Cambridge Assessment International Education

Cambridge IGCSE™ (9–1)

CO-ORDINATED SCIENCES **0973/21**

Paper 2 Multiple Choice (Extended) **May/June 2021**

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 is respiration?

A breakdown of food by enzymes in the alimentary canal

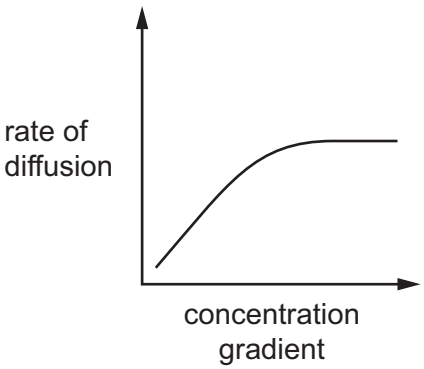
B breathing to supply oxygen to cells

C release of carbon dioxide from the lungs

D release of energy for body activities

2 What is the effect of increasing the concentration gradient on the rate of diffusion?

A



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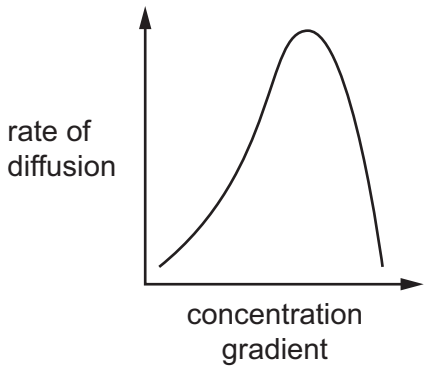

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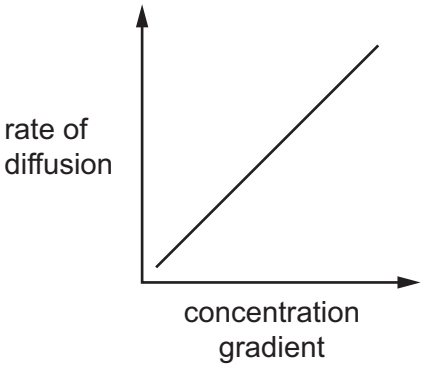
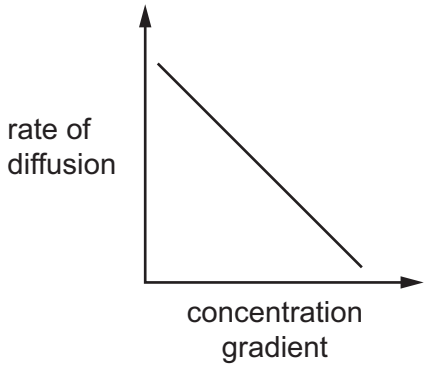


D



3 Three food tests are carried out on a sample of food. The results are shown in the table.

food test	final colour
Benedict's	blue
biuret	blue
iodine	blue-black

From these results, which nutrient is in the food?

A reducing sugar

B protein

C starch

D vitamin C

4 What is an enzyme?

A a carbohydrate that speeds up the rate of a reaction

B a carbohydrate that alters the activity of a target organ

C a protein that alters the activity of a target organ

D a protein that speeds up the rate of a reaction

5 The balanced equation for photosynthesis is shown.

$$6CO_2 + 6H_2O \xrightarrow[\text{chlorophyll}]{\text{light}} \mathbf{X} + 6O_2$$

What is **X**?

A $C_6H_{12}O_6$ **B** $C_6H_{12}O_{12}$ **C** $C_{12}H_6O_6$ **D** $C_{12}H_{12}O_2$

6 Protein shakes can be used by athletes to supplement their diet. They are a drink made by dissolving protein powders in water or milk.

Which types of digestion will be required before they can be absorbed?

	chemical digestion	mechanical digestion
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

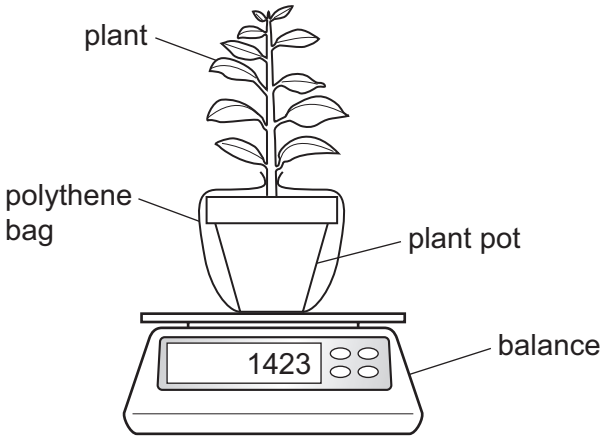
key

✓ = yes

✗ = no

7 A student investigates the effect of humidity on transpiration rate.

A plant is placed on a balance as shown for one hour. The mass of the plant decreases.



The student repeats the experiment in air of higher humidity.

What is the effect of increasing humidity?

A larger decrease in mass due to a steeper diffusion gradient of water

B larger decrease in mass due to a less steep diffusion gradient of water

C smaller decrease in mass due to a steeper diffusion gradient of water

D smaller decrease in mass due to a less steep diffusion gradient of water

8 A child blows into a rubber balloon.

What is the percentage of oxygen inside the balloon?

A 0% **B** 4% **C** 16% **D** 21%

9 What is homeostasis?

A keeping internal conditions constant

B keeping the body at the same temperature as the environment

C sweating to keep the body warm

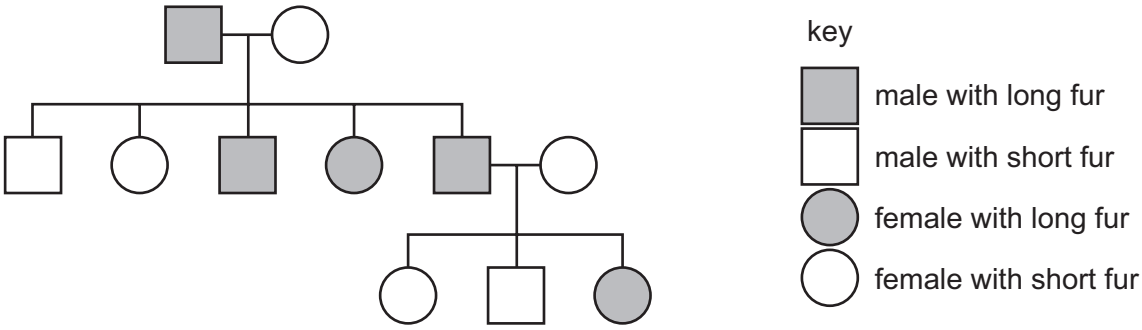
D vasoconstriction of arterioles to increase heat loss

10 Which row about these human cells is correct?

	type of human cell	chromosome number	description
A	gamete	23	diploid
B	gamete	46	haploid
C	zygote	46	diploid
D	zygote	23	haploid

11 The allele for long fur in cats is recessive to the allele for short fur.

The pedigree diagram shows the inheritance of long and short fur in a family of cats.



How many cats in the pedigree diagram are heterozygous for fur length?

A 2 **B** 4 **C** 5 **D** 6

12 Why do food chains usually have fewer than five trophic levels?

A All the carnivores consume herbivores.

B The energy passed on reduces from one trophic level to the next.

C There is less protein in each individual higher up the chain.

D There is only one producer in each chain.

13 What decreases as a result of deforestation?

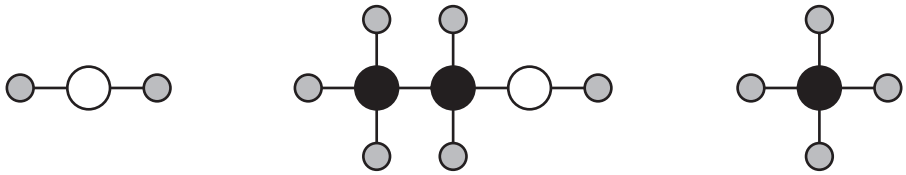
A available habitats

B atmospheric carbon dioxide

C flooding

D soil loss

14 The structures of some substances are shown.



water ethanol methane

Which row shows the total number of different elements and the total number of atoms in the three structures?

	total number of different elements	total number of atoms
A	3	9
B	3	17
C	7	9
D	7	17

15 Pure substance X has a melting point of 110 °C.

The melting point ranges of four impure samples of substance X are measured.

What is the melting point range of the most impure sample of substance X?

	melting point / °C
A	81–85
B	86–92
C	98–99
D	102–110

16 Which row explains why the melting points of covalent compounds are lower than those of ionic compounds?

	covalent compound	ionic compound
A	strong attractive forces between molecules	strong attraction between oppositely charged ions
B	strong attractive forces between molecules	weak attraction between oppositely charged ions
C	weak attractive forces between molecules	strong attraction between oppositely charged ions
D	weak attractive forces between molecules	weak attraction between oppositely charged ions

17 The charges on some ions are shown.

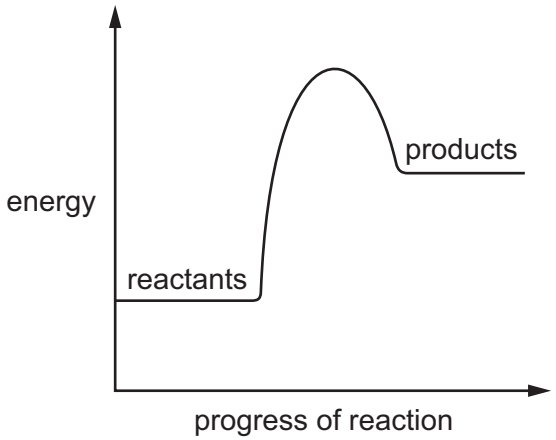
positive ions	negative ions
Al^{3+}	N^{3-}
Li^{+}	NO_3^{-}
Mg^{2+}	O^{2-}
Zn^{2+}	SO_4^{2-}

Which formula is correct?

	compound	formula
A	aluminium sulfate	$Al_2(SO_4)_3$
B	lithium nitrate	Li_2NO_3
C	magnesium nitride	Mg_2N_3
D	zinc oxide	ZnO_2

[Turn over

18 An energy level diagram for a chemical reaction is shown.



Which row describes the energy change and the type of reaction?

	energy change	type of reaction
A	energy is given out to the surroundings	endothermic
B	energy is given out to the surroundings	exothermic
C	energy is taken in from the surroundings	endothermic
D	energy is taken in from the surroundings	exothermic

19 Which equation represents a redox reaction?

A $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

B $CuCO_3 \rightarrow CuO + CO_2$

C $Mg + CuSO_4 \rightarrow MgSO_4 + Cu$

D $Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$

20 What reacts with ammonia gas?

	hydrochloric acid	sodium hydroxide
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = reacts

✗ = does not react

21 Substance Q is added to cold water. It floats on the water and hydrogen gas is made.

What is Q?

A iodine

B lithium

C magnesium

D zinc

22 Four metals W, X, Y and Z are added to different solutions of metal nitrates.

The results are shown.

		metal nitrate solution			
		W	X	Y	Z
metal	W		✗	✗	✗
	X	✓		✓	✗
	Y	✓	✗		✗
	Z	✓	✓	✓	

key

✓ = reacts

✗ = no reaction

Which statements are correct?

1 Metal Z is the most reactive.

2 Metal W has the lowest tendency to form positive ions.

3 Metal X is less reactive than metal W.

4 Metal Y is more reactive than metal X.

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

23 Which statement explains how oxides of nitrogen are formed in a car engine?

A Nitrogen from the air reacts with the fuel.

B Oxygen and nitrogen from the air react together.

C Oxygen from the air reacts with sulfur impurities in the fuel.

D Oxygen from the air reacts with the fuel.

24 Other than hydrogen and oxygen, which substance provides only **one** of the essential elements for plant growth?

A K_3PO_4 **B** KNO_3 **C** $(NH_4)_3PO_4$ **D** NH_4NO_3

25 What is the chemical name for lime?

A calcium carbonate

B calcium hydroxide

C calcium oxide

D calcium sulfate

26 Which row about the Contact process is correct?

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

27 Which reaction produces only one product?

A combustion of ethanol

B cracking of alkanes

C fermentation of sugar solution

D reaction of ethene and steam

28 A car accelerates with constant acceleration from a speed of 3.0 m / s to a speed of 9.0 m / s in 3.0 s.

What is the acceleration of the car?

A $1.0\,m/s^2$ **B** $2.0\,m/s^2$ **C** $3.0\,m/s^2$ **D** $4.0\,m/s^2$

29 Which two quantities can be used to calculate the acceleration of a rocket?

A the mass of the rocket and its speed

B the mass of the rocket and its weight

C the resultant force on the rocket and its mass

D the resultant force on the rocket and its speed

30 Which statement applies to a system in equilibrium?

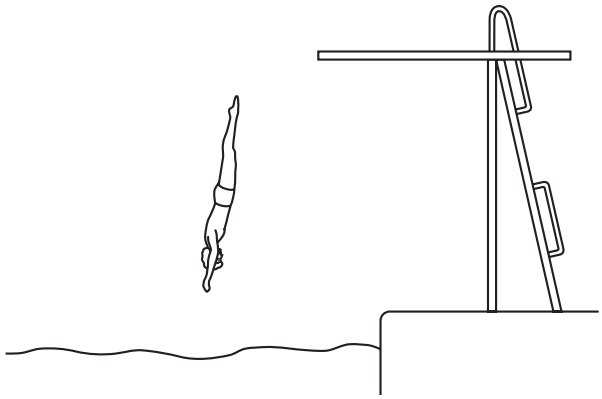
A There is a resultant force and there is a resultant turning effect on the system.

B There is a resultant force but there is no resultant turning effect on the system.

C There is no resultant force but there is a resultant turning effect on the system.

D There is no resultant force and there is no resultant turning effect on the system.

31 The diagram shows a man diving into water.



Which form of energy is increasing as he accelerates downwards through the air?

A chemical

B elastic potential (strain)

C gravitational potential

D kinetic

32 The Sun is an important energy resource.

Which energy source powers the Sun?

A chemical

B geothermal

C nuclear fission

D nuclear fusion

33 Which example of thermal conduction involves energy transfer by electrons?

A A person's feet become warm when walking on hot sand.

B Chocolate becomes warm if it is held in a hand.

C One end of a metal spoon becomes hot when the other end is placed in hot water.

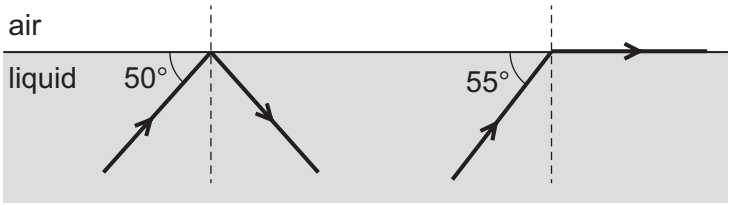
D The outside of a plastic mug filled with hot water becomes hot.

[Turn over

34 Which colour of outer clothing helps to keep the wearer cool on a hot, sunny day, and why is this clothing effective?

	colour of clothing	why it is effective
A	black	it is a good absorber of radiation from the Sun
B	black	it is a poor absorber of radiation from the Sun
C	white	it is a good absorber of radiation from the Sun
D	white	it is a poor absorber of radiation from the Sun

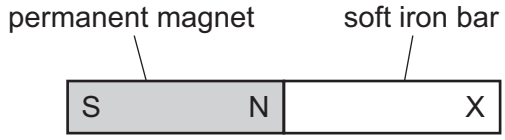
35 The diagram represents the surface of a transparent liquid. Two rays of light are travelling in the liquid. They both reach the surface. The path of each ray is shown.



What is the critical angle for this liquid?

A 35° **B** 40° **C** 50° **D** 55°

36 An unmagnetised soft iron bar is held close to a permanent magnet and becomes attached to the magnet. The soft iron bar is then moved a large distance from the magnet.

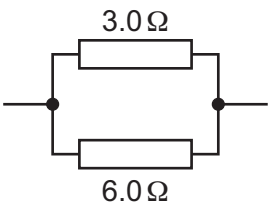


What happens at point X when the soft iron bar is attached to the magnet, and what happens when the bar is moved a large distance from the magnet?

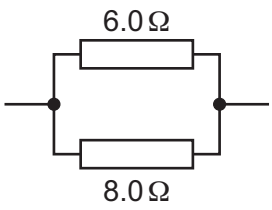
	attached to magnet	bar moved away
A	X becomes an N pole	no pole at X
B	X becomes an N pole	remains an N pole
C	X becomes an S pole	no pole at X
D	X becomes an S pole	remains an S pole

37 Which combination of resistors has a combined resistance of 2.0 Ω?

A



B



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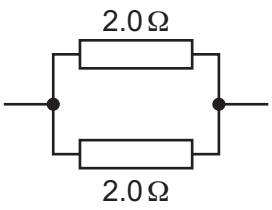

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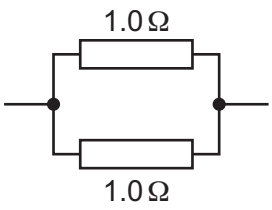
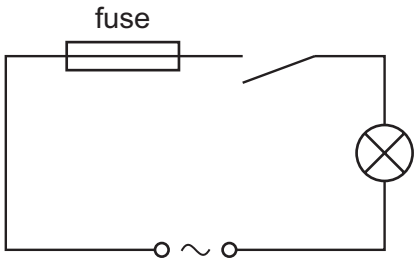


38 A student connects the circuit shown.



When the switch is closed the fuse blows and stops the current.

What is a possible reason for this?

A The current rating of the fuse is too high.

B The current is too large.

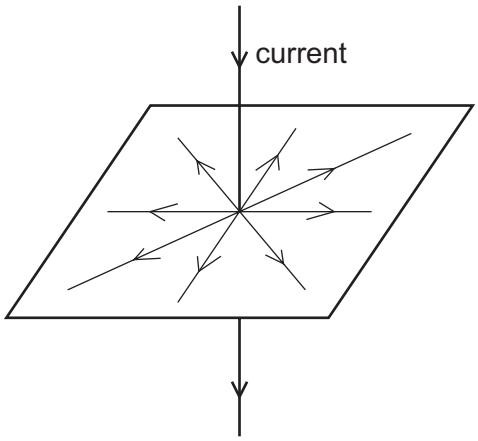
C The lamp is too dim.

D The voltage is too small.

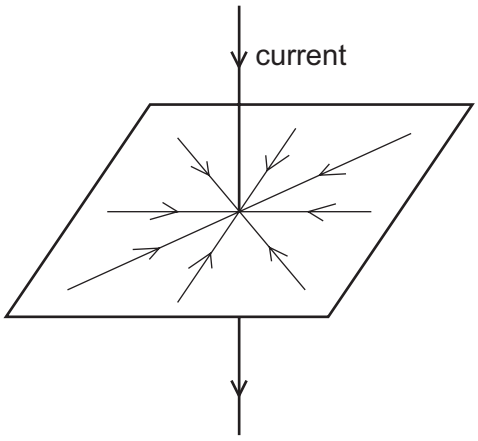
39 The diagrams each show a wire carrying a current in the direction of the arrow.

Which diagram shows the pattern and the direction of the magnetic field around the wire?

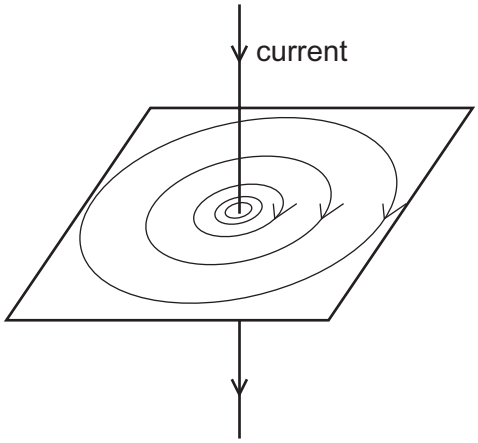
A



B



C



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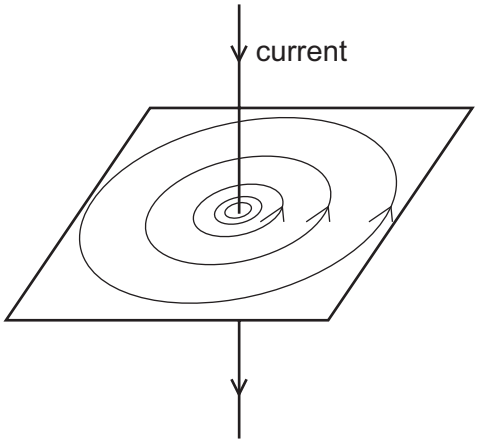

40 A radioactive nucleus emits a β-particle.

What happens to the proton number (atomic number) of the nucleus?

A It stays the same.

B It increases by 1.

C It decreases by 2.

D It decreases by 4.

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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.).