Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE **0653/22**

Paper 2 Multiple Choice (Extended) **February/March 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 16.
Electronic calculators may be used.

1 Which is a characteristic of all living organisms?

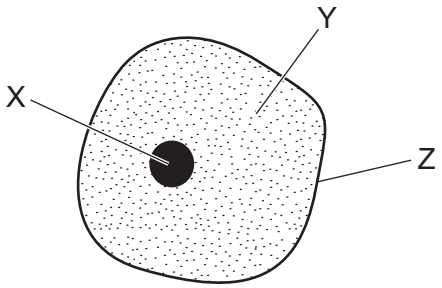
A breathing

B eating

C egestion

D movement

2 The diagram shows a typical animal cell.



What are the functions of structures X, Y and Z?

	X	Y	Z
A	traps light	contains genetic material	controls entry and exit of materials
B	traps light	site of chemical reactions	provides support
C	contains genetic material	site of chemical reactions	controls entry and exit of materials
D	contains genetic material	controls entry and exit of materials	provides support

3 The statements explain the activity of a human enzyme as the temperature increases from 20 °C to 50 °C. The statements are in the wrong order.

1 The enzyme is working at its optimum rate.

2 The kinetic energy of the enzyme molecules begins to increase.

3 The enzyme begins to change shape.

4 The enzyme is completely denatured.

What is the correct order of the statements?

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

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

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

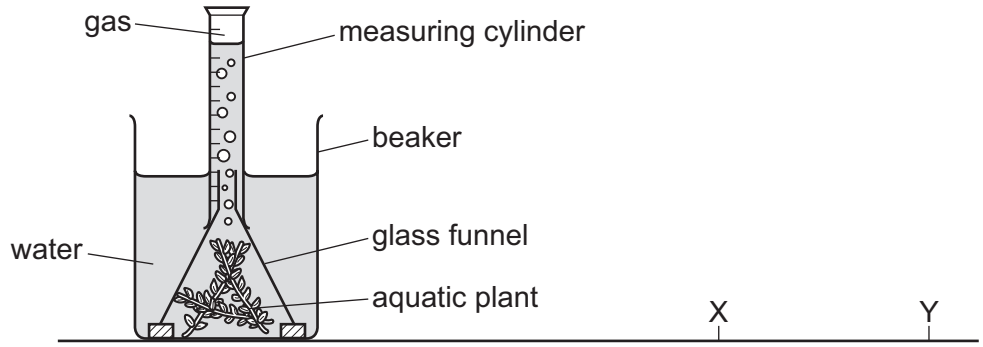
D $3 \rightarrow 2 \rightarrow 4 \rightarrow 1$

4 Tests were performed on four samples of food. The results are shown in the table.

Which food contains protein **only**?

	results of food tests		
	Benedict's test	biuret test	iodine test
A	blue	blue	blue/black
B	blue	purple	brown
C	red	blue	blue/black
D	red	purple	brown

5 A student is investigating how light affects photosynthesis.



The student shines a light from point Y and measures the volume of gas produced in five minutes.

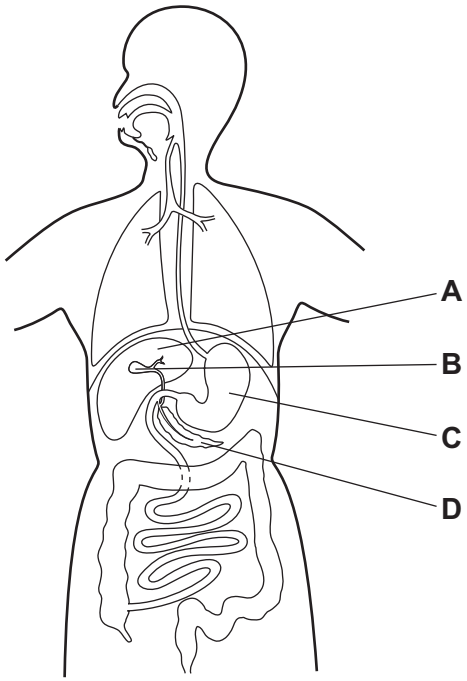
Which gas is produced and how does the rate of gas production change when the light is moved from Y to X?

	gas produced	rate of gas production
A	carbon dioxide	decreases
B	carbon dioxide	increases
C	oxygen	decreases
D	oxygen	increases

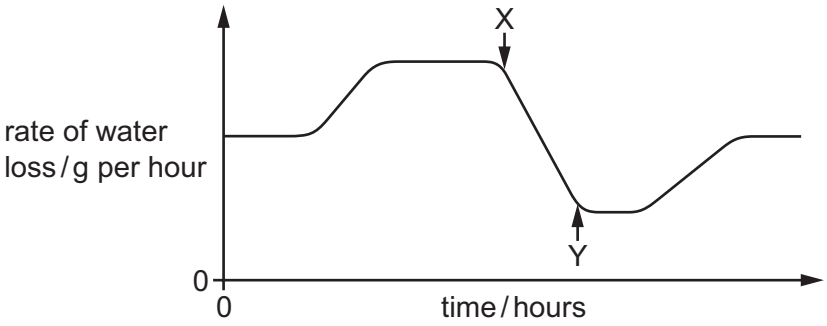
[Turn over

6 The diagram shows the alimentary canal.

Which label shows where bile is stored?



7 The graph shows the rate of water loss from a plant during daylight hours.



What could cause the change in the rate of water loss between point X and point Y?

A The air becomes cooler.

B The air becomes drier.

C The day becomes sunnier.

D The stomata open wider.

8 What are possible causes of coronary heart disease?

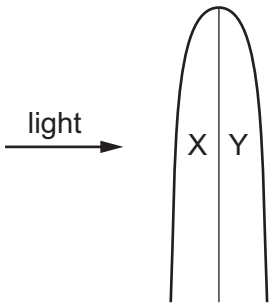
	exercise	smoking	stress
A	✓	✓	✗
B	✓	✗	✓
C	✗	✗	✗
D	✗	✓	✓

9 During aerobic respiration of glucose, oxygen is used up and water is produced.

How many molecules of oxygen are used and how many molecules of water are produced when one molecule of glucose is respired?

	number of molecules of oxygen used	number of molecules of water produced
A	1	1
B	1	6
C	6	1
D	6	6

10 Light shines on a shoot tip from the direction shown.



After three days the shoot tip has bent towards the light.

What is the reason for this change?

A Auxin moves away from the light causing cell elongation in area Y.

B Auxin moves away from the light preventing cell elongation in area Y.

C Auxin moves towards the light causing cell elongation in area X.

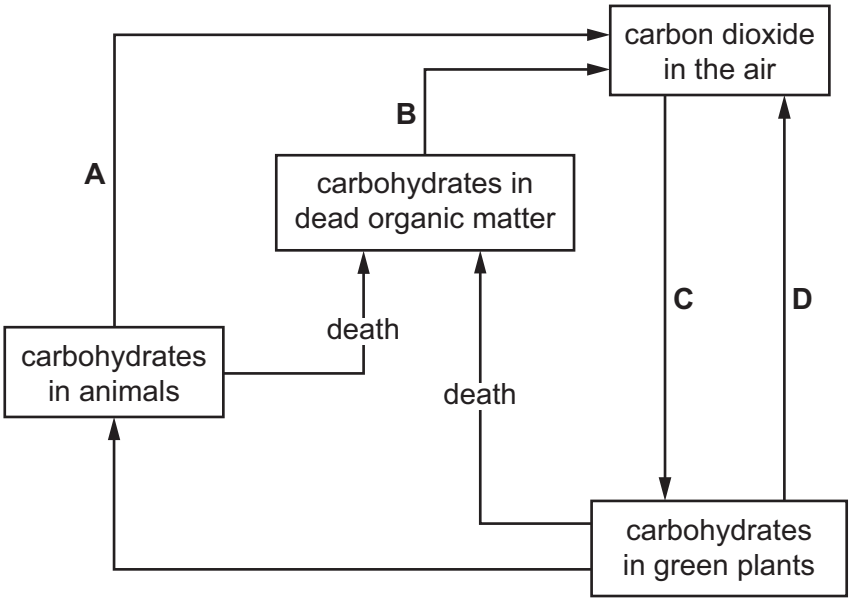
D Auxin moves towards the light preventing cell elongation in area X.

11 How do male gametes compare with female gametes?

	size	move independently
A	larger	✓
B	larger	✗
C	smaller	✓
D	smaller	✗

12 The diagram shows part of the carbon cycle.

Which arrow represents a process that releases oxygen into the atmosphere?



13 Eutrophication occurs after fertiliser is washed into a lake.

What is **not** true of eutrophication?

A Algae population in the lake decreases.

B Bacteria population in the lake increases.

C Nitrate concentration in the lake increases.

D Oxygen concentration in the lake decreases.

14 Which statement about atoms and molecules is correct?

A Atoms gain or lose electrons to become molecules.

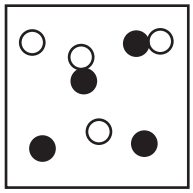
B Atoms of the same element contain the same number of molecules.

C Molecules are the simplest unit of an atom.

D Molecules contain atoms which are covalently bonded.

15 Which diagram represents a mixture of two elements?

A



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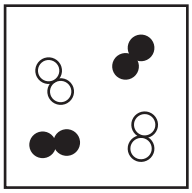

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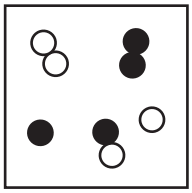
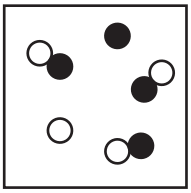


D



16 Which statement about atoms and ions is **not** correct?

A A chlorine atom loses one electron to obtain a noble gas electronic structure.

B A magnesium atom has two valency electrons.

C A sodium ion, Na^+, has eight electrons in its outer shell.

D Oxygen atoms and oxide ions each have two occupied electron shells.

17 Which substance contains a multiple covalent bond?

A hydrogen

B methane

C nitrogen

D water

18 Which equation represents the reaction at the cathode during the electrolysis of aqueous copper(II) chloride?

A $2Cl^- \rightarrow Cl_2 + 2e^-$

B $Cu^{2+} + 2e^- \rightarrow Cu$

C $2H^+ + 2e^- \rightarrow H_2$

D $4OH^- \rightarrow O_2 + 2H_2O + 4e^-$

19 In the reaction between an acid and a metal, the rate of reaction decreases as the reaction proceeds.

A student suggests three reasons why the rate of this reaction decreases.

1 The concentration of the acid decreases as it gets used up.

2 The energy needed to break bonds is used up as the product forms.

3 The surface area of the metal increases as it gets smaller.

Which reasons are correct?

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

20 The equation shows the reaction of copper oxide with carbon.

$$\text{copper oxide} + \text{carbon} \rightarrow \text{copper} + \text{carbon dioxide}$$

In the reaction, the carbon is the ……1…… agent and is ……2…… during the reaction.

Which words complete gaps 1 and 2?

	1	2
A	oxidising	oxidised
B	oxidising	reduced
C	reducing	oxidised
D	reducing	reduced

21 Magnesium, magnesium oxide and magnesium carbonate are insoluble in water.

Which method is used to make **pure** crystals of magnesium sulfate?

A Add an excess of magnesium carbonate to dilute sulfuric acid, filter and evaporate the filtrate to dryness.

B Add an excess of magnesium oxide to dilute sulfuric acid and leave overnight to crystallise.

C Add magnesium oxide to an excess of dilute sulfuric acid and evaporate to dryness.

D Add magnesium ribbon to an excess of dilute sulfuric acid, filter and evaporate to dryness.

22 Solid X is warmed with dilute sodium hydroxide. A gas, which turns moist red litmus paper to blue, is given off.

Dilute hydrochloric acid is added to solid X. A gas, which turns limewater cloudy, is given off.

What is X?

A ammonium carbonate

B ammonium chloride

C sodium carbonate

D sodium chloride

23 Astatine is at the bottom of Group VII of the Periodic Table.

What happens if astatine is added to aqueous potassium chloride?

A A black precipitate is formed.

B Chlorine is formed.

C No reaction takes place.

D The colour of the solution becomes darker.

24 The noble gases make up Group VIII of the Periodic Table.

Which statement is correct?

A Argon exists as non-bonded atoms.

B Krypton is very poisonous.

C Neon burns in pure oxygen with a red flame.

D The chemical formula of helium is He_2.

25 Why is drinking water treated with chlorine?

A to improve the taste

B to kill bacteria

C to remove colour

D to remove insoluble impurities

26 A gas that causes climate change is formed during the extraction of iron from iron ore.

Which solution reacts with this gas?

A aqueous sodium chloride

B hydrochloric acid

C dilute sulfuric acid

D limewater

27 Which statement about the rusting of iron is correct?

A Iron becomes lighter when it rusts.

B Iron is reduced when it rusts.

C Rusting is a reaction involving iron, oxygen and water.

D Rusting is a reaction involving iron and water only.

28 Diagrams 1, 2 and 3 each show either a distance-time graph or a speed-time graph.

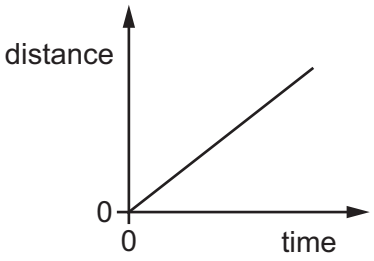


diagram 1

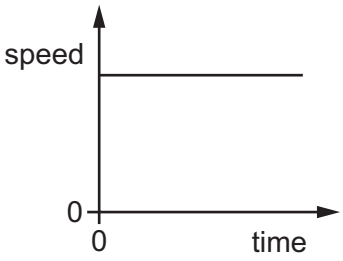


diagram 2

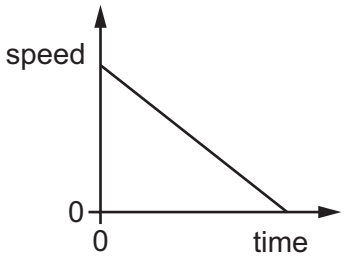


diagram 3

Which of the diagrams represent the motion of an object moving with a non-zero constant acceleration?

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

29 Two objects on Earth each have a mass of 20 kg.

One object is moved to a planet larger than Earth. The other object is moved into deep space.

What is the mass of the objects in these new positions?

	mass of object on the other planet / kg	mass of object in deep space / kg
A	20	0
B	20	20
C	more than 20	0
D	more than 20	20

30 A spring that obeys Hooke's law has no load attached to it. The length of the spring is 8.0 cm and it has a spring constant *k* of 5.0 N / cm.

A load is now hung from the spring, and the length of the spring increases to 18 cm. The limit of proportionality is not reached.

What is the weight of the load?

A 2.0 N **B** 40 N **C** 50 N **D** 90 N

31 Which energy resource is non-renewable?

A geothermal energy

B hydroelectric energy

C nuclear energy

D wave energy

32 A force of 20 N does 10 J of work when it moves an object through a distance *d* in the direction of the force.

What is distance *d*?

A 0.50 m **B** 2.0 m **C** 10 m **D** 200 m

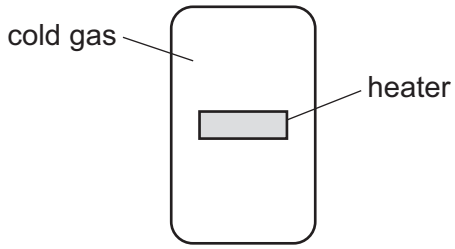
33 The molecules of a substance are far apart and move at high speed in straight lines until they hit something.

The temperature of the substance is changed and this causes the molecules to move more quickly.

What is the state of the substance, and how has its temperature changed?

	state of substance	how temperature has changed
A	gas	decreased
B	gas	increased
C	liquid	decreased
D	liquid	increased

34 The diagram shows a cold gas in a tank. The tank contains a heater that is switched off.

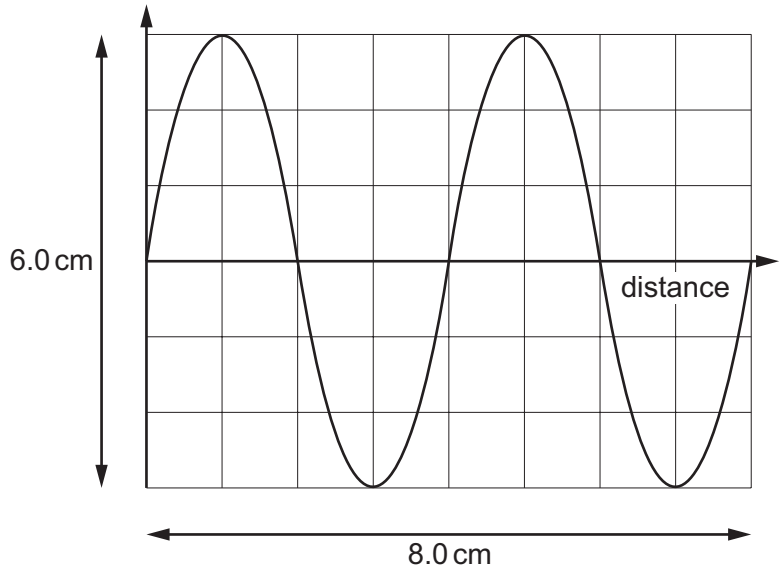


The heater is now switched on.

What happens to the density of the gas near the heater, and in which direction does the heated gas start to move?

	density	direction of movement
A	decreases	downwards
B	decreases	upwards
C	increases	downwards
D	increases	upwards

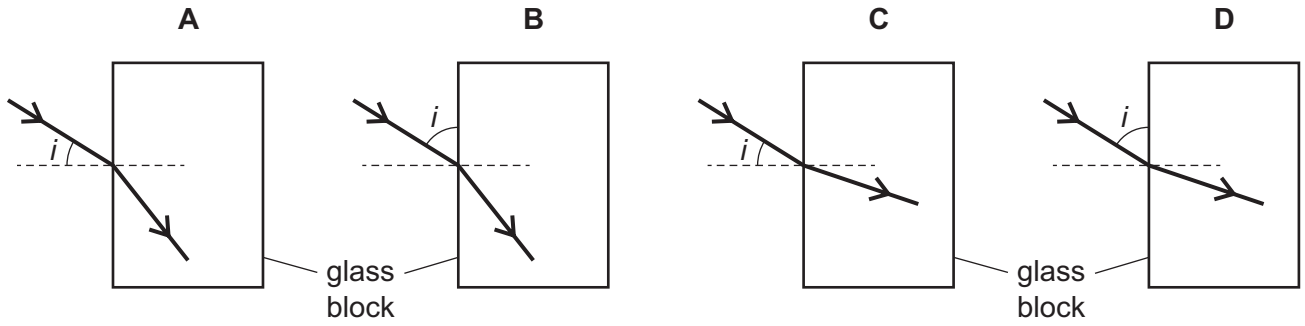
35 The diagram represents a wave.



What is the wavelength of the wave?

A 3.0 cm **B** 4.0 cm **C** 6.0 cm **D** 8.0 cm

36 Which diagram shows how a ray of light passes from air into a glass block, and shows the angle of incidence labelled *i*?



37 A sound wave travels in substance P. The sound wave then passes into a different substance Q and the speed of the sound wave decreases.

What are possible substances for P and Q?

	P	Q
A	air	steel
B	air	water
C	water	air
D	water	steel

38 A lamp is labelled 12 V, 25 W.

How much electrical energy does the lamp convert in 4.0 minutes when lit at its normal brightness?

A 100 J **B** 1200 J **C** 6000 J **D** 72 000 J

39 Why is the electricity supply to a house fitted with a fuse?

A to increase the current in the circuit

B to increase the resistance of the circuit

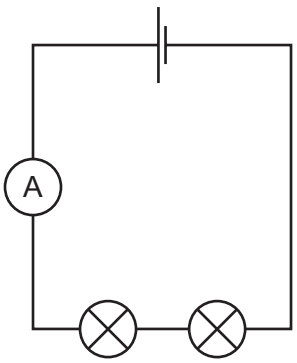
C to maintain a constant current in the circuit

D to prevent overheating of the cables in the circuit

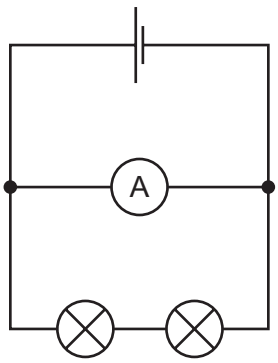
40 The diagrams show four circuits, each containing an ammeter and two lamps with different resistances.

Which circuit shows an ammeter with a reading equal to the current in each lamp?

A



B



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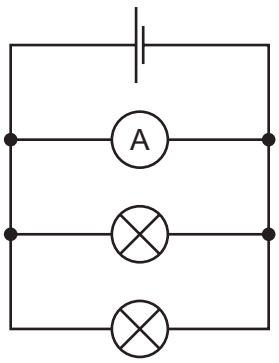

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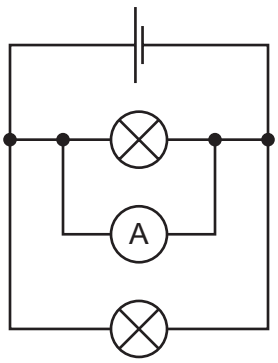

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The Periodic Table of Elements

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.).