



Cambridge IGCSE™

CO-ORDINATED SCIENCES

0654/13

Paper 1 Multiple Choice (Core)

October/November 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)

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

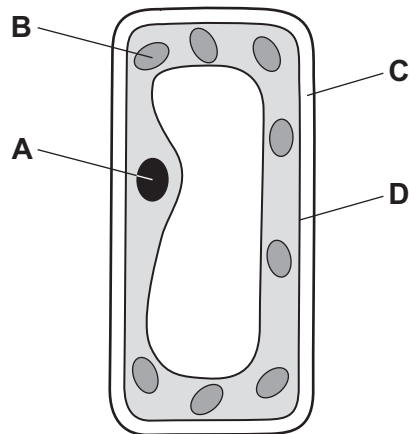
- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

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



- 1 Which characteristic of living organisms involves chemical reactions that break down nutrient molecules to release energy?
- A excretion
 - B nutrition
 - C reproduction
 - D respiration

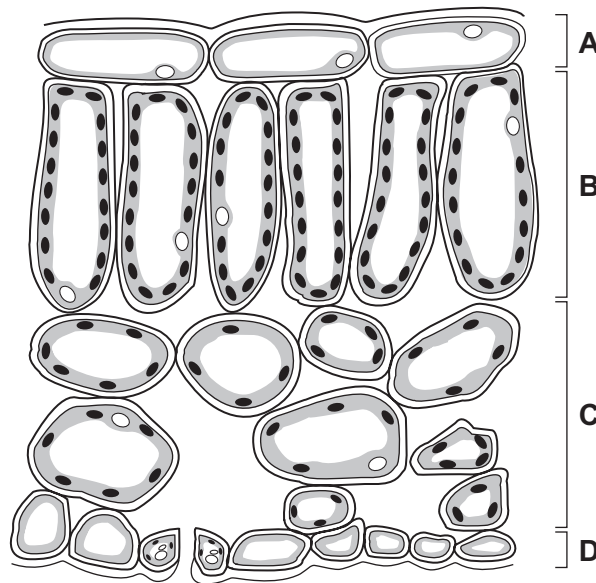
- 2 Which structure in a plant cell allows osmosis to occur?



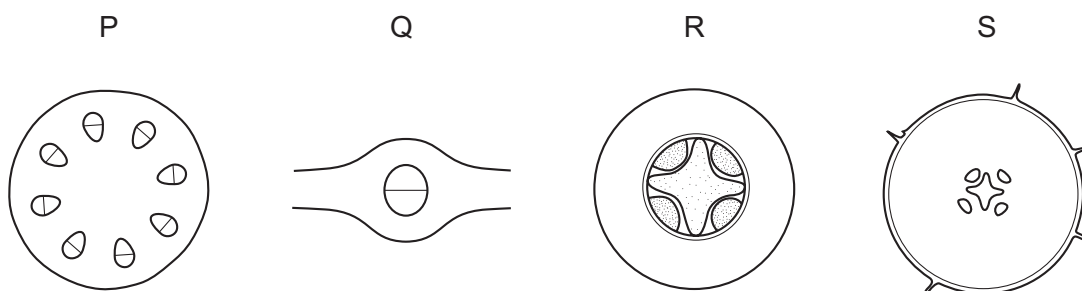
- 3 Glycerol is a component of which large molecules?
- A fats
 - B glycogen
 - C proteins
 - D starch
- 4 Which process involves enzymes?
- A absorption
 - B digestion
 - C egestion
 - D ingestion

- 5 The diagram shows a section of a dicotyledonous leaf.

Which layer is the spongy mesophyll?



- 6 Which food ensures the blood has enough haemoglobin to carry oxygen?
- A** cheese which contains a large amount of calcium
B orange juice which contains a large amount of vitamin C
C liver which contains a large amount of iron
D salmon which contains a large amount of vitamin D
- 7 The diagrams represent sections through a root, a stem and a leaf mid-rib, not drawn to the same scale.



In which row are the sections correctly identified?

	root	stem	leaf
A	P	S	R
B	Q	R	S
C	R	P	Q
D	S	Q	P

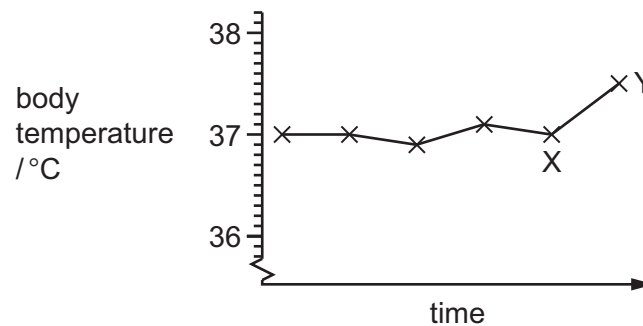
- 8 A student places an insect in a sealed test-tube and measures the concentration of oxygen and carbon dioxide in the test-tube. The insect is left for 30 minutes.

The concentration of oxygen and carbon dioxide are then measured again. The results are shown in the table.

Which row shows how these concentrations change during the experiment?

	oxygen concentration	carbon dioxide concentration
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

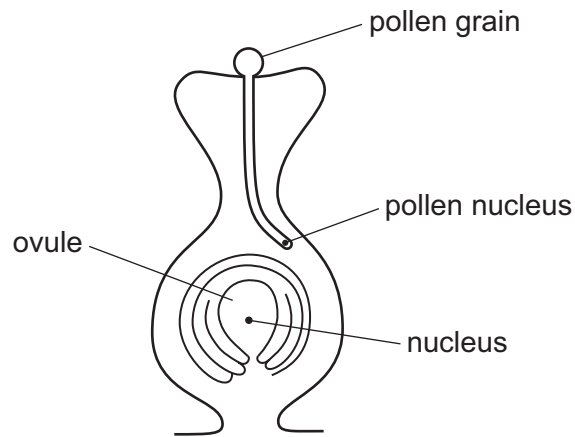
- 9 The graph shows the variation of body temperature over time of a healthy person at rest.



How will the body reverse the temperature change shown between times X and Y?

- A** decreased breathing rate
- B** decreased pulse rate
- C** shivering
- D** sweating

10 The diagram shows a cross-section of a carpel of an insect-pollinated flower.

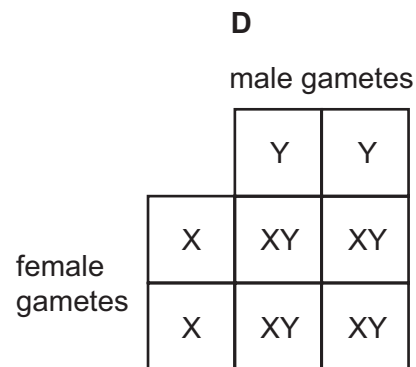
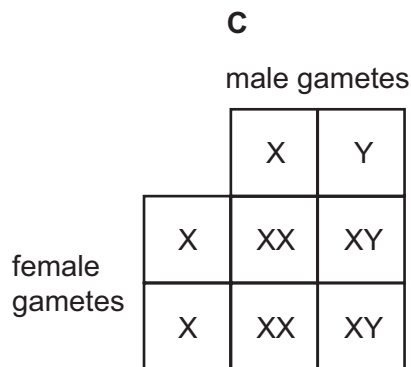
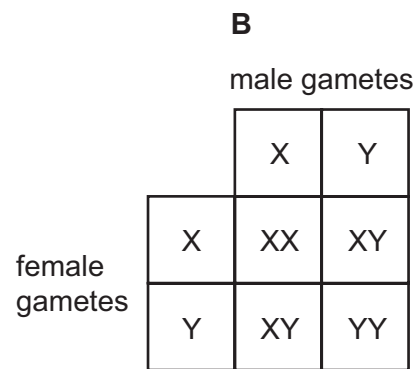
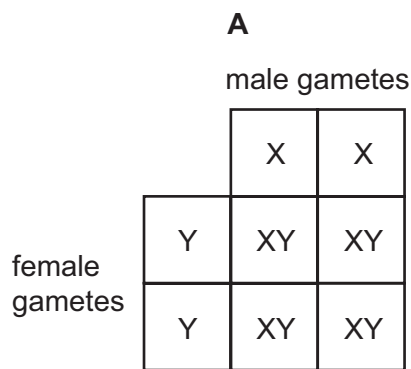


Which row correctly shows the processes that have taken place?

	pollination	fertilisation
A	✓	✓
B	✓	x
C	x	✓
D	x	x

key
 ✓ = has occurred
 x = has not occurred

11 Which diagram correctly shows sex inheritance in humans?



- 12 What is a carnivore?
- A an organism that gets its energy by eating animals
 - B an organism that gets its energy by eating plants
 - C an organism that gets its energy from dead matter
 - D an organism that makes its own organic matter
- 13 What is an undesirable effect of deforestation?
- A It increases the oxygen concentration of the atmosphere.
 - B It leads to erosion and loss of soil.
 - C It makes land available for agriculture.
 - D It pollutes the air with methane.
- 14 In which substance are the particles closest together at room temperature?
- A CO₂
 - B Ne
 - C N₂
 - D Zn
- 15 How many neutrons are in one atom of the isotope $^{35}_{17}\text{Cl}$?
- A 17
 - B 18
 - C 35
 - D 52
- 16 A mixture contains water, H₂O, copper chloride, CuCl₂, and barium sulfate, BaSO₄.
How many different non-metallic elements are in the mixture?
- A 2
 - B 4
 - C 7
 - D 12
- 17 Which process is used to produce sodium and chlorine from the compound sodium chloride?
- A chromatography
 - B cracking
 - C distillation
 - D electrolysis

18 A metal oxide powder is added to a dilute acid.

The initial temperature of the acid is 21 °C. The pH of the acid is 2.

When all the acid has reacted, the temperature of the reaction mixture is 23 °C and the pH is 7.

Which statement describes this reaction?

- A It is endothermic and neutralisation.
- B It is endothermic and oxidation.
- C It is exothermic and neutralisation
- D It is exothermic and oxidation.

19 A chemical reaction produces a gas.

The volume of gas given off over time is measured.

The results are shown.

time / s	0	10	20	30	40	50	60	70	80
volume of gas / cm ³	0	27	48	63	77	86	89	90	90

During which time period is the rate of reaction greatest?

- A 0–10 seconds
- B 20–30 seconds
- C 40–50 seconds
- D 60–70 seconds

20 Which gas is produced when zinc reacts with dilute hydrochloric acid?

- A carbon dioxide
- B hydrogen
- C oxygen
- D sulfur dioxide

21 What is **not** a property of transition elements?

- A They often act as catalysts.
- B They form coloured compounds.
- C They have high densities.
- D They have low melting points.

22 Filament lamps require an inert atmosphere.

Which gas is used to fill these lamps?

- A argon
- B helium
- C hydrogen
- D oxygen

23 Alloys are formed by dissolving one metal in another.

Alloys are1..... .

.....2..... alloys conduct electricity.

Which words complete gaps 1 and 2?

	1	2
A	compounds	All
B	compounds	Some
C	mixtures	All
D	mixtures	Some

24 Metal X is extracted from its ore by heating the ore with carbon.

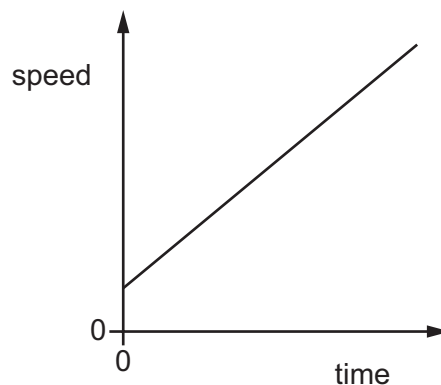
Which statement explains why carbon is used?

- A Carbon is a non-metal.
- B Carbon is more reactive than X.
- C Carbon reacts with oxygen in the air.
- D Carbon is less reactive than X.

25 Which substance turns blue when it is added to pure water?

- A anhydrous copper(II) sulfate
- B anhydrous cobalt(II) chloride
- C red litmus
- D universal indicator

- 26 What is **not** a use of limestone?
- A manufacture of calcium oxide
 - B neutralising industrial waste products
 - C purifying water
 - D treating acidic soil
- 27 Which statement about alkanes is correct?
- A They rapidly decolourise aqueous bromine.
 - B They are unsaturated hydrocarbons.
 - C They are used to make polymers.
 - D They can be used as fuels.
- 28 Which quantity can be measured using only a measuring cylinder?
- A the density of a liquid
 - B the mass of a liquid
 - C the volume of a liquid
 - D the weight of a liquid
- 29 The graph shows how the speed of an object varies with time.



How is the motion of the object described during the time shown by the graph?

- A moving at the start, then increasing speed with constant acceleration
- B moving at the start, then increasing speed with increasing acceleration
- C starting from rest, then increasing speed with constant acceleration
- D starting from rest, then moving at a constant speed

30 The density of gold is 19g/cm^3 . The masses and volumes of four coins are given in the table.

Which coin is made of gold?

	mass / g	volume / cm^3
A	1.0	1.9
B	9.5	0.50
C	10	1.9
D	19	9.5

31 From which type of energy is electrical energy transferred in a hydroelectric power station?

- A** chemical potential energy
- B** elastic potential (strain) energy
- C** gravitational potential energy
- D** nuclear energy

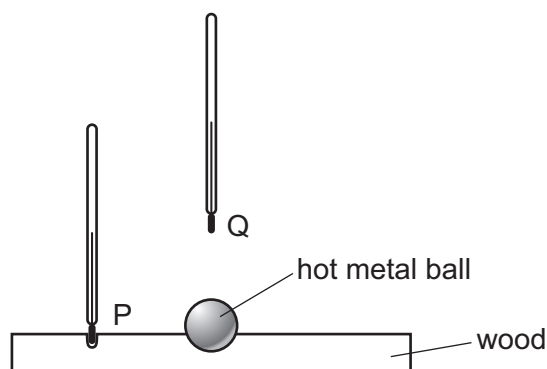
32 A bowl of water is placed on a balance outside where it is sunny and windy. The reading on the balance is recorded.

After some time, the reading on the balance is less than the original reading.

Which statement explains why the reading is less?

- A** The water has become cooler.
- B** The water has become warmer.
- C** The water has condensed.
- D** The water has evaporated.

- 33 A hot metal ball is placed in a small hollow in a piece of wood. Two thermometers are placed equal distances from the ball, one at position P and one at position Q.

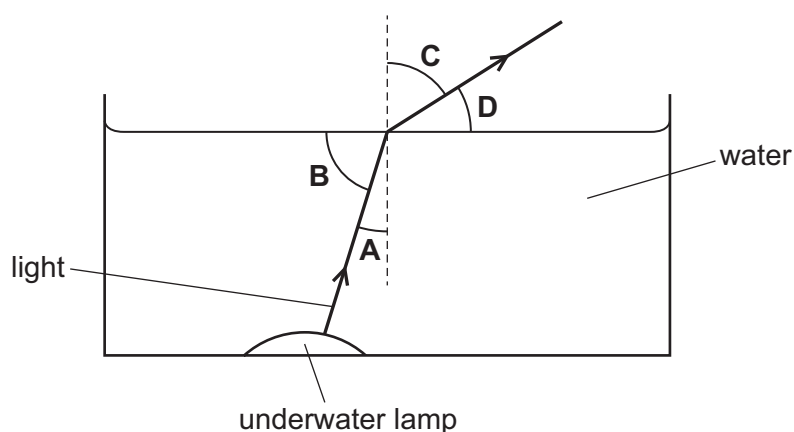


Which thermometer gives the higher reading and why?

	higher reading	reason
A	thermometer at P	the air conducts heat sideways, not upwards
B	thermometer at P	the wood conducts heat sideways, not upwards
C	thermometer at Q	convection carries heat upwards, not sideways
D	thermometer at Q	infrared rays always carry heat upwards, not sideways

- 34 Light from an underwater lamp is refracted at the surface of water.

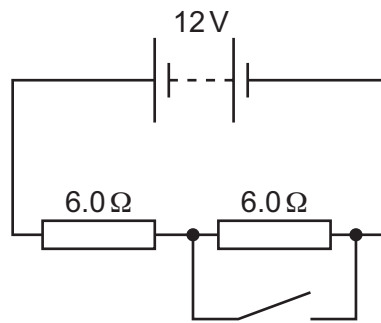
Which labelled angle is the angle of refraction of the light?



- 35 Which type of magnet can be switched on and off many times per second?

- A** an electromagnet only
- B** a permanent magnet only
- C** both electromagnets and permanent magnets
- D** neither electromagnets or permanent magnets

36 The diagram shows a 12 V battery connected to two $6.0\ \Omega$ resistors and a switch.



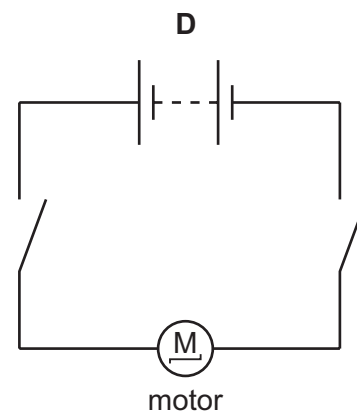
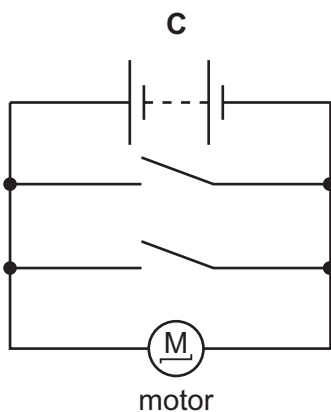
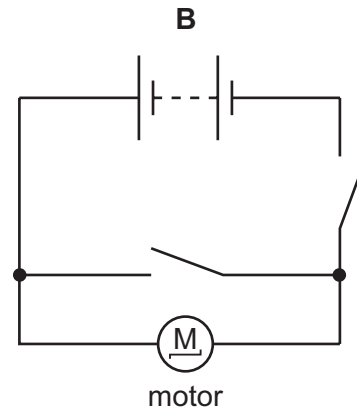
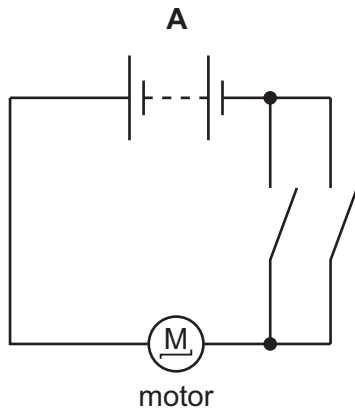
What is the current in the battery with the switch closed and what is the current with the switch open?

	current with switch closed / A	current with switch open / A
A	1.0	1.0
B	1.0	2.0
C	2.0	1.0
D	2.0	2.0

- 37 The diagrams show four circuits each containing a motor and two switches. The switches are all open.

In one of the circuits, closing one of the switches on its own starts the motor turning, and closing the other switch on its own also starts the motor turning.

Which circuit is this?



- 38 What is an advantage of connecting lamps in parallel in a circuit, rather than in series?

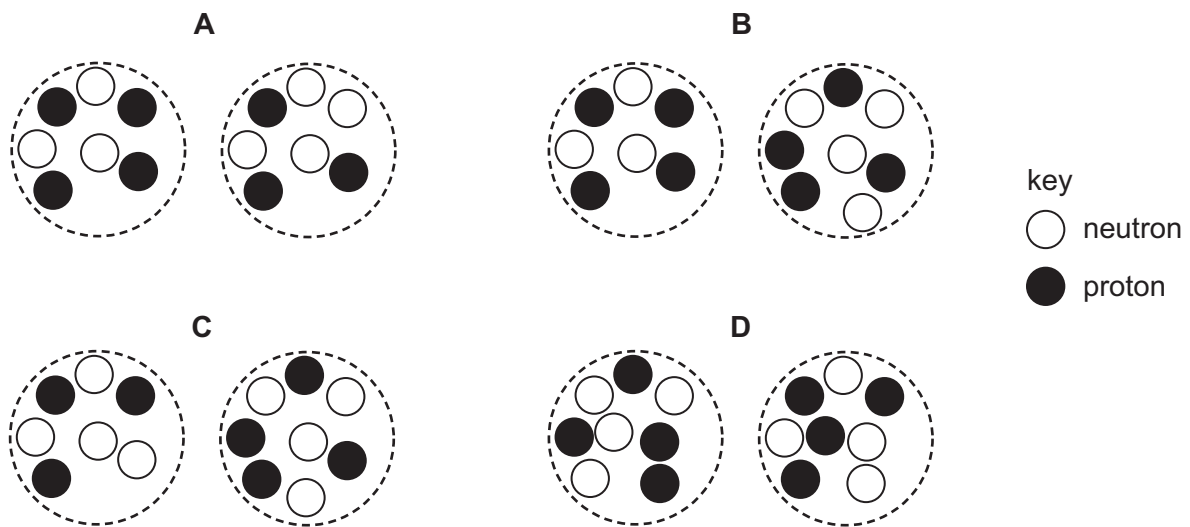
- A The lamps do not use as much energy.
- B The lamps last longer before failing.
- C The potential difference (p.d.) across each lamp is smaller.
- D When one lamp fails, all the others remain lit.

- 39 A device that is designed to protect a circuit contains a thin wire. When there is a large current in the circuit, the thin wire melts and cuts off the supply.

What is the device?

- A fuse
 - B lamp
 - C resistor
 - D thermistor
- 40 The diagrams represent pairs of nuclei of some atoms.

Which pair shows nuclei of different isotopes of the same element?



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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										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											1 H hydrogen 1	13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5
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 —	—	—	—	—

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.).