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CO-ORDINATED SCIENCES **0654/23**

Paper 2 Multiple Choice (Extended) **May/June 2026**

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 or tape.
- Do **not** write on any bar codes.
- You may use a calculator.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = 9.8 m / s^2).

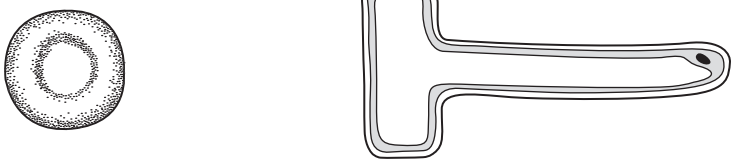
INFORMATION

- 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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1 The diagram shows two cells.

cell 1 cell 2



Which row matches the name of each type of cell with its function?

	cell 1		cell 2	
	name	**function**	**name**	**function**
A	red blood	transport	root hair	absorption
B	red blood	reproduction	ciliated	photosynthesis
C	egg	transport	root hair	photosynthesis
D	egg	reproduction	ciliated	absorption

2 What is osmosis?

A the diffusion of water molecules from a dilute solution to a concentrated solution through a partially permeable membrane

B the diffusion of water molecules from a concentrated solution to a dilute solution through a partially permeable membrane

C the diffusion of sugar molecules from a dilute solution to a concentrated solution through a partially permeable membrane

D the diffusion of sugar molecules from a concentrated solution to a dilute solution through a partially permeable membrane

3 Which type of molecule is an enzyme?

A carbohydrate

B fat

C protein

D vitamin

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4 A farmer observes that a field of grass is **not** as green as usual.

Which substance has decreased in availability?

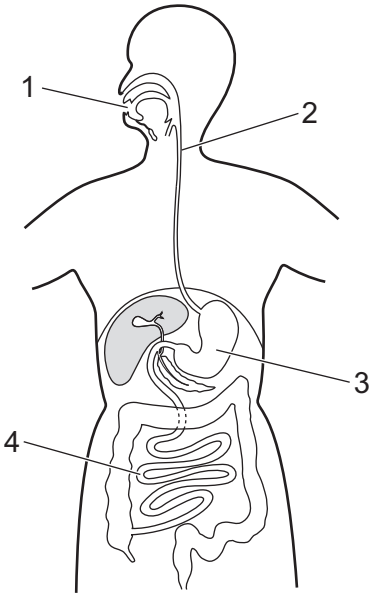
A oxygen in the air

B nitrogen in the soil

C magnesium in the soil

D carbon dioxide in the air

5 The diagram shows the human digestive system.



Which labels identify two locations where amylase acts?

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

6 What causes a plant to wilt?

A Water gain is greater than water loss.

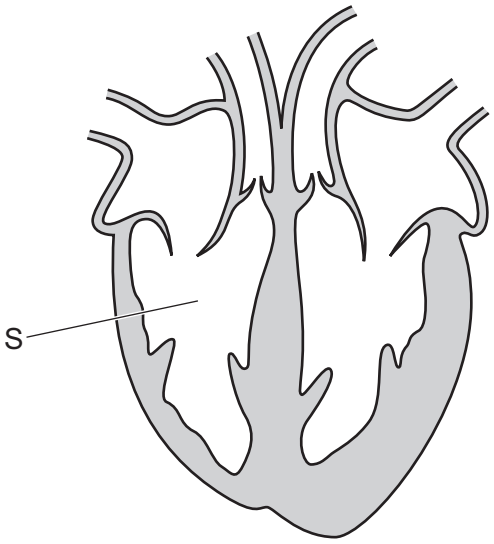
B Water moves from the leaves to the stem.

C Water moves from the leaves to the flowers.

D Water loss is greater than water gain.

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7 The diagram shows a mammalian heart.



What is structure S?

A left atrium

B left ventricle

C right atrium

D right ventricle

8 Some of the stages in protecting a person from a pathogen by vaccination are listed.

1 Antibodies are produced by lymphocytes.

2 Antigens are introduced into the body.

3 Long term immunity is developed.

4 Memory cells are produced.

What is the order of these stages?

A $1 \rightarrow 3 \rightarrow 2 \rightarrow 4$

B $2 \rightarrow 1 \rightarrow 4 \rightarrow 3$

C $2 \rightarrow 1 \rightarrow 3 \rightarrow 4$

D $4 \rightarrow 2 \rightarrow 3 \rightarrow 1$

9 Which statement about anaerobic respiration in muscles is correct?

A It produces carbon dioxide and lactic acid.

B It produces carbon dioxide and water.

C It releases less energy per glucose molecule than aerobic respiration.

D It releases more energy per glucose molecule than aerobic respiration.

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10 Which statement about reflex actions is correct?

A Neurones carry out responses.

B Reflex actions are slow.

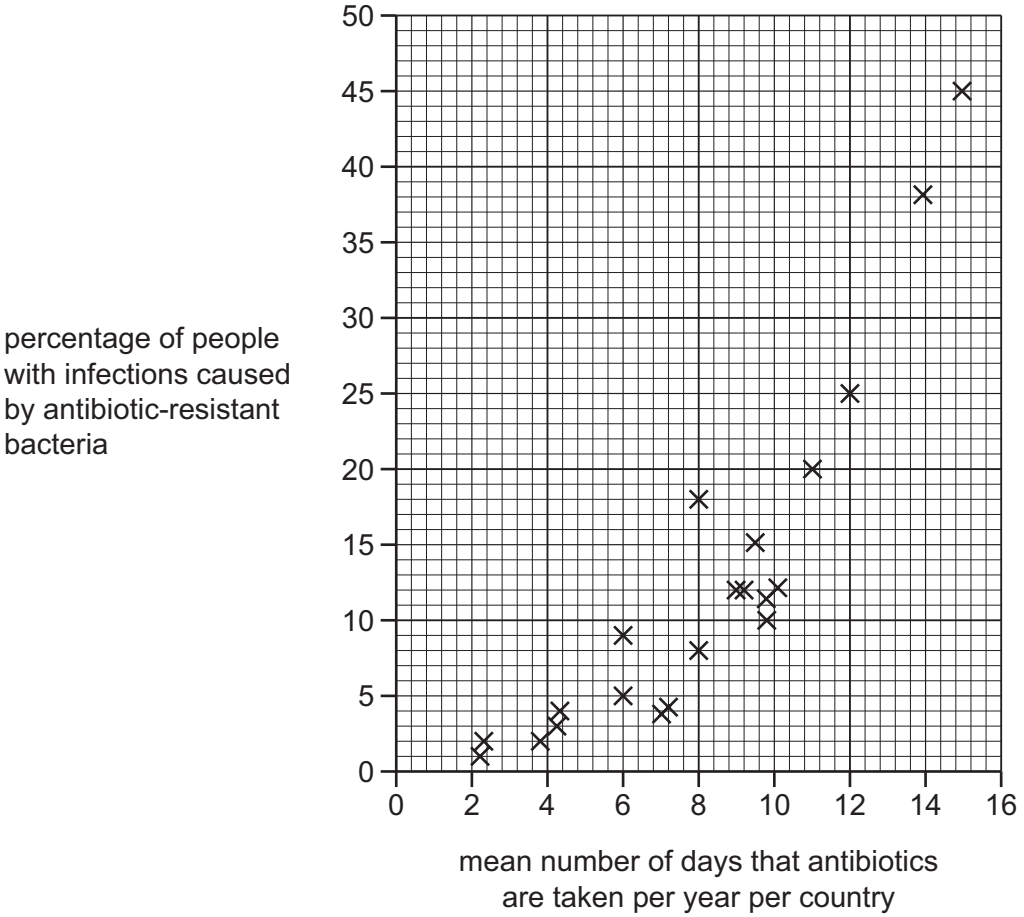
C Muscles and glands coordinate stimuli.

D Receptors detect stimuli.

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11 The graph shows the relationship in different countries between the mean number of days that antibiotics are taken per year and the percentage of people with infections caused by antibiotic-resistant bacteria.

Each point represents a different country.



Which conclusions can be made from the data in the graph?

1 In most countries, antibiotics are taken for fewer than 10 days per year.

2 Antibiotics increase the percentage of people with infections caused by antibiotic-resistant bacteria.

3 Fewer people take antibiotics in some countries than others.

4 As the mean number of days that antibiotics are taken per year increases, the percentage of people with infections caused by antibiotic-resistant bacteria increases.

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

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12 A student makes correct statements about reproduction in four organisms.

What are examples of asexual reproduction?

1	shark	A shark kept alone in an aquarium gives birth to a healthy female offspring.
2	frog	A female poison dart frog deposits eggs on damp leaves. The male poison dart frog adds sperm to these eggs.
3	seahorse	A female seahorse deposits eggs into the abdominal pouch of a male seahorse where he releases sperm.
4	starfish	A starfish breaks off an arm which then grows into another starfish.

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

13 A type of chicken has either red feathers or black feathers.

Which statements explain why a chicken with the allele for red feathers is born with black feathers?

1 The chicken also has a black feather allele.

2 The chicken is heterozygous for feather colour.

3 The red feather allele is recessive.

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

14 Which statement describes the bonding in diamond?

A each carbon atom covalently bonded to four other carbon atoms

B a flat structure of hexagonal rings of covalently bonded carbon atoms

C an electrostatic attraction between positive carbon ions and a sea of delocalised electrons

D each carbon atom bonded to another carbon atom by a double covalent bond

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15 Phosphorus pentachloride, PCl_5, reacts with water to form phosphoric acid, H_3PO_4, and substance Y.

The incomplete equation for the reaction is shown.

$$PCl_5 + 4H_2O \rightarrow H_3PO_4 + xY$$

Which row identifies substance Y and gives the value of *x*?

	Y	***x***
A	HCl	5
B	HCl	10
C	Cl_2	5
D	Cl_2	10

16 36 cm^3 of carbon dioxide is produced in a reaction at room temperature and pressure.

What is the mass of carbon dioxide gas produced?

A 0.0015 g **B** 0.0018 g **C** 0.066 g **D** 0.079 g

17 Concentrated aqueous sodium chloride, molten lead(II) bromide, aqueous copper(II) sulfate and dilute sulfuric acid are electrolysed using carbon electrodes.

Which rows show the correct products that form at each electrode?

	electrolyte	**cathode**	**anode**
1	concentrated aqueous sodium chloride	sodium	chlorine
2	molten lead(II) bromide	lead	bromine
3	aqueous copper(II) sulfate	copper	oxygen
4	dilute sulfuric acid	oxygen	hydrogen

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

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18 In a reaction, iron(II) oxide is converted to iron(III) oxide.

Which row shows what happens to the iron(II) oxide?

	gain of oxygen	gain of an electron
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

19 25.0 cm^3 of alkali and three drops of methyl orange indicator are added to a conical flask.

Acid is added to the conical flask from a burette.

A white tile is used.

Which colour change is observed and where should the white tile be placed?

	colour change	white tile
A	from red to yellow	behind the scale of the burette
B	from red to yellow	underneath the conical flask
C	from yellow to red	behind the scale of the burette
D	from yellow to red	underneath the conical flask

20 A dry sample of the soluble salt zinc chloride is prepared.

The equation for the reaction is shown.

$$Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g)$$

Which sets of apparatus are needed for this salt preparation?

1 burette and pipette

2 evaporating basin and Bunsen burner

3 filter funnel and filter paper

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

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21 Which statements about the properties of Group I elements are correct?

1 Lithium is less dense than potassium.

2 Sodium has a higher melting point than lithium.

3 Potassium reacts more vigorously with water than sodium.

4 They are all hard metals.

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

22 Which row describes and explains why helium is unreactive?

	description	explanation
A	diatomic gas	full outer-shell of electrons
B	diatomic gas	incomplete outer-shell of electrons
C	monatomic gas	full outer-shell of electrons
D	monatomic gas	incomplete outer-shell of electrons

23 Which statement about the reactivity of metals is correct?

A Atoms of iron lose electrons more readily than atoms of zinc.

B Copper reacts with dilute hydrochloric acid.

C Magnesium reacts with heated copper oxide.

D Zinc reacts with aqueous magnesium sulfate.

24 Four methods of preventing the rusting of iron are listed.

1 copper plating

2 galvanising

3 painting

4 sacrificial protection

Which methods involve the use of a more reactive metal?

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

25 Which statement about methane is correct?

A Methane burns in air to form carbon dioxide.

B Methane decolourises aqueous bromine.

C Methane contains a carbon–carbon single bond.

D When methane burns, an endothermic reaction takes place.

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26 What is the name of the process that forms alkenes from long chain alkanes?

A addition polymerisation

B cracking

C fractional distillation

D reduction

27 Aqueous Z is warmed with aqueous sodium hydroxide and a piece of aluminium foil.

A gas is produced which turns damp red litmus paper blue.

A second sample of aqueous Z is mixed with dilute sulfuric acid. A white precipitate is observed.

What is Z?

A ammonium chloride

B ammonium nitrate

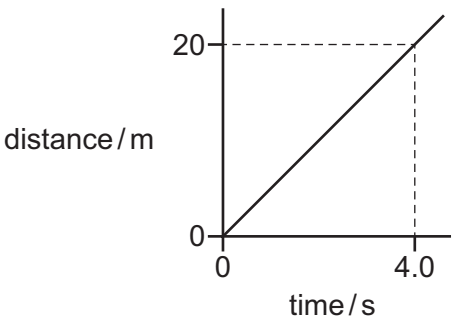
C barium chloride

D barium nitrate

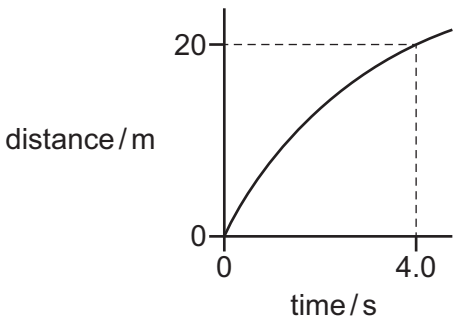
28 An object travels in a straight line with a constant acceleration of $5.0\,m/s^2$.

Which graph represents the motion of this object?

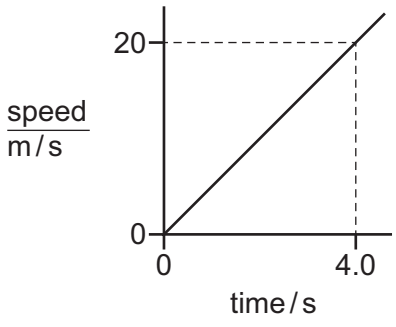
A



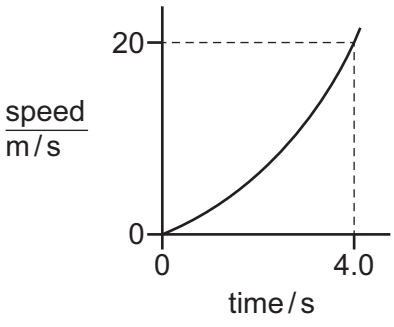
B



C



D



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29 A solid metal block has a mass of 2.0×10^4 kg and a volume of $2.5\,m^3$.

What is the density of the metal?

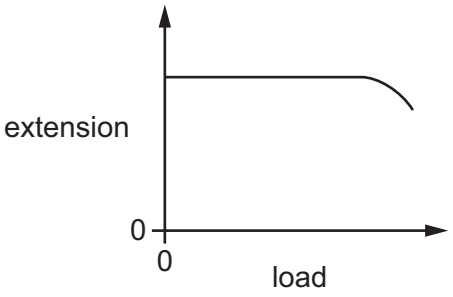
A $800\,kg/m^3$ **B** $5000\,kg/m^3$ **C** $8000\,kg/m^3$ **D** $50\,000\,kg/m^3$

30 A solid is stretched by gradually increasing a load applied to one end of the solid. At first the extension of the solid is directly proportional to the load applied.

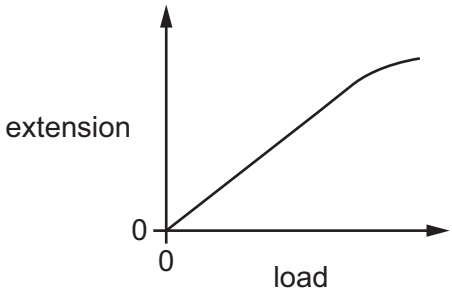
When the solid reaches its limit of proportionality it becomes more difficult to stretch.

Which graph is the extension–load graph for this solid?

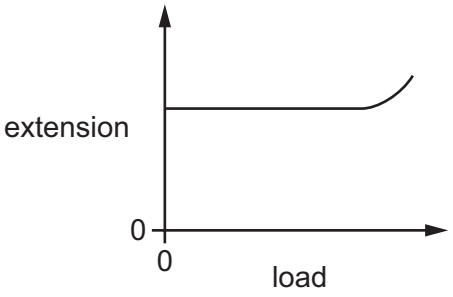
A



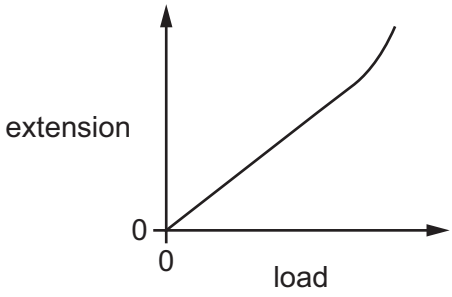
B



C



D



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31 A beam of light shines through a sealed transparent box.

The box contains air and smoke.

The air and smoke are viewed with a microscope.

Particles are seen moving randomly.

Which row shows the particles that are seen and describes why the particles move randomly?

	particles	**why the particles move randomly**
A	air	they collide with other air particles
B	air	they collide with the light
C	smoke	they collide with air particles
D	smoke	they collide with the light

32 Which row describes a difference between evaporation of a liquid and boiling of a liquid?

	evaporation	**boiling**
A	temperature of liquid remains constant	temperature of liquid decreases
B	temperature of liquid decreases	temperature of liquid remains constant
C	occurs throughout the liquid	occurs only at the surface of the liquid
D	occurs at a fixed temperature	occurs at any temperature

33 The speed of sound in air is 340 m / s.

What is the range of wavelengths of sound in air that is audible to humans?

A 59 mm to 59 m

B 17 mm to 17 m

C 59 m to 59 km

D 17 m to 17 km

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34 A thin converging lens is used as a magnifying glass to view an object.

The focal length of the lens is 15 cm.

What is a suitable distance from the lens for the object to be placed?

A 10 cm **B** 20 cm **C** 30 cm **D** 60 cm

35 Which statement about sound waves is correct?

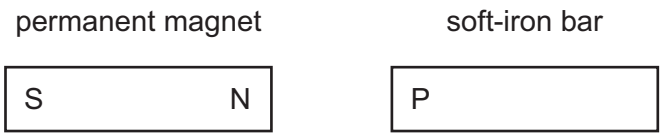
A An echo is caused by the refraction of sound waves.

B Sound waves are transverse waves.

C Sound waves can travel through a vacuum.

D The speed of sound waves in water is greater than the speed of sound waves in air.

36 An unmagnetised soft-iron bar is brought near to the north pole of a permanent magnet.



The permanent magnet induces a magnetic pole at end P of the soft-iron bar.

Which row shows the pole induced at P and the force between the permanent magnet and the soft-iron bar?

	pole induced at P	**force**
A	north pole	repulsion
B	north pole	attraction
C	south pole	repulsion
D	south pole	attraction

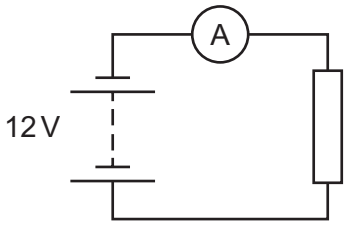
37 Two rods made of different insulators are charged by friction using a cloth. One rod becomes negatively charged and the other rod becomes positively charged.

What happens during the charging process?

	positively charged rod	**negatively charged rod**
A	gains electrons	gains protons
B	gains protons	loses protons
C	loses electrons	gains electrons
D	loses electrons	gains protons

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38 A resistor is connected to a 12 V battery and an ammeter as shown.



The ammeter reads 6.0 A.

What is the resistance of the resistor?

A 0.50 Ω **B** 2.0 Ω **C** 18 Ω **D** 72 Ω

39 A radioactive source that emits gamma radiation is a risk to people.

Which action does **not** reduce the risk to people when using the source?

A Keep the source at a very low temperature.

B Keep the time of exposure to a minimum.

C Stand a large distance from the source.

D Wear lead-lined clothing.

40 A stable star is powered by nuclear reactions. Over time the composition of the star changes.

Which row shows the type of nuclear reaction that powers the star and how the composition of the star changes over time?

	nuclear reaction	**composition**
A	fission	hydrogen decreases and helium increases
B	fission	hydrogen increases and helium decreases
C	fusion	hydrogen decreases and helium increases
D	fusion	hydrogen increases and helium decreases

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The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											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											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 oganesson –

Key

atomic number
atomic symbol
name
relative atomic mass

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.).