



# Cambridge IGCSE™

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## COMBINED SCIENCE

0653/23

Paper 2 Multiple Choice (Extended)

October/November 2021

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

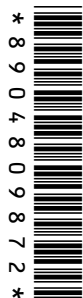
- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A, B, C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple 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. Any blank pages are indicated.



1 Movement is a characteristic of all living organisms.

Which two other characteristics of living organisms provide the energy for movement?

- A excretion and nutrition
- B growth and sensitivity
- C nutrition and respiration
- D respiration and growth

2 Which row correctly describes a feature of a specialised cell?

	specialised cell	feature
<b>A</b>	egg cell	energy store
<b>B</b>	palisade cell	cilia
<b>C</b>	red blood cell	cell wall
<b>D</b>	root hair cell	chloroplasts

3 Which small molecules are used to make proteins?

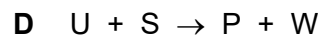
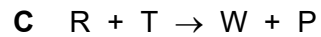
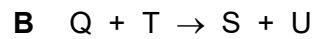
- A amino acids
- B fatty acids
- C glucose
- D glycerol

4 What is a suitable range for investigating the effect of temperature on the activity of an enzyme from a human body?

- A 0°C to 30°C
- B 20°C to 60°C
- C 40°C to 60°C
- D 50°C to 100°C

5 Which letters from the list represent the balanced equation for photosynthesis?

P	$C_6H_{12}O_6$	T	$H_2O$
Q	$6C_6H_{12}O_6$	U	$6H_2O$
R	$CO_2$	V	$O_2$
S	$6CO_2$	W	$6O_2$



6 Which type of digestion causes the breakdown of large, insoluble molecules into small, soluble molecules?

**A** chemical

**B** hormonal

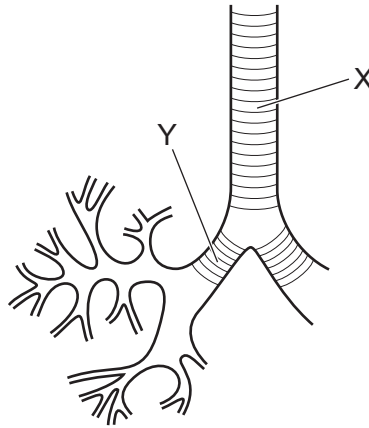
**C** mechanical

**D** physical

7 Which conditions cause plants to lose most mass by transpiration?

	humidity	temperature
<b>A</b>	high	high
<b>B</b>	high	low
<b>C</b>	low	high
<b>D</b>	low	low

- 8 The diagram shows part of the gas exchange system in humans.



What are the structures labelled X and Y?

	X	Y
<b>A</b>	bronchiole	trachea
<b>B</b>	bronchus	trachea
<b>C</b>	trachea	bronchiole
<b>D</b>	trachea	bronchus

- 9 A plant shoot is illuminated from one side only.

What collects on the shaded side of the plant shoot?

- A** auxin
  - B** chlorophyll
  - C** glucose
  - D** starch
- 10 What is a characteristic of **insect**-pollinated flowers?
- A** anthers hanging outside the flower
  - B** hairy or sticky stigmas
  - C** large quantities of smooth, light pollen
  - D** no scent or nectar

11 Which comparison between human female and male gametes is correct?

	eggs	sperm
<b>A</b>	have a flagellum	have no flagellum
<b>B</b>	move a short distance	move a long distance
<b>C</b>	produced in greater numbers	produced in fewer numbers
<b>D</b>	smaller size	larger size

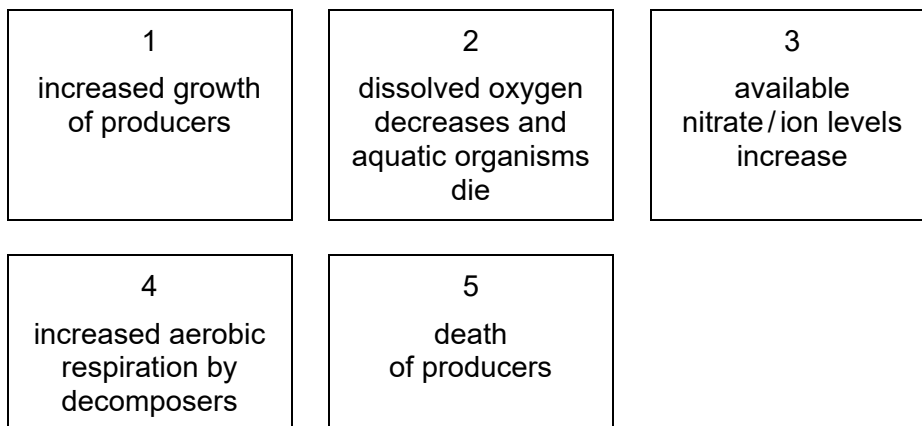
12 The diagram represents four organisms in a food chain.

T → U → V → W

Which organisms are consumers?

- A** T, U and V    **B** T, U and W    **C** T, V and W    **D** U, V and W

13 The eutrophication of water has a number of stages.



What is the correct order of the stages?

- A** 1 → 3 → 5 → 4 → 2  
**B** 1 → 2 → 5 → 4 → 3  
**C** 3 → 1 → 5 → 4 → 2  
**D** 3 → 1 → 4 → 2 → 5

14 How many electrons are shared by the atoms in a nitrogen molecule, N<sub>2</sub>?

- A** 2                      **B** 4                      **C** 6                      **D** 8

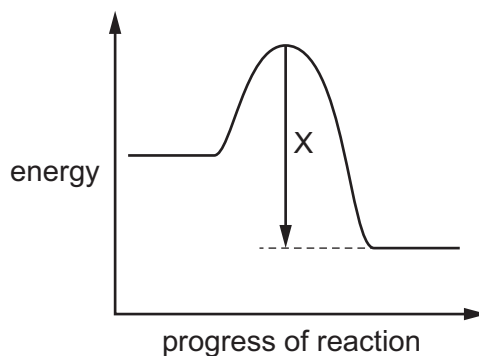
15 The formula of magnesium chloride is  $\text{MgCl}_2$ .

The formula of sodium phosphide is  $\text{Na}_3\text{P}$ .

What is the formula of magnesium phosphide?

- A  $\text{MgP}$                       B  $\text{MgP}_2$                       C  $\text{Mg}_2\text{P}_3$                       D  $\text{Mg}_3\text{P}_2$

16 An energy level diagram for a reaction is shown.



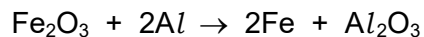
Which statement describes and explains energy change X?

- A Energy is given out as bonds break.  
 B Energy is given out as bonds form.  
 C Energy is taken in as bonds break.  
 D Energy is taken in as bonds form.
- 17 Hydrogen peroxide decomposes to form water and oxygen.

Which changes in temperature and in concentration **both** reduce the rate of this reaction?

	temperature of hydrogen peroxide	concentration of hydrogen peroxide
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

18 Iron oxide reacts with aluminium.



Which row identifies the oxidising agent and reducing agent in the reaction?

	oxidising agent	reducing agent
<b>A</b>	aluminium oxide	aluminium
<b>B</b>	aluminium oxide	iron
<b>C</b>	iron(III) oxide	aluminium
<b>D</b>	iron(III) oxide	iron

19 Which statement describes an acid?

- A** It has a pH less than 7.
- B** It reacts with calcium carbonate to form a white precipitate.
- C** It reacts with hydrochloric acid to form a salt and water.
- D** It turns universal indicator blue.

20 A piece of damp blue litmus paper is placed in a gas.

The litmus paper turns red and then turns white.

What is the gas?

- A** carbon dioxide
- B** chlorine
- C** hydrogen
- D** oxygen

21 Some properties of noble gases are shown.

	melting point/ $^{\circ}\text{C}$	boiling point/ $^{\circ}\text{C}$	density $\text{g}/\text{cm}^3$
helium	-272	-269	0.0002
neon			
argon	-189		
krypton		-152	0.0059
xenon	-112	-108	0.0097

What are the properties of neon?

	melting point/ $^{\circ}\text{C}$	boiling point/ $^{\circ}\text{C}$	density $\text{g}/\text{cm}^3$
<b>A</b>	-251	-274	0.0004
<b>B</b>	-178	-174	0.0041
<b>C</b>	-249	-246	0.0008
<b>D</b>	-240	-236	0.0062

22 P, Q, R and S are four metals.

P is soft.

Q reacts violently with water.

R has a high melting point.

S forms blue compounds.

Which metals are transition elements?

- A** P and Q      **B** P and R      **C** Q and S      **D** R and S

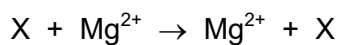
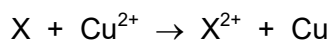
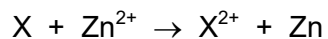
23 Brass is an alloy.

What is brass?

- A** a compound containing two metallic elements  
**B** a compound containing two non-metallic elements  
**C** a mixture containing two metallic elements  
**D** a mixture containing two non-metallic elements



24 The results of mixing metal X with aqueous metal ions are shown.



What is the position of X in the reactivity series?

	<div style="display: flex; align-items: center; justify-content: space-between;"> <span>most reactive</span> <span>→</span> <span>least reactive</span> </div>			
<b>A</b>	X	Mg	Zn	Cu
<b>B</b>	Mg	X	Zn	Cu
<b>C</b>	Mg	Zn	X	Cu
<b>D</b>	Mg	Zn	Cu	X

25 Which substance reduces iron(III) oxide in the blast furnace?

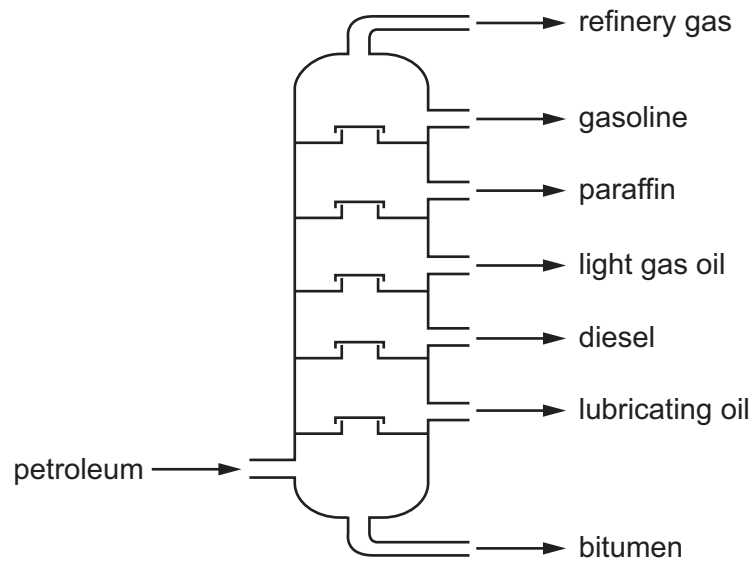
- A** carbon dioxide
- B** carbon monoxide
- C** limestone
- D** oxygen

26 Which statements about the rusting of iron are correct?

- 1 It requires oxygen and water.
- 2 It is prevented by coating with another metal.
- 3 Painted iron nails do not rust.

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

27 The fractional distillation of petroleum is shown.



Which fraction contains molecules that have the largest attractive forces?

- A bitumen
  - B diesel
  - C gasoline
  - D refinery gas
- 28 A distance–time graph and a speed–time graph are plotted for a moving vehicle.
- Which feature gives the acceleration of the vehicle?
- A the area under the distance–time graph
  - B the area under the speed–time graph
  - C the gradient of the distance–time graph
  - D the gradient of the speed–time graph
- 29 A container is filled to the top with water. An object is slowly lowered into the water until it is completely submerged. The water that overflows from the container is collected.
- The mass of the object is 84 kg. The volume of water collected is  $0.12 \text{ m}^3$ .
- What is the density of the object?
- A  $1.4 \text{ kg/m}^3$
  - B  $10 \text{ kg/m}^3$
  - C  $84 \text{ kg/m}^3$
  - D  $700 \text{ kg/m}^3$

30 A spring that obeys Hooke's Law has unstretched length  $l$ .

A load  $F$  is suspended from the spring, and the spring extends by an amount  $x$ .

Which equation is used to define the spring constant  $k$ ?

- A**  $k = Fx$       **B**  $k = \frac{F}{(l+x)}$       **C**  $k = \frac{F}{x}$       **D**  $k = \frac{x}{F}$

31 A force pushes an object in a straight line.

Which expression gives the work done by the force?

- A** force  $\times$  distance moved  
**B** force  $\times$  time taken  
**C** force  $\div$  distance moved  
**D** force  $\div$  time taken

32 Water in a beaker evaporates quickly.

Which statements about the evaporation of the water from the beaker are correct?

- 1 Evaporation happens at all temperatures between  $0^\circ\text{C}$  and  $100^\circ\text{C}$ .
- 2 The more-energetic water molecules escape from the surface of the water.
- 3 The temperature of the water remaining in the beaker decreases.

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

33 A gas is heated.

Which statement explains how thermal energy is transferred by convection in the gas?

- A** The heated gas expands, becomes less dense and falls.  
**B** The heated gas expands, becomes less dense and rises.  
**C** The heated gas expands, becomes more dense and falls.  
**D** The heated gas expands, becomes more dense and rises.

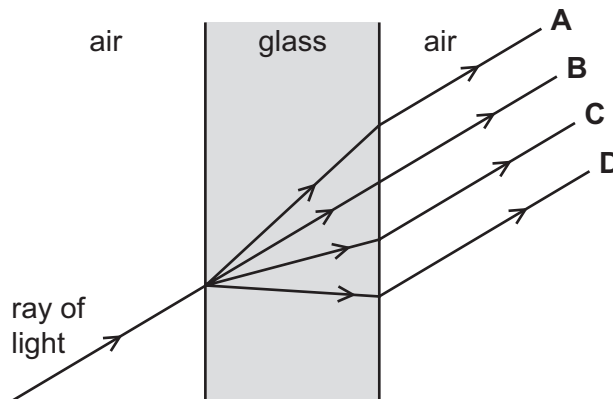
34 A microwave oven uses microwaves with a frequency of  $2.5 \times 10^9$  Hz.

What is the wavelength of these microwaves?

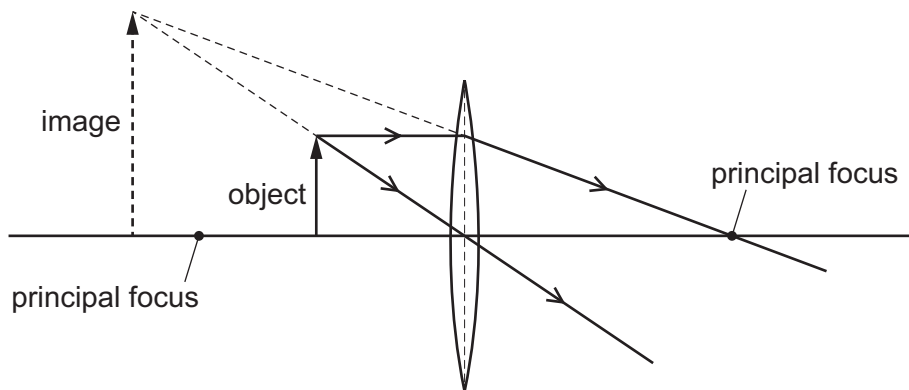
- A** 0.0075 m      **B** 0.12 m      **C** 7.5 m      **D** 12 m

35 A ray of light passes through a glass window.

Which path does it take?



36 The diagram shows a thin converging lens used as a magnifying glass. Each principal focus of the lens is labelled.



The object is moved to the right, closer to the lens.

What happens to the image?

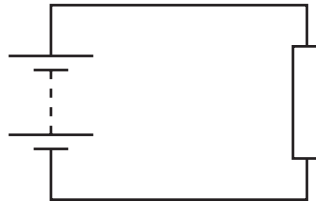
- A It moves to the left and becomes larger.
- B It moves to the left and becomes smaller.
- C It moves to the right and becomes larger.
- D It moves to the right and becomes smaller.

37 There is a potential difference of  $4.0\text{ V}$  across a resistor of resistance  $2.0\ \Omega$ .

How much charge passes through the resistor in  $10\text{ s}$ ?

- A  $0.80\text{ C}$
- B  $5.0\text{ C}$
- C  $20\text{ C}$
- D  $80\text{ C}$

- 38 A circuit contains a battery connected to a resistor.



Which values of electromotive force (e.m.f.) and resistance produce the smallest current in the circuit?

	e.m.f./V	resistance/ $\Omega$
<b>A</b>	6.0	10
<b>B</b>	6.0	20
<b>C</b>	24	80
<b>D</b>	24	160

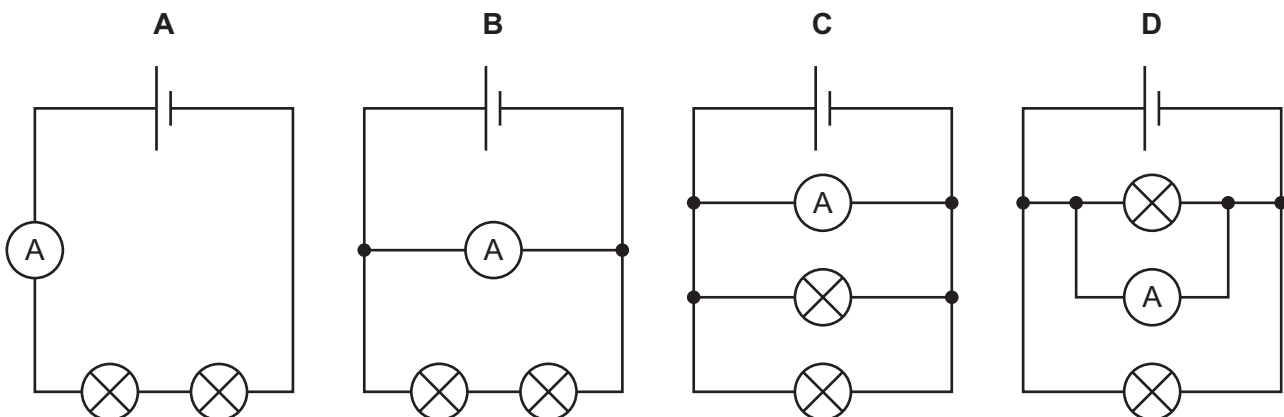
- 39 Four wires are made from the same material but have different lengths and diameters.

Which wire has the smallest resistance?

	length / cm	diameter / mm
<b>A</b>	50	0.10
<b>B</b>	50	0.20
<b>C</b>	100	0.10
<b>D</b>	100	0.20

- 40 The diagrams show four circuits, each containing an ammeter and two lamps with different resistances.

Which circuit shows an ammeter with a reading equal to the current in each lamp?



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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	<p style="text-align: center;"><b>Key</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">atomic number</td> </tr> <tr> <td style="text-align: center;">atomic symbol</td> </tr> <tr> <td style="text-align: center;">name</td> </tr> <tr> <td style="text-align: center;">relative atomic mass</td> </tr> </table>										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	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	18 <b>Ar</b> argon 40	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 —	—	—	—
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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.).