Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/21**

Paper 2 Multiple Choice (Extended) **October/November 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 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 Red onion cells are placed in distilled water.

Which statement is correct?

A The cells plasmolyse; water moves into the cells from a high to a low water potential.

B The cells plasmolyse; water moves out of the cells from a low to a high water potential.

C The cells become turgid; water moves into the cells from a high to a low water potential.

D The cells become turgid; water moves out of the cells from a low to a high water potential.

3 Glycerol is a component of which large molecules?

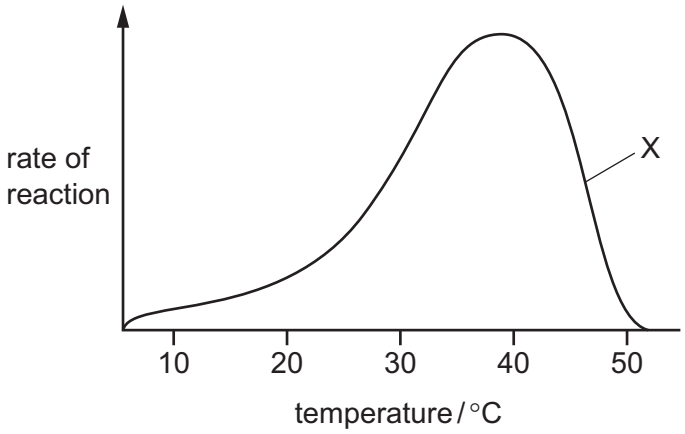
A fats

B glycogen

C proteins

D starch

4 The graph shows the rate of reaction of salivary amylase at different temperatures.



What does the graph show at point X?

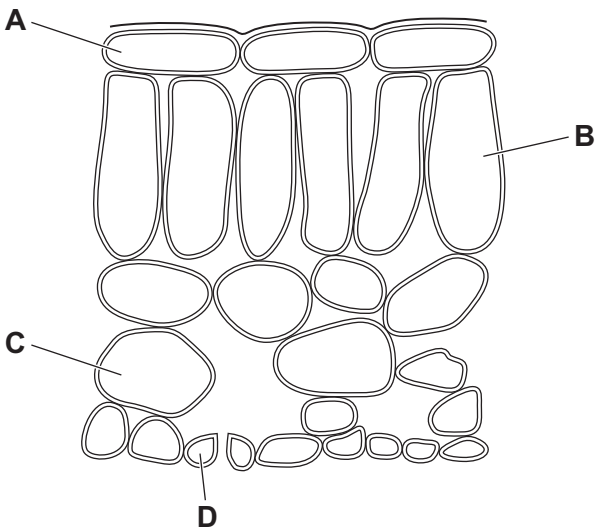
A The enzyme has stopped working.

B The reaction is nearly completed.

C The reaction rate is controlled by pH.

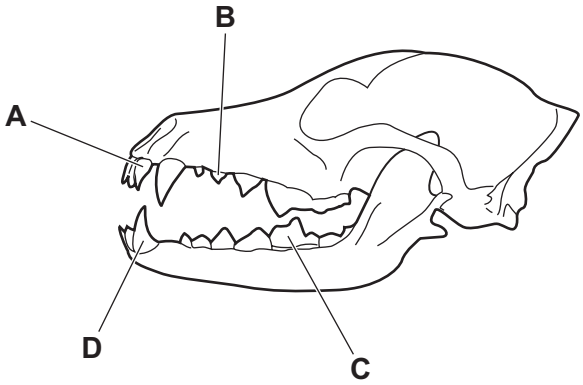
D The temperature is higher than the optimum.

5 Which cell does **not** require magnesium ions for the synthesis of chlorophyll?



6 Dogs are mammals and have the same types of teeth as humans.

Which tooth is a canine?

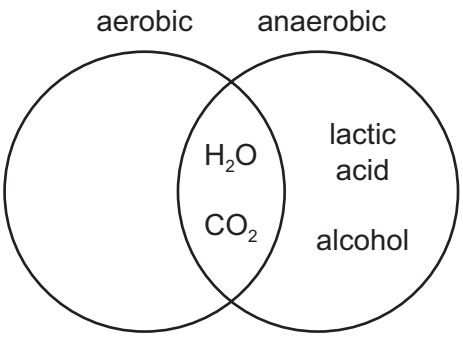


7 Which row correctly describes translocation and transpiration in plants?

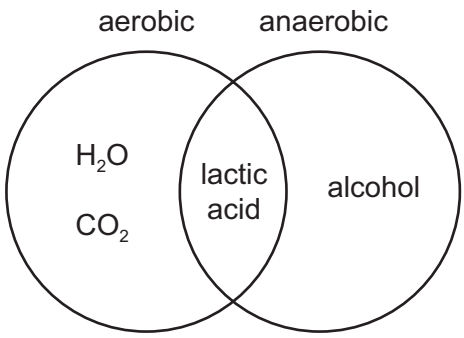
	transport method	from	to	transport vessel
A	translocation	leaf	respiring tissue	xylem
	transpiration	root	leaf	phloem
B	translocation	leaf	root	xylem
	transpiration	respiring tissue	leaf	phloem
C	translocation	leaf	respiring tissue	phloem
	transpiration	root	leaf	xylem
D	translocation	leaf	root	phloem
	transpiration	respiring tissue	leaf	xylem

8 Which diagram gives the possible products of aerobic respiration and anaerobic respiration?

A



B



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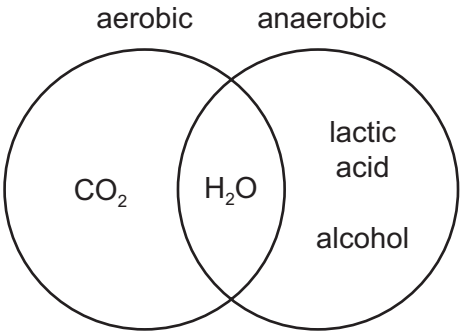
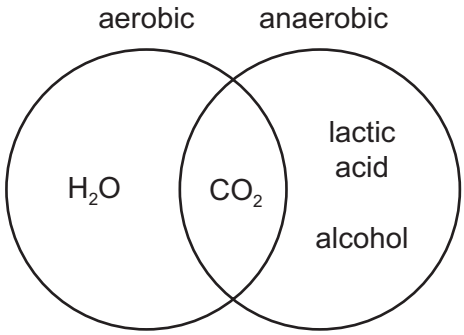


D



9 When a seed germinates in the soil, the root grows downwards.

Which type of response is the root exhibiting?

A negative gravitropism

B negative phototropism

C positive gravitropism

D positive phototropism

10 What is a function of the placenta?

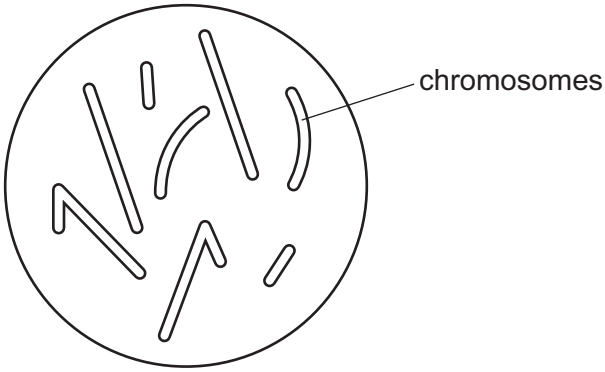
A It acts as a barrier to toxins.

B It cushions the fetus from bumps.

C It maintains a constant temperature.

D It exchanges blood between the fetus and the mother.

11 The diagram shows the chromosomes present in a cell.



The cell divides by meiosis.

What correctly describes the cells that are produced?

A genetically identical, 8 chromosomes, diploid

B genetically different, 4 chromosomes, haploid

C genetically identical, 4 chromosomes, diploid

D genetically different, 8 chromosomes, haploid

12 Which type of organism gets its energy from the remains of dead organisms or other organic waste?

A a carnivore

B a decomposer

C a herbivore

D a producer

13 What is an undesirable effect of deforestation?

A It increases the oxygen concentration of the atmosphere.

B It leads to erosion and loss of soil.

C It makes land available for agriculture.

D It pollutes the air with methane.

14 Which properties are used to distinguish between solids and gases?

1 compressibility

2 melting point

3 flammability

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

15 An atom of fluorine is represented by $^{19}_{9}F$.

How many electrons does this atom contain?

A 9 **B** 10 **C** 19 **D** 28

16 Which statement describes the lattice structure of sodium chloride, NaCl?

A It is a random arrangement of equal numbers of sodium atoms and chlorine atoms.

B It is a random arrangement of equal numbers of sodium ions and chloride ions.

C It is a regular arrangement of alternating sodium atoms and chlorine atoms.

D It is a regular arrangement of alternating sodium ions and chloride ions.

17 1 g of hydrogen contains 6×10^{23} atoms.

The relative atomic mass of helium is 4.

How many atoms does 1 g of helium contain?

A 1.5×10^{23} **B** 3×10^{23} **C** 6×10^{23} **D** 2.4×10^{24}

18 Copper(II) sulfate can be electrolysed using either carbon electrodes or copper electrodes.

What happens to the concentration of copper(II) ions in the electrolyte during electrolysis using these electrodes?

	using carbon electrodes	using copper electrodes
A	decreases	decreases
B	decreases	no change
C	no change	decreases
D	no change	increases

19 Which statement about energy changes in chemical reactions is correct?

A Activation energy is the maximum energy required by the reactants for a reaction to occur.

B Bond forming is an endothermic process.

C In an exothermic reaction, the energy level of the reactants is higher than the energy level of the products.

D Increasing temperature increases the minimum energy required by the reactants for a reaction to occur.

[Turn over

20 The equation for the reaction of iron(III) oxide and aluminium is shown.

$$2Al + Fe_2O_3 \rightarrow Al_2O_3 + 2Fe$$

Which statements about this reaction are correct?

1 Iron(III) ions are reduced.

2 O atoms gain electrons.

3 Fe_2O_3 is a reducing agent.

4 Al atoms lose electrons.

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

21 Which statement about the halogens is **not** correct?

A Iodine has a darker colour than chlorine.

B They all exist as diatomic molecules.

C They are all gases at room temperature.

D They are all non-metals.

22 Filament lamps require an inert atmosphere.

Which gas is used to fill these lamps?

A argon

B helium

C hydrogen

D oxygen

23 Alloys are formed by dissolving one metal in another.

Alloys are ……1…… .

……2…… alloys conduct electricity.

Which words complete gaps 1 and 2?

	1	2
A	compounds	All
B	compounds	Some
C	mixtures	All
D	mixtures	Some

24 Which statement about reactions of metals is correct?

A When copper is added to aqueous aluminium nitrate, the colourless solution turns blue.

B When magnesium oxide is heated with iron, solid iron(III) oxide is formed.

C When potassium oxide is heated with copper, an orange-brown solid is formed.

D When zinc is added to aqueous copper sulfate, the blue solution turns colourless.

25 Which row describes conditions for the conversion of sulfur dioxide to sulfur trioxide in the Contact process?

	temperature / °C	catalyst
A	200	iron
B	200	vanadium(V) oxide
C	450	iron
D	450	vanadium(V) oxide

26 What is **not** a use of limestone?

A manufacture of calcium oxide

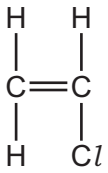
B neutralising industrial waste products

C purifying water

D treating acidic soil

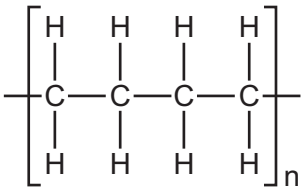
[Turn over

27 The structure of the monomer chloroethene is shown.



What is the structure of the polymer formed from this monomer?

A



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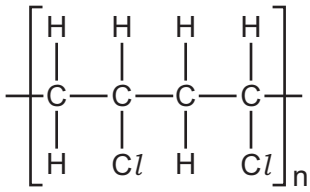

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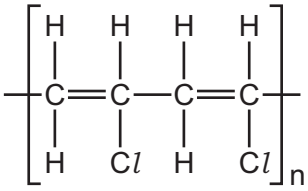

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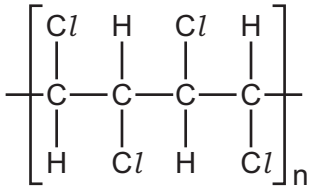


28 A motorcycle accelerates uniformly from a velocity of 20 m/s to a velocity of 35 m/s in 5.0 s.

What is its acceleration?

A $3.0\,m/s^2$ **B** $5.5\,m/s^2$ **C** $7.0\,m/s^2$ **D** $11\,m/s^2$

29 Which two pieces of apparatus are used to find the density of a small, irregularly shaped piece of metal?

A balance and measuring cylinder

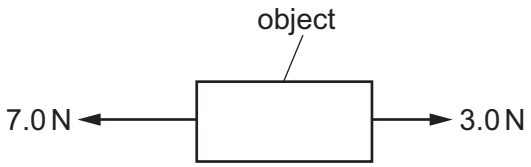
B balance and metre rule

C beaker and measuring cylinder

D beaker and metre rule

30 An object of mass 2.0 kg is acted upon by a force of 3.0 N and a force of 7.0 N.

The directions of the forces are shown.



What is the acceleration of the object?

A $0.20\,m/s^2$ **B** $0.50\,m/s^2$ **C** $2.0\,m/s^2$ **D** $5.0\,m/s^2$

31 Which electrical device transfers chemical energy into electrical energy?

A battery

B lamp

C electric motor

D television

32 From which type of energy is electrical energy transferred in a hydroelectric power station?

A chemical potential energy

B elastic potential (strain) energy

C gravitational potential energy

D nuclear energy

33 Equal volumes of a gas, a liquid and a solid are heated through the same temperature difference at constant pressure.

Which statement about their expansions is correct?

A The gas expands the most.

B The liquid expands the most.

C The solid expands the most.

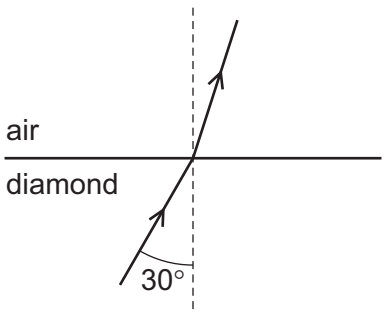
D The gas, the liquid and the solid all expand by the same amount.

[Turn over

34 The critical angle for diamond in air is 25°. Light travels faster in air than in diamond.

Which diagram shows the path of light passing from diamond into air?

A



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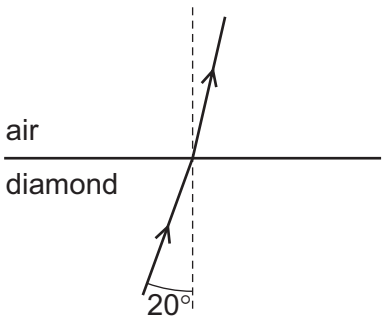

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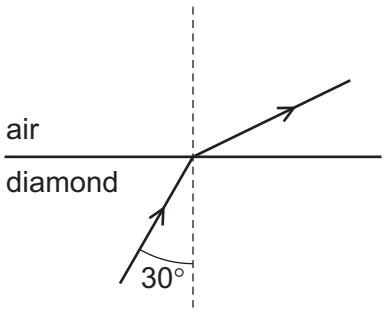

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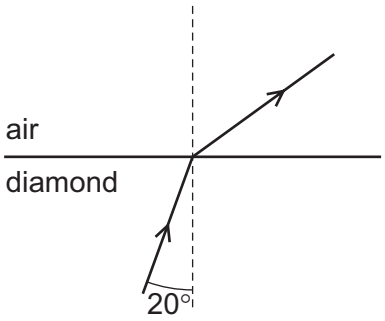


35 Which type of magnet can be switched on and off many times per second?

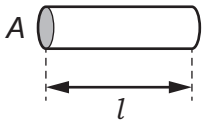
A an electromagnet only

B a permanent magnet only

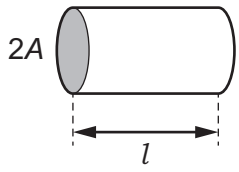
C both electromagnets and permanent magnets

D neither electromagnets or permanent magnets

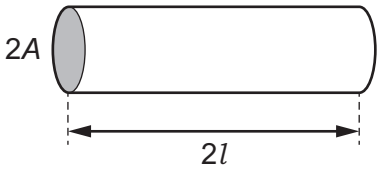
36 A resistance wire of cross-sectional area A and length l has resistance R.



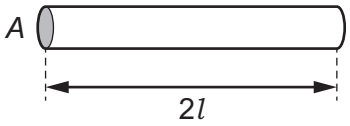
Wires X, Y and Z are made of the same material as the first wire but have different dimensions as shown.



wire X



wire Y



wire Z

Which of the wires X, Y and Z has resistance R?

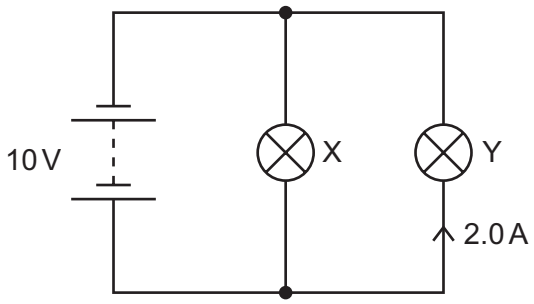
A wire X

B wire Y

C wire Z

D none of them

37 A battery of electromotive force (e.m.f.) 10 V is connected to two lamps X and Y.



The current in lamp Y is 2.0 A.

The power of lamp Y is half the power of lamp X.

How much energy is transferred by the battery in 1.0 minute?

A 30 J **B** 1800 J **C** 2400 J **D** 3600 J

38 The current in an electric heater during normal use is 11 A.

What is an appropriate rating for a fuse to protect the heater?

A 3 A **B** 10 A **C** 13 A **D** 36 A

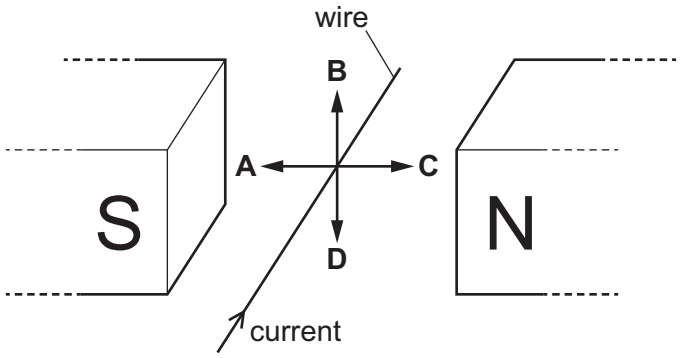
[Turn over

39 A current-carrying wire is placed between the poles of a magnet, as shown.

The current direction in the wire is shown.

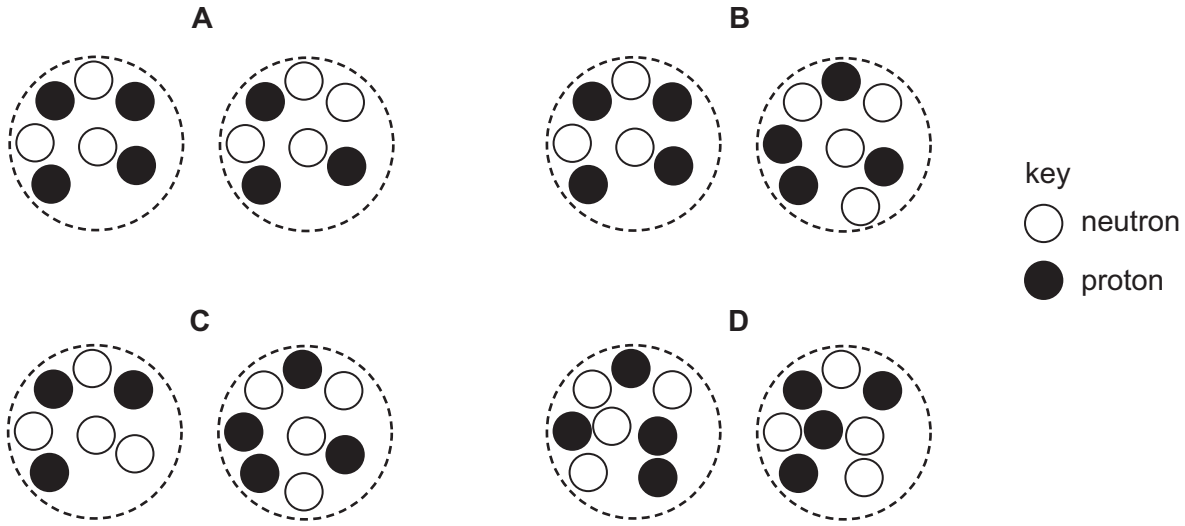
A force is produced on the wire.

In which labelled direction does the force act?



40 The diagrams represent pairs of nuclei of some atoms.

Which pair shows nuclei of different isotopes of the same element?



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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.).