Cambridge Assessment International Education

Cambridge O Level

COMBINED SCIENCE **5129/12**

Paper 1 Multiple Choice **October/November 2021**

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.

1 Which structure is **not** found in an animal cell?

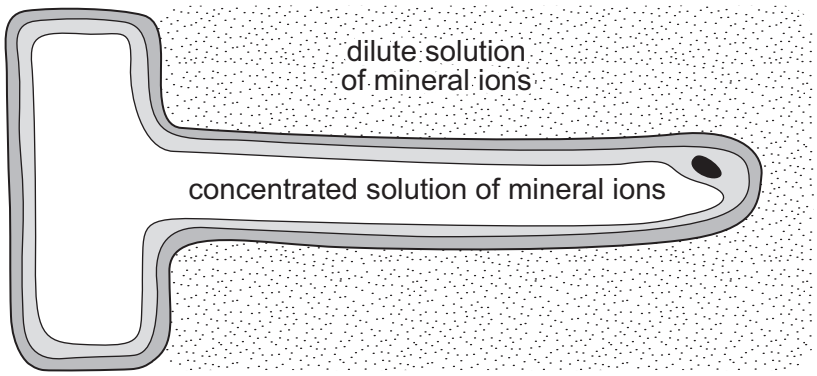
A cell wall

B cell membrane

C cytoplasm

D nucleus

2 The diagram shows a root hair cell surrounded by a dilute solution of mineral ions.



Which statement describes what happens?

A Water molecules move into the root hair because their concentration is lower inside.

B Water molecules move into the root hair because their concentration is lower outside.

C Water molecules move out of the root hair because their concentration is lower inside.

D Water molecules move out of the root hair because their concentration is lower outside.

3 What are enzymes classified as?

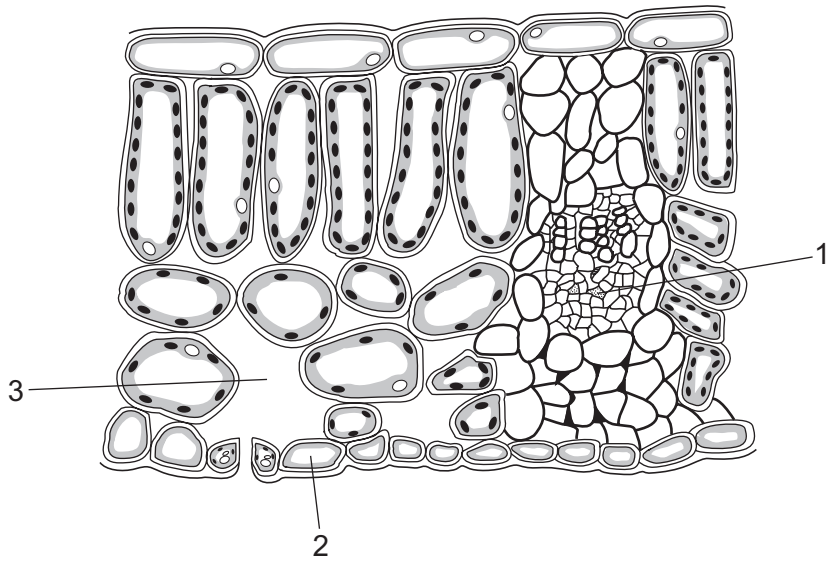
A carbohydrates

B lipids

C proteins

D vitamins

4 The diagram shows a section through a leaf.



Which row identifies the structures labelled 1, 2 and 3?

	1	2	3
A	cuticle	guard cell	stoma
B	cuticle	epidermis cell	air space
C	vascular bundle	guard cell	stoma
D	vascular bundle	epidermis cell	air space

5 Which helps prevent tooth decay?

1 avoiding eating foods which contain sugar

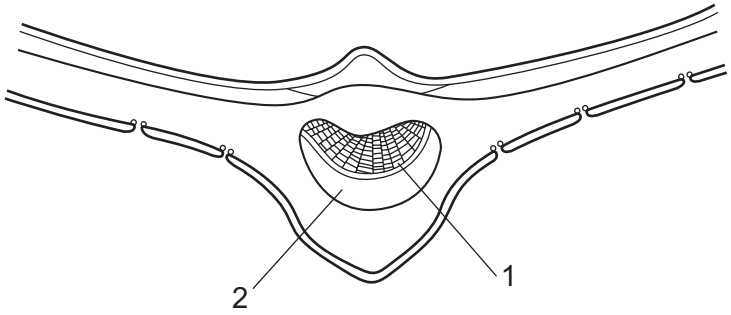
2 brushing teeth regularly

3 drinking fruit juice

4 visiting the dentist regularly

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

6 The diagram shows a section through the central part of a dicotyledonous leaf.

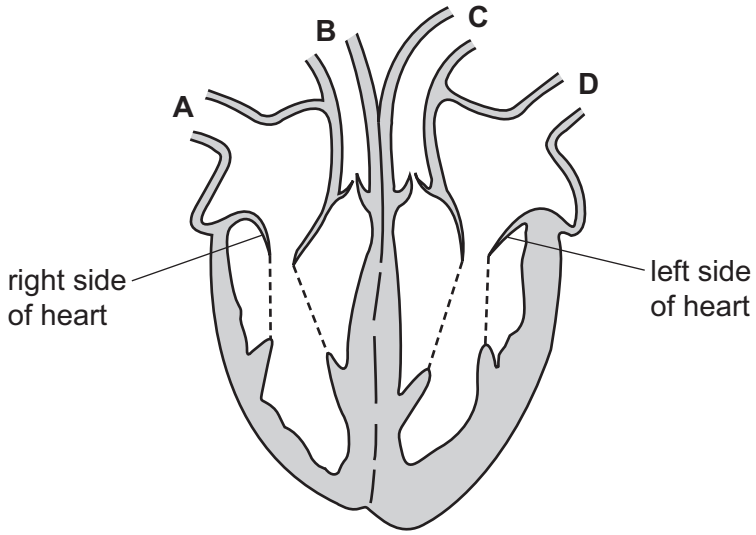


Which row shows the functions of the tissues at point 1 and point 2 in a leaf?

	tissue 1	tissue 2
A	supports the leaf	supports the flower
B	supports the stomata	transports sugars to the roots
C	transports water to the leaf	transports sugars to growing tips
D	transports water to the roots	transports ions away from the leaf

7 The diagram shows the heart.

Which label is an artery carrying deoxygenated blood?



8 During vigorous exercise lactic acid is produced in muscles.

Which sentence explains why this occurs?

A Blood flow is inadequate to remove the carbon dioxide produced.

B Fats are respired to release large amounts of extra energy.

C Oxygen supply to the muscles is increased rapidly.

D The glucose respired is not fully broken down due to the lack of oxygen.

9 Substance X is formed in the liver and is removed by organ Y.

Which row is correct?

	substance X	organ Y
A	amino acids	kidney
B	amino acids	lungs
C	urea	kidney
D	urea	lungs

10 Which row best describes a hormone?

	carried by	destroyed by the
A	blood	liver
B	blood	pancreas
C	urine	liver
D	urine	pancreas

11 Which substance is absorbed into the blood and can have a depressant effect?

A alcohol

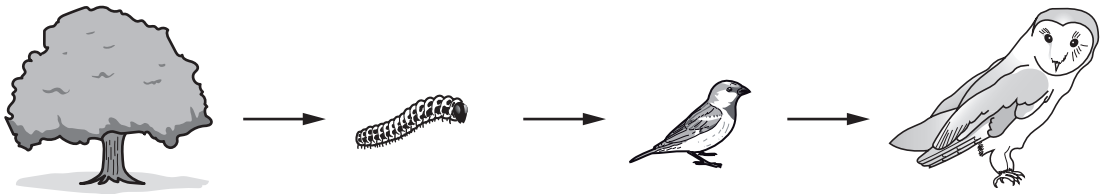
B amino acids

C glucose

D oxygen

[Turn over

12 The diagram shows a food chain.

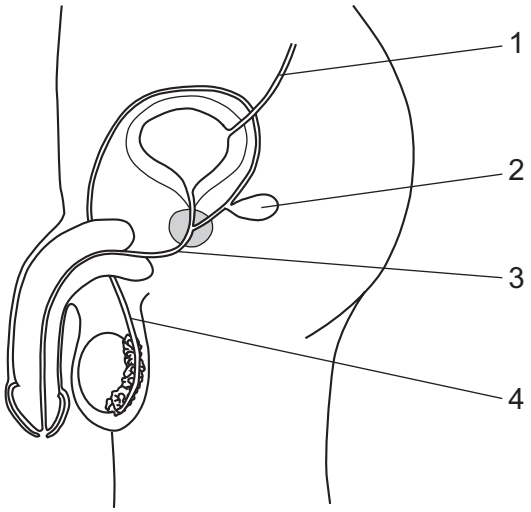
	 oak tree → caterpillars → sparrows → owls			
trophic level	1	2	3	4

The tree has 100 000 kJ of energy.

Which row indicates the likely energy transfer between each trophic level in this food chain?

	between 1–2 / kJ	between 2–3 / kJ	between 3–4 / kJ
A	500	10 000	100 000
B	10 000	500	50
C	10 000	500	500
D	100 000	50 000	10 000

13 The diagram shows the male reproductive system.



How is surgical contraception carried out?

A cutting and tying tube 1

B cutting and tying tube 3

C cutting and tying tube 4

D removing gland 2

14 Which pieces of apparatus are required to perform a titration?

1 condenser

2 evaporating basin

3 burette

4 pipette

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

15 A nucleus is represented by the symbol $^{81}_{37}X$.

What does this nucleus contain?

A 37 electrons and 44 neutrons

B 37 neutrons and 81 protons

C 37 protons and 44 neutrons

D 37 protons and 81 neutrons

16 Nickel is a metal and oxygen is a non-metal.

Nickel reacts with oxygen to make a compound.

Which row describes what happens to the atoms during the reaction and identifies the type of bond formed?

	nickel atoms	oxygen atoms	type of bond
A	lose electrons	gain electrons	covalent
B	share electrons	share electrons	covalent
C	lose electrons	gain electrons	ionic
D	share electrons	share electrons	ionic

17 Which 'dot-and-cross' diagram represents the outer electrons in a nitrogen molecule?

A

B

C

D

18 What is the total number of atoms in a $(C_2H_5)_2O$ molecule?

A 3 **B** 9 **C** 13 **D** 15

19 When sulfur dioxide dissolves in water an acidic solution is formed.

Which ion causes the solution to be acidic?

A the hydrogen ion

B the hydroxide ion

C the oxide ion

D the sulfate ion

20 The table shows the melting point and boiling point of some Group I elements.

element	melting point / °C	boiling point / °C
Li	180	1330
K	64	759
Rb	39	688

Which row gives the melting point and boiling point of sodium?

	melting point / °C	boiling point / °C
A	58	750
B	98	883
C	102	1525
D	196	1210

21 A more reactive metal displaces a less reactive metal from an aqueous solution of its ions.

Four unknown metals W, X, Y and Z react as shown.

$W(s) + X^{2+}(aq) \rightarrow$ no reaction

$X(s) + Y^{3+}(aq) \rightarrow$ a reaction

$Z(s) + W^{+}(aq) \rightarrow$ a reaction

$X(s) + Z^{2+}(aq) \rightarrow$ a reaction

$Z(s) + Y^{3+}(aq) \rightarrow$ no reaction

What is the correct order of reactivity, putting the most reactive first?

A $W \rightarrow X \rightarrow Y \rightarrow Z$

B $X \rightarrow W \rightarrow Z \rightarrow Y$

C $X \rightarrow Y \rightarrow Z \rightarrow W$

D $Z \rightarrow X \rightarrow W \rightarrow Y$

22 Which substance is used to remove impurities in the blast furnace during the extraction of iron?

A calcium carbonate

B carbon monoxide

C coke

D oxygen

23 Octane (C_8H_{18}) is a fossil fuel.

A sample of pure octane is burned in a limited supply of pure oxygen.

Which atmospheric pollutants are produced?

	carbon monoxide	oxides of nitrogen	sulfur dioxide
A	no	no	yes
B	yes	no	no
C	yes	no	yes
D	yes	yes	no

[Turn over

24 What is the test for hydrogen?

A Hydrogen extinguishes a lighted splint.

B Hydrogen pops with a glowing splint.

C Hydrogen pops with a lighted splint.

D Hydrogen relights a glowing splint.

25 Different fractions are obtained from the fractional distillation of petroleum (crude oil).

Which row identifies a correct use of a fraction?

	fraction	use
A	kerosene	fuel for oil stoves
B	petrol	fuel for planes
C	oils	fuel for diesel engines
D	bitumen	waxes and polishes

26 What is observed when ethene gas is bubbled into aqueous bromine?

A The aqueous bromine remains colourless.

B The aqueous bromine remains orange.

C There is a colour change from colourless to orange.

D There is a colour change from orange to colourless.

27 Ethanol is produced by the catalytic addition of steam to ethene.

What are the correct conditions for this process?

A 300 °C temperature and 60 atm pressure only

B phosphoric acid catalyst, 300 °C temperature and 60 atm pressure

C phosphoric acid catalyst and 60 atm pressure only

D phosphoric acid catalyst and 300 °C temperature only

28 A student wishes to measure the effect of changing the length of a pendulum on its period.

Which apparatus is needed in addition to the pendulum?

	measuring cylinder	ruler	stop watch
A	✓	✓	✗
B	✗	✓	✓
C	✓	✗	✓
D	✗	✗	✓

key

✓ = needed

✗ = not needed

29 A footballer kicks a ball.

Which quantity does **not** change when the force from his foot acts on the ball?

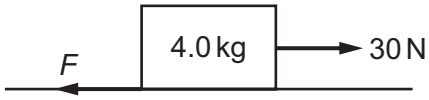
A the mass of the ball

B the shape of the ball

C the velocity of the ball

D the volume of the ball

30 A block of mass 4.0 kg is pulled across a rough horizontal surface with a force of 30 N.

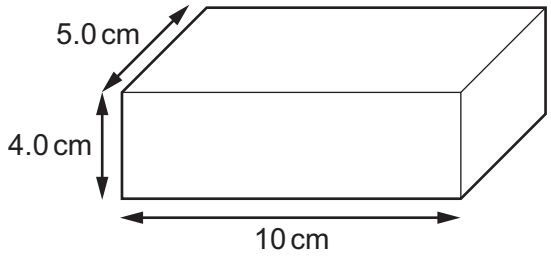


The acceleration of the block is 2.5 m / s^2.

What is *F*, the force of friction between the block and the surface?

A 10 N **B** 20 N **C** 30 N **D** 40 N

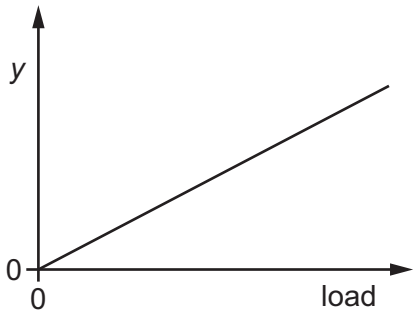
31 A rectangular metal block measures 4.0 cm × 5.0 cm × 10 cm. The mass of the block is 800 g.



What is the density of the metal?

A 0.25 g / cm^3 **B** 2.5 g / cm^3 **C** 4.0 g / cm^3 **D** 40 g / cm^3

32 The graph shows the results for the stretching of a spring. The *y*-axis has not been labelled.



Which label should be on the *y*-axis?

A extension

B length

C mass

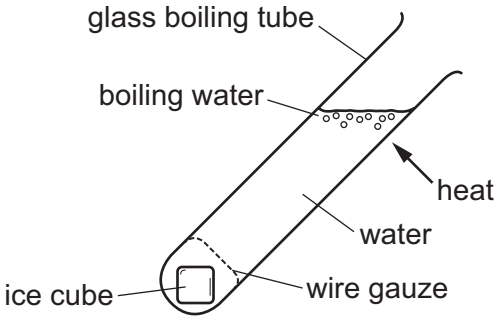
D weight

33 An object with a weight of 1400 N is lifted through a height of 2.5 m.

How much work is done?

A 56 J **B** 350 J **C** 560 J **D** 3500 J

34 The diagram shows water boiling at the top of a boiling tube while an ice cube remains unmelted at the bottom.



What makes this possible?

A Glass is a good conductor of heat.

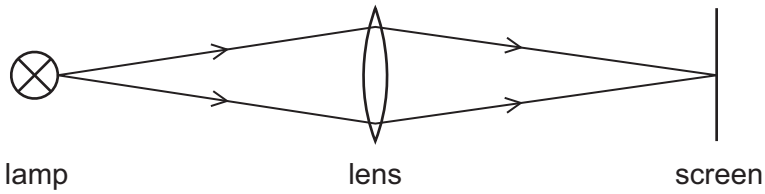
B Glass is a poor radiator of heat.

C Water is a good radiator of heat.

D Water is a poor conductor of heat.

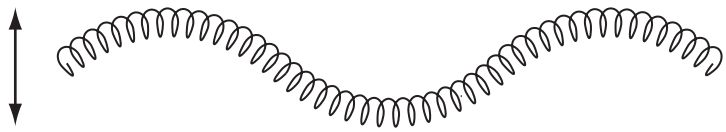
35 Which diagram shows an example of a longitudinal wave?

A light travelling from a lamp to a screen



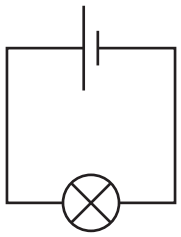
B a spring pulled backwards and pushed forwards repeatedly

C a spring moved up and down repeatedly



D a water ripple caused by a dipper moving up and down repeatedly

36 In the circuit shown, 20 J of energy is dissipated by the cell in driving 8.0 C of charge round the circuit.

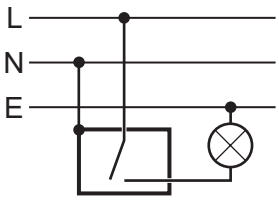


What is the value of the e.m.f. of the cell?

A 0.40 V **B** 2.5 V **C** 28 V **D** 160 V

37 Which diagram shows the correct connections for a switch and a lamp in a lighting circuit?

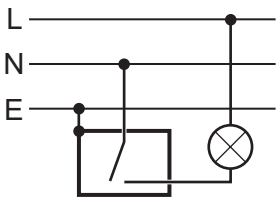
A



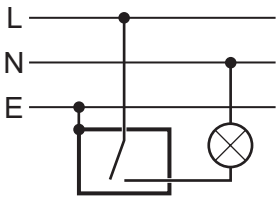
key

L	live
N	neutral
E	earth
▭	metal case

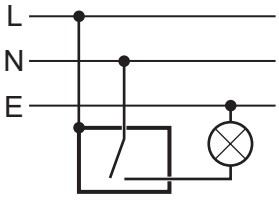
B



C



D

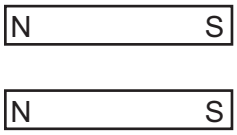


38 Which pair of magnets shows attraction?

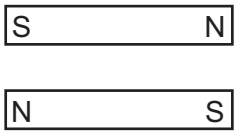
A

B

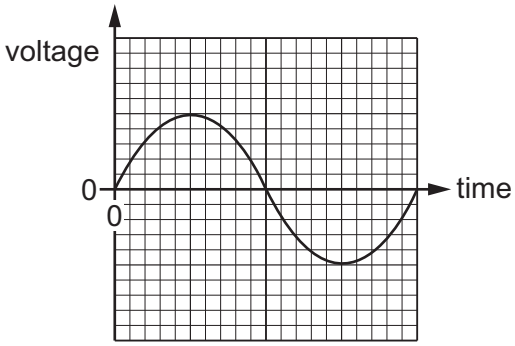
C



D



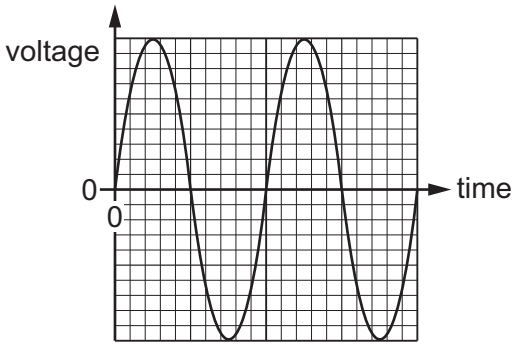
39 The graph shows the voltage output from a generator.



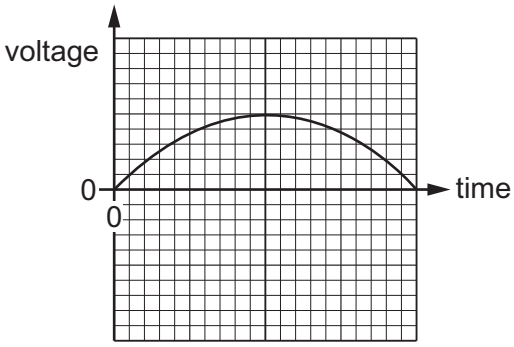
The generator is now rotated at twice the speed.

Which diagram shows the new output?

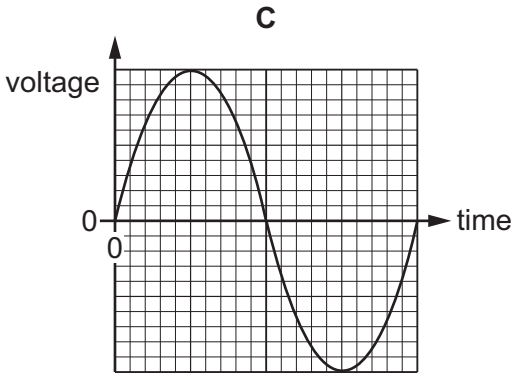
A



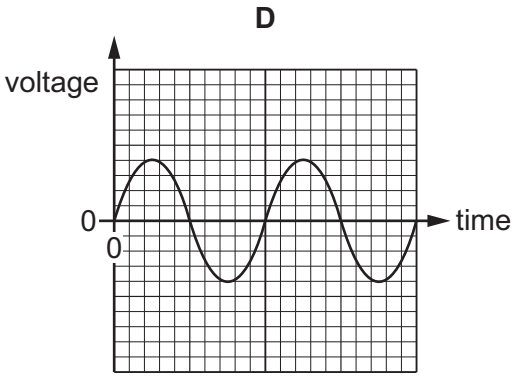
B



C



D



40 A radioactive decay is represented by the incomplete equation shown.

$$^{99}_{42}\text{Mo} \rightarrow {}^{99}_{43}\text{Tc}$$

In this decay, what happens to the nucleus of Mo-99?

A It absorbs a beta-particle.

B It absorbs an alpha-particle.

C It emits a beta-particle.

D It emits an alpha-particle.

BLANK PAGE

BLANK PAGE

BLANK PAGE

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 –		114 Fl flerovium –		116 Lv livermorium –		

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.).