Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES **0654/22**

Paper 2 Multiple Choice (Extended) **October/November 2018**

45 minutes

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

* 3 2 8 2 2 4 9 4 1 8 *

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.

1 What are the optimum conditions of pH and temperature for the action of protease in the stomach?

	pH	temperature / °C
A	2	27
B	2	37
C	7	27
D	7	37

2 What will cause plant leaves to turn yellow?

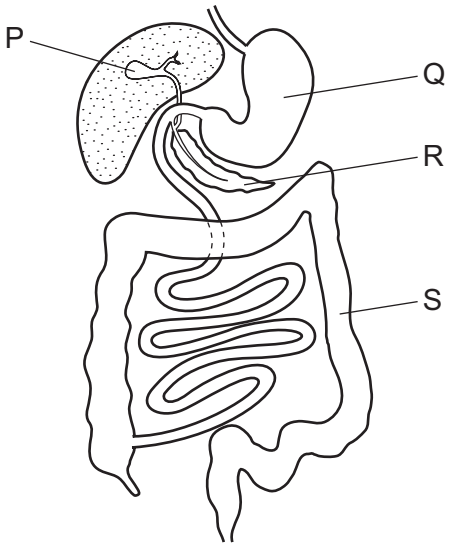
A a lack of magnesium in the soil

B a lack of starch in the leaves

C a reduction in the rate of photosynthesis

D a reduction in the rate of respiration

3 The diagram shows part of the digestive system.



Which of the labelled parts produce digestive enzymes, absorb water and store bile?

	produce digestive enzymes	absorb water	store bile
A	P	Q	R
B	Q	R	P
C	R	S	P
D	S	P	R

4 Plant cells are placed in a solution with a water potential higher than the cells.

Which row is correct?

	movement of water	volume of vacuole
A	enters cells	decreases
B	enters cells	increases
C	leaves cells	decreases
D	leaves cells	increases

5 Water is taken in through the roots and lost from the leaves of tall trees.

What enables this to happen?

A active transport by the xylem vessels

B pressure from the roots

C translocation in the phloem

D transpiration loss from the leaves

6 What is meant by *respiration*?

A breakdown of protein

B sweating to lose heat

C the function of lungs

D the release of energy

7 What is the equation for aerobic respiration?

A $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

B $6CO_2 + C_6H_{12}O_6 \rightarrow 6O_2 + 6H_2O$

C $6O_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6CO_2$

D $6O_2 + C_6H_{12}O_6 \rightarrow 6CO_2 + 6H_2O$

8 To which environmental stimulus is a plant root responding when it grows downwards?

A a decrease in soil water content

B light falling on the leaves of the plant

C rising temperature

D the force of gravity

9 What is an advantage of asexual reproduction compared with sexual reproduction?

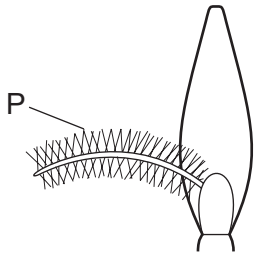
A A specific disease is less likely to spread throughout the whole population.

B It increases variation in the offspring.

C It produces offspring more rapidly.

D It requires two parents.

10 The diagram shows part of a flower.



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

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

11 A man breeds small mammals in which the fur colour is black or white. The allele for white is dominant to black.

If he chooses a pair of heterozygous white mammals to breed together, which proportion of the offspring mammals will be black?

A none of them

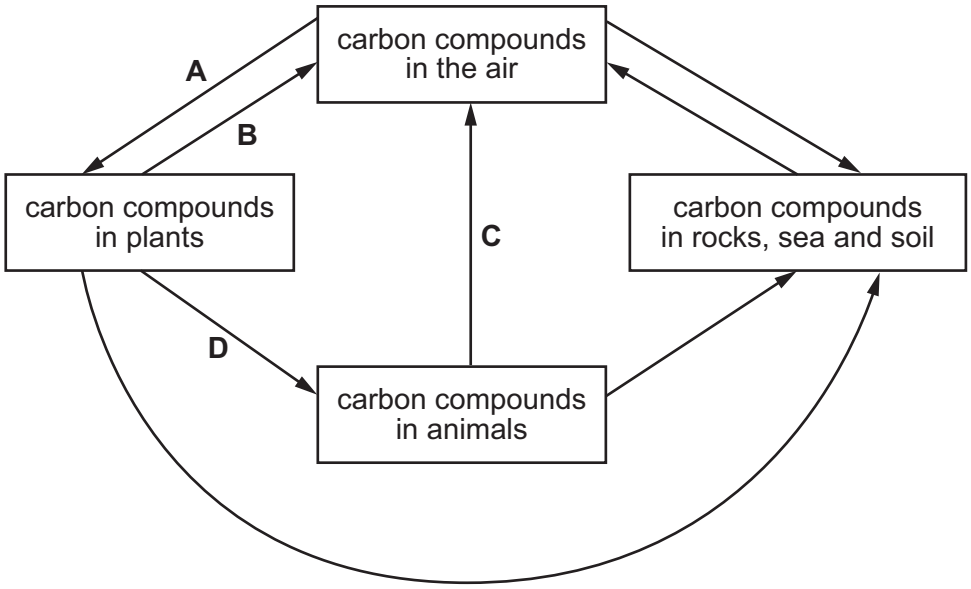
B about a quarter

C about half

D all of them

12 The diagram shows part of the carbon cycle.

Which arrow represents plant respiration?



13 Which gas does **not** contribute to acid rain?

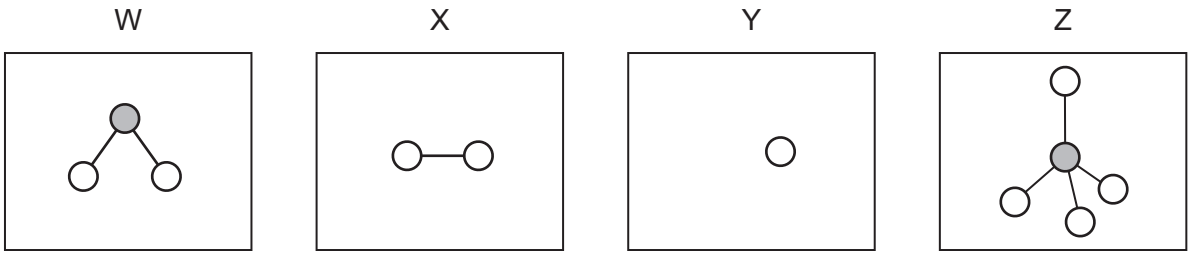
A carbon dioxide

B methane

C oxides of nitrogen

D sulfur dioxide

14 W, X, Y and Z are diagrams representing atoms and molecules.



Which statement is correct?

A W and Z are molecules and X and Y are atoms.

B W, X and Z are molecules and Y is an atom.

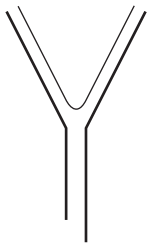
C W, Y and Z are molecules and X is an atom.

D X, Y and Z are molecules and W is an atom.

15 Hexane and octane are liquid hydrocarbons that mix together.

Which apparatus is used to separate a mixture of these two liquids?

A



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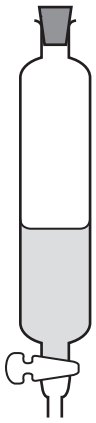

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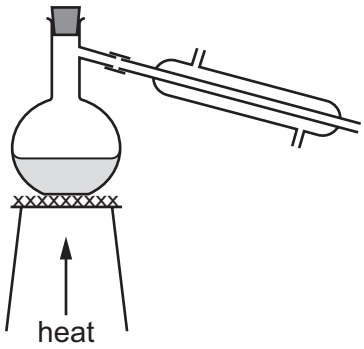

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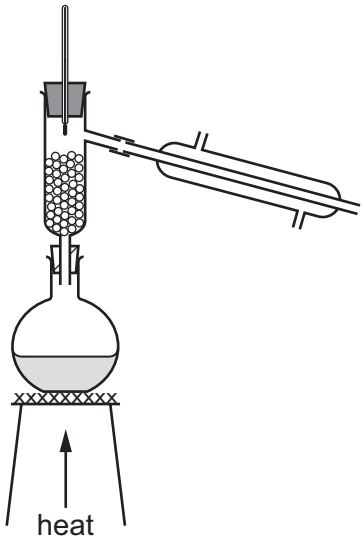


16 Compounds are made up from two or more different elements ……1…… bonded together.

Compounds cannot be broken down into simpler substances by ……2…… processes.

Compounds and their elements have ……3…… properties.

Which words complete gaps 1, 2 and 3?

	1	2	3
A	chemically	chemical	similar
B	chemically	physical	different
C	physically	chemical	similar
D	physically	physical	different

17 Cryolite is a mineral which contains aluminium, sodium and fluorine.

It contains twice as many fluorine atoms as sodium atoms.

It contains three times as many sodium atoms as aluminium atoms.

What is the formula of cryolite?

A $NaAl_3F_6$ **B** Na_2AlF_4 **C** Na_3AlF_6 **D** Na_3AlF_4

18 The equation for the decomposition of copper carbonate is

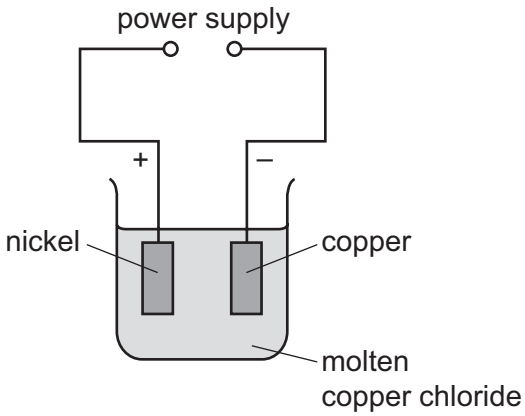
$$CuCO_3(s) \rightarrow CuO(s) + CO_2(g)$$

Which volume of carbon dioxide is produced when 0.10 mol of copper carbonate is decomposed?

A $0.24\,dm^3$ **B** $2.4\,dm^3$ **C** $24\,dm^3$ **D** $240\,dm^3$

19 Which diagram shows equipment used to electroplate nickel with copper?

A



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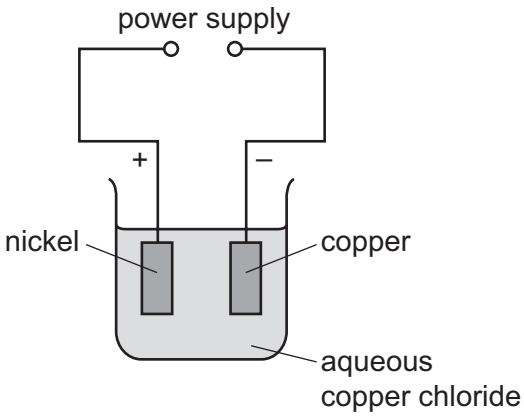

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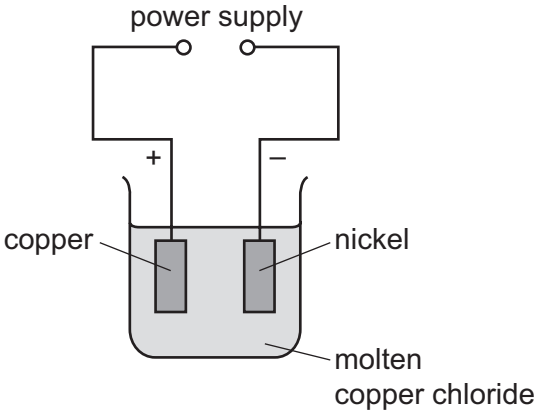

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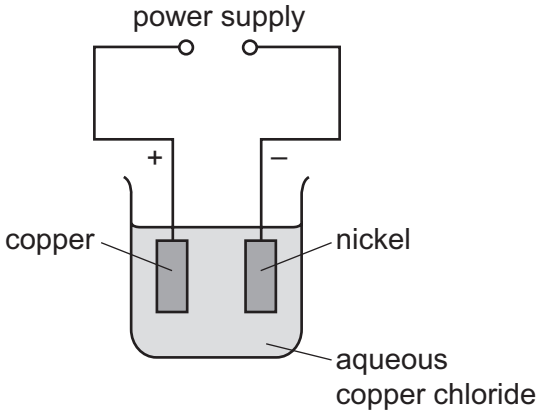


20 Lime is manufactured from calcium carbonate.

Which type of reaction is involved in this process?

A endothermic

B neutralisation

C precipitation

D reduction

21 Which row describes what happens to an aluminium atom when it forms an aluminium ion, and what is this process known as?

	aluminium atom	process
A	gains three electrons	oxidation
B	gains three electrons	reduction
C	loses three electrons	oxidation
D	loses three electrons	reduction

22 Which statement about fluorine and astatine is correct?

A Fluorine is a solid and astatine is a gas at room temperature.

B Fluorine is darker in colour than astatine.

C Fluorine is more reactive than astatine.

D The formula of fluorine is F_2 and the formula of astatine is At.

23 Which reaction does **not** occur in the blast furnace?

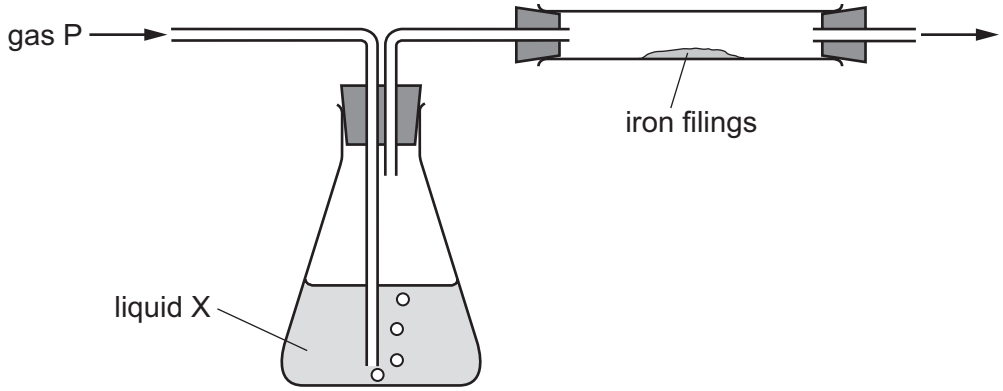
A $C + CO_2 \rightarrow 2CO$

B $CaCO_3 \rightarrow CaO + CO_2$

C $CaO + SiO_2 \rightarrow CaSiO_3$

D $2Fe + 3CO_2 \rightarrow Fe_2O_3 + 3CO$

24 The diagram shows gas P being passed through liquid X and over iron filings.



Which gas and liquid cause the iron to rust?

	gas P	liquid X
A	nitrogen	concentrated sulfuric acid (a drying agent)
B	nitrogen	water
C	oxygen	concentrated sulfuric acid (a drying agent)
D	oxygen	water

25 Sulfuric acid is manufactured by the Contact process.

Which conditions are used in this process?

A 2 atmospheres pressure and a vanadium pentoxide catalyst

B 2 atmospheres pressure and an iron catalyst

C 200 atmospheres pressure and a vanadium pentoxide catalyst

D 200 atmospheres pressure and an iron catalyst

26 Ethene reacts with steam to make ethanol in the presence of a catalyst.

Which type of reaction occurs?

A addition

B displacement

C oxidation

D polymerisation

[Turn over

27 Which statement about proteins is **not** correct?

A They are formed by addition polymerisation.

B They are macromolecules.

C They can be hydrolysed by acids.

D They consist of amino acids joined by amide linkages.

28 A model aircraft starts to move. It takes 16 seconds to reach its take-off speed of 32 m / s.

What is the average acceleration of the aircraft during this time?

A $0.25\,m/s^2$ **B** $0.50\,m/s^2$ **C** $1.0\,m/s^2$ **D** $2.0\,m/s^2$

29 What is the unit of work and what is an equivalent combination of units?

	unit	equivalent combination
A	joule	newton metre
B	joule	newton / metre
C	newton	joule metre
D	newton	joule / metre

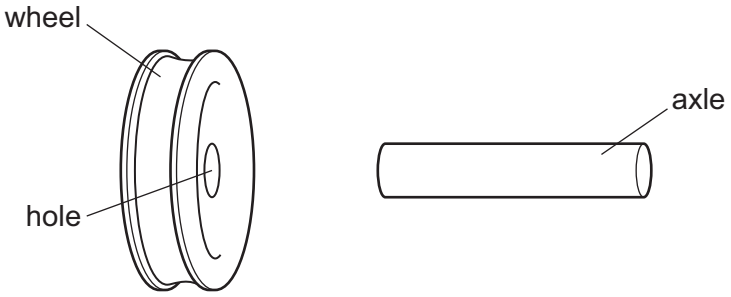
30 A ball is thrown vertically upwards at a speed of 4.0 m / s.

The acceleration of free fall *g* is $10\,m/s^2$. Air resistance can be ignored.

What is the maximum height the ball reaches?

A 0.20 m **B** 0.40 m **C** 0.80 m **D** 40 m

31 An axle is slightly larger than the hole in a wheel made from the same metal.



How could an engineer fit the wheel onto the axle?

A cool the axle only

B cool the axle and cool the wheel by the same temperature change

C heat the axle only

D heat the axle and heat the wheel by the same temperature change

32 There is a vacuum between the double walls of a vacuum flask.

Which types of heat transfer are reduced by the vacuum?

A conduction, convection and radiation

B conduction and convection only

C conduction and radiation only

D convection and radiation only

33 A radio transmitter emits radio waves with a frequency of 1.25×10^8 Hz. The most suitable aerial for this frequency is $\frac{1}{4}$ of a wavelength long.

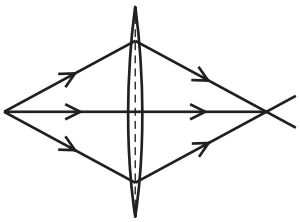
The speed of radio waves is 3.0×10^8 m/s.

What is the length of the most suitable aerial?

A 0.10 m **B** 0.60 m **C** 2.4 m **D** 9.6 m

34 Which diagram shows how a real image is formed by a convex lens?

A



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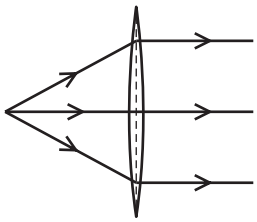

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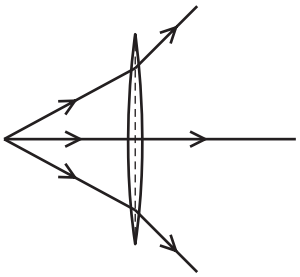

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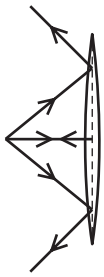


35 The speed of sound in air is 330 m / s.

How do the speeds of sound in concrete and water compare with this speed?

	speed in concrete	speed in water
A	greater	greater
B	greater	less
C	less	greater
D	less	less

36 An electromagnet has a metal core.

Which metal is used and why?

A iron because it becomes a permanent magnet

B iron because it does not become a permanent magnet

C steel because it becomes a permanent magnet

D steel because it does not become a permanent magnet

37 A circuit contains a lamp and a fuse.

There is a current of 2.0 A in the lamp and it operates normally.

A fault develops in the lamp. The current in the circuit increases, and the fuse now blows.

The diagrams show two circuits.

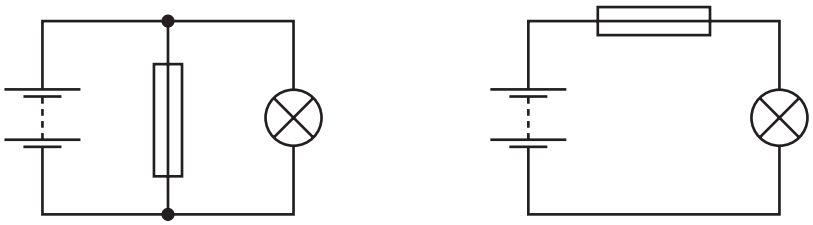
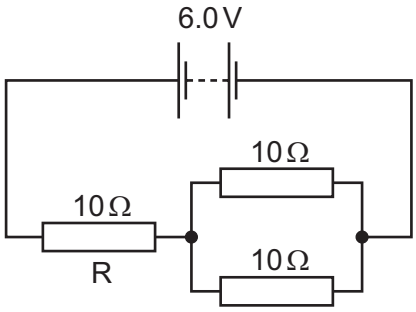


diagram 1 diagram 2

Which is the circuit used and what is the effect of the fuse when it blows?

	circuit	effect of fuse
A	diagram 1	reduces current to 0
B	diagram 1	reduces current to 2.0 A
C	diagram 2	reduces current to 0
D	diagram 2	reduces current to 2.0 A

38 A 6.0 V battery is connected to three 10 Ω resistors, as shown. One resistor is labelled R.



What is the current in resistor R?

A 0.20 A **B** 0.40 A **C** 0.60 A **D** 1.8 A

39 A current-carrying conductor is in a magnetic field. The current is switched on and a force acts on the conductor.

The current is doubled and the magnetic field is reversed.

How does the force on the conductor change, if at all?

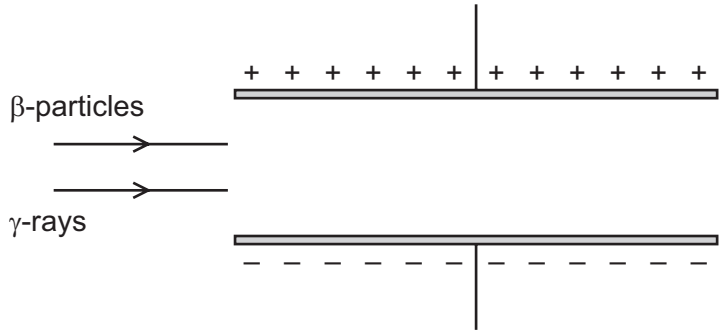
A The force is greater and in the opposite direction.

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 but in the opposite direction.

40 The diagram shows a beam of β-particles and a beam of γ-rays entering the electric field between two charged plates.



What is the effect of the electric field on each of the beams?

	β-particles	γ-rays
A	deflected downwards	deflected upwards
B	deflected upwards	deflected downwards
C	deflected upwards	no effect
D	no effect	deflected downwards

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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.).