Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/23**

Paper 2 Multiple Choice (Extended) **October/November 2025**

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.
- 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.

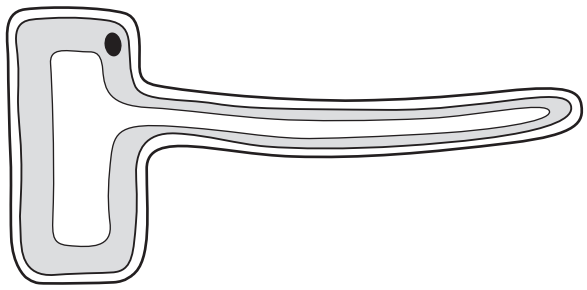
This document has **16** pages.

1 Which rows match characteristics of living things with their descriptions?

	characteristic	description
1	excretion	removal of waste products of metabolism and substances in excess of requirements
2	growth	processes that make more of the same kind of organism
3	nutrition	taking in of materials for energy, growth and development
4	respiration	chemical reactions in cells that break down nutrient molecules and release energy for metabolism

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

2 Which type of specialised cell is shown?



A ciliated cell

B palisade mesophyll cell

C root hair cell

D sperm cell

3 What is a definition of diffusion?

A the net movement of molecules from a region of their higher concentration to a region of their lower concentration down a concentration gradient

B the net movement of molecules from a region of their higher concentration to a region of their lower concentration up a concentration gradient

C the net movement of molecules from a region of their lower concentration to a region of their higher concentration down a concentration gradient

D the net movement of molecules from a region of their lower concentration to a region of their higher concentration up a concentration gradient

4 Enzymes work best at an optimum pH. Protease in the stomach works best at pH 1.6.

What is a reason why the activity of protease decreases at pH values greater than 1.6?

A The enzyme's active site changes shape.

B The kinetic energy of the molecules increases.

C There are more effective collisions.

D There is a higher substrate concentration.

5 Which statement about transport in plants is correct?

A Amino acids are moved from source to sink in the xylem.

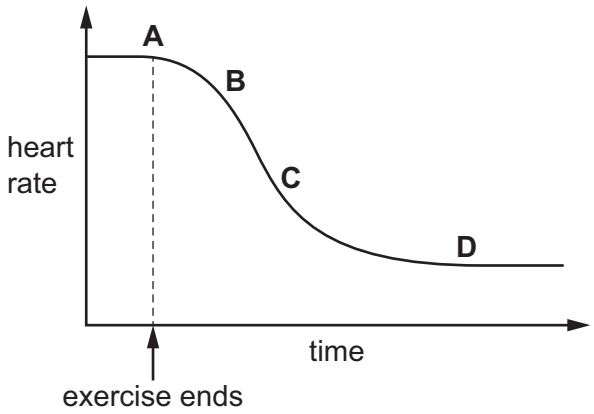
B Glucose is moved from sink to source in the xylem.

C Sucrose is moved from source to sink in the phloem.

D Starch is moved from sink to source in the phloem.

6 Scientists measure the heart rate of an athlete during and after exercise.

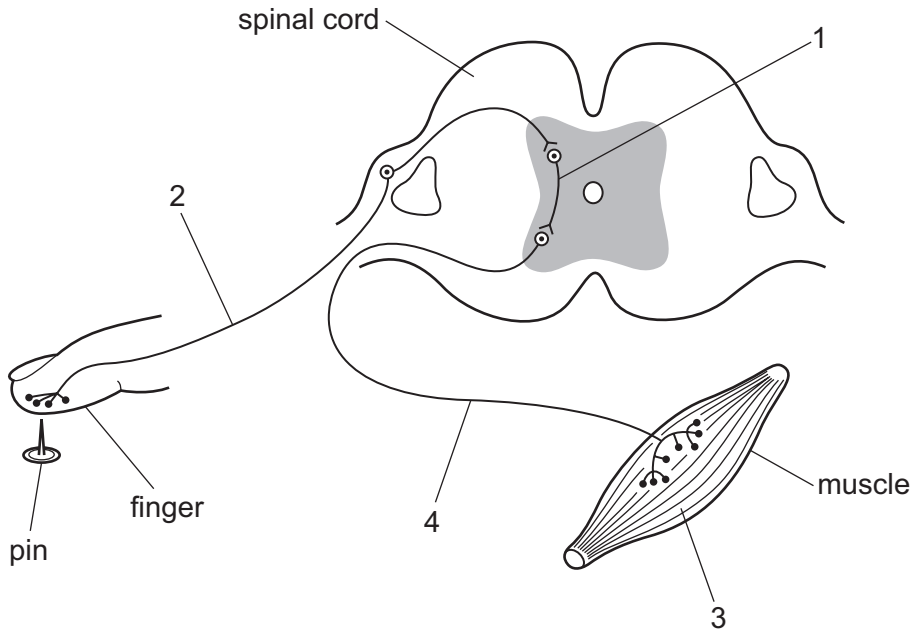
Which point on the graph shows the time when the oxygen debt is removed from the athlete?



7 Which row describes part of the circulatory system in mammals?

	name of blood vessel	type of blood transported	comes from	goes to
A	aorta	oxygenated	right ventricle	body
B	pulmonary artery	oxygenated	left ventricle	lungs
C	pulmonary vein	deoxygenated	lungs	left atrium
D	vena cava	deoxygenated	body	right atrium

8 The diagram shows a simple reflex arc.



Which row gives the correct labels for the diagram?

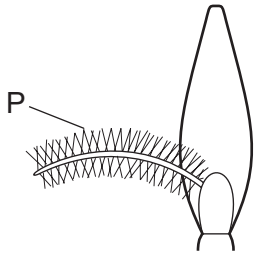
	1	2	3	4
A	motor neurone	sensory neurone	receptor	relay neurone
B	motor neurone	relay neurone	receptor	effector
C	relay neurone	motor neurone	effector	sensory neurone
D	relay neurone	sensory neurone	effector	motor neurone

9 Sheep have 54 chromosomes in their body cells.

Which row is correct for a female sheep?

	number of chromosomes in egg cells	egg cells
A	27	haploid
B	54	haploid
C	27	diploid
D	54	diploid

10 The diagram shows part of a flower.



What is structure P and which type of pollination is used by the flower?

	structure P	type of pollination
A	stamen	insect
B	stamen	wind
C	stigma	insect
D	stigma	wind

11 A student makes three statements about processes in cell division.

1 Process 1 is involved in the production of gametes.

2 The cells produced by process 2 are genetically different.

3 The zygote then divides by process 3, which leads to growth.

Which row identifies each process?

	process 1	process 2	process 3
A	meiosis	meiosis	mitosis
B	meiosis	mitosis	meiosis
C	mitosis	mitosis	meiosis
D	mitosis	meiosis	mitosis

12 Which row shows the monohybrid crosses that produce predicted phenotype ratios of 1 : 1 and 3 : 1?

	1 : 1 ratio	3 : 1 ratio
A	AA × aa	Aa × aa
B	Aa × Aa	Aa × aa
C	Aa × aa	Aa × Aa
D	Aa × aa	AA × Aa

13 What is the most energy efficient resource for humans to eat?

A herbivores

B primary consumers

C producers

D secondary consumers

14 Concentrated aqueous sodium chloride is electrolysed using inert electrodes.

What is the ionic half-equation for the reaction at the cathode?

A $2Cl^- \rightarrow Cl_2 + 2e^-$

B $2H^+ + 2e^- \rightarrow H_2$

C $Na^+ + e^- \rightarrow Na$

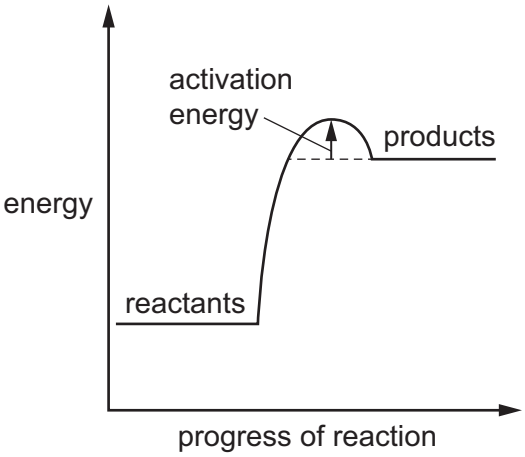
D $NaCl \rightarrow Na^+ + Cl^-$

15 Magnesium reacts with dilute hydrochloric acid.

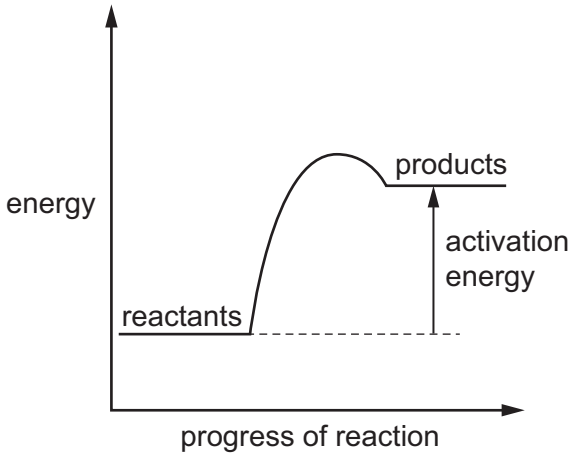
During the reaction, the reaction mixture becomes warm.

What is the reaction pathway diagram for this reaction?

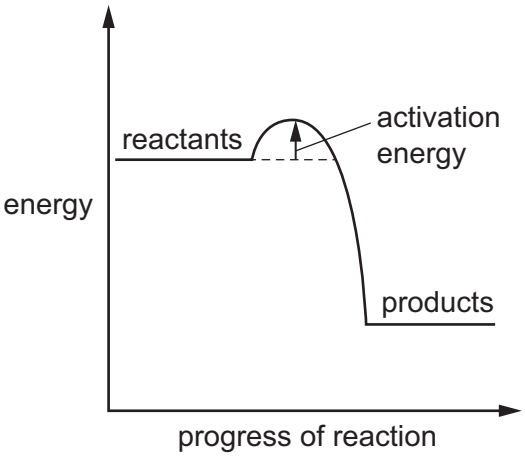
A



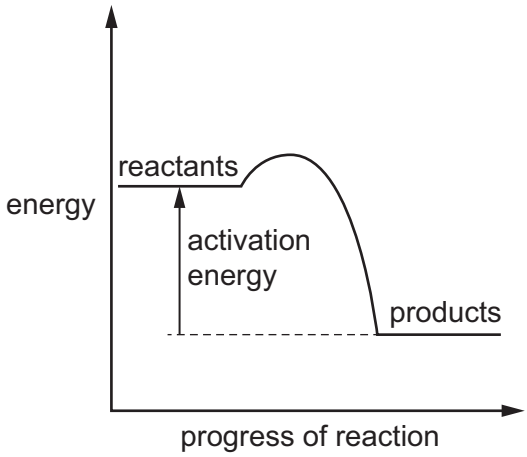
B



C



D



16 Calcium carbonate and dilute hydrochloric acid react together in a beaker.

When the reaction mixture is heated, the rate of the reaction increases.

Which statements explain this observation?

1 The frequency of particle collisions increases.

2 More colliding particles have energy greater than the activation energy.

3 The gas pressure in the beaker increases.

4 The activation energy decreases.

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

17 Which element in Period 3 of the Periodic Table has the greatest metallic character?

A the element with the highest relative atomic mass

B the element with the lowest group number

C the element with the most outer-shell electrons

D the element with the most protons

18 The melting points of some Group I metals are shown.

element	melting point / °C
caesium	28
potassium	64
rubidium	–
sodium	98

What is the melting point of rubidium?

A 20 °C **B** 40 °C **C** 80 °C **D** 100 °C

19 Which statement describes **all** metals?

A They break when hit with a hammer.

B They have good electrical conductivity.

C They dissolve in water.

D They have high densities.

20 What is brass?

A a mixture of a compound of copper and a compound of zinc

B a compound of copper and zinc

C a mixture of copper and a compound of zinc

D a mixture of copper and zinc

21 Metal X reacts rapidly with steam but only very slowly with cold water.

What is X?

A calcium

B copper

C magnesium

D sodium

22 Which row describes the colour changes when water is added to anhydrous copper(II) sulfate and to anhydrous cobalt(II) chloride?

	copper(II) sulfate	cobalt(II) chloride
A	blue → white	blue → pink
B	blue → white	pink → blue
C	white → blue	blue → pink
D	white → blue	pink → blue

23 Which row explains why filtration and chlorination are used in the treatment of the domestic water supply?

	filtration	chlorination
A	to remove soluble substances	to kill microbes
B	to remove insoluble substances	to kill microbes
C	to kill microbes	to remove insoluble substances
D	to remove insoluble substances	to remove soluble substances

24 Which statements about air pollution are correct?

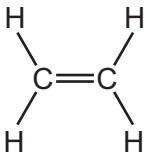
1 Carbon monoxide is a toxic gas that is formed by the incomplete combustion of carbon-based fuels.

2 Oxides of nitrogen damage buildings and are produced by impurities in carbon-based fuels.

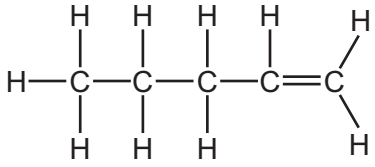
3 Sulfur dioxide produces acid rain and is formed by the combustion of fossil fuels.

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

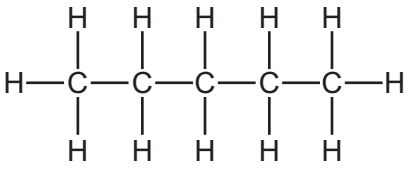
25 The structures of four organic compounds, P, Q, R and S, are shown.



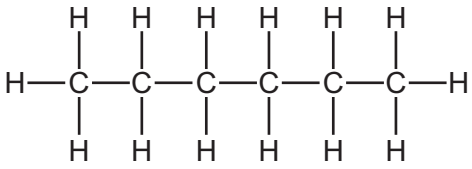
P



Q



R



S

Which statements about P, Q, R and S are correct?

1 P and Q have the same general formula.

2 Q and R have similar chemical properties.

3 R and S are members of the same homologous series.

4 R and Q have the same molecular mass, M_r.

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

26 What is the structure of but-2-ene?

A $CH_3–CH=CH_2$

B $CH_3–CH_2–CH_3$

C $CH_3–CH_2–CH=CH_2$

D $CH_3–CH=CH–CH_3$

27 Which statement about polymerisation is correct?

A Addition polymerisation requires monomers from different homologous series.

B Condensation polymerisation produces a small molecule as well as a polymer.

C Polymerisation always produces polymers of the same chain length.

D The formation of poly(ethene) is by condensation polymerisation.

28 A spring is 16 cm long when it supports a load of 12 N.

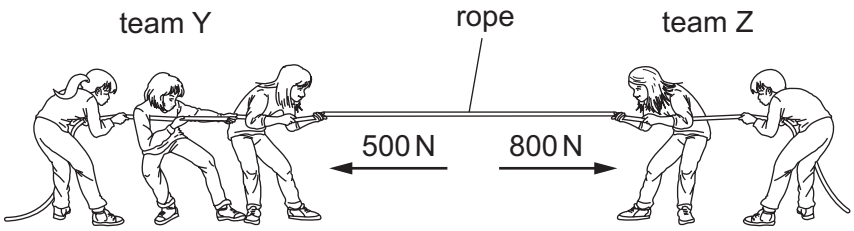
The spring is 20 cm long when it supports a load of 20 N.

What is the spring constant of the spring?

A 0.50 N / cm **B** 1.0 N / cm **C** 2.0 N / cm **D** 5.0 N / cm

29 The diagram shows two teams, Y and Z, pulling on a rope.

Team Y pulls with a force of 500 N to the left and team Z pulls with a force of 800 N to the right.



What is the resultant force produced by the two forces?

A 300 N to the left

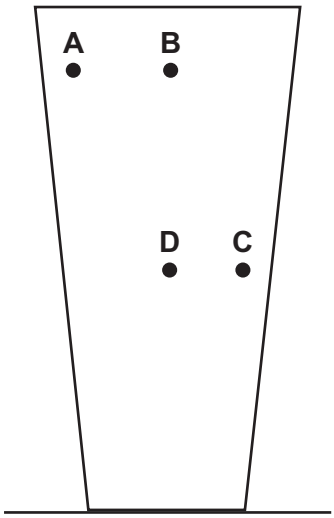
B 300 N to the right

C 1300 N to the left

D 1300 N to the right

30 A student labels an object with four possible positions for the centre of gravity.

Which position for the centre of gravity makes the object the most stable?



31 When a liquid evaporates, particles escape from the surface of the liquid.

Which row shows the particles that escape and the average energy of the remaining particles?

	particles that escape	average energy of remaining particles
A	less energetic particles	decreases
B	less energetic particles	stays the same
C	more energetic particles	decreases
D	more energetic particles	stays the same

32 Which row shows the colour of outer clothing that helps to keep the wearer cool on a hot, sunny day and the reason why this colour is effective?

	colour	reason
A	black	it is a good absorber of radiation from the Sun
B	black	it is a bad absorber of radiation from the Sun
C	white	it is a good absorber of radiation from the Sun
D	white	it is a bad absorber of radiation from the Sun

33 Which statement describes the term critical angle?

A the largest angle of incidence in a denser medium for which refraction into a less dense medium occurs

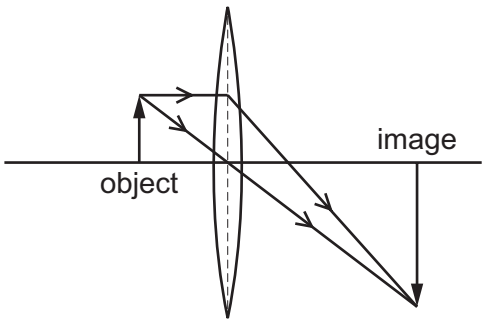
B the largest angle of incidence in a less dense medium for which refraction into a denser medium occurs

C the smallest angle of incidence in a denser medium for which refraction into a less dense medium occurs

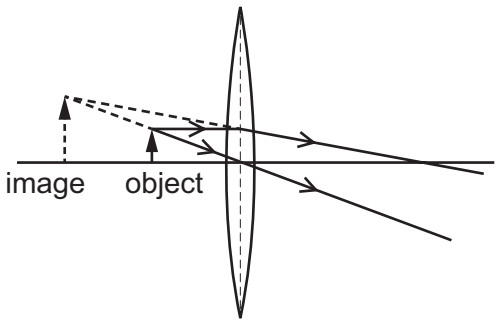
D the smallest angle of incidence in a less dense medium for which refraction into a denser medium occurs

34 Which ray diagram shows the formation of a virtual image?

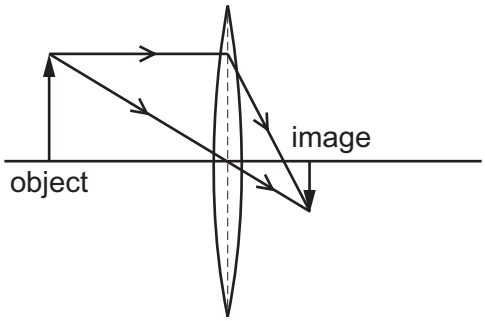
A



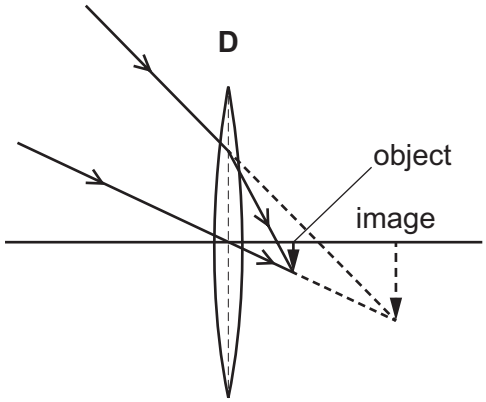
B



C

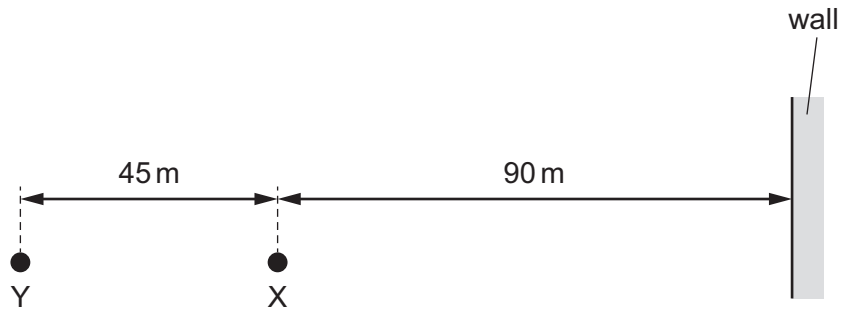


D



35 Person X stands facing a high wall that is 90 m away.

Person Y stands 45 m behind person X on a line perpendicular to the wall, as shown.



Person X claps loudly once.

Person Y hears the sound of this clap, then an echo of the sound from the wall.

The speed of sound in air is 330 m / s.

What is the time interval between person Y hearing the first sound and the echo?

A 0.27 s **B** 0.41 s **C** 0.55 s **D** 0.68 s

36 What is defined in terms of the electrical work done by a source in moving unit charge around a complete circuit?

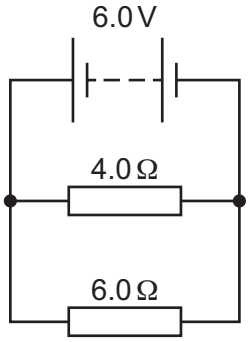
A electromotive force (e.m.f.)

B current

C potential difference (p.d.)

D power

37 The diagram shows a circuit.



Which statement is correct?

A The current in the 4.0 Ω resistor is 1.0 A.

B The current in the 4.0 Ω resistor is 1.5 A.

C The current in the 6.0 Ω resistor is 1.5 A.

D The current in the 6.0 Ω resistor is 2.5 A.

38 A current-carrying conductor is in a magnetic field. This causes a force to act on the conductor.

The current is increased and the magnetic field is reversed.

Which statement describes the force after the changes to the current and the magnetic field?

A The force is greater and in the opposite direction.

B The force is greater and in the same direction.

C The force is the same and in the same direction.

D The force is the same and in the opposite direction.

39 A decay equation for strontium-90 is shown.

$$^{90}_{38}\mathrm{Sr} \rightarrow {}^{90}_{39}\mathrm{Y} + x$$

What is x?

A alpha particle

B beta particle

C neutron

D proton

40 Which statement about the Universe is included in the Big Bang Theory?

A The Universe is approximately 13.8 thousand years old.

B The Universe is contracting.

C The Universe started as a single point.

D The Universe started at a low temperature and a low density.

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.).