaks in circuit 2, lamp Z goes off, but lamp X remains on.

**40** A mains circuit can safely supply a current of up to 40 A.

The current in a hairdryer is 2 A when it is operating normally. The hairdryer is connected to the mains by a lead which can safely carry up to 5 A.

What is the correct fuse to protect the hairdryer?

**A** 1 A fuse

**B** 3 A fuse

**C** 10 A fuse

**D** 50 A fuse

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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.).