



Cambridge IGCSE™

COMBINED SCIENCE

0653/22

Paper 2 Multiple Choice (Extended)

February/March 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.



- 1 Which row shows the features of a plant cell?

	cell membrane surrounding the cell wall	cell wall surrounding the cell membrane	vacuole present
A	✓	x	✓
B	x	✓	✓
C	✓	x	x
D	x	✓	x

- 2 When an apple is cut, the cut surface quickly turns brown. This is due to enzyme action.

Which action destroys the enzyme?

- A** brushing the cut surface with a strong sugar solution
 - B** cutting the apple into smaller pieces
 - C** placing the cut apple in boiling water
 - D** placing the cut apple in cold water
- 3 Which vitamin and which mineral would a doctor recommend increasing in the diet of a patient with scurvy and anemia?
- A** vitamin C and calcium
 - B** vitamin C and iron
 - C** vitamin D and calcium
 - D** vitamin D and iron
- 4 Animals break down large, insoluble molecules into small, soluble molecules in the alimentary canal.

What is this process?

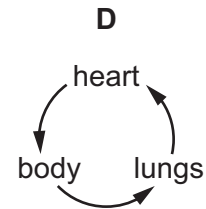
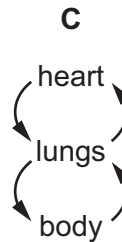
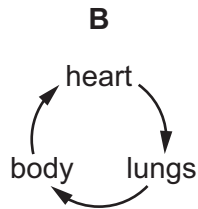
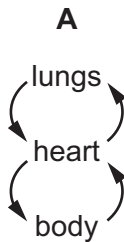
- A** chemical digestion
- B** chemical ingestion
- C** mechanical digestion
- D** mechanical ingestion

- 5 The table shows how humidity may affect the rate of diffusion of water vapour from a plant to the surrounding air.

Which row will result in the highest rate of transpiration?

	humidity	diffusion gradient for water
A	high	low
B	high	high
C	low	low
D	low	high

- 6 Which diagram shows how blood circulates in mammals?



- 7 Which component of tobacco smoke increases the risk of lung cancer?

- A** carbon dioxide
- B** carbon monoxide
- C** nicotine
- D** tar

- 8 What is the equation for aerobic respiration?

- A** carbon dioxide + water → glucose + oxygen
- B** glucose + oxygen → carbon dioxide + water
- C** glucose + water → carbon dioxide + oxygen
- D** oxygen + water → carbon dioxide + glucose

- 9 When an athlete prepares for the start of a sprint race, excitement causes the concentration of adrenaline in the blood to increase.

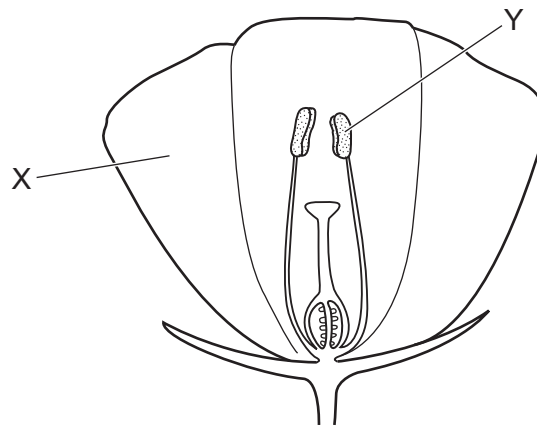
What effects does adrenaline have on the blood glucose concentration and the heart rate of the athlete?

	blood glucose concentration	heart rate
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 10 Which row shows the responses of a young shoot to gravity and light?

	gravity	light
A	negatively gravitropic	negatively phototropic
B	negatively gravitropic	positively phototropic
C	positively gravitropic	negatively phototropic
D	positively gravitropic	positively phototropic

11 The diagram shows a section through a flower.



What are the correct labels and functions for parts X and Y of the flower?

	X		Y	
	label	function	label	function
A	petal	attracts insects	anther	produces pollen grains
B	petal	protects flower	ovary	produces pollen grains
C	sepal	attracts insects	anther	contains egg cells
D	sepal	protects flower	ovary	contains egg cells

12 What gives the human embryo protection from mechanical shock?

- A** amniotic fluid
- B** amniotic sac
- C** placenta
- D** umbilical cord

13 What is an undesirable effect of overuse of fertilisers in agriculture?

- A** acid rain
- B** deforestation
- C** eutrophication
- D** global warming

14 What happens to water molecules when water is heated to 100 °C in a beaker?

- A** They gain energy and escape from the beaker.
- B** They gain energy and move more slowly.
- C** They lose energy and escape from the beaker.
- D** They lose energy and move more slowly.

15 A dye contains four different coloured components.

The dye is separated by chromatography.

The table shows the colour and R_f values of the four coloured components.

colour	R_f value
blue	0.50
green	0.52
red	0.74
yellow	0.36

Which two dyes are furthest apart from each other on the final chromatogram?

- A** blue and green
- B** blue and yellow
- C** green and red
- D** red and yellow

16 A mixture contains hydrogen, helium, neon and oxygen.

What does this mixture contain?

- A** elements and compounds
- B** elements only
- C** molecules and compounds
- D** molecules only

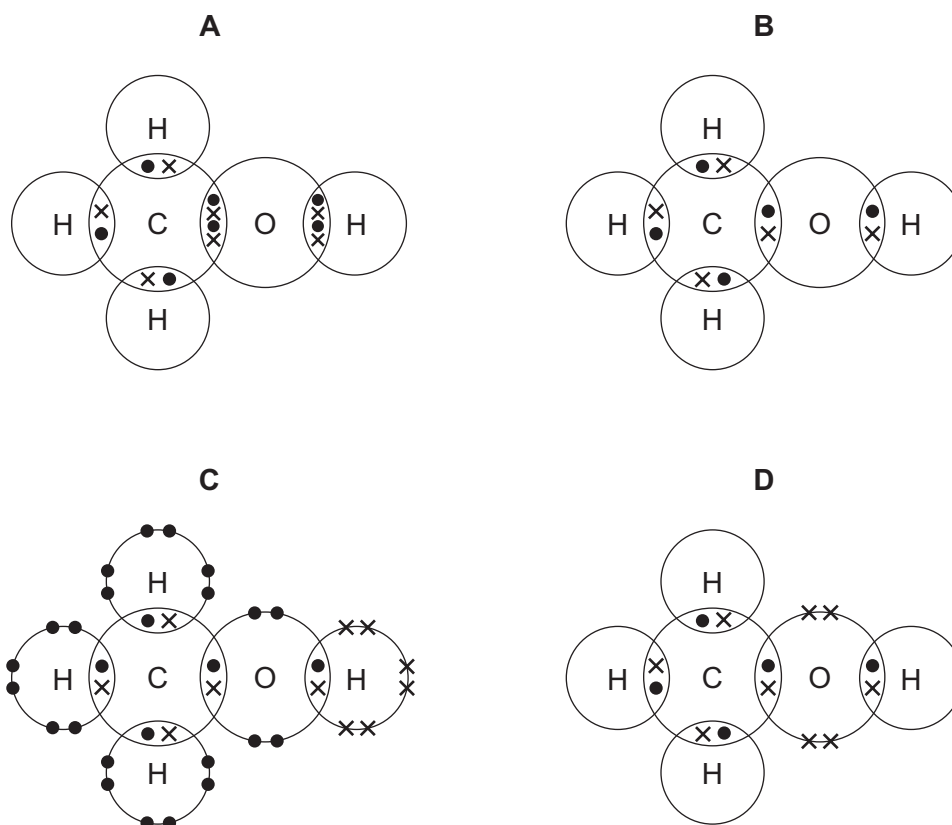
17 Some information about a sodium ion is shown.

particle	proton number	nucleon number	number of protons	number of neutrons	number of electrons
Na^+	11	23	11	X	Y

What are the values of X and Y?

	X	Y
A	11	10
B	11	11
C	12	10
D	12	11

18 Which diagram represents a molecule of methanol?

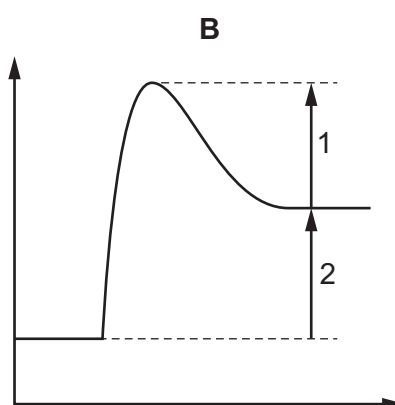
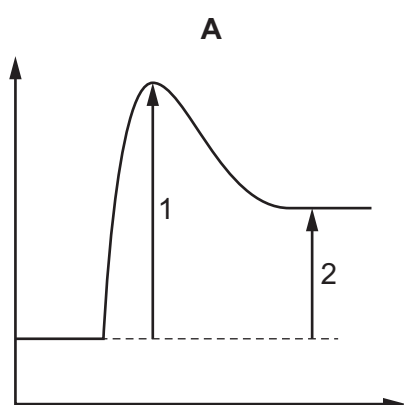


- 19 Aqueous sodium sulfate reacts with aqueous barium chloride to make barium sulfate and sodium chloride.

What is the ionic equation for this reaction?

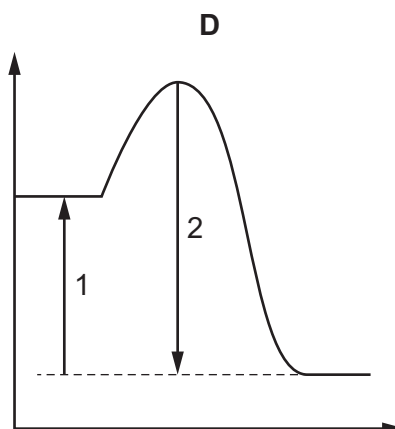
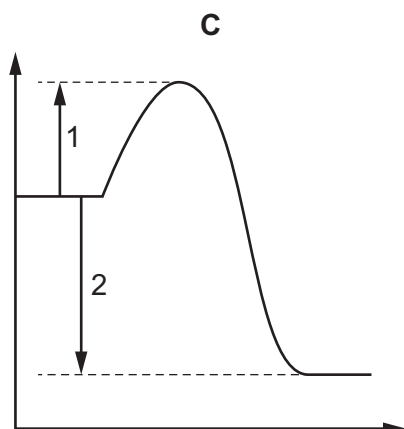
- A $\text{Ba}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{aq})$
 B $\text{Ba}^{2+}(\text{aq}) + \text{SO}_4^{2-}(\text{aq}) \rightarrow \text{BaSO}_4(\text{s})$
 C $\text{Na}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{NaCl}(\text{s})$
 D $\text{Na}^+(\text{aq}) + \text{Cl}^-(\text{aq}) \rightarrow \text{NaCl}(\text{aq})$

- 20 Which energy level diagram identifies the activation energy and the energy change for an exothermic reaction?



key

1 = activation energy
 2 = energy change
 for the reaction



- 21 Which process is a redox reaction?

- A combustion of methane
 B decomposition of calcium carbonate
 C neutralisation of dilute hydrochloric acid by copper oxide
 D precipitation by the addition of aqueous silver nitrate to aqueous chloride ions

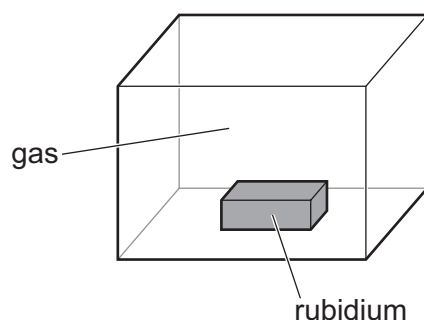
- 22 A solution of compound X produces a dark green precipitate when aqueous sodium hydroxide is added.

What is X?

- A copper(II) chloride
- B copper(II) sulfate
- C iron(II) sulfate
- D iron(III) chloride

- 23 Rubidium is a very reactive Group I metal.

It is kept in a sealed box surrounded by a gas.



Which gas does **not** react with rubidium?

- A chlorine
 - B neon
 - C oxygen
 - D water vapour
- 24 Which ionic equation represents a more reactive metal displacing a less reactive metal?
- A $\text{Cu} + \text{Mg}^{2+} \rightarrow \text{Cu}^{2+} + \text{Mg}$
 - B $\text{Mg} + \text{Ca}^{2+} \rightarrow \text{Mg}^{2+} + \text{Ca}$
 - C $\text{Zn} + \text{Mg}^{2+} \rightarrow \text{Zn}^{2+} + \text{Mg}$
 - D $\text{Zn} + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu}$
- 25 Why is carbon used to extract some metals from their oxide ores?
- A It oxidises the ore by removing oxygen.
 - B It prevents the oxygen of the air reacting with the ore.
 - C It reacts with impurities in the ore.
 - D It reduces the ore by removing oxygen.

26 Which statement describes the structure of sodium chloride?

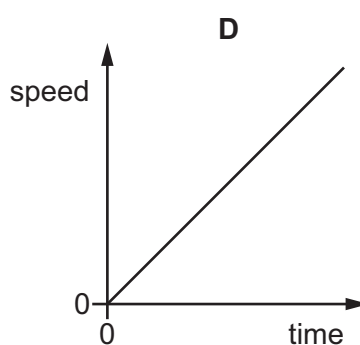
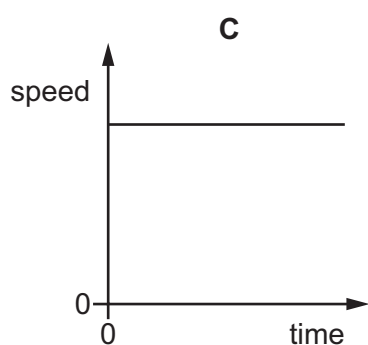
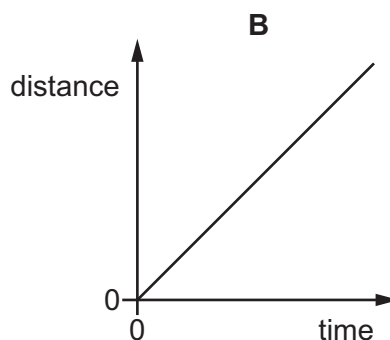
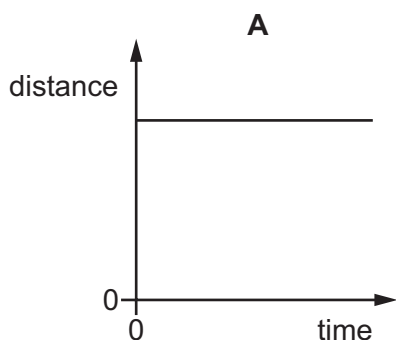
- A It is composed of a regular arrangement of alternating positive and negative ions.
- B It is composed of negatively charged sodium ions joined to positively charged chloride ions.
- C It is composed of oppositely charged ions held together by strong covalent bonds.
- D It is composed of sodium atoms joined to chlorine atoms by shared pairs of electrons.

27 What is formed during the complete combustion of a hydrocarbon?

- A carbon dioxide and water
- B carbon dioxide and hydrogen
- C carbon monoxide and carbon dioxide
- D carbon monoxide and water

28 The diagrams show two distance–time graphs and two speed–time graphs.

Which graph represents the motion of an object that is moving with constant acceleration?



- 29** A measuring cylinder contains 60 cm^3 of water.

A solid object of mass 120 g is lowered into the water until it is completely submerged.

The new reading on the measuring cylinder is 80 cm^3 .

What is the density of the object?

- A** 0.50 g/cm^3 **B** 1.5 g/cm^3 **C** 2.0 g/cm^3 **D** 6.0 g/cm^3

- 30** A heavy bag of flour is dragged against friction along a horizontal floor at a constant speed of 12 m/s for 2.0 s .

The energy input required is 3000 J .

What is the force due to friction?

- A** 125 N **B** 500 N **C** $18\,000 \text{ N}$ **D** $72\,000 \text{ N}$

- 31** A toy car rolls from rest down a slope and on to a horizontal bench.

The car stops before it reaches the end of the bench.

What energy changes take place during this journey?

- A** gravitational potential $\rightarrow$ kinetic $\rightarrow$ elastic potential
B gravitational potential $\rightarrow$ kinetic $\rightarrow$ thermal and sound
C kinetic $\rightarrow$ gravitational potential $\rightarrow$ elastic potential
D kinetic $\rightarrow$ gravitational potential $\rightarrow$ thermal and sound

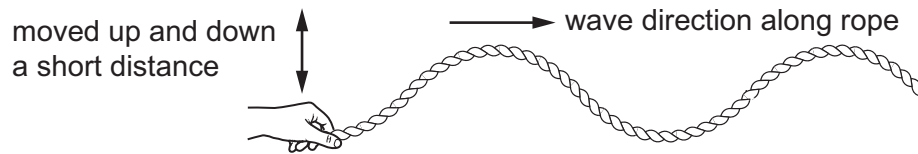
- 32** Which statement about a tidal energy power station is correct?

- A** It creates no environmental impact when being built.
B It does not work at night.
C It does not work when there is no wind.
D It supplies energy at predictable times.

- 33** Which row describes the forces between molecules in a solid and the motion of the molecules in a solid?

	forces	motion
A	strong	free to change places
B	strong	vibration only
C	weak	free to change places
D	weak	vibration only

- 34 A student moves one end of a long rope up and down through a short distance. A wave travels along the rope in the direction shown.



The student now moves the rope up and down through a larger distance. He also moves it up and down more times in each minute.

Which row shows the effects of these two changes?

	amplitude of the wave	frequency of the wave
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

- 35 A student determines the speed of sound in air. She measures the time between making a sound and hearing the echo from a cliff.



She uses the equation: $\text{speed} = \frac{\text{distance}}{\text{time}}$.

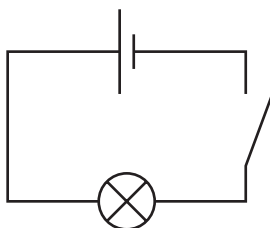
Which type of sound does she make and which distance does she use in her calculation?

	type of sound	distance used
A	continuous sound	$2 \times \text{distance to cliff}$
B	continuous sound	$\frac{1}{2} \times \text{distance to cliff}$
C	short, sharp sound	$2 \times \text{distance to cliff}$
D	short, sharp sound	$\frac{1}{2} \times \text{distance to cliff}$

- 36** A polythene rod is rubbed with a cloth. The rod becomes positively charged.

What has happened to the rod?

- A** It has gained electrons.
B It has gained protons.
C It has lost electrons.
D It has lost protons.
- 37** In the circuit shown, the cell has an electromotive force (e.m.f.) of 1.5 V and the total resistance of the circuit is $12\ \Omega$.



What is the total charge that flows through the cell in 2.0 minutes?

- A** 0.25 C **B** 15 C **C** 36 C **D** 2160 C
- 38** In each of four circuits a lamp is connected to a battery using connecting wires that have resistance.

The wires are all made from the same metal but have different lengths and thicknesses.

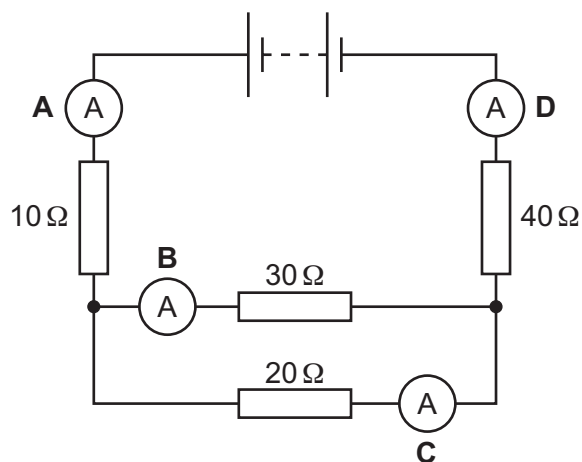
The lamps are all identical and the batteries are all identical.

In which circuit does the lamp shine most brightly?

	length of connecting wires / cm	diameter of connecting wires / mm
A	10	0.25
B	10	0.50
C	20	0.25
D	20	0.50

- 39 The diagram shows a circuit containing four resistors and four ammeters.

Which ammeter has the smallest reading?



- 40 An electric oven is connected to the mains supply using insulated copper wires. The wires become very warm.

Which change reduces the amount of heat produced in the connecting wires?

- A Use thicker copper wires.
- B Use thinner copper wires.
- C Use thicker insulation.
- D Use thinner insulation.

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The Periodic Table of Elements

Group																																																																														
I	II	Key										III	IV	V	VI	VII	VIII																																																													
3 Li lithium 7	4 Be beryllium 9	atomic number atomic symbol name relative atomic mass										5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	2 He helium 4																																																													
		1 H hydrogen 1																																																																												
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 —	113 Nh nihonium —	114 Fl flerovium —	115 Lv livermorium —	116 Ts tennessine —	117 Og oganesson —

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 dm³ at room temperature and pressure (r.t.p.).