Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES **0654/22**

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)

7387412696

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 **16** printed pages.

1 What do plants need for their nutrition?

A carbon dioxide, ions, organic compounds and light

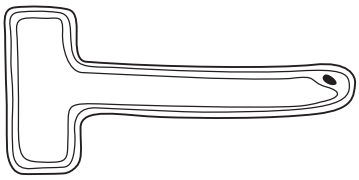
B carbon dioxide, ions, organic compounds and water

C carbon dioxide, ions, light and water

D carbon dioxide, organic compounds, light and water

2 The diagram shows two cells.

cell 1



cell 2

Which row matches the name of each type of cell with its function?

	cell 1		cell 2	
	name	function	name	function
A	egg	reproduction	ciliated	absorption
B	egg	transport	root hair	photosynthesis
C	red blood	reproduction	ciliated	photosynthesis
D	red blood	transport	root hair	absorption

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

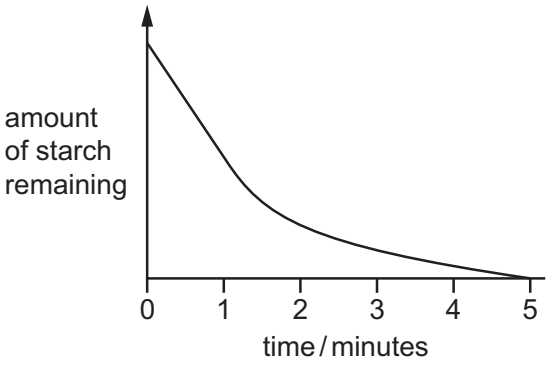
A blue

B green

C orange

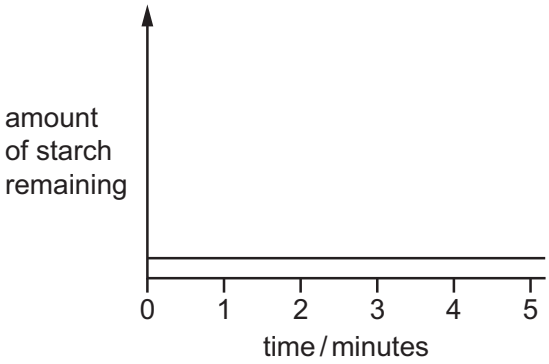
D purple

4 A test-tube containing a starch-amylase mixture is incubated at 35 °C. The graph shows how the amount of starch in the test-tube changes over the next five minutes.



Which graph shows what happens if a similar starch-amylase mixture is incubated at 100 °C?

A



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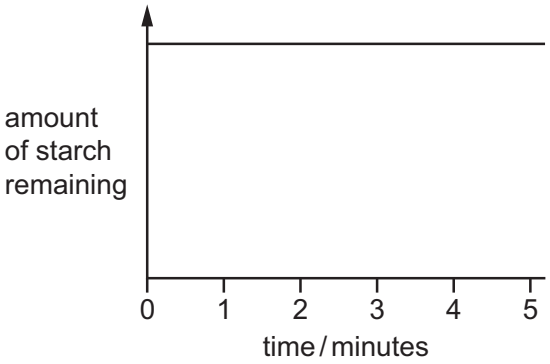

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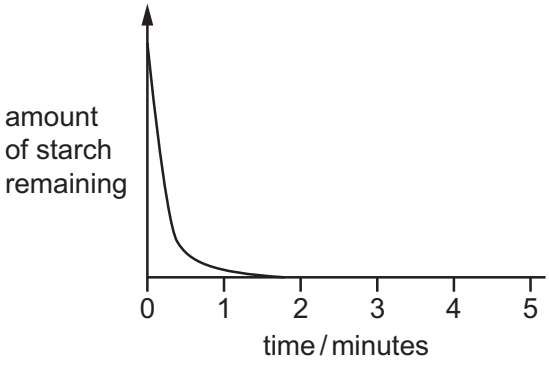

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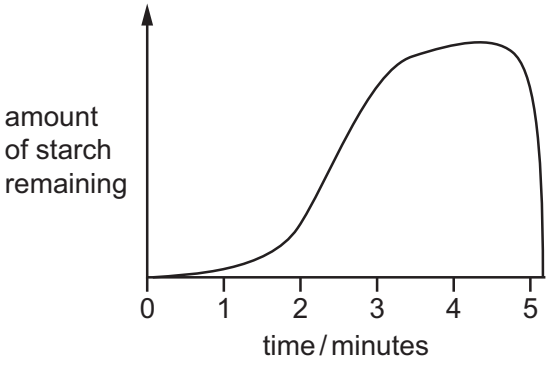


5 Green plants need magnesium ions.

Which plant process is limited when magnesium is deficient?

A meiosis

B photosynthesis

C pollination

D respiration

6 Which diet would be most likely to prevent anaemia and rickets?

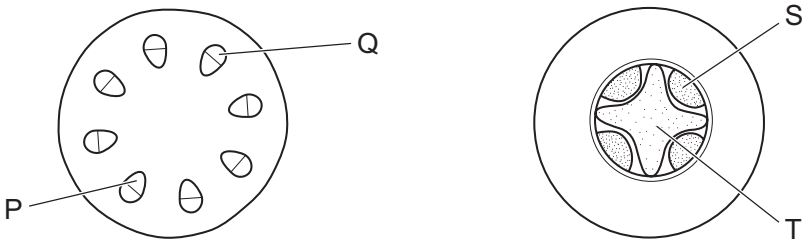
A high in calcium and vitamin C

B high in calcium and vitamin D

C high in iron and vitamin C

D high in iron and vitamin D

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

9 Auxin is a chemical involved in phototropism of plant shoots.

When light shines on one side of a plant, the shoot will grow towards it.

This is caused by the effect of auxin on cell elongation.

Which row is correct?

	where most auxin is found	effect on elongation
A	bright side	inhibits
B	bright side	stimulates
C	shaded side	inhibits
D	shaded side	stimulates

10 Sexual reproduction involves the fusion of cells.

Which row shows the types of cells involved and what the fusion produces?

	type of cell	product of fusion
A	gametes	genetically different zygote
B	gametes	genetically identical zygote
C	zygotes	genetically different gamete
D	zygotes	genetically identical gamete

11 What causes phenotypic variation?

A both environmental and genetic factors

B environmental factors only

C genetic factors only

D neither environmental nor genetic factors

12 Which statement about how organisms get their energy is **not** correct?

	organism	source of energy
A	carnivores	animals
B	decomposers	dead plants
C	green plants	minerals
D	herbivores	plants

[Turn over

13 The list shows changes that occur in a lake which is polluted by nitrogen-containing fertiliser.

1 decomposers feed on plants

2 growth of algae increases on the lake's surface

3 oxygen levels decrease in the lake

4 underwater plants die

In which order do these changes occur?

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

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

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

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

14 Which observation shows that a substance is pure water?

A It boils between 100 °C and 102 °C.

B It melts at 0 °C and boils at 100 °C.

C It turns copper(II) sulfate from white to blue.

D It turns cobalt(II) chloride from pink to blue.

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

17 What is the definition of the *relative atomic mass*, A_r, of an element?

A the average mass of atoms of the element on a scale in which an atom of ^{12}C has a mass of exactly 12 units

B the average mass of atoms of the element on a scale in which an atom of ^{1}H has a mass of exactly 1 unit

C the average mass of atoms of the element on a scale in which an atom of ^{12}C has a mass of exactly 1 unit

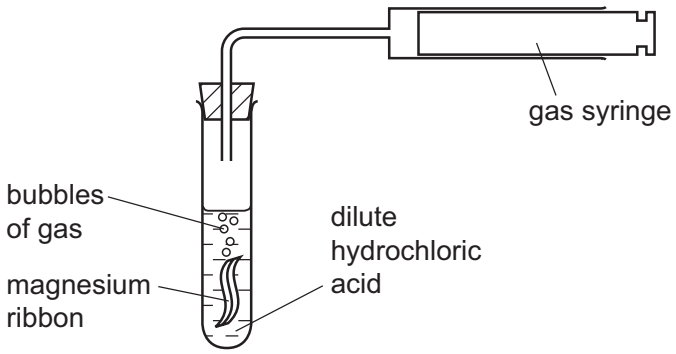
D the mass in grams of one mole of atoms of the element

18 Which particle is oxidised at the anode during the electrolysis of aqueous copper(II) sulfate using inert electrodes?

A Cu^{2+} **B** H^{+} **C** OH^{-} **D** SO_4^{2-}

19 A 2 cm strip of magnesium ribbon, painted on one side, is placed in dilute hydrochloric acid.

The apparatus is shown.



The total volume of gas produced is measured.

The experiment is repeated using a 2 cm strip of unpainted magnesium ribbon.

The same volume and concentration of dilute hydrochloric acid is used.

What is the rate of the reaction and the total volume of hydrogen produced in the second reaction compared to the first reaction?

	rate	total volume
A	faster	greater
B	faster	same
C	same	greater
D	same	same

20 An acid neutralises solution X.

A neutral solution is formed.

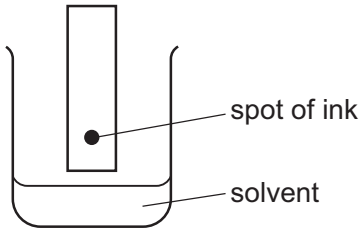
What are the pH values of solution X and of the neutral solution?

	pH of solution X	pH of neutral solution
A	2	7
B	2	12
C	12	2
D	12	7

21 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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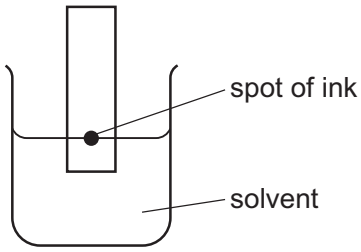

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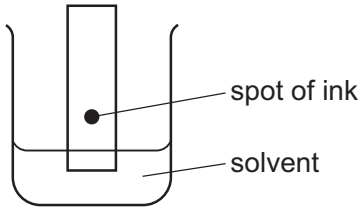

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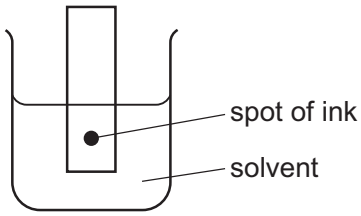


22 Which statement about the Periodic Table is correct?

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.

23 Zinc is mixed with molten element X.

A new material, Y, is made.

Y conducts electricity.

Which type of substance is Y?

A alloy

B covalent compound

C macromolecule

D ionic compound

24 Tin is extracted from cassiterite (tin oxide).

The process involves two reactions.

reaction 1 carbon + oxygen → carbon monoxide

reaction 2 carbon monoxide + tin oxide → carbon dioxide + tin

Which statement about the process is correct?

A Carbon is higher than tin in the reactivity series.

B Carbon monoxide is formed in reaction 1 by complete combustion.

C Carbon monoxide is reduced in reaction 2.

D Cassiterite is oxidised in reaction 2.

25 Which reaction does **not** occur in a catalytic converter?

A $2CO + O_2 \rightarrow 2CO_2$

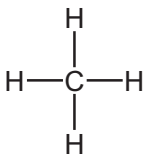
B $CO_2 + C \rightarrow 2CO$

C $2NO + 2CO \rightarrow N_2 + 2CO_2$

D $2NO \rightarrow N_2 + O_2$

26 Which diagram represents a molecule of ethane?

A



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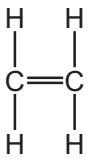

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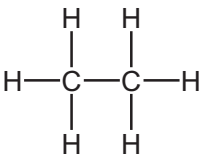

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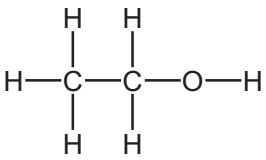


27 One molecule of hydrocarbon Q undergoes complete combustion to produce four molecules of carbon dioxide.

Hydrocarbon Q has no effect on the colour of bromine water.

What is hydrocarbon Q?

A butane

B butene

C propane

D propene

28 What **cannot** be changed by a force acting on a body?

A the mass of the body

B the motion of the body

C the shape of the body

D the size of the body

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.

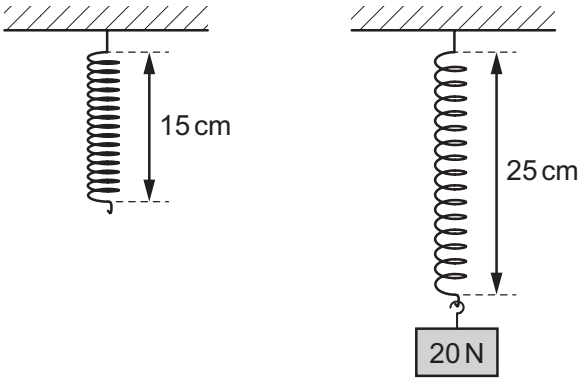
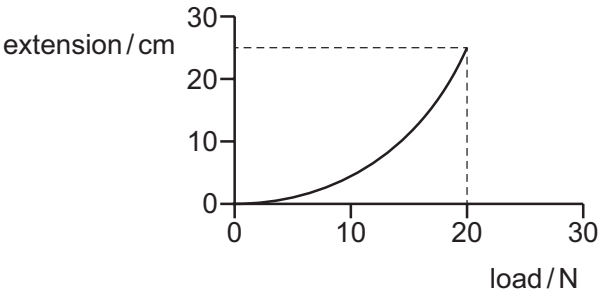


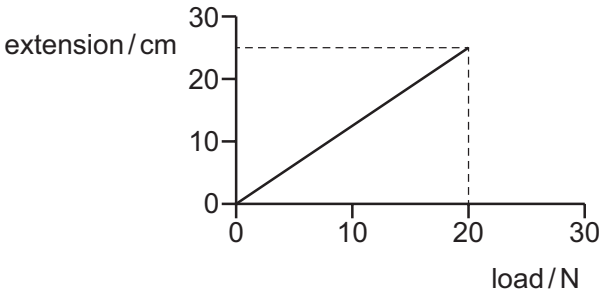
diagram 1 diagram 2

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

A



B



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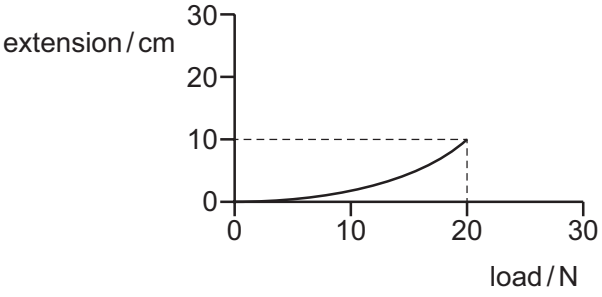

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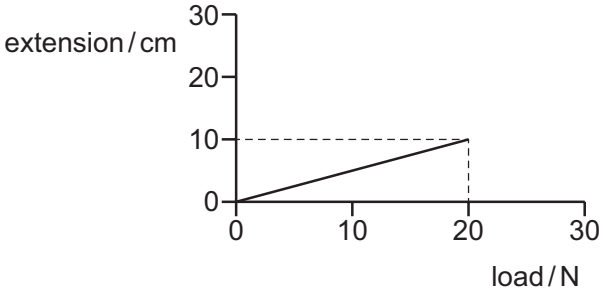


[Turn over

30 A force acts on an object and moves it a certain distance in the direction of the force.

The force is now doubled and the distance increases by a factor of 3.

What happens to the work done by the force on the object?

A It increases by a factor of 1.5.

B It doubles.

C It increases by a factor of 3.

D It increases by a factor of 6.

31 Which statement about evaporation of a liquid is correct?

A Evaporation causes heating of the liquid.

B Evaporation has no effect on the temperature of the liquid.

C Evaporation is the result of the less-energetic molecules escaping from the surface of the liquid.

D Evaporation occurs more quickly if the surface area of the liquid is increased.

32 Which statement describes the conduction of thermal energy through a metal bar?

A Atoms at the hot end move to the cold end.

B Atoms at the hot end vibrate and hit atoms at the cold end.

C Free electrons move from the hot end and collide with atoms further along the rod.

D Free electrons vibrate and pass energy on to their neighbours.

33 An experiment is set up to investigate the motion of particles floating on water in a tank. A wave passes along the water surface from left to right.

What happens to the floating particles?

A They do not move.

B They move up and down.

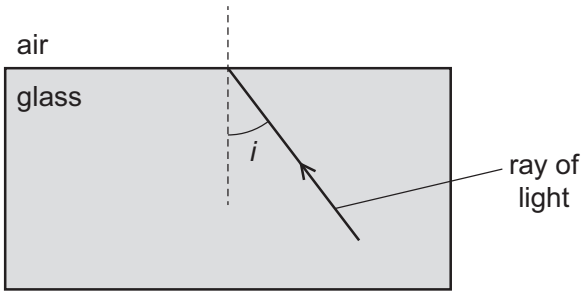
C They move only to the left.

D They move only to the right.

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 Which row gives the properties of a sound wave that affect the pitch and the loudness of a sound?

	pitch	loudness
A	amplitude	amplitude
B	amplitude	frequency
C	frequency	amplitude
D	frequency	frequency

36 A wire of a certain length has a resistance of 8.0 Ω. A second wire made of the same material has double the length and double the cross-sectional area of the first wire.

What is the resistance of the second wire?

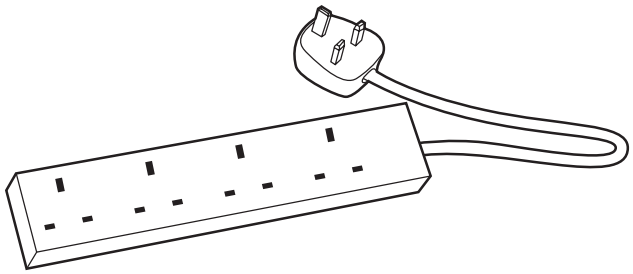
A 4.0 Ω **B** 8.0 Ω **C** 16 Ω **D** 32 Ω

[Turn over

37 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

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.

39 A transformer with an efficiency of 100% has an input current of 10 A. The input voltage is 100 V and the output voltage is 20 V.

What is the output current?

A 2.0 A **B** 10 A **C** 50 A **D** 200 A

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

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.).