Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education (9–1)

CO-ORDINATED SCIENCES **0973/21**

Paper 2 Multiple Choice (Extended) **October/November 2019**

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

* 0 9 2 7 6 6 3 5 4 3 *

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, glue or correction fluid.
Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.
DO **NOT** WRITE IN ANY BARCODES.

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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
Any rough working should be done in this booklet.
A copy of the Periodic Table is printed on page 16.
Electronic calculators may be used.

This document consists of **15** printed pages and **1** blank page.

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1 Which process do all living organisms carry out?

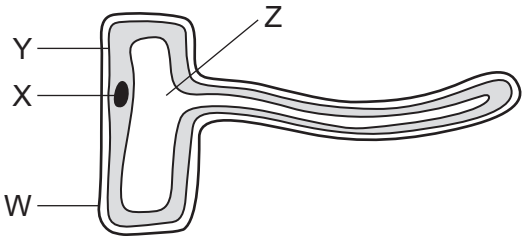
A asexual reproduction

B excretion

C ingestion

D photosynthesis

2 The diagram shows a specialised cell from a plant.



Which structures **not** found in animal cells are shown in the diagram and which structure often found in other plant cells is missing?

	structures not found in animal cells	structure found in other plant cells
A	W and X	chloroplast
B	X and Y	nucleus
C	Y and Z	nucleus
D	Z and W	chloroplast

3 Which result with the biuret test shows that protein is present?

A blue

B green

C orange

D purple

4 Which statements are correct for all enzymes?

1 They are proteins.

2 They are unaffected by temperature.

3 They speed up chemical reactions.

4 They work best at a high pH.

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

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5 Green plants need magnesium ions.

Which plant process is limited when magnesium is deficient?

A meiosis

B photosynthesis

C pollination

D respiration

6 What is the effect of bile on food after it leaves the stomach?

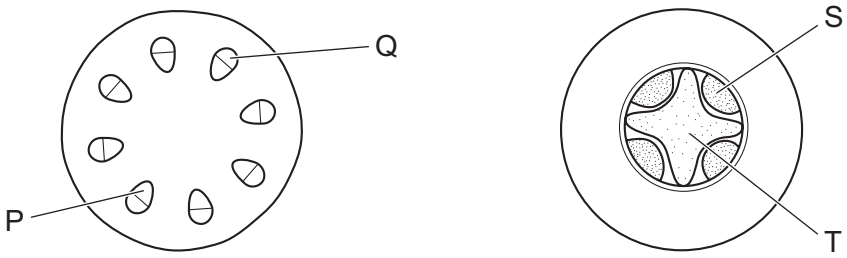
A acidifies the food entering the duodenum

B activates enzymes which digest glycerol

C increases the surface area of fats for digestion

D provides fat for digesting enzymes

7 The diagrams show sections through a stem and a root.



stem root

Which indicate the positions of the xylem?

A P and S **B** P and T **C** Q and S **D** Q and T

8 What are the products of the anaerobic respiration of glucose in yeast?

A alcohol and carbon dioxide

B alcohol only

C lactic acid and carbon dioxide

D lactic acid only

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9 Which statement about the role of blood vessels in the skin is correct?

A If the environment is too cold, vasoconstriction of capillaries occurs.

B If the environment is too cold, vasodilation of arterioles occurs.

C If the environment is too hot, vasoconstriction of capillaries occurs.

D If the environment is too hot, vasodilation of arterioles occurs.

10 During pregnancy, the placenta is used to exchange substances between the mother and the fetus.

Which row is correct?

	substance exchanged	direction
A	carbon dioxide	mother to fetus
B	glucose	mother to fetus
C	glucose	fetus to mother
D	oxygen	fetus to mother

11 A nucleus of a potato plant cell has 48 chromosomes.

How many chromosomes will there be in a potato pollen nucleus?

A 12 **B** 24 **C** 48 **D** 96

12 In the food chain shown, 10% of the energy is transferred between each trophic level.

grass → grasshopper → frog → snake → buzzard

For every 100 kJ of energy in the herbivore, how much energy will be transferred to the tertiary consumer?

A 0.1 kJ **B** 1 kJ **C** 10 kJ **D** 100 kJ

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13 Some of the stages of eutrophication are listed.

1 death of organisms requiring dissolved oxygen in water

2 increased availability of nitrate and other ions

3 increased decomposition after death of producers

4 reduction in dissolved oxygen

What is the correct order of these stages in eutrophication?

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

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

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

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

14 Which statement describes the arrangement of particles in a solid?

A The particles are close together and move randomly.

B The particles are close together and vibrate about a fixed point.

C The particles are far apart and move randomly.

D The particles are far apart and vibrate about a fixed point.

15 Which processes are chemical changes?

1 conversion of steam to liquid water

2 cracking of alkanes

3 fractional distillation of petroleum

4 thermal decomposition of calcium carbonate

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

16 Silicon(IV) oxide has a giant molecular structure.

Which row is correct?

	number of oxygen atoms bonded to each silicon atom	number of silicon atoms bonded to each oxygen atom
A	2	2
B	2	4
C	4	2
D	4	4

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17 1 g of hydrogen contains 6×10^{23} atoms.

The relative atomic mass of helium is 4.

How many atoms does 1 g of helium contain?

A 1.5×10^{23} **B** 2.4×10^{24} **C** 6×10^{23} **D** 2.4×10^{23}

18 During the electrolysis of aluminium oxide, which ions are reduced and at which electrode does this reduction occur?

A aluminium ions at the anode

B aluminium ions at the cathode

C oxide ions at the anode

D oxide ions at the cathode

19 Which statement describes what happens when ethanol burns?

A Chemical energy transfers to thermal energy in an endothermic reaction.

B Chemical energy transfers to thermal energy in an exothermic reaction.

C Thermal energy transfers to chemical energy in an endothermic reaction.

D Thermal energy transfers to chemical energy in an exothermic reaction.

20 Three reaction equations are listed.

1 $2Na + H_2O \rightarrow 2NaOH + H_2$

2 $2NaCl \rightarrow 2Na + Cl_2$

3 $CaCO_3 \rightarrow CaO + CO_2$

Which reactions involve reduction and oxidation?

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

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21 The pH values of four liquids are 1, 4, 7 and 13.

The four liquids are distilled water, nitric acid, potassium hydroxide and vinegar.

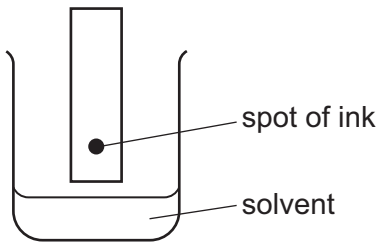
Which row shows the pH values of the liquids?

	distilled water	nitric acid	potassium hydroxide	vinegar
A	4	7	13	1
B	4	13	7	1
C	7	1	4	13
D	7	1	13	4

22 The colours in an ink can be separated by chromatography.

Which diagram shows the correct way to set up the apparatus?

A



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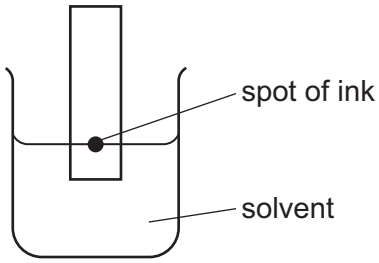

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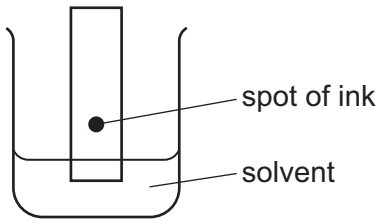

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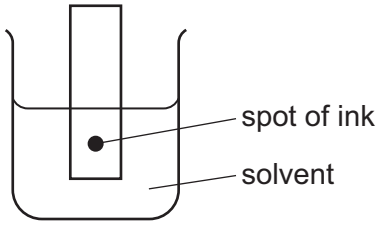

23 Which statement about the Periodic Table is correct?

A Elements are listed in order of neutron number.

B Elements are listed in order of nucleon number.

C Elements are listed in order of proton number.

D Elements are listed in order of relative atomic mass.

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[Turn over

24 Information about three Group I elements is shown.

	melting point / °C	the formula of the oxides
lithium	180	Li_2O
sodium	98	Na_2O
potassium	63	K_2O

Rubidium is below potassium in Group I.

Which statements about rubidium are correct?

1 The formula of rubidium oxide is Rb_2O.

2 Rubidium is more dense than potassium.

3 Rubidium's melting point is greater than 63 °C.

4 The formula of rubidium hydroxide is $Rb(OH)_2$.

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

25 Four properties of metals are listed.

1 high melting point

2 low density

3 resistance to corrosion

4 conducts electricity

Which properties make aluminium suitable for use in cans containing drinks?

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

26 During the Contact process, sulfur dioxide is reacted with oxygen to convert it to sulfur trioxide.

Which catalyst is used?

A copper oxide

B iron

C nickel

D vanadium(V) oxide

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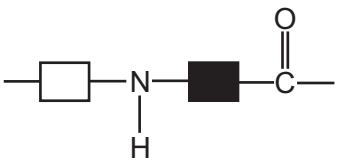
27 Which diagram represents the structure of nylon?

A



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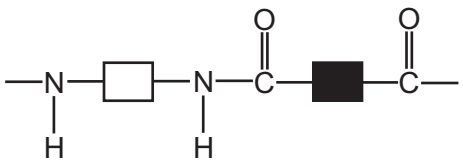

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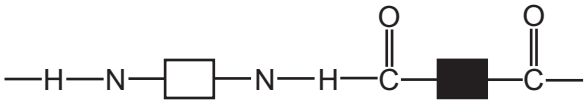

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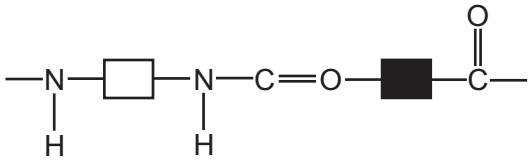
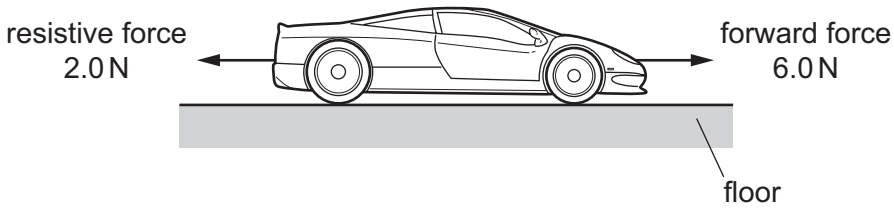


28 The diagram shows the two horizontal forces acting on a toy car of mass 2.0 kg that is moving along a horizontal floor.



What are the resultant force on the car and its acceleration?

	resultant force / N	$\frac{\text{acceleration}}{\text{m/s}^2}$
A	4.0	0.50
B	4.0	2.0
C	8.0	0.25
D	8.0	4.0

29 Diagram 1 shows a spring with its length indicated. Diagram 2 shows the same spring with a 20 N load hung from it, and the new length of the spring.

The spring obeys Hooke's Law.

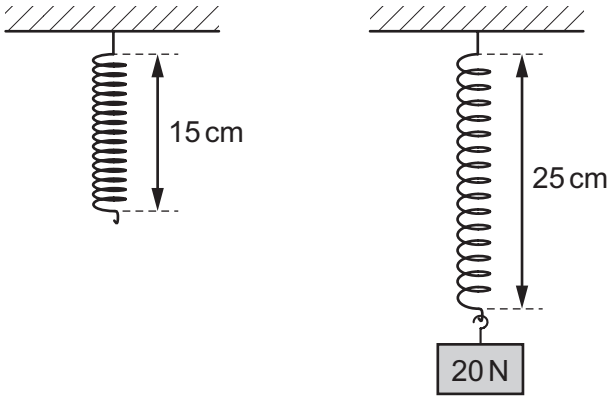
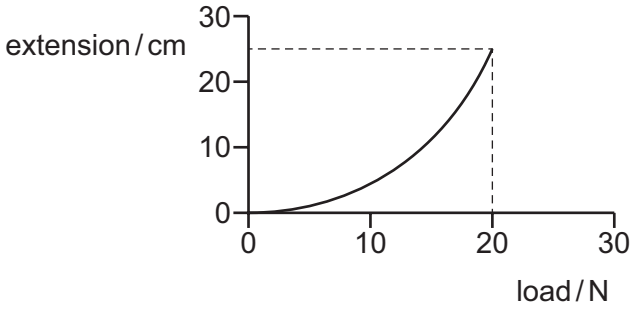


diagram 1 diagram 2

Which graph is the extension-load graph for the spring?

A



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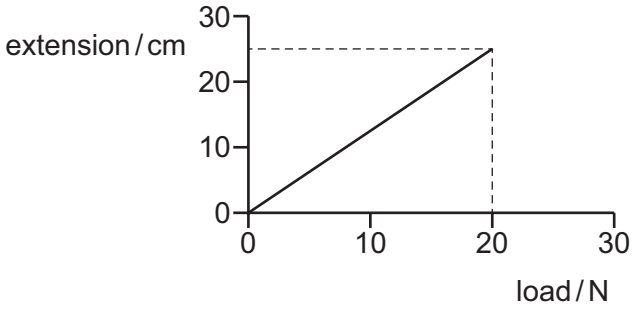

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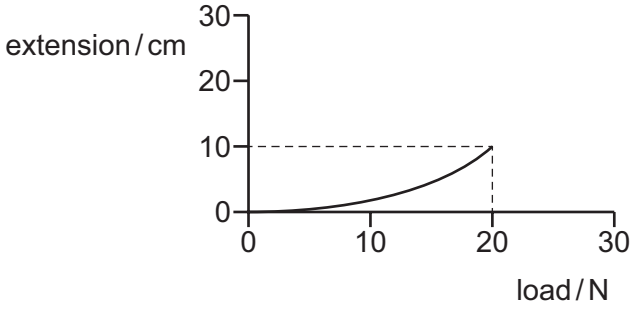

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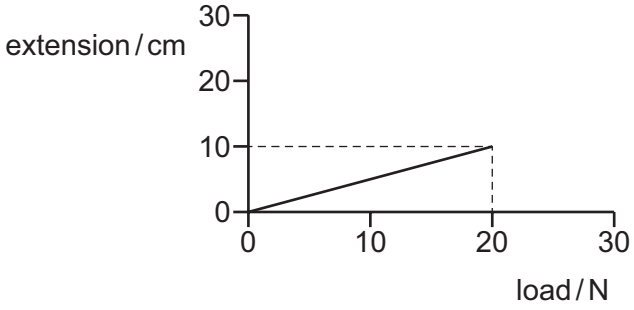

30 An engine is doing work on a car as the car moves along a road.

Which two changes **must** result in less work being done on the car by the engine?

A decreasing the engine's force on the car and decreasing the distance moved by the car

B decreasing the engine's force on the car and increasing the distance moved by the car

C increasing the engine's force on the car and decreasing the distance moved by the car

D increasing the engine's force on the car and increasing the distance moved by the car

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31 A machine has useful output energy of 1000 J, and wasted energy of 300 J.

Which expression is used to calculate the efficiency of the machine?

A $\frac{300}{(1000+300)} \times 100\%$

B $\frac{300}{1000} \times 100\%$

C $\frac{(1000-300)}{1000} \times 100\%$

D $\frac{1000}{(1000+300)} \times 100\%$

32 The more energetic molecules of a liquid are escaping from its surface, causing the liquid to cool.

What is happening to the liquid?

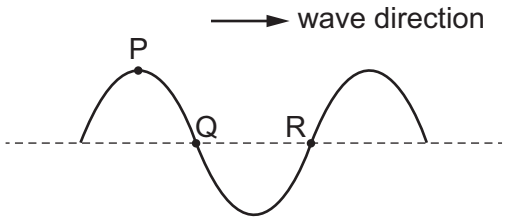
A It is boiling.

B It is condensing.

C It is evaporating.

D It is melting.

33 A transverse wave is travelling through a medium in the direction shown.



In which direction do the particles of the medium vibrate?

A parallel to the line joining P to Q

B parallel to the line joining Q to R

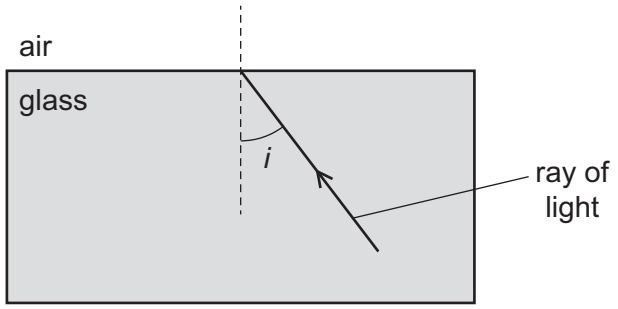
C perpendicular to the line joining P to Q

D perpendicular to the line joining Q to R

34 A glass block is surrounded by air.

Light travelling in the glass block reaches the edge of the block.

The critical angle of the glass is 42°.



NOT TO SCALE

Which row shows an angle of incidence *i* of the light and what happens to the light when it reaches the edge of the glass block at this angle of incidence?

	i	what happens to the light
A	30°	totally internally reflected
B	45°	refracted
C	60°	totally internally reflected
D	75°	refracted

35 There is a current of 6.0 A in an electric heater.

How much charge passes through the heater in one minute?

A 0.10 C **B** 6.0 C **C** 10 C **D** 360 C

36 Which row shows how lamps are connected in a lighting circuit in a house and gives an advantage of connecting them in this way?

	how lamps are connected	advantage of connecting them in this way
A	in parallel	they can be switched separately
B	in parallel	they share the voltage
C	in series	they can be switched separately
D	in series	they share the voltage

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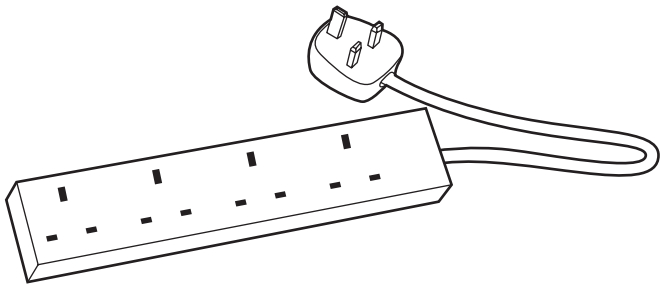
37 An electric kettle is rated at 3.0 kW and is connected to a 250 V supply. The kettle is switched on for 2.0 minutes.

Which row shows the current in the kettle and the energy transferred by the kettle?

	current / A	energy / J
A	12	6000
B	12	360 000
C	750	6000
D	750	360 000

38 An electrical extension block has four sockets, a cable which can safely take a current of 6 A and a plug. It is protected by a fuse rated at 5 A.



The extension block is used with four appliances and the 5 A fuse blows. The owner replaces the 5 A fuse with a 13 A fuse.

Why is the extension block now dangerous?

A The appliances may overheat before the fuse blows.

B The cable may overheat before the fuse blows.

C The sockets may burn out before the fuse blows.

D The 13 A fuse may blow too soon.

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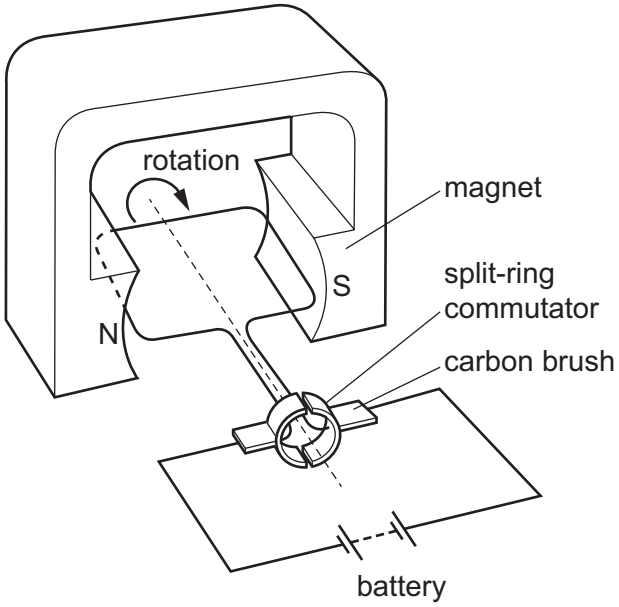
39 The diagram shows an electrical device.



What is this electrical device?

A a d.c. motor

B an a.c. generator

C a transformer

D a solenoid

40 Which type of radiation has the greatest ionising effect, and which is the most penetrating?

	greatest ionising effect	most penetrating
A	α-particles	α-particles
B	α-particles	γ-rays
C	γ-rays	α-particles
D	γ-rays	γ-rays

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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 –		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.).