



Cambridge IGCSE™

CO-ORDINATED SCIENCES

0654/12

Paper 1 Multiple Choice (Core)

May/June 2022

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Any blank pages are indicated.



- 1 Which statement about the characteristics of living organisms is correct?
- A Excretion is the chemical reactions in cells that release energy.
 - B Nutrition is the taking in of materials for energy, growth and development.
 - C Respiration is the process that makes more of the same kind.
 - D Sensitivity is the removal of toxic materials and excess substances.
- 2 Which statement about cells is correct?
- A Cell membranes are found only in animal cells.
 - B Cell membranes are found only in plant cells.
 - C Cell walls are found only in animal cells.
 - D Cell walls are found only in plant cells.
- 3 Which reagent is used to test for the presence of protein in a food sample?
- A Benedict's solution
 - B biuret
 - C ethanol
 - D iodine

- 4 Catalase is an enzyme that breaks down hydrogen peroxide to form a foam of water and oxygen. The maximum height of the foam produced at different temperatures in a given length of time is measured.

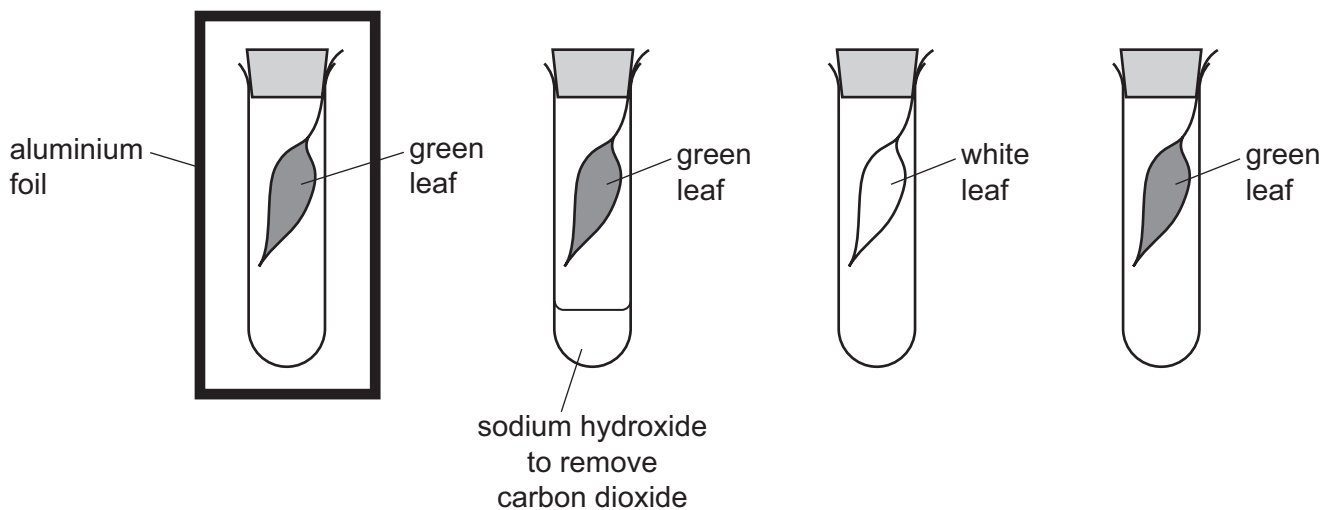
The rate of the reaction is proportional to the height of foam.

The table shows the results.

temperature / °C	height of foam / mm
10	1.2
20	3.1
30	4.2
40	5.4
50	3.6
60	0.0

Which conclusion can be drawn from these results?

- A** Increasing the temperature decreases the rate of the reaction up to 50 °C.
B Increasing the temperature decreases the rate of the reaction up to 60 °C.
C Increasing the temperature increases the rate of the reaction up to 40 °C.
D Increasing the temperature increases the rate of the reaction up to 50 °C.
- 5 The diagram shows an investigation into factors affecting photosynthesis.

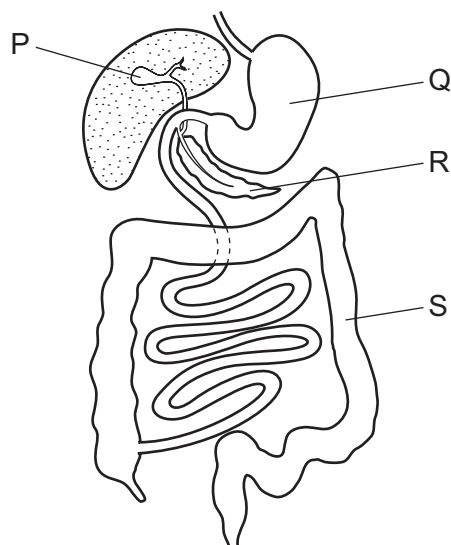


The tubes are left for 24 hours after which the leaves are tested with iodine solution.

How many of these leaves turn blue-black when tested with iodine solution?

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

6 The diagram shows part of the digestive system.



Which 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

7 Which changes increase the rate of transpiration?

- 1 increasing temperature
- 2 increasing humidity
- 3 decreasing temperature
- 4 decreasing humidity

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

8 When a person exercises for 10 minutes, what is the effect on the depth and rate of their breathing?

	depth of breathing	rate of breathing
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

9 What is a hormone?

- A a chemical substance, produced by a gland, which alters the activity of target organs
- B a protein that acts as a biological catalyst
- C a thread-like structure of DNA, carrying genetic information in the form of genes
- D an electrical signal that travels along a nerve cell to an effector

10 Which statement about asexual reproduction is correct?

- A It involves the fusion of gametes from one parent.
- B It involves the fusion of gametes from two parents.
- C It produces offspring which are genetically different.
- D It produces offspring which are genetically identical.

11 Selection in chickens has produced individuals that lay more eggs per week.

What is required for this to occur?

	reproduction	selection
A	asexual	human
B	asexual	natural
C	sexual	human
D	sexual	natural

12 The diagram shows a food chain.

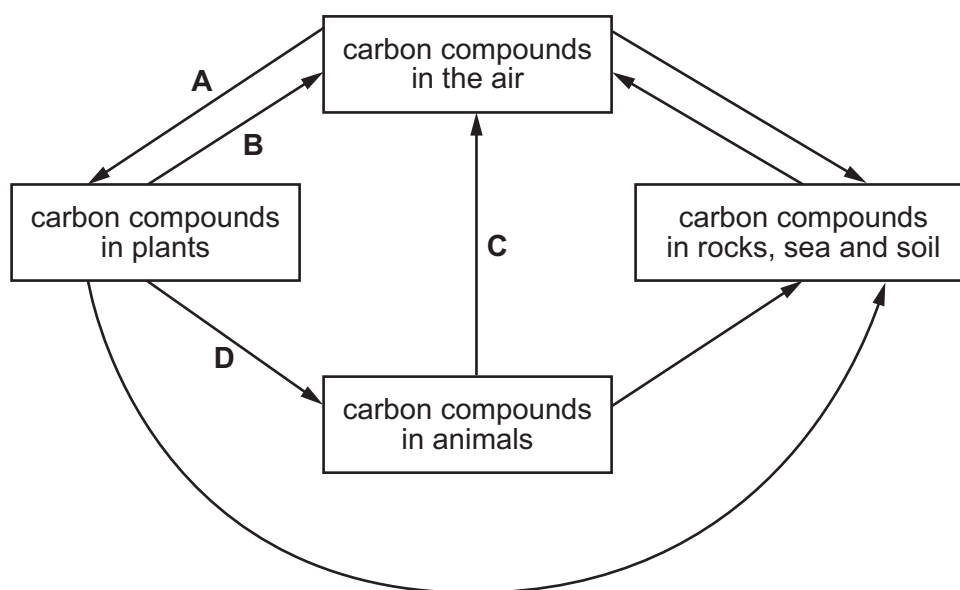
dandelion plant → slug → blackbird → fox

Which organisms are consumers?

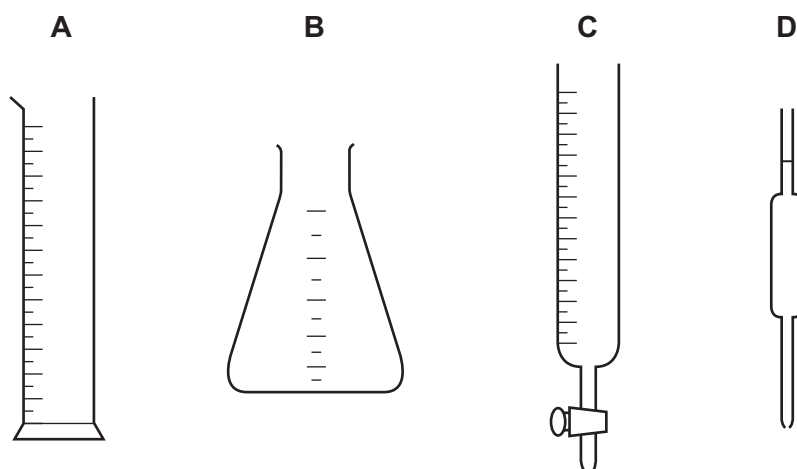
- A dandelion plant only
- B fox only
- C blackbird and slug only
- D slug, blackbird and fox

13 The diagram shows part of the carbon cycle.

Which arrow represents plant respiration?



14 Which piece of apparatus is used to measure the change in the volume of a liquid most accurately?



15 Some physical and chemical changes are listed.

- 1 burning methane
- 2 dissolving sugar in water
- 3 evaporating ethanol
- 4 rusting iron

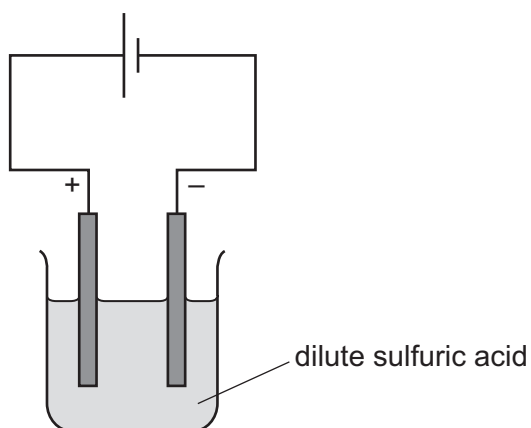
Which changes are chemical changes?

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

16 Which equation is balanced?

- A** $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}_2$
- B** $\text{MgO} + 2\text{H}_2\text{SO}_4 \rightarrow \text{MgSO}_4 + 2\text{H}_2\text{O}$
- C** $\text{Na} + \text{H}_2\text{O} \rightarrow \text{NaOH} + \text{H}_2$
- D** $\text{Na}_2\text{CO}_3 + 2\text{HCl} \rightarrow 2\text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$

17 The diagram shows the electrolysis of dilute sulfuric acid using inert electrodes.



Which row shows the products formed at each electrode and describes the bonding in sulfuric acid?

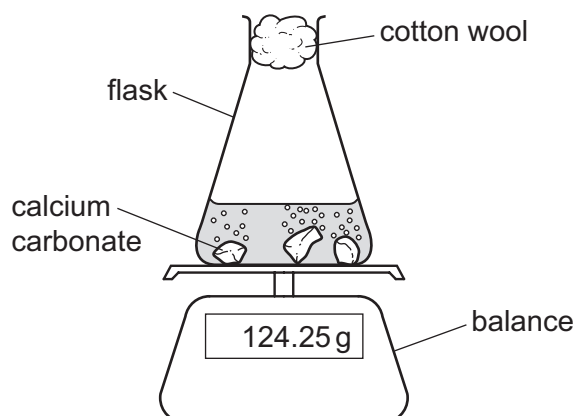
	anode	cathode	type of bonding
A	oxygen	hydrogen	ionic
B	oxygen	hydrogen	covalent
C	hydrogen	oxygen	ionic
D	hydrogen	oxygen	covalent

18 Which word describes reactions that give out heat energy?

- A** endothermic
- B** exothermic
- C** oxidation
- D** reduction

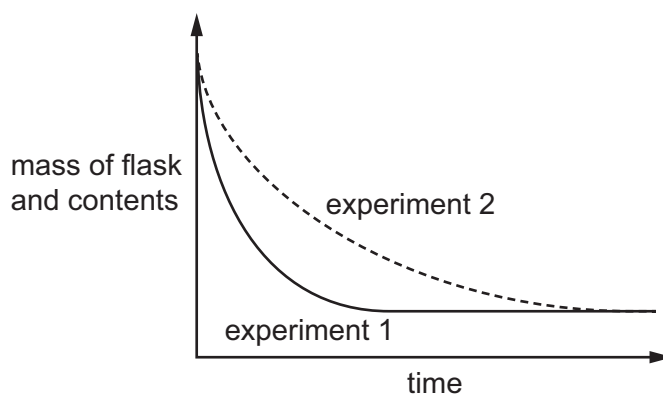
- 19** When solid pieces of calcium carbonate are added to dilute hydrochloric acid in a flask, carbon dioxide gas is given off.

The mass of the flask and its contents are measured over time.



Two different experiments are carried out. In both experiments the acid is in excess.

The results of these two experiments are shown.



Which statement explains the different shapes of the curves?

- A** Experiment 2 uses a catalyst.
 - B** Experiment 2 uses acid at a higher temperature.
 - C** Experiment 2 uses acid that is more dilute.
 - D** Experiment 2 uses powdered calcium carbonate.
- 20** When aqueous potassium hydroxide is warmed with ammonium chloride, a gas is given off.

Which test result identifies the gas?

- A** It bleaches pH paper.
- B** It turns anhydrous cobalt(II) chloride blue.
- C** It turns universal indicator red.
- D** It turns red litmus blue.

- 21** A gas is used in welding metals together at high temperatures.

The gas is used to provide an inert atmosphere.

What is the gas?

- A** argon
- B** carbon dioxide
- C** fluorine
- D** oxygen

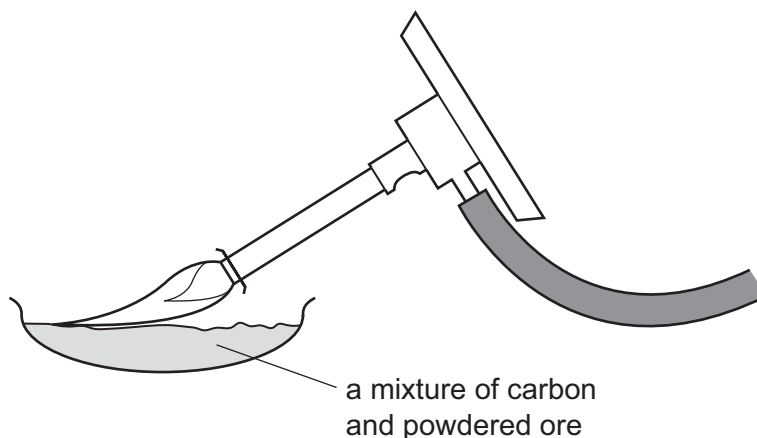
- 22** Which row does **not** link a general physical property to the type of element?

	type of element	general physical property
A	metal	malleable
B	metal	thermal conductor
C	non-metal	electrical conductor
D	non-metal	low melting point

- 23** Which row describes a transition element?

	melting point/°C	electrical conductor
A	115	no
B	181	yes
C	1538	yes
D	4726	no

- 24 The diagram shows a metal being extracted from its powdered ore using carbon.



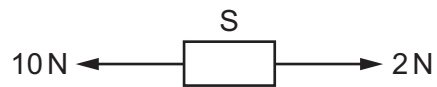
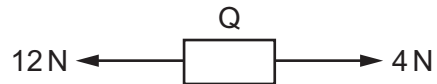
What happens to the ore in this reaction?

- A It burns.
 - B It decomposes.
 - C It is oxidised.
 - D It is reduced.
- 25 Which colour change is observed when water is tested using copper(II) sulfate?
- A blue → pink
 - B blue → white
 - C white → blue
 - D white → pink
- 26 Why do farmers add limestone to soil?
- A It acts as a fertiliser.
 - B It adds nitrogen to the soil.
 - C It decreases the pH of the soil.
 - D It increases the pH of the soil.
- 27 What are the products of the complete combustion of ethanol?
- A carbon dioxide and hydrogen
 - B carbon dioxide and water
 - C carbon monoxide and hydrogen
 - D carbon monoxide and water

28 What does the area under a speed–time graph represent?

- A acceleration
- B average speed
- C distance travelled
- D total time taken

29 The diagrams show the two forces acting on four objects P, Q, R and S.



Which two objects experience equal resultant forces acting in the same direction?

- A P and Q B P and R C Q and R D Q and S

30 A student lifts a box vertically from the floor and places it on a table.

Which two quantities must be known in order to calculate the work done on the box by the student?

- A the force used to lift the box and the height of the table
- B the force used to lift the box and the time taken to lift the box
- C the volume of the box and the height of the table
- D the volume of the box and the time taken to lift the box

31 Which energy resource does **not** use a turbine and generator to produce electricity?

- A geothermal
- B nuclear fission
- C solar cells
- D wind

32 What are used as the fixed points on the Celsius scale of temperature?

	lower fixed point	upper fixed point
A	melting point of salt solution	boiling point of pure ethanol
B	melting point of salt solution	boiling point of pure water
C	melting point of pure ice	boiling point of pure ethanol
D	melting point of pure ice	boiling point of pure water

33 What happens to the temperature of a substance as it is melting and as it is boiling?

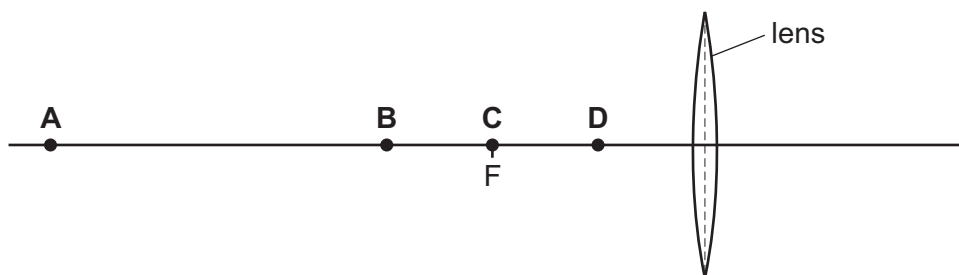
	melting	boiling
A	decreases	increases
B	decreases	no change
C	increases	increases
D	no change	no change

34 A thin, converging lens produces an inverted, enlarged image of an object.

The image is formed on a screen.

F is a principal focus of the lens.

Which labelled point is a possible position for the object?

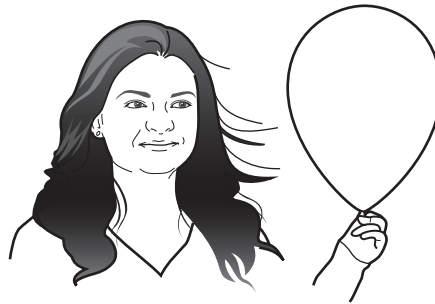


35 Which statement about the electromagnetic spectrum is correct?

- A** Gamma-radiation has a lower frequency than visible light.
- B** Infrared radiation has a higher frequency than radio waves.
- C** Microwaves have a smaller wavelength than ultraviolet radiation.
- D** X-rays have a larger wavelength than visible light.

- 36** A student rubs a balloon against her hair. Electrons are transferred from the hair onto the balloon, and the hair and the balloon both become charged.

The hair is now attracted to the balloon.

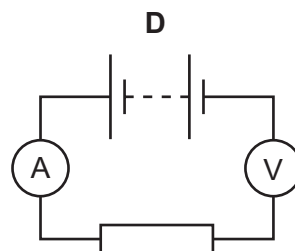
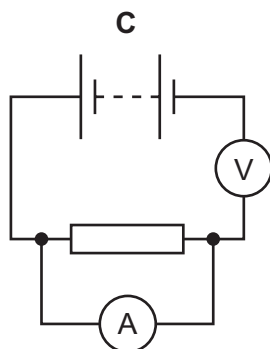
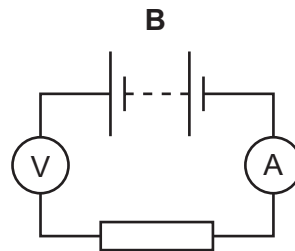
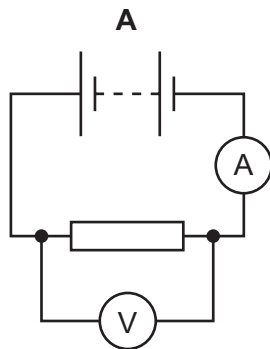


Which row shows the charges on the hair and on the balloon after rubbing?

	charge on hair	charge on balloon
A	negative	negative
B	negative	positive
C	positive	negative
D	positive	positive

- 37** A student connects a circuit to determine the resistance of a resistor.

Which circuit enables the current in the resistor and the potential difference (p.d.) across it to be measured?

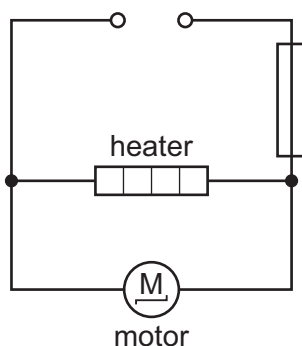


- 38 Which row shows how lamps are connected in a lighting circuit in a house and gives an advantage of connecting them in this way?

	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

- 39 The diagram shows a circuit containing an electric heater, a motor and a fuse.

The current in the heater is 6.0 A and the current in the motor is 2.0 A.



What is an appropriate rating for the fuse?

- A** 2 A **B** 4 A **C** 6 A **D** 10 A
- 40 An atom of beryllium is represented by ${}^9_4\text{Be}$.

How many neutrons are in the nucleus of this type of beryllium atom?

- A** 4 **B** 5 **C** 9 **D** 13

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The Periodic Table of Elements

Group																								
I	II											III	IV	V	VI	VII	VIII							
3 Li lithium 7	4 Be beryllium 9	Key atomic number atomic symbol name relative atomic mass										1 H hydrogen 1												
												5 B boron 11								6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
												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 —									

lanthanoids

actinoids

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
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 dm³ at room temperature and pressure (r.t.p.).