



Cambridge IGCSE™

COMBINED SCIENCE

0653/21

Paper 2 Multiple Choice (Extended)

October/November 2023

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.

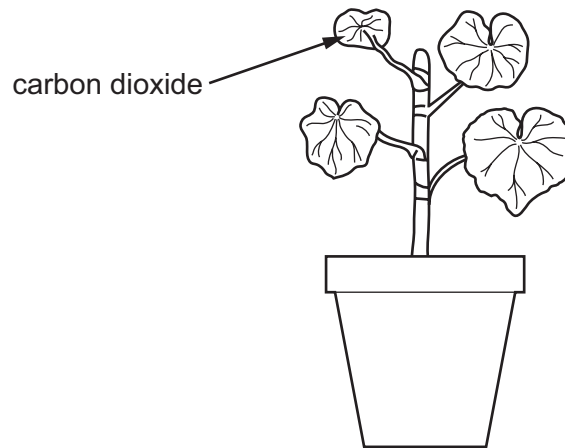
INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Any blank pages are indicated.



- 1 The diagram shows a plant absorbing carbon dioxide in order to carry out photosynthesis.

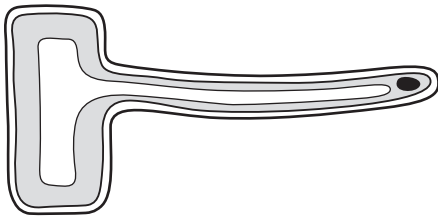


Which characteristic of all living organisms is this?

- A movement
 - B nutrition
 - C excretion
 - D reproduction
- 2 Four different cells and functions are shown.

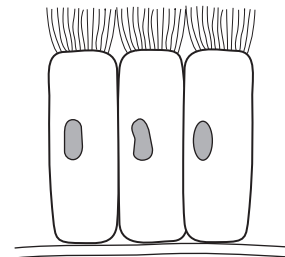
Which cell has the correct function stated?

A



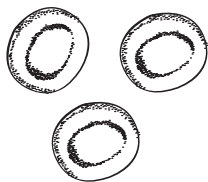
involved in reproduction

B



moves mucus in the trachea

C



involved in photosynthesis

D

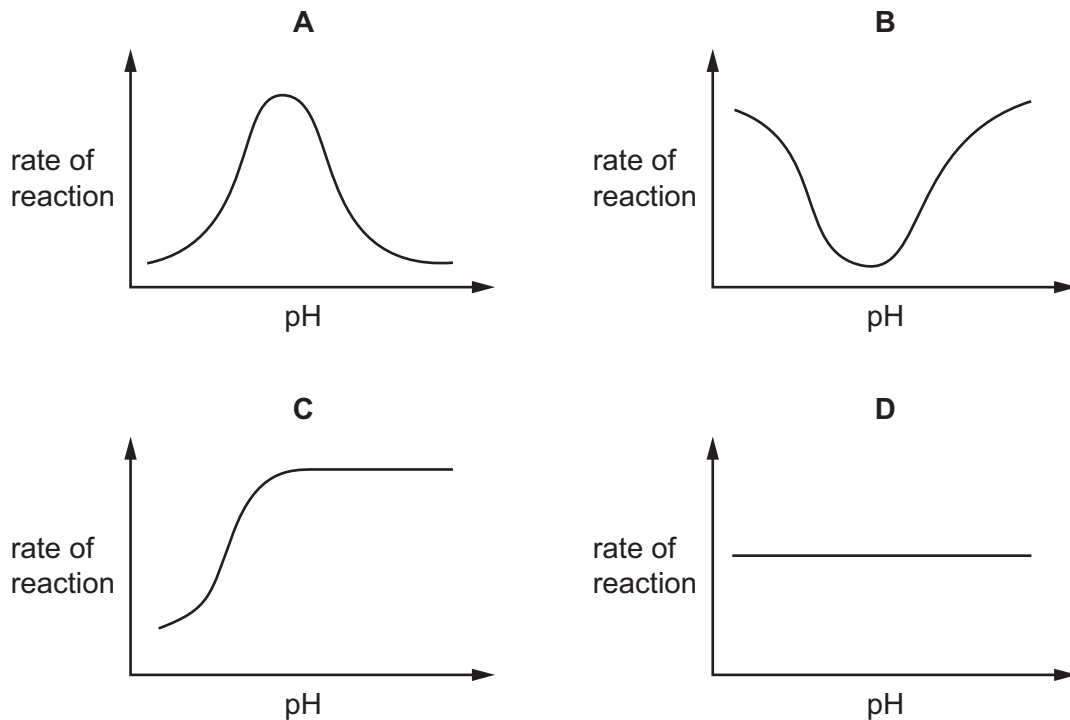


absorbs water from the soil

3 What is diffusion?

- A net movement of molecules down a concentration gradient
- B net movement of molecules up a concentration gradient
- C total movement of molecules down a concentration gradient
- D total movement of molecules up a concentration gradient

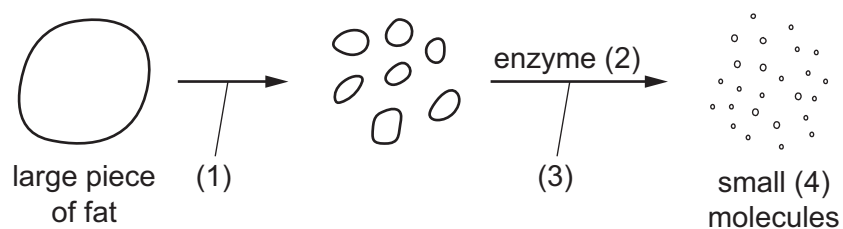
4 Which graph shows the effect of increasing pH on enzyme activity?



5 What is the correct definition of a balanced diet?

- A a diet in which all the components needed to maintain health are present in appropriate proportions
- B a diet which contains only carbohydrates, fats and proteins
- C a diet which contains mostly protein and dietary fibre
- D a diet which contains only vitamins and minerals

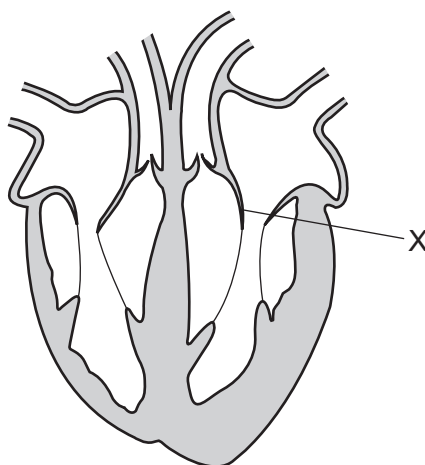
- 6 The diagram shows what happens to fat in the alimentary canal.



Which row correctly identifies 1, 2, 3 and 4?

	1	2	3	4
A	chemical digestion	lipase	mechanical digestion	soluble
B	chemical digestion	protease	ingestion	insoluble
C	mechanical digestion	lipase	chemical digestion	soluble
D	mechanical digestion	protease	ingestion	insoluble

- 7 The diagram shows a section through the heart.



What causes valve X to close?

- A** contraction of the left ventricle
- B** contraction of the left atrium
- C** relaxation of the left ventricle
- D** relaxation of the left atrium

8 Which chemical is used to test for carbon dioxide in expired air?

- A Benedict's solution
- B distilled water
- C iodine solution
- D limewater

9 Six molecules of glucose are aerobically respired in an animal cell.

How many molecules of carbon dioxide are released in this process?

- A 1 B 6 C 12 D 36

10 Which statement about auxin is correct?

- A Auxin is always equally distributed.
- B Auxin is made in the carpels only.
- C Auxin spreads through the plant from the sepals.
- D Auxin stimulates cell elongation.

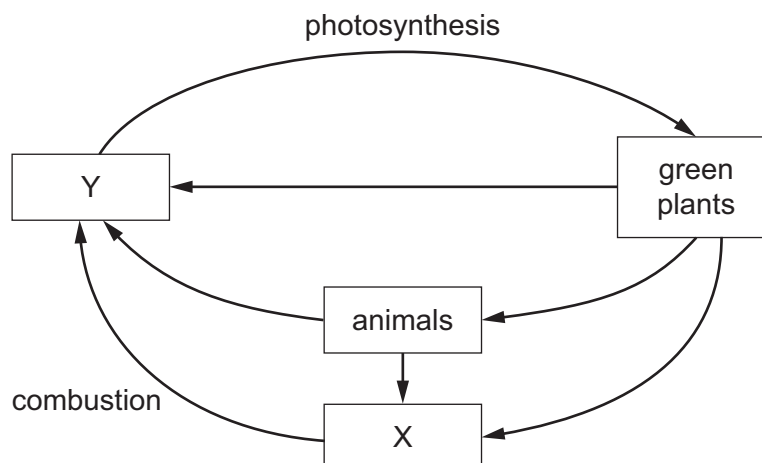
11 Which row is correct for sexual reproduction?

	genetically different offspring produced	one parent	zygote produced
A	✓	✓	x
B	✓	x	✓
C	x	✓	x
D	x	x	✓

12 Which feature is a structural adaptation found in wind-pollinated flowers?

- A Scent is produced.
- B Nectar is produced.
- C Petals are small or absent.
- D Stigma is inside flower.

13 The diagram shows part of the carbon cycle.



What are X and Y?

	X	Y
A	fossil fuel	carbon dioxide
B	carbon dioxide	oxygen
C	fossil fuel	oxygen
D	oxygen	carbon dioxide

14 Which substance is liquid at 25 °C?

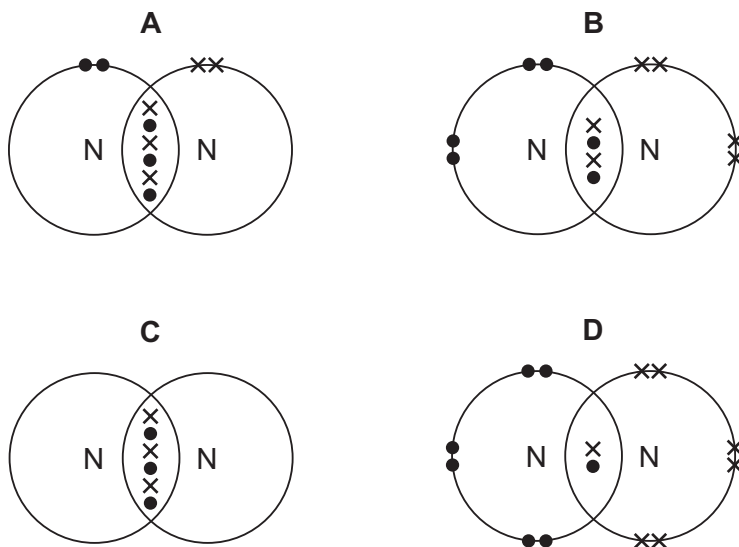
	melting point / °C	boiling point / °C
A	–182	–161
B	–100	80
C	–77	–34
D	44	280

15 A solid is added to a liquid and stirred until the solid is no longer visible.

Which word describes the type of mixture that is formed?

- A** concentration
- B** solute
- C** solution
- D** solvent

16 Which dot-and-cross diagram represents the outer shell electrons in a nitrogen molecule?



17 Iron(III) sulfate contains Fe^{3+} ions and SO_4^{2-} ions.

What is the formula of iron(III) sulfate?

- A** FeSO_4 **B** Fe_3SO_4 **C** $\text{Fe}_2(\text{SO}_4)_3$ **D** $\text{Fe}_3(\text{SO}_4)_2$

18 During electrolysis, positive ions are changed.

Which row describes what happens to the positive ions and identifies the electrode where this happens?

	what happens to the positive ions	electrode
A	gain electrons	anode
B	gain electrons	cathode
C	lose electrons	anode
D	lose electrons	cathode

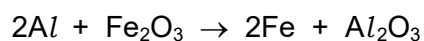
- 19** Dilute hydrochloric acid and calcium carbonate react together to produce a gas.

The rate of reaction changes if the concentration of the hydrochloric acid or the temperature is changed.

Which row about a change and how it affects the activation energy and the frequency of collisions between reacting particles is correct?

	change	activation energy	frequency of collisions
A	increased concentration	decreases	increases
B	increased concentration	no effect	no effect
C	increased temperature	decreases	no effect
D	increased temperature	no effect	increases

- 20** The equation for the redox reaction between aluminium and iron(III) oxide is shown.



Which row identifies the substance that is reduced and the oxidising agent?

	substance reduced	oxidising agent
A	Al	Fe_2O_3
B	Al	Al
C	Fe_2O_3	Fe_2O_3
D	Fe_2O_3	Al

- 21** Calcium oxide is added to water containing universal indicator. The universal indicator turns blue.

What is the pH of the solution?

- A** 1 **B** 6 **C** 7 **D** 11

22 Acid X reacts with metal Y.

A colourless gas is given off and a pale green solution is produced.

Two tests are carried out on the solution.

test	reagents added	result
1	aqueous silver nitrate and dilute nitric acid	white precipitate
2	aqueous sodium hydroxide	green precipitate

What are acid X and metal Y?

	acid X	metal Y
A	hydrochloric	iron
B	hydrochloric	zinc
C	sulfuric	iron
D	sulfuric	zinc

23 Fluorine is at the top of Group VII in the Periodic Table.

It reacts with potassium iodide as shown.



What is substance Z?

- A** fluoride
- B** potassium
- C** potassium fluoride
- D** potassium fluorine

24 Which statements about metals and their compounds are correct?

- 1 Copper reacts with dilute hydrochloric acid to give hydrogen.
- 2 Carbon does not react with aluminium oxide.
- 3 Hydrogen is formed when steam is passed over heated zinc.
- 4 Iron is more reactive than magnesium.

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

25 Different reactions occur in the blast furnace.

Which substances are products in some reactions and reactants in other reactions in the blast furnace?

- A** carbon dioxide and carbon monoxide
- B** carbon dioxide and carbon
- C** carbon monoxide and iron
- D** iron and carbon

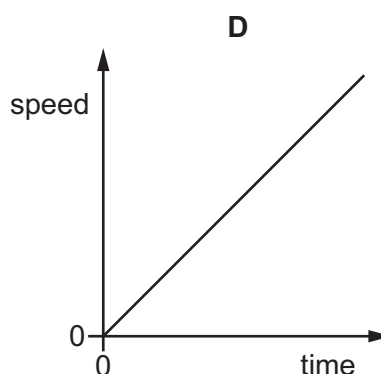
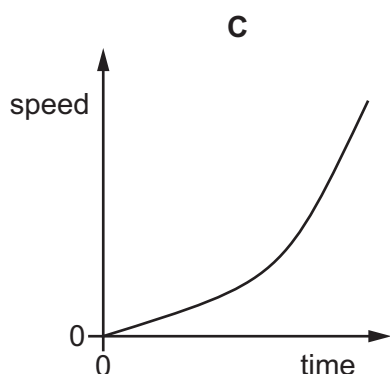
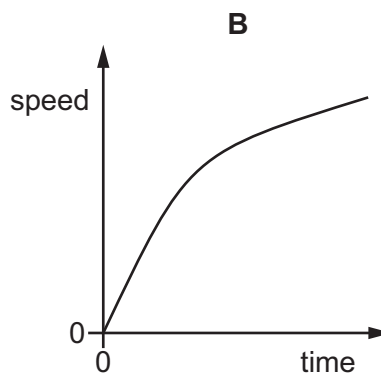
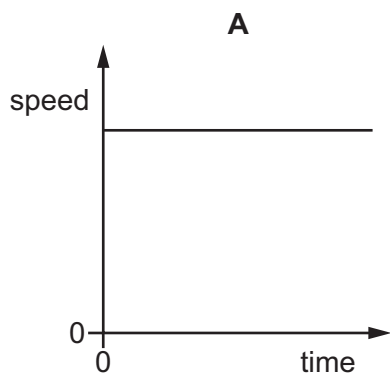
26 Which gases can directly cause an enhanced greenhouse effect?

- A** carbon monoxide and carbon dioxide
- B** carbon dioxide and methane
- C** nitrogen dioxide and sulfur dioxide
- D** sulfur dioxide and methane

27 Which statement about alkanes is correct?

- A** Their molecules are unsaturated.
- B** They are generally reactive compounds.
- C** They are mixtures of carbon and hydrogen atoms only.
- D** They produce water when they burn.

28 Which speed–time graph represents motion for which the acceleration is constant but **not** zero?



29 A glass block has a mass of 30 g and a volume of 15 cm³.

What is the density of the glass?

- A** 0.50 g/cm³ **B** 2.0 g/cm³ **C** 15 g/cm³ **D** 450 g/cm³

30 A spring that obeys Hooke's law is stretched by a force of 4.0 N.

The length of the spring changes from 10 cm to 12 cm.

What is the spring constant of the spring?

- A** 0.33 N/cm **B** 0.50 N/cm **C** 2.0 N/cm **D** 3.0 N/cm

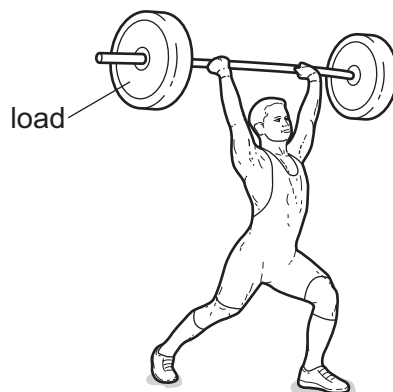
31 A car has a kinetic energy of 200 kJ as it passes a point P on a straight horizontal road.

A constant resultant force of 500 N then causes the car to accelerate.

What is the kinetic energy of the car when it has travelled a distance of 50 m past P?

- A** 2000 J **B** 25000 J **C** 225 000 J **D** 5 000 000 J

- 32** A man lifts a heavy load vertically, from the ground to above his head.



He then moves the load horizontally at constant speed.

During which motion is work done on the load, and why?

	work is done	reason
A	when lifting	the force exerted on the load is at right angles to the direction of movement of the load
B	when lifting	the force exerted on the load is in the same direction as the movement of the load
C	when moving horizontally	the force exerted on the load is at right angles to the direction of movement of the load
D	when moving horizontally	the force exerted on the load is in the same direction as the movement of the load

- 33** 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.

- 34** The molecules in a substance are close together but free to change positions with each other.

Which substance at 20 °C matches this description?

- A** air
- B** copper
- C** iron
- D** water

- 35** A sound wave passes from one medium into a second medium.

What happens to the sound wave entering the second medium and why does this happen?

	what happens	why it happens
A	it is reflected	the frequency changes
B	it is reflected	the speed changes
C	it is refracted	the frequency changes
D	it is refracted	the speed changes

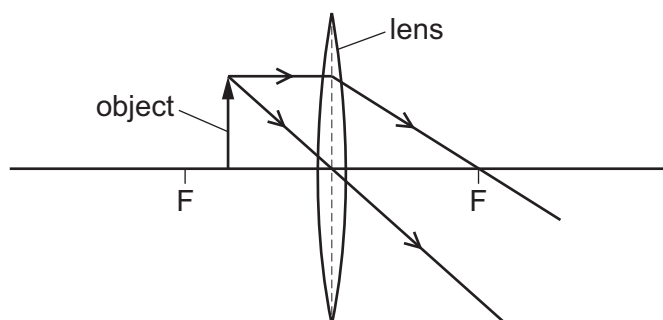
- 36** An earthquake wave shakes the ground at right angles to the direction of travel of the wave.

This wave has a frequency of 0.10 Hz and a wavelength of 30 000 m.

Which row shows the type of wave this is and its speed?

	type of wave	$\frac{\text{speed}}{\text{m/s}}$
A	longitudinal	3 000
B	longitudinal	300 000
C	transverse	3 000
D	transverse	300 000

- 37** The diagram shows two light rays from an object that pass through a thin converging lens. Each point labelled F is a principal focus of the lens.



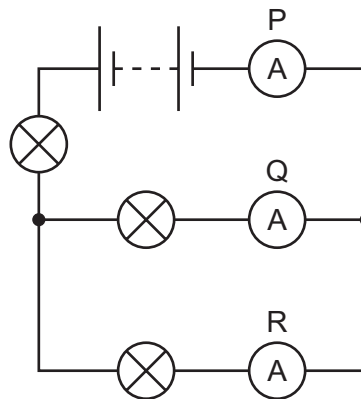
What is the nature of the image formed?

- A** right way up and larger than the object
- B** right way up and smaller than the object
- C** upside down and larger than the object
- D** upside down and smaller than the object

- 38 The amplitude of a sound wave decreases and its frequency increases.

What happens to the sound heard?

- A It becomes louder and its pitch becomes higher.
 - B It becomes louder and its pitch becomes lower.
 - C It becomes quieter and its pitch becomes higher.
 - D It becomes quieter and its pitch becomes lower.
- 39 There is a current of 6.0 A in a wire.
- How much charge flows through the wire in 2.0 minutes?
- A 0.050 C B 3.0 C C 12 C D 720 C
- 40 A circuit contains three ammeters, P, Q and R, and three identical lamps.



How do the readings on the ammeters compare?

- A All three ammeters show the same reading.
- B The reading on P is greater than the reading on Q and greater than the reading on R.
- C The reading on P is less than the reading on Q and less than the reading on R.
- D The three ammeters show three different readings.

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The Periodic Table of Elements

Group																																																					
I	II											III	IV	V	VI	VII	VIII																																				
3 Li lithium 7	4 Be beryllium 9	Key atomic number atomic symbol name relative atomic mass										1 H hydrogen 1												2 He helium 4																													
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 Mc moscovium —	116 Lv livermorium —	117 Ts tennessine —	118 Og oganesion —

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.).