



Cambridge O Level

COMBINED SCIENCE

5129/12

Paper 1 Multiple Choice

May/June 2025

1 hour

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 A palisade mesophyll cell and a root hair cell are observed under a light microscope.

Which structure will only be present in the palisade mesophyll cell?

- A cell membrane
- B chloroplast
- C cytoplasm
- D nucleus

- 2 A plant cell is placed in a concentrated salt solution for 10 minutes.

Which row describes and explains the appearance of the plant cell?

	appearance of cell	movement of water
A	flaccid	high water potential to low water potential
B	turgid	high water potential to low water potential
C	flaccid	low water potential to high water potential
D	turgid	low water potential to high water potential

- 3 The stomata of the leaves of many plants remain open all day and all night.

Which row shows the **overall** diffusion of gases through the stomata of such plants?

	during the day	during the night
A	carbon dioxide into the leaf	oxygen out of the leaf
B	carbon dioxide out of the leaf	oxygen into the leaf
C	oxygen into the leaf	carbon dioxide into the leaf
D	oxygen out of the leaf	carbon dioxide out of the leaf

- 4 Which molecule required for photosynthesis does the xylem supply to the mesophyll cells?

- A carbon dioxide
- B glucose
- C oxygen
- D water

5 Which processes occur in the mouth?

- 1 chemical digestion by amylase
- 2 chemical digestion by protease
- 3 physical digestion

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

6 Which substance, when in excess, is broken down to produce urea in the liver?

- A** amino acids
- B** fatty acids
- C** glycerol
- D** glycogen

7 Which row shows the difference in the concentration of oxygen and carbon dioxide in expired air compared to inspired air?

	concentration of oxygen	concentration of carbon dioxide
A	higher in expired air	higher in expired air
B	higher in expired air	lower in expired air
C	lower in expired air	higher in expired air
D	lower in expired air	lower in expired air

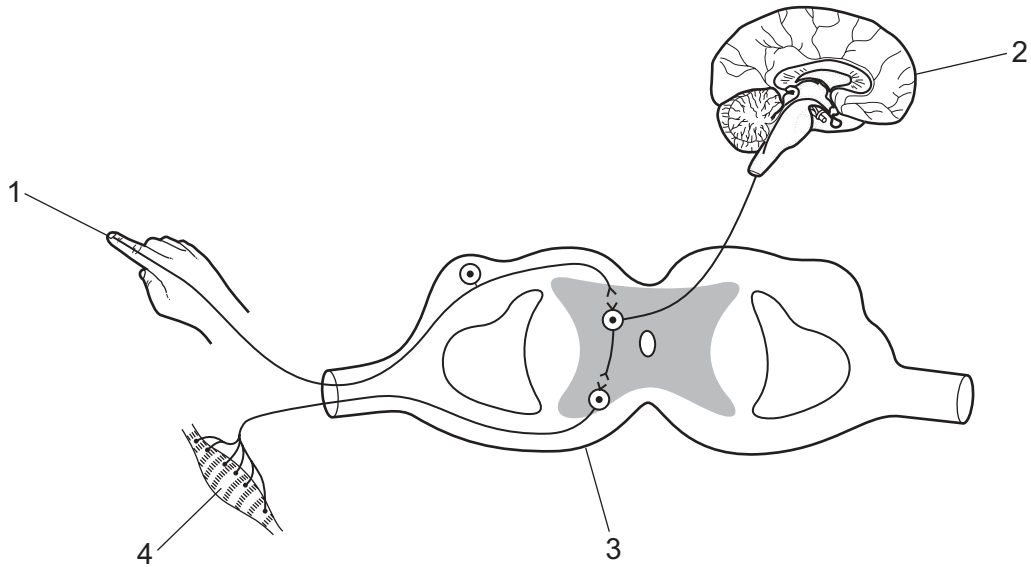
8 What is produced by anaerobic respiration in a muscle cell during exercise?

- A** carbon dioxide and lactic acid
- B** carbon dioxide and water
- C** carbon dioxide only
- D** lactic acid only

9 Which action increases the risk of coronary heart disease?

- A** decreasing fat in the diet
- B** decreasing smoking
- C** increasing physical exercise
- D** increasing salt in the diet

10 The diagram shows the pathways involved in a reflex action.



Which labelled parts are the components of a simple reflex arc?

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

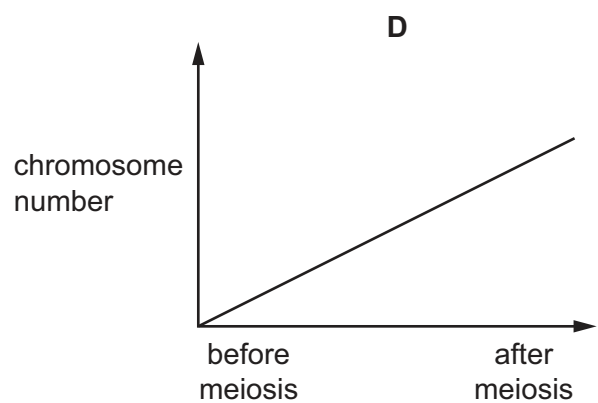
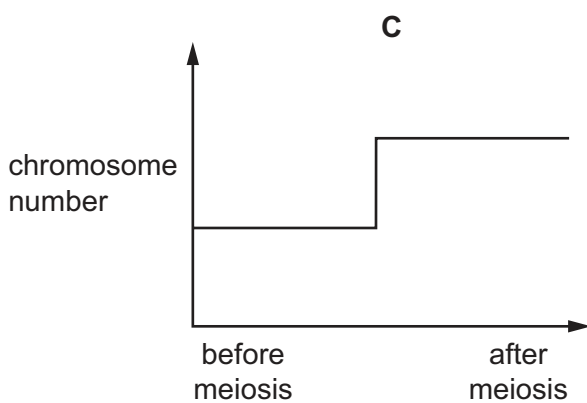
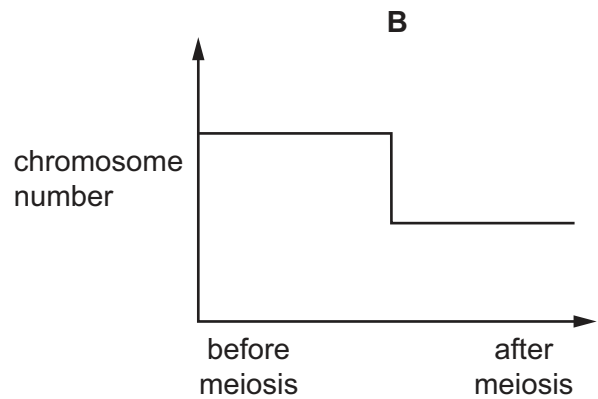
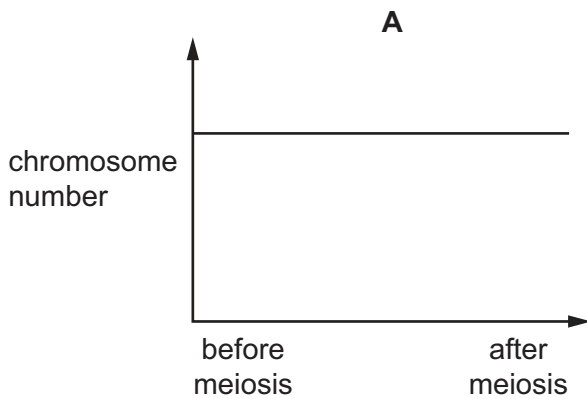
11 Which statements about human male and female gametes are correct?

- 1 Female gametes are much larger than male gametes.
- 2 Male gametes are motile.
- 3 Many more male gametes than female gametes are produced at one time.

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

12 The graphs show the relative number of chromosomes present in a cell.

Which graph represents the chromosome number in a cell before and after meiosis?



13 What is the effect of deforestation on part of a rainforest?

- A** The concentration of carbon dioxide in the atmosphere decreases.
- B** There is a decrease in flooding.
- C** There is an increase in biodiversity.
- D** There is an increase in soil loss.

14 Which statement about particles in a gas is correct?

- A** They have a regular arrangement.
- B** They are far apart.
- C** They only vibrate about a fixed point.
- D** They have strong forces of attraction between them.

15 What are the relative masses and relative charges of electrons, neutrons and protons?

	electron		neutron		proton	
	relative mass	relative charge	relative mass	relative charge	relative mass	relative charge
A	0.0005	−1	1	0	1	+1
B	0.0005	−1	1	+1	1	0
C	1	0	0.0005	−1	1	+1
D	1	+1	1	0	0.0005	−1

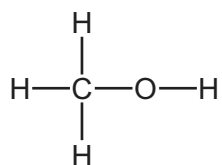
16 Sodium chloride is an ionic compound.

Which statements about sodium chloride are correct?

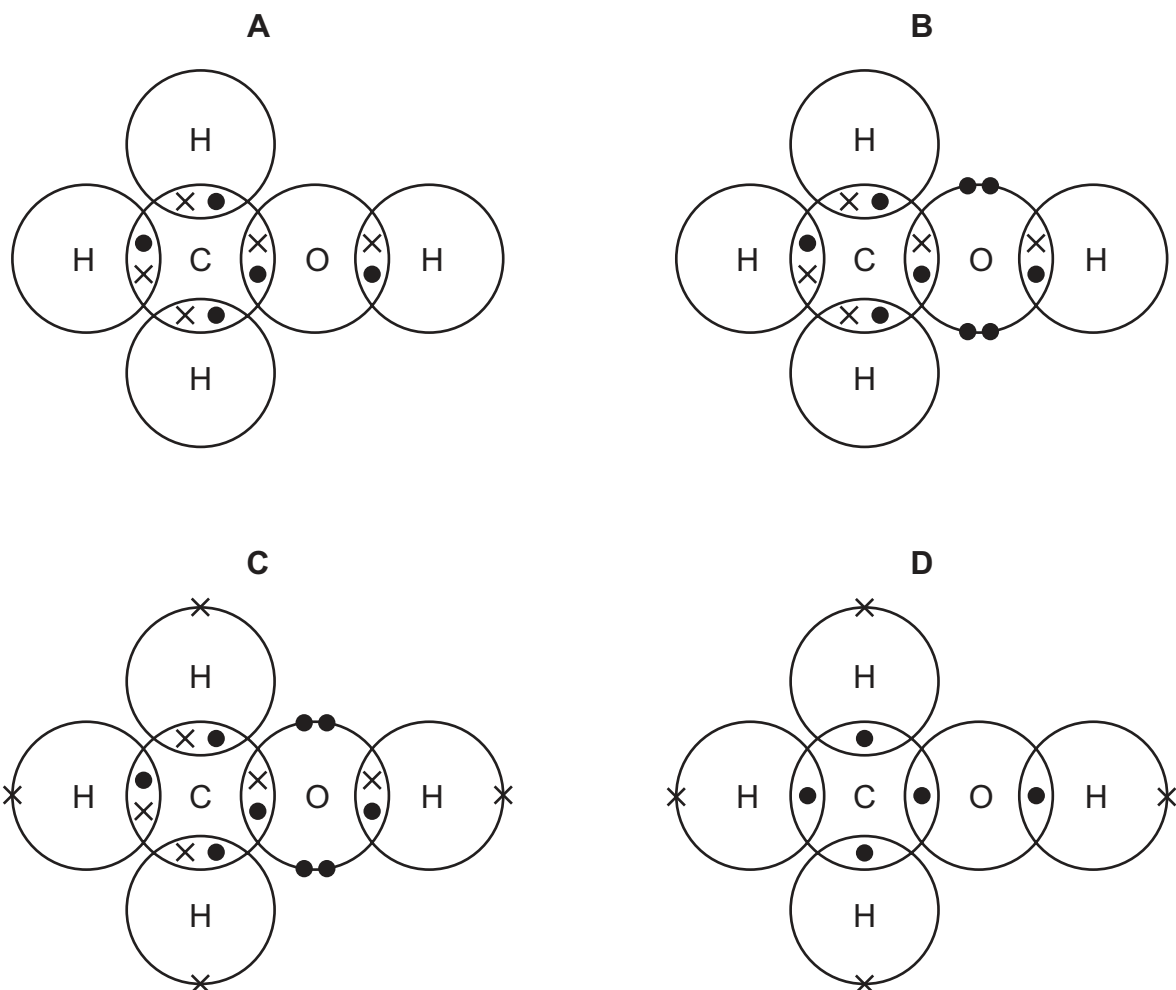
- 1 It conducts electricity when solid.
- 2 It conducts electricity when molten.
- 3 It exists as a simple molecule.
- 4 It has a high melting point.

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

17 The structural formula of a compound is shown.



Which dot-and-cross diagram shows a molecule of this compound?

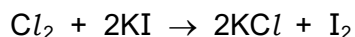


18 Chromium is a metallic element that combines with oxygen to form chromium oxide, Cr_2O_3 .

Which statement about chromium oxide is correct?

- A** It is a covalent compound.
- B** It contains Cr^+ ions.
- C** It contains Cr^{2+} ions.
- D** It contains Cr^{3+} ions.

- 19 The equation for the reaction between chlorine and potassium iodide is shown.



Which mass of iodine is produced from 0.166 g of potassium iodide?

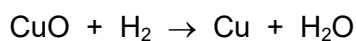
- A** 0.083 g **B** 0.127 g **C** 0.254 g **D** 0.332 g

- 20 A catalyst is used to make alkenes and hydrogen by cracking.

Which statement about this catalyst is correct?

- A** The catalyst only works at low temperatures.
B The catalyst is used up at the same rate as the reactants.
C The catalyst is used to decrease the time taken for the reaction.
D The catalyst is an alkane.

- 21 The equation for the reaction between copper(II) oxide and hydrogen is shown.



Which statement about the reaction is correct?

- A** Copper is oxidised and hydrogen is reduced.
B Copper is reduced and hydrogen is oxidised.
C Hydrogen is oxidised and oxygen is reduced.
D Hydrogen is reduced and oxygen is oxidised.

- 22 Aqueous sodium ethanoate is alkaline.

What is the colour of universal indicator in aqueous sodium ethanoate?

- A** blue
B green
C orange
D red

23 Which statement about the elements in the Periodic Table is correct?

- A They are arranged in atomic number order and elements in the same group have similar properties.
- B They are arranged in atomic number order and elements in the same period have similar properties.
- C They are arranged in mass number order and elements in the same group have similar properties.
- D They are arranged in mass number order and elements in the same period have similar properties.

24 Aluminium is used for aircraft parts and food containers.

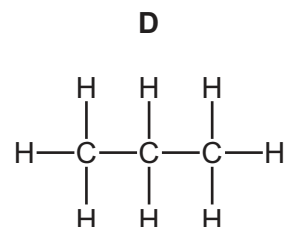
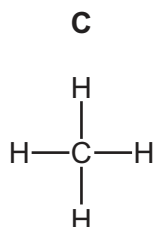
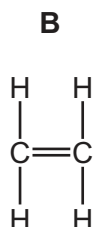
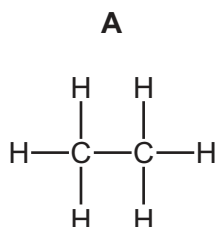
Which use of aluminium is **not** correctly linked to a property of aluminium?

	use of aluminium	property on which the use depends
A	aircraft bodies	high strength
B	aircraft bodies	low density
C	food containers	resists corrosion
D	food containers	good conductor of electricity

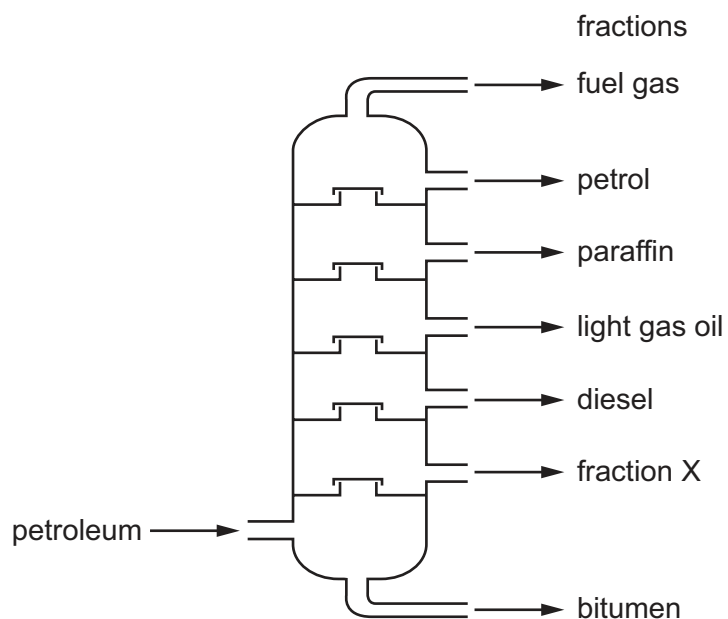
25 Which statement about the reactivity of metals is correct?

- A Copper is more reactive than magnesium because it has a stronger tendency to form a positive ion.
- B Zinc will **not** displace iron from aqueous iron(II) sulfate because zinc forms positive ions less easily than iron.
- C Copper does **not** react with dilute hydrochloric acid because it is less reactive than hydrogen.
- D Silver does **not** react with dilute hydrochloric acid because it is protected by an oxide layer.

26 Which molecular structure represents the main constituent of natural gas?



27 The fractional distillation of petroleum is shown.



What is a use of fraction X?

- A** fuel for an aircraft
- B** fuel for an oil stove
- C** fuel for ships
- D** making roads

28 The table shows possible units for speed and acceleration.

Which row gives the correct units for each quantity?

	speed	acceleration
A	m	m/s
B	m	m/s ²
C	m/s	m
D	m/s	m/s ²

29 The gravitational field strength on the Moon is about $\frac{1}{6}$ of that on the surface of the Earth.

On Earth, an astronaut weighs 900 N and the gravitational field strength is 10 N/kg.

What is the astronaut's mass on the Moon?

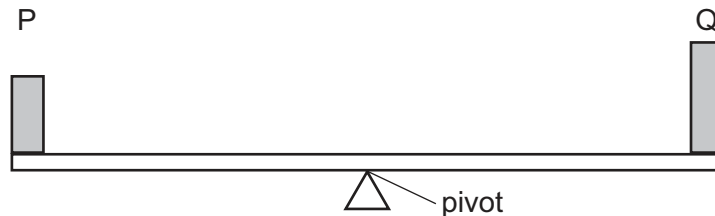
- A** 15 kg
- B** 90 kg
- C** 150 N
- D** 900 N

- 30 A block of mass 2.0 kg is pulled across a frictionless surface by a force of 10 N. A second identical block is placed on top of the first one and the two are pulled across the surface with the same force.

What is the acceleration of the two-block combination?

- A 0.40 m/s² B 2.5 m/s² C 5.0 m/s² D 20 m/s²

- 31 A beam is balanced using two objects, P and Q, one at each end.



The pivot is at the centre of the beam.

Which statement is correct?

- A P and Q have different masses and different weights.
 B P and Q have different masses but the same weight.
 C P and Q have the same mass and the same weight.
 D P and Q have the same mass but different weights.

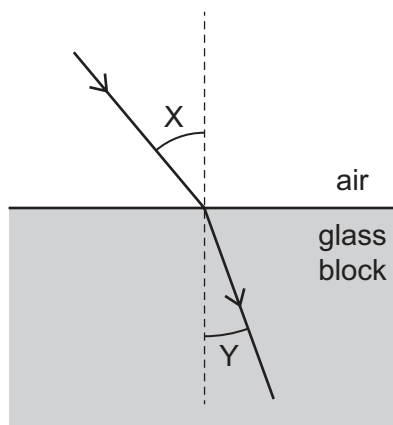
- 32 Which row correctly links a source of energy to the process that releases the energy?

	energy source	process releasing energy
A	fuels	radioactive decay
B	geothermal	re-grouping of atoms
C	hydroelectricity	changing kinetic energy to gravitational potential energy
D	solar	nuclei of atoms fusing

- 33 Which statement about waves is correct?

- A Waves transfer both energy and matter.
 B Waves transfer energy but **not** matter.
 C Waves transfer matter but **not** energy.
 D Waves transfer neither energy nor matter.

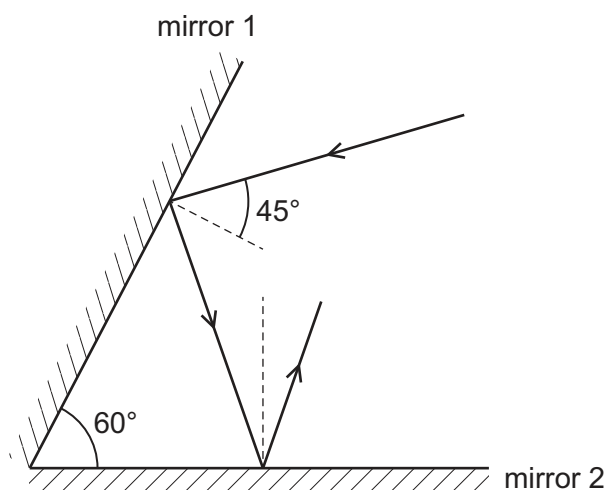
34 The diagram shows a ray of light in air entering a glass block.



Which row gives the names for angle X and angle Y ?

	angle X	angle Y
A	angle of incidence	angle of reflection
B	angle of incidence	angle of refraction
C	angle of refraction	angle of reflection
D	angle of refraction	angle of refraction

35 A ray of light is incident on a mirror as shown.



A second mirror is at 60° to the first mirror.

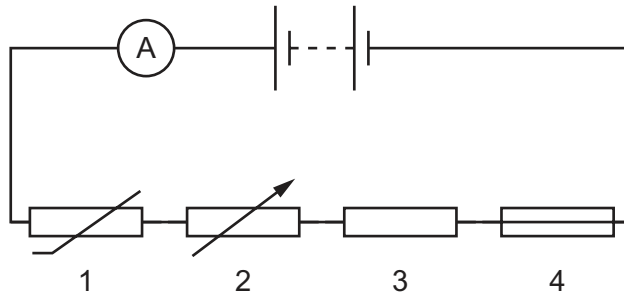
What is the angle of reflection from the second mirror?

- A** 15° **B** 25° **C** 45° **D** 75°

36 What is the speed of electromagnetic waves in a vacuum?

- A 340 m/s
- B 300 000 m/s
- C 340 km/s
- D 300 000 km/s

37 In the circuit diagram, all the components labelled 1–4 in the circuit can affect the reading of the current on the ammeter.

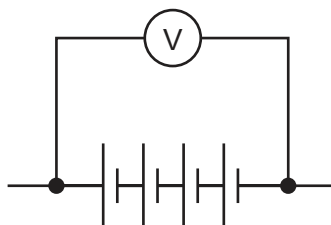


Which component causes the ammeter reading to increase when the temperature increases?

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

38 The diagram shows four identical cells connected in series, with a voltmeter connected across them.

Each cell has a voltage of 1.2 V.



What is the reading on the voltmeter?

- A 1.2 V
- B 2.4 V
- C 3.6 V
- D 4.8 V

- 39** A 2 kW heater is left on for 4 hours.

Which row gives the quantity of energy transferred by the heater in kilojoules (kJ) and in kilowatt-hours (kWh)?

	energy / kJ	energy / kWh
A	28 800	2
B	28 800	8
C	28 800 000	2
D	28 800 000	8

- 40** In a smoke detector, some of the smoke particles become charged through ionisation by a radioactive source. This allows a small gap between two electrodes in a circuit to conduct electricity and sound the alarm.

Household smoke alarms have a life span of 10 years before needing to be replaced.

Which radioactive source would be the most suitable?

- A** an alpha source with a half-life of hundreds of years
- B** an alpha source with a half-life of several hours
- C** a beta source with a half-life of several days
- D** a gamma source with a half-life of thousands of years

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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	<div>Key</div> <div>atomic number atomic symbol name relative atomic mass</div>										<div>1 H hydrogen 1</div>											
11 Na sodium 23	12 Mg magnesium 24	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	5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20						
19 K potassium 39	20 Ca calcium 40	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 oganeson —						

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
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 —

actinoids

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).