Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE **0653/22**

Paper 2 Multiple Choice (Extended) **May/June 2018**

45 minutes

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

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 20.
Electronic calculators may be used.

This document consists of **17** printed pages and **3** blank pages.

1 Which pair of structures is found in a typical plant cell but **not** in a typical animal cell?

A cell membrane and chloroplasts

B cell membrane and cytoplasm

C cell wall and chloroplasts

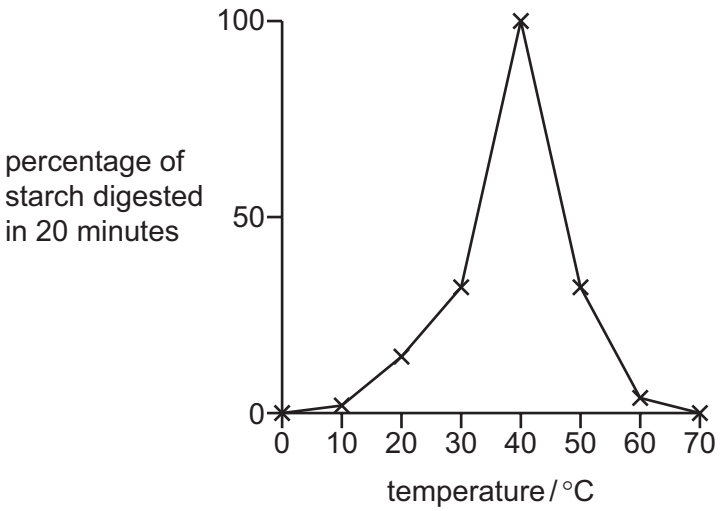
D cell wall and cytoplasm

2 Amylase is an enzyme that digests starch.

Identical mixtures of starch and amylase are kept at different temperatures.

The percentage of starch digested in 20 minutes is recorded.

The results are shown in the graph.



The mixtures that were kept at 0 °C and 70 °C are then kept at a temperature of 40 °C for one hour.

What are the results after this hour?

	percentage of starch digested	
	sample originally kept at 0 °C	sample originally kept at 70 °C
A	0	0
B	0	100
C	100	0
D	100	100

3 Which two chemical substances are required for photosynthesis?

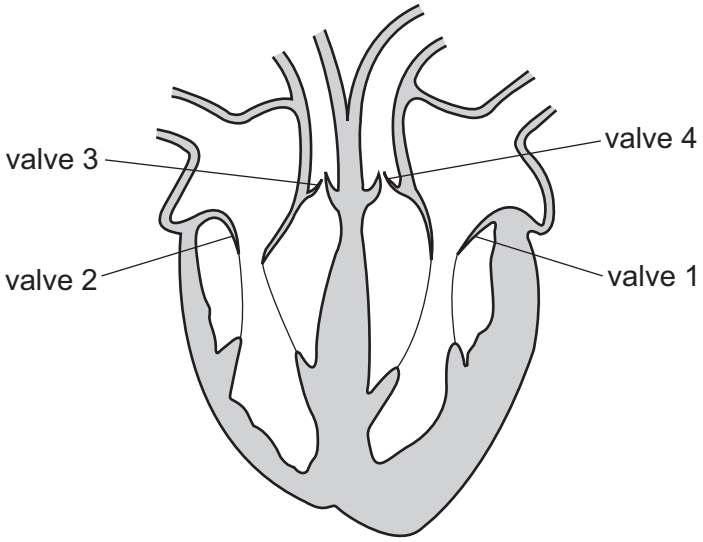
A carbon dioxide and glucose

B glucose and oxygen

C oxygen and water

D water and carbon dioxide

4 The diagram shows a section through the human heart.



What happens to the valves as blood is being pumped to the lungs?

	valve 1	valve 2	valve 3	valve 4
A	closed	closed	open	closed
B	closed	closed	open	open
C	open	open	closed	closed
D	open	open	closed	open

5 Two students exercised for five minutes. Immediately afterwards, each student measured her own pulse rate.

The pulse rate for one student was lower than the pulse rate for the other student.

Why might her pulse rate be lower?

A Her exercise was harder.

B Her heart rate was higher.

C She had secreted more adrenaline.

D She takes regular exercise.

[Turn over

6 What is **not** a feature of a gas exchange surface in animals?

A moist

B permeable

C small surface area

D thin

7 What is the maximum number of carbon dioxide molecules produced when four glucose molecules are used in aerobic respiration?

A 6 **B** 12 **C** 24 **D** 48

8 Adrenaline is sometimes called the 'fight or flight' hormone.

Which is an effect of adrenaline that helps prepare the body to fight or to take flight when frightened?

A It increases blood glucose concentration.

B It increases the rate of digestion.

C It maintains a constant body temperature.

D It slows down the heart rate.

9 Which row describes sexual reproduction?

	number of parents	offspring genetically identical to parents	involves zygote production
A	1	✓	✓
B	1	✗	✗
C	2	✓	✗
D	2	✗	✓

10 Which features are correct for a wind-pollinated flower?

	nectar	petals
A	absent	small
B	absent	large
C	present	small
D	present	large

11 In a food chain, the energy transferred from the first trophic level to the second trophic level is greater than the energy transferred from the second trophic level to the third trophic level.

Which process is **not** a reason for this difference?

A egestion

B excretion

C movement

D photosynthesis

12 Fertilisers help crop plants grow.

How might the overuse of fertilisers damage the ecosystem?

A Animals feeding on the crop plants will die.

B It will lead to flooding

C Nutrients will not be available to plants.

D Waterways will be polluted.

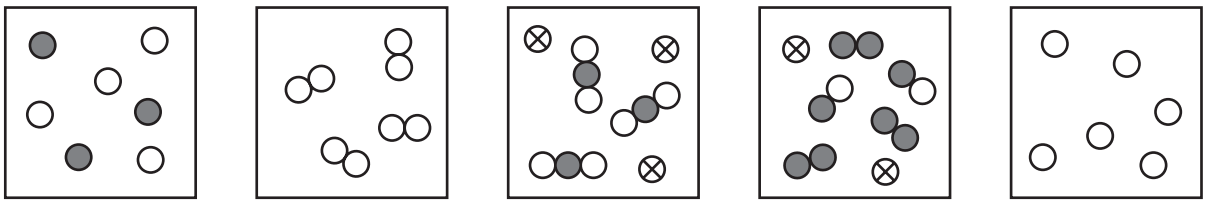
13 What are the effects of acid rain?

	damage to limestone buildings	damage to trees
A	✓	✗
B	✓	✓
C	✗	✗
D	✗	✓

[Turn over

14 The diagrams represent different substances.

P Q R S T



Which row describes the substances?

	only separate atoms	only molecules	mixture of atoms and molecules
A	P	Q	S
B	Q	T	R
C	T	P	R
D	T	Q	P

15 Which method is used to separate a mixture of two liquids?

A chromatography

B crystallisation

C filtration

D fractional distillation

16 Which process involves a physical change?

A adding magnesium to nitric acid

B burning methane

C evaporating petroleum

D rusting iron

17 An ion of element X has 8 protons, 8 neutrons and 10 electrons.

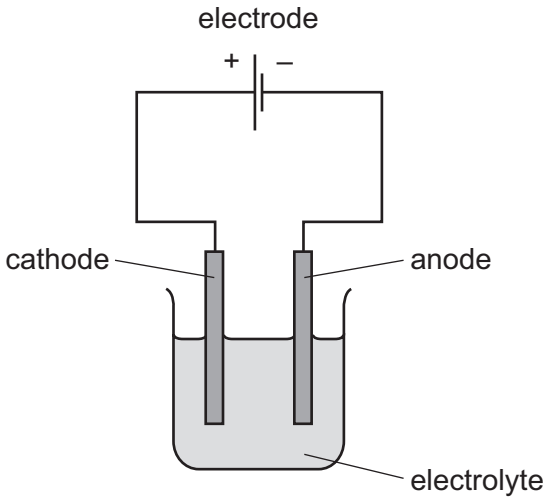
An ion of element Y has 11 protons, 12 neutrons and 10 electrons.

What is the formula of the ionic compound formed between X and Y?

A XY **B** XY_2 **C** X_2Y **D** X_2Y_2

18 The diagram shows apparatus for electrolysis.

Only one label is correct.



Which label on the diagram is correct?

A anode

B cathode

C electrode

D electrolyte

19 When aqueous copper chloride is electrolysed, ions move to the electrodes.

Which ions move to the positive electrode?

A chloride

B copper

C hydrogen

D oxide

20 Which change **must** take place in an endothermic reaction?

A Bubbles of gas are released.

B The mass decreases.

C The temperature decreases.

D The temperature increases.

[Turn over

21 Magnesium reacts with dilute hydrochloric acid in four experiments.

The same mass of magnesium and the same volume and concentration of the acid are used.

Which conditions produce the greatest rate of reaction?

	magnesium	temperature / °C
A	powder	10
B	powder	20
C	ribbon	10
D	ribbon	20

22 The equation for the combustion of ethane is shown.

$$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$$

Which statement about this reaction is correct?

A Ethane is oxidised because it gains oxygen.

B Ethane is reduced because carbon to hydrogen bonds are broken.

C It is endothermic because chemical energy is transformed to heat.

D It is exothermic because heat is transformed to chemical energy.

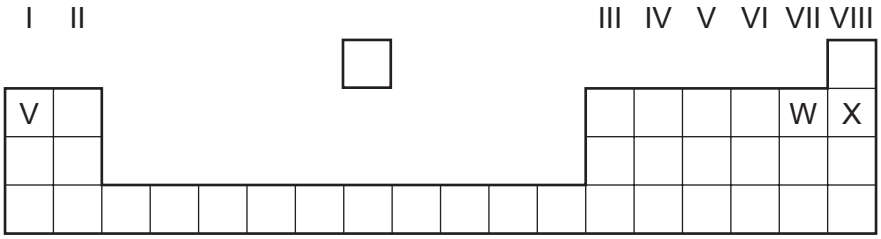
23 Zinc sulfate is a soluble salt.

It is made by reacting excess zinc with dilute sulfuric acid.

Which row describes how zinc sulfate is obtained from the mixture after the reaction has finished?

	step 1	step 2	step 3
A	evaporate all of the water	wash the solid that is left	dry the solid
B	filter the mixture	collect the residue from the filter paper	wash and dry the residue
C	filter the mixture	saturate the solution and crystallise	filter, wash and dry the crystals
D	saturate the solution	allow the solution to crystallise	filter, wash and dry the crystals

24 Part of the Periodic Table is shown.



Which element forms an anion and which element forms a cation?

	forms an anion	forms a cation
A	V	W
B	V	X
C	W	V
D	X	W

25 Which statement about metals is **not** correct?

A Calcium is extracted from its ore by electrolysis.

B Compounds containing metals are ionic and the metal is always the positive ion.

C Magnesium is more reactive than iron because it forms positive ions less easily than iron.

D Some metals react with dilute hydrochloric acid to give hydrogen.

26 Which process produces a gas that contributes to climate change?

A the electrolysis of molten lead(II) bromide

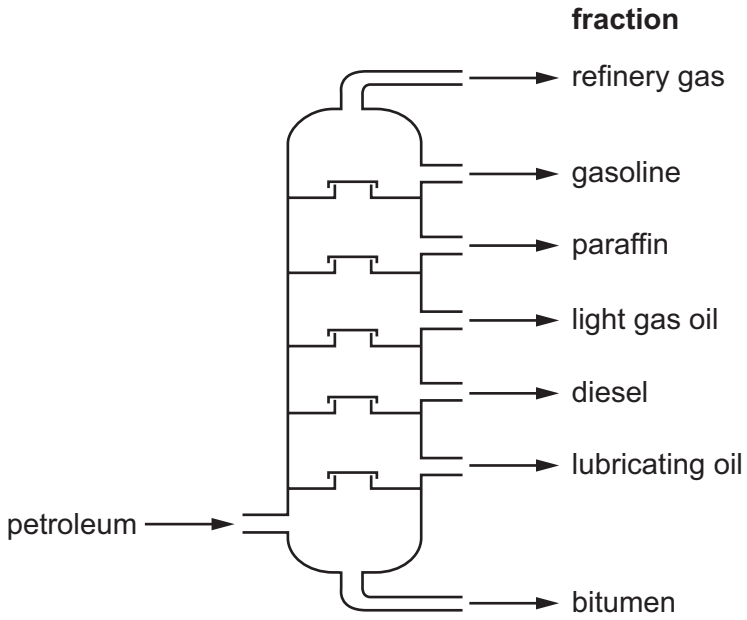
B the reaction of calcium with water

C the reaction of copper oxide with dilute sulfuric acid

D the thermal decomposition of calcium carbonate

[Turn over

27 The fractional distillation of petroleum is shown.



Which fraction contains molecules with the largest intermolecular attractive forces?

A bitumen

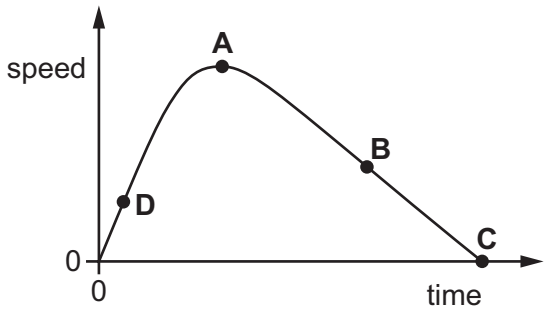
B diesel

C gasoline

D refinery gas

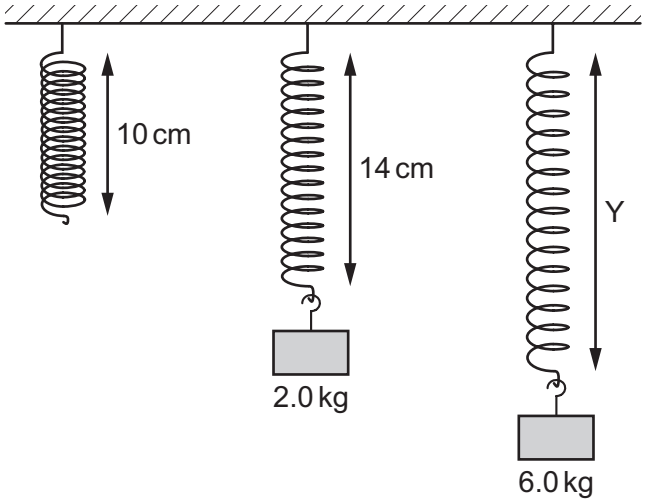
28 The graph shows how the speed of a bicycle varies with time.

At which labelled point is the acceleration of the bicycle the greatest?



29 An unstretched spring obeys Hooke's law and has a length of 10 cm. A load with a mass of 2.0 kg is hung from it, and its length becomes 14 cm.

The load is now increased to 6.0 kg, and the new length of the spring is Y. The limit of proportionality is not reached.



What is Y?

A 22 cm **B** 26 cm **C** 30 cm **D** 42 cm

30 A train is travelling along a straight, horizontal track at constant speed.

The work done by the train is recorded as it travels through a measured distance.

Which quantity can be calculated using only these two pieces of information?

A force exerted by the train

B speed of the train

C time taken to travel this distance

D weight of the train

31 The molecules of a substance are close together. They are vibrating and constantly changing places within the substance.

The substance now loses energy and this causes it to change state.

Which change of state has occurred?

A gas to liquid

B liquid to gas

C liquid to solid

D solid to liquid

[Turn over

32 On a summer's day, hot air rises above hot roofs.

What is the name of this process?

A concentration

B condensation

C conduction

D convection

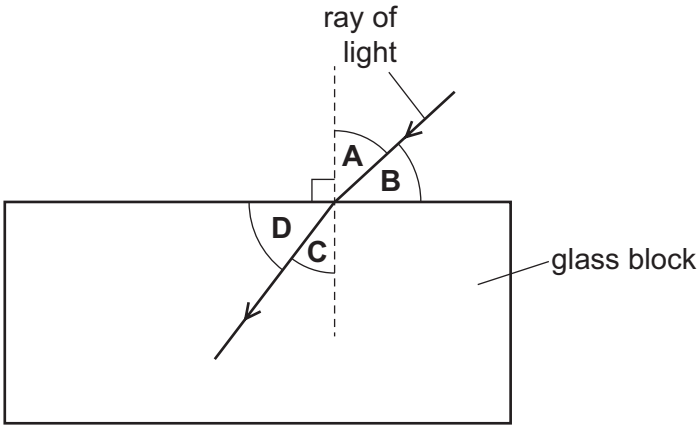
33 A wave has a frequency of 120 Hz and a wavelength of 50 cm.

What is the speed of the wave?

A 2.4 m / s **B** 60 m / s **C** 240 m / s **D** 6000 m / s

34 The diagram shows a ray of light as it enters a glass block.

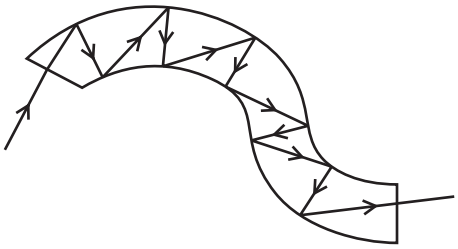
Which labelled angle is the angle of refraction?



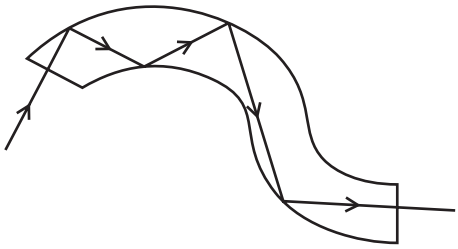
35 Light travels along a glass optical fibre by total internal reflection. The light enters the fibre at right angles to the end.

Which diagram shows the path of the light in the fibre?

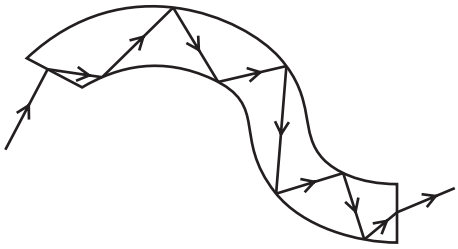
A



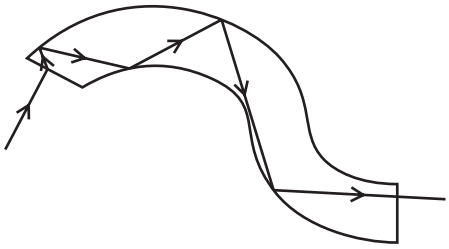
B



C



D



36 Gamma rays, radio waves and visible light all travel in a vacuum.

How do the speeds of these waves compare?

A Gamma rays have the highest speed.

B Radio waves have the highest speed.

C The waves all have the same speed.

D Visible light waves have the highest speed.

[Turn over

37 A student writes two sentences about sound waves.

‘A sound wave travels through the air as compressions and ......X..... .’

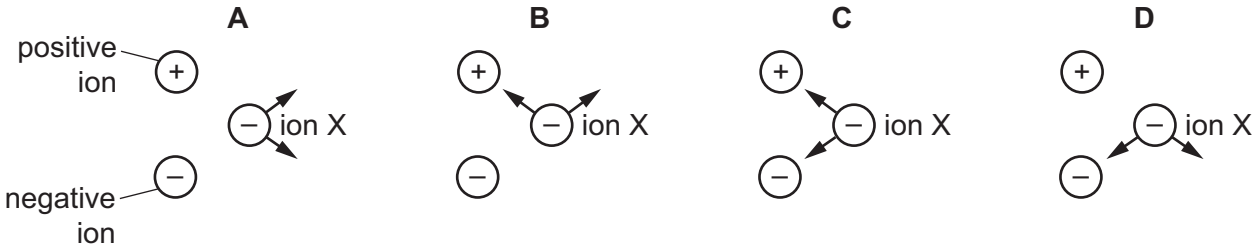
‘The air at the compressions has a different ......Y..... from the air at ......X..... .’

What are the missing words, X and Y?

	X	Y
A	rarefactions	density
B	rarefactions	state
C	refractions	density
D	refractions	state

38 A negative ion X is close to a positive ion and another negative ion. Electrical forces act on ion X because of the charges in the other two ions.

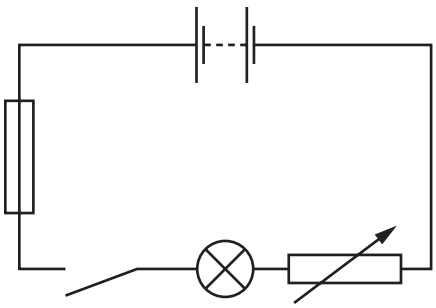
Which diagram shows the directions of the two forces acting on ion X?



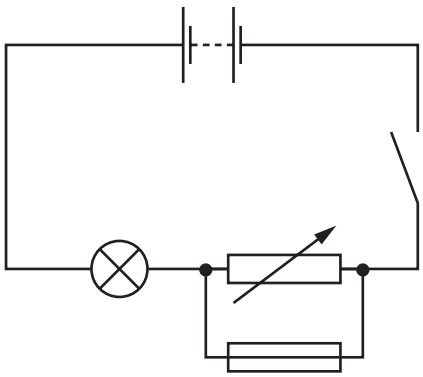
39 A lamp can be dimmed or switched off. Its circuit is protected by a fuse.

Which diagram shows this circuit?

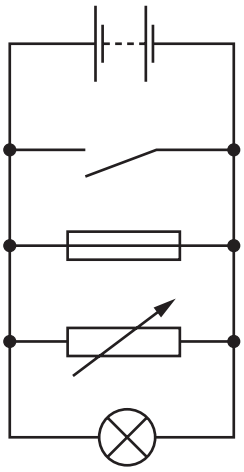
A



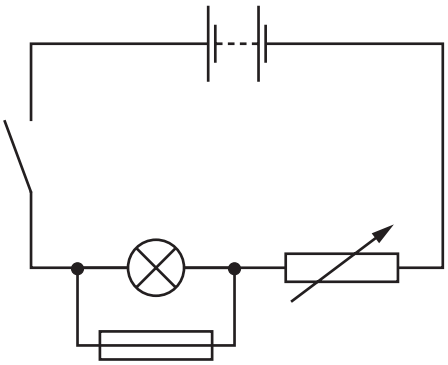
B



C

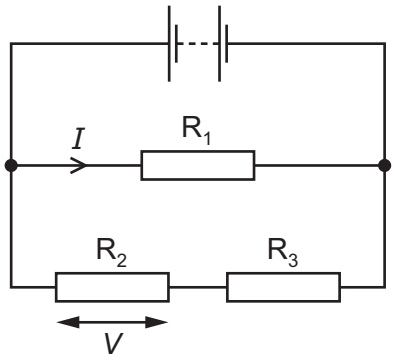


D



40 The diagram shows three identical resistors R_1, R_2 and R_3 connected to a battery.

The current in R_1 is I. The potential difference (p.d.) across R_2 is V.



Which row gives the current in R_3 and the p.d. across R_3?

	current in R_3	p.d. across R_3
A	$\frac{I}{2}$	$\frac{V}{2}$
B	$\frac{I}{2}$	V
C	I	$\frac{V}{2}$
D	I	V

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.).