



# Cambridge IGCSE™

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## COMBINED SCIENCE

0653/12

Paper 1 Multiple Choice (Core)

February/March 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)

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### 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.

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This document has **16** pages.



1 What is a characteristic of all living organisms?

- A breathing
- B eating
- C egestion
- D movement

2 What is the function of the cell membrane?

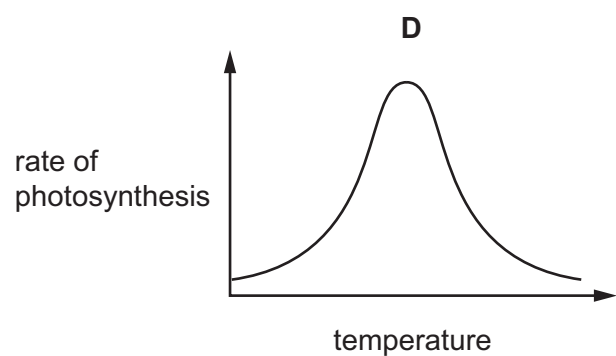
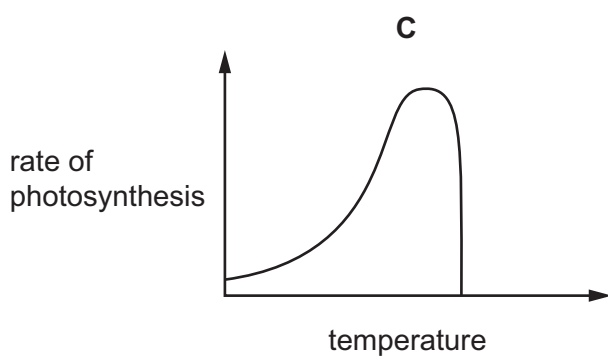
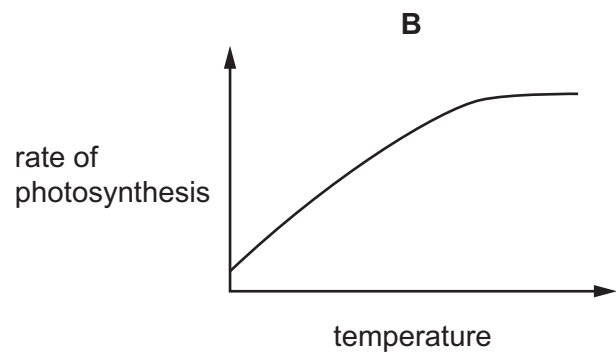
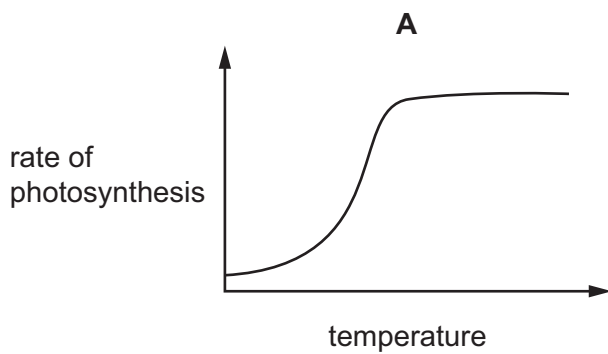
- A to control which substances move in and out of the cell
- B to hold the DNA of the cell
- C to hold the chlorophyll of the cell
- D to store nutrients or waste products

3 Which row shows the correct reagents for food tests?

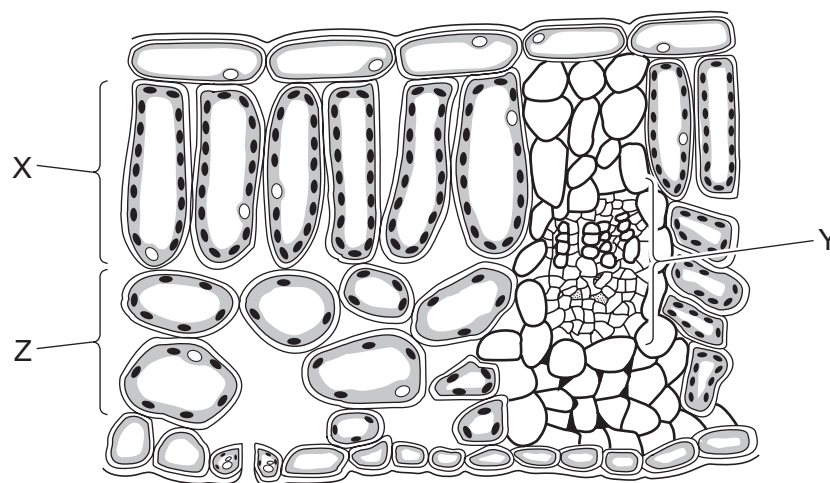
	fats and oils	proteins	reducing sugars
<b>A</b>	Benedict's	biuret	ethanol
<b>B</b>	ethanol	biuret	Benedict's
<b>C</b>	Benedict's	iodine	ethanol
<b>D</b>	ethanol	iodine	Benedict's

- 4 The chemical reactions in photosynthesis depend on enzymes.

Which graph shows the effect of temperature on the rate of these reactions?



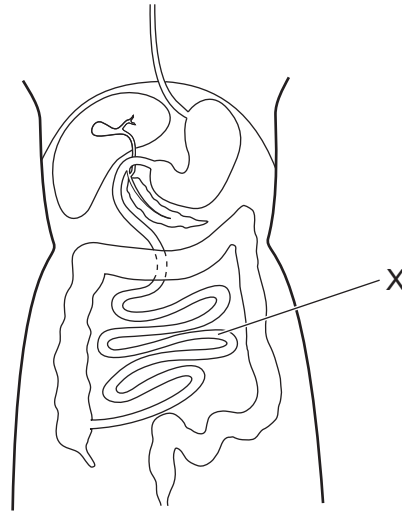
- 5 The diagram shows a section through a leaf.



Which row correctly identifies the labelled parts of the leaf section?

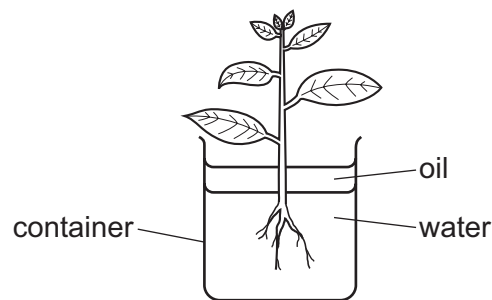
	X	Y	Z
<b>A</b>	cuticle	vascular bundle	palisade mesophyll
<b>B</b>	palisade mesophyll	vascular bundle	spongy mesophyll
<b>C</b>	palisade mesophyll	cuticle	spongy mesophyll
<b>D</b>	spongy mesophyll	cuticle	vascular bundle

- 6 The diagram shows the alimentary canal.



Which processes take place in the region marked X?

- A absorption and digestion
  - B digestion and egestion
  - C egestion and ingestion
  - D ingestion and absorption
- 7 The diagram shows a plant in a container of water. The layer of oil stops the water in the container from evaporating.



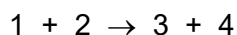
The initial mass of the container and its contents is 296 g.

After two hours, the mass of the container and its contents is 292 g.

What is the rate of transpiration in this time?

- A 148 g of water per hour
- B 146 g of water per hour
- C 4 g of water per hour
- D 2 g of water per hour

- 8 In the equation for respiration shown, the components have been represented by numbers.



Each component has been given a letter, as shown.

W = carbon dioxide, X = glucose, Y = oxygen, Z = water

Which letter should be inserted into each position in the equation?

	1	2	3	4
A	W	Y	X	Z
B	W	Z	X	Y
C	X	Y	W	Z
D	X	Z	W	Y

- 9 A student encounters a large growling dog. The student is frightened and prepares to run.

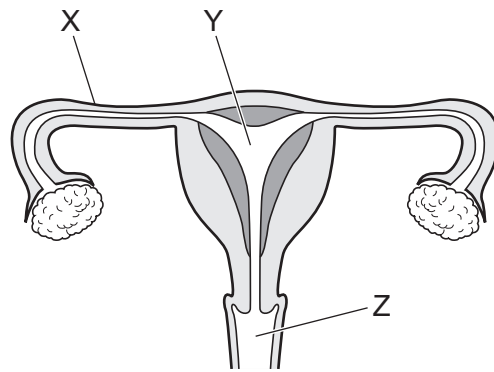
What is likely to occur?

	heart rate	pupil diameter
A	unchanged	narrows
B	unchanged	widens
C	increases	narrows
D	increases	widens

- 10 What is a feature of asexual reproduction?

- A development and growth of a zygote
- B fusion of the nuclei of two cells
- C offspring are all genetically different
- D only requires a single parent

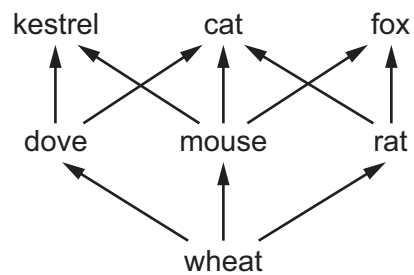
11 The diagram shows the female reproductive system of a human.



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

	X	Y	Z
<b>A</b>	oviduct	uterus	vagina
<b>B</b>	vagina	cervix	uterus
<b>C</b>	oviduct	uterus	cervix
<b>D</b>	vagina	cervix	oviduct

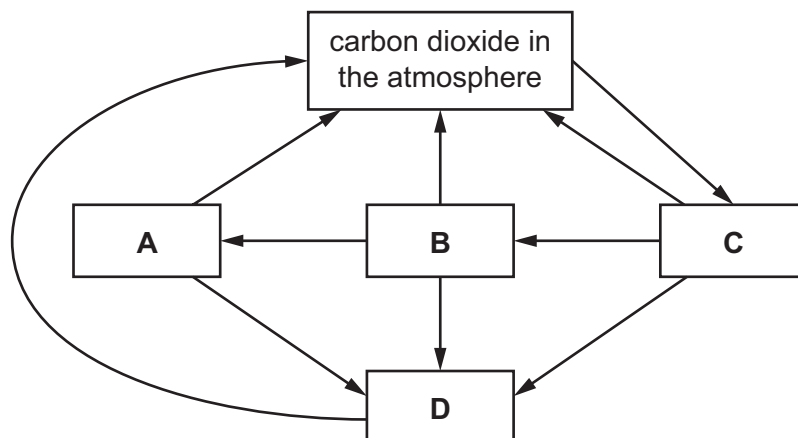
12 The diagram shows a food web.



Which organism is a herbivore?

- A** cat
- B** dove
- C** fox
- D** wheat

13 Which labelled box represents plants in the carbon cycle?

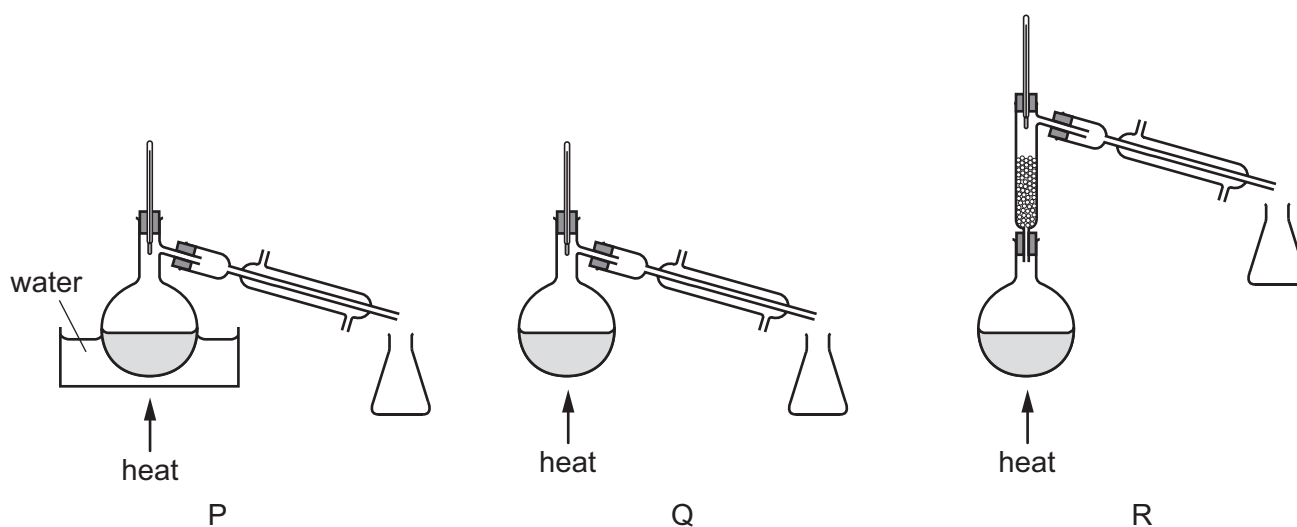


14 A mixture contains two liquids.

One liquid has a boiling point of 120 °C.

The other liquid has a boiling point of 160 °C.

They are separated by fractional distillation.



Which apparatus is used to separate the two liquids?

- A P and Q      B P only      C Q only      D R only

15 Iodine is a non-metal.

It is a solid at room temperature.

What is a property of iodine?

- A It can be stretched into a wire.
- B It is brittle.
- C It is a good conductor of electricity.
- D It is a good conductor of heat.

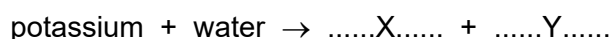
16 The atomic number of argon is 18.

The mass number of argon is 40.

How many protons, neutrons and electrons are in an argon atom?

	protons	neutrons	electrons
A	18	22	18
B	18	22	22
C	22	18	18
D	22	18	22

17 Potassium reacts with water in an exothermic reaction.



What are substances X and Y?

	X	Y
A	potassium oxide	hydrogen
B	potassium hydroxide	hydrogen
C	potassium oxide	oxygen
D	potassium hydroxide	oxygen

18 Which statement about the electrolysis of dilute sulfuric acid is correct?

- A Only hydrogen is formed at the positive electrode.
- B Only oxygen is formed at the anode.
- C Only sulfur dioxide is formed at the negative electrode.
- D Sulfur dioxide and hydrogen are formed at the cathode.



- 19 Excess magnesium ribbon is reacted with  $10\text{ cm}^3$  of dilute hydrochloric acid. The hydrogen gas produced is collected and measured.

Which change to the reaction conditions increases the rate of reaction **and** the volume of hydrogen produced?

- A Use a lower temperature.
  - B Use a transition metal catalyst.
  - C Use concentrated hydrochloric acid.
  - D Use powdered magnesium.
- 20 Carbon dioxide reacts with carbon.



Which row describes what happens to the carbon dioxide and to the carbon during the reaction?

	carbon dioxide	carbon
A	oxidised	oxidised
B	oxidised	reduced
C	reduced	oxidised
D	reduced	reduced

- 21 In which reaction is carbon dioxide **not** formed?
- A adding hydrochloric acid to calcium
  - B adding hydrochloric acid to calcium carbonate
  - C burning coal in air
  - D burning methane in air
- 22 Which process produces pure copper sulfate from aqueous copper sulfate?
- A distillation
  - B filtration
  - C chromatography
  - D crystallisation

23 What is used to identify chlorine?

- A a glowing splint
- B a lighted splint
- C damp litmus paper
- D limewater

24 The melting points of some Group I metals are shown.

metal	melting point/°C
lithium	180
potassium	63
rubidium	39

What is the melting point of sodium?

- A 28°C      B 44°C      C 98°C      D 232°C

25 Which statement about noble gases is correct?

- A Argon is used in lamps because it gives out a bright light when it is heated.
- B Helium is used to fill balloons because it is more dense than air.
- C Krypton forms diatomic molecules because it is an unreactive gas.
- D Neon is unreactive because it has a full outer shell of electrons.

26 Which description identifies the monomer that is used to form poly(ethene) by addition polymerisation?

- A saturated alkane
- B saturated alkene
- C unsaturated alkane
- D unsaturated alkene

27 Which statement describes a saturated hydrocarbon gas but **not** any other gas?

- A It contains carbon and hydrogen atoms bonded by single covalent bonds only.
- B It contains carbon and hydrogen atoms only.
- C It burns completely to give carbon dioxide and water.
- D It rapidly decolourises aqueous bromine.

- 28 A man takes 30 minutes to walk 4.0 km to a station. He then immediately gets on a train that takes 60 minutes to travel 100 km.

What is the average speed for the man's complete journey?

- A 1.2 km/hour    B 1.8 km/hour    C 54 km/hour    D 69 km/hour

- 29 A measuring cylinder is used to find the density of a liquid.

Which other piece of apparatus is needed?

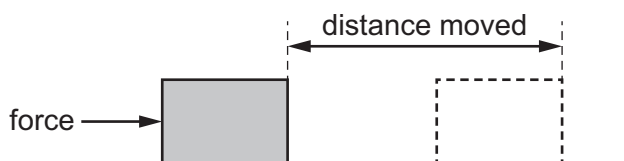
- A balance  
B clock  
C ruler  
D thermometer

- 30 A car moves along a horizontal road. There is no resultant force acting on the car.

Which row describes the speed of the car and its direction of movement?

	speed of car	direction of movement
<b>A</b>	changing	changing
<b>B</b>	changing	constant
<b>C</b>	constant	changing
<b>D</b>	constant	constant

- 31 An object is pushed along a smooth horizontal surface by a force.



Which quantities are used to determine the work done on the object?

	force	distance moved	
<b>A</b>	✓	✓	key ✓ = used x = not used
<b>B</b>	✓	x	
<b>C</b>	x	✓	
<b>D</b>	x	x	

- 32 Electricity is generated in different power stations that use coal, hydroelectric dams, nuclear fission or geothermal resources.

How is a hydroelectric power station different from the other three types of power station?

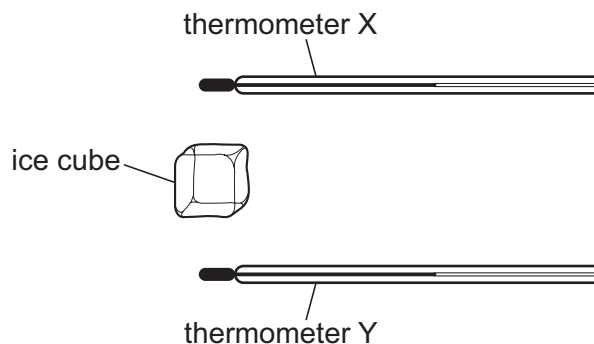
- A It is the only power station that uses steam as part of the process.
- B It is the only power station that does not use steam as part of the process.
- C It is the only power station that uses a renewable form of energy.
- D It is the only power station that does not use a renewable form of energy.

- 33 A gas is trapped in a container.

Which properties of the molecules of the gas determine its temperature and its pressure?

	temperature determined by	pressure determined by
A	the separation of the molecules	how often the molecules collide with the container
B	the separation of the molecules	the forces between the molecules
C	the speed of the molecules	how often the molecules collide with the container
D	the speed of the molecules	the forces between the molecules

- 34 Thermometer X is held above an ice cube and thermometer Y is held an equal distance below the ice cube. After several minutes, the reading on one thermometer changes. The ice cube does not melt.



The reading of which thermometer changes, and why?

	thermometer	reason
A	X	cool air rises from the ice cube
B	X	warm air rises from the ice cube
C	Y	cool air falls from the ice cube
D	Y	warm air falls from the ice cube

35 What is **not** part of the electromagnetic spectrum?

- A gamma-radiation
- B microwaves
- C sound waves
- D X-rays

36 Sound of which frequencies can be heard by a healthy human ear?

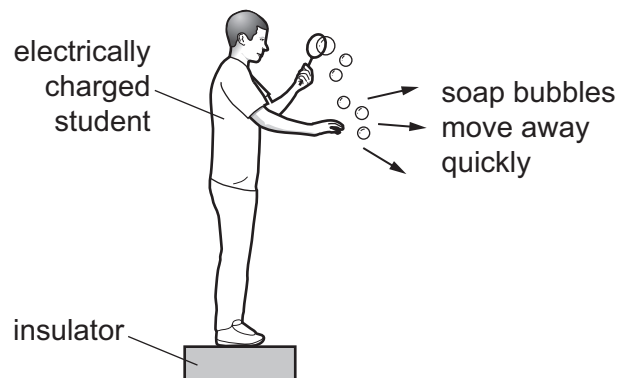
	30 Hz	300 Hz	3.0 kHz
<b>A</b>	✓	✓	✓
<b>B</b>	✓	✓	✗
<b>C</b>	✗	✓	✓
<b>D</b>	✗	✗	✓

key

✓ = can be heard

✗ = cannot be heard

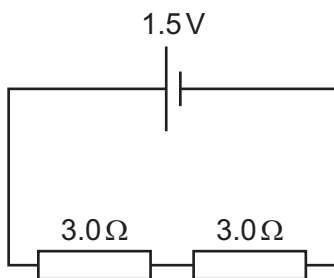
37 An electrically charged student produces soap bubbles. When he holds his hand near the bubbles, they move away quickly from his hand.



For this movement of the bubbles to happen, which statement is correct?

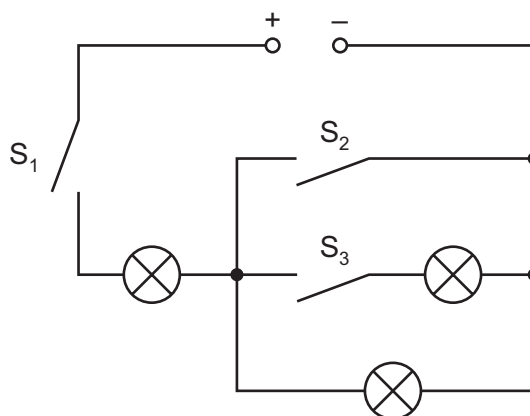
- A The bubbles must be negatively charged.
- B The bubbles must be positively charged.
- C The bubbles must have the opposite charge to the charge on the student.
- D The bubbles must have the same charge as the charge on the student.

- 38 Two  $3.0\Omega$  resistors are connected in series to a  $1.5\text{V}$  cell.



What is the current in the circuit?

- A**  $0.25\text{A}$       **B**  $0.50\text{A}$       **C**  $4.0\text{A}$       **D**  $9.0\text{A}$
- 39 The diagram shows a power supply, three lamps and three switches,  $S_1$ ,  $S_2$  and  $S_3$ , in a circuit.

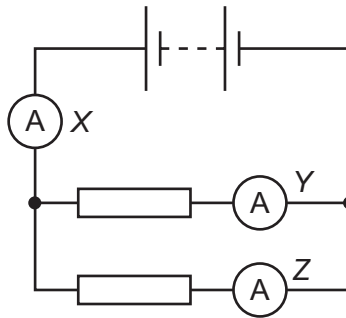


All the lamps are lit.

Which row gives the states of the switches?

	$S_1$	$S_2$	$S_3$
<b>A</b>	closed	closed	open
<b>B</b>	closed	open	closed
<b>C</b>	open	closed	open
<b>D</b>	open	open	closed

40 The diagram shows a circuit with three ammeters. The readings on the ammeters are X, Y and Z.



Which set of readings on the ammeters is possible?

	X/A	Y/A	Z/A
<b>A</b>	2	3	5
<b>B</b>	3	2	5
<b>C</b>	3	3	3
<b>D</b>	5	2	3

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## The Periodic Table of Elements

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

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

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