Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/21**

Paper 2 Multiple Choice (Extended) **October/November 2024**

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.

IB24 11_0653_21/2RP

1 Which characteristics are found in all living organisms?

	excretion	growth	photosynthesis	respiration
A	yes	yes	no	yes
B	yes	yes	yes	no
C	yes	no	yes	yes
D	no	yes	yes	yes

2 What is the function of ciliated cells in the bronchi?

A absorption of oxygen

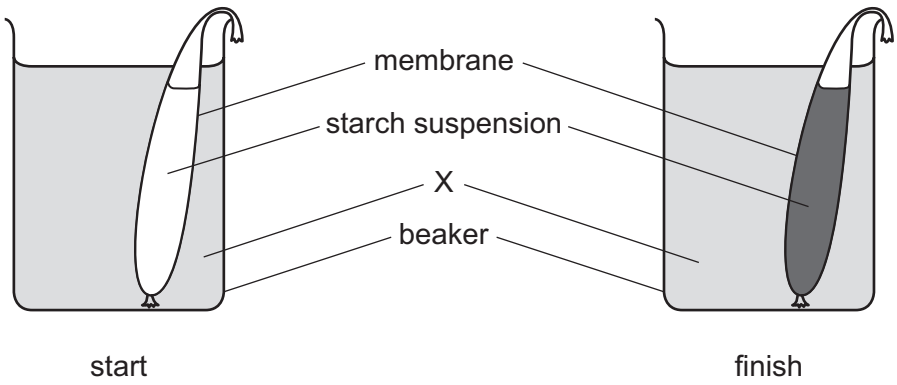
B movement of mucus

C production of mucus

D transport of oxygen

3 A student uses a starch suspension contained in a transparent partially permeable membrane to investigate diffusion. The membrane is placed in a beaker of X.

The diagram shows the start and finish of the investigation.



The colour of the starch suspension changes from white to blue-black.

What is X?

A Benedict's solution

B biuret solution

C ethanol

D iodine solution

4 Which two components of cow's milk are essential for strong teeth and bones?

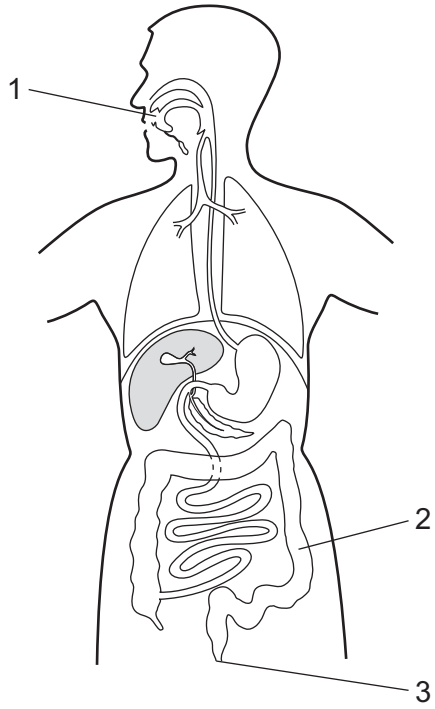
A minerals and vitamins

B fats and proteins

C carbohydrates and vitamins

D minerals and water

5 The diagram shows the human alimentary canal.



Where do egestion and ingestion occur?

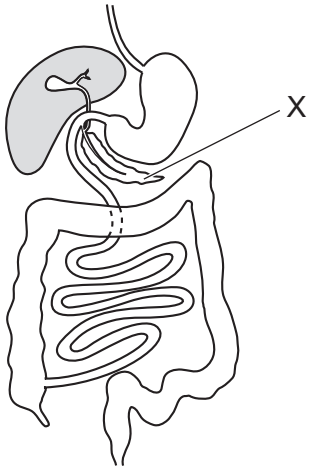
	egestion	ingestion
A	1	3
B	2	3
C	3	1
D	3	2

6 A list of enzymes and a diagram of some human organs are shown.

1 amylase

2 protease

3 lipase



Which enzymes are secreted by the organ labelled X?

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

7 Which row is correct for the transport of water during transpiration in plants?

	tissue	direction of transport
A	phloem	leaf to root
B	phloem	root to leaf
C	xylem	leaf to root
D	xylem	root to leaf

8 What happens after blood has filled the atria of the heart?

	muscles of the atria	muscles of the ventricles	valves between atria and ventricles
A	contract	contract	open
B	relax	contract	close
C	contract	relax	open
D	relax	relax	close

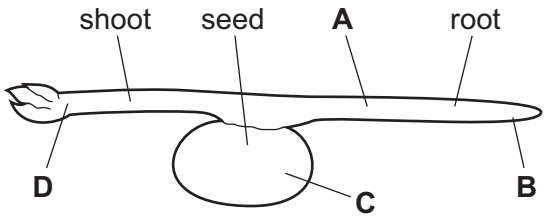
9 Which row completes the balanced chemical equation for aerobic respiration?

$$C_6H_{12}O_6 + ...1..... \rightarrow .....2..... + ...3.....$$

	1	2	3
A	$6H_2O$	$6O_2$	$6CO_2$
B	$6O_2$	$6CO_2$	$3H_2O$
C	$3O_2$	$6CO_2$	$3H_2O$
D	$6O_2$	$6H_2O$	$6CO_2$

10 The diagram shows a germinated seed in a horizontal position.

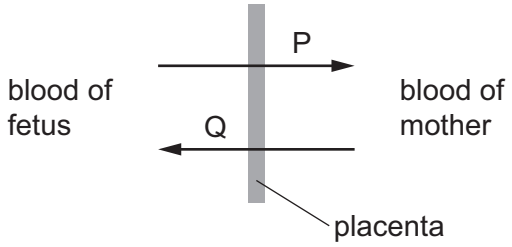
In which area is the cell elongation the greatest?



11 Which row about wind-pollinated plants is correct?

	position of stamens and stigmas	size of petals compared to insect-pollinated plants
A	outside the flower	large
B	outside the flower	small
C	inside the flower	large
D	inside the flower	small

12 The diagram represents the human placenta.



P and Q show the net movement of substances.

Which row identifies substances that travel in the directions P and Q?

	in direction P	in direction Q
A	blood	urea
B	oxygen	carbon dioxide
C	excretory products	glucose
D	amino acids	toxins

13 Which factors reduce the possible number of trophic levels in a food chain?

1 energy lost in faeces

2 energy absorbed by a plant leaf

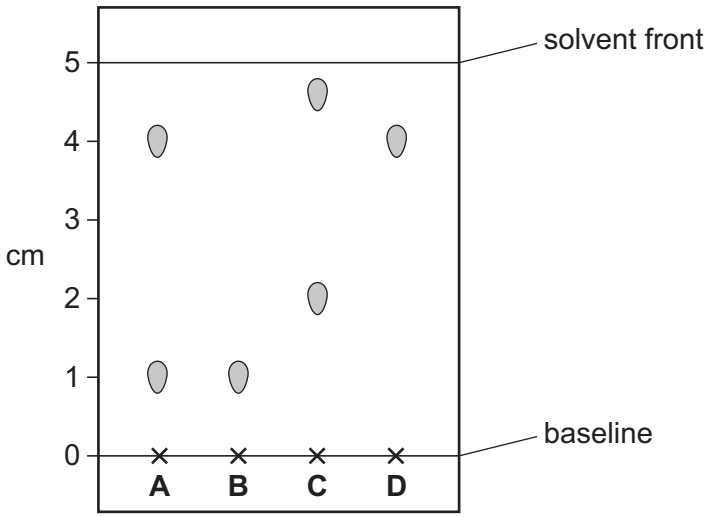
3 energy released by respiration

4 energy stored in an animal

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

14 The diagram shows a chromatogram produced by four different substances.

Which pure substance has an R_f value of 0.8?



15 Which process is **not** a chemical change?

A electrolysis of molten lead bromide

B fractional distillation of petroleum

C oxidation of copper

D rusting of iron

16 Magnesium chloride is an ionic compound.

Which row describes the formation of magnesium chloride and the strength of the attraction between its ions?

	formation of magnesium chloride	strength of the attraction between ions
A	Electrons are shared between magnesium and chlorine.	strong
B	Electrons are shared between magnesium and chlorine.	weak
C	Electrons are transferred from magnesium to chlorine.	strong
D	Electrons are transferred from magnesium to chlorine.	weak

17 The equation for the reaction between barium nitrate and sodium sulfate is shown.

$$Ba(NO_3)_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaNO_3(aq)$$

What is the ionic equation for this reaction?

A $Ba^{+}(aq) + SO_4^{-}(aq) \rightarrow BaSO_4(s)$

B $Na^{+}(aq) + NO_3^{-}(aq) \rightarrow NaNO_3(aq)$

C $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$

D $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow Ba^{2+}(s) + SO_4^{2-}(s)$

18 When molten sodium chloride is electrolysed using inert electrodes, sodium and chlorine are produced at the electrodes.

Which row describes what happens at the anode and at the cathode?

	at the anode	at the cathode
A	chloride ions gain electrons	sodium ions lose electrons
B	chloride ions lose electrons	sodium ions gain electrons
C	sodium ions lose electrons	chloride ions gain electrons
D	sodium ions gain electrons	chloride ions lose electrons

19 Which row about bond breaking is correct?

	type of process	net energy transfer
A	endothermic	to surroundings
B	endothermic	from surroundings
C	exothermic	to surroundings
D	exothermic	from surroundings

20 Which statement explains how decreasing the concentration of reactants affects the rate of a reaction?

A It decreases because the frequency of collisions decreases.

B It decreases because the proportion of colliding particles with the activation energy decreases.

C It increases because the frequency of collisions increases.

D It increases because the proportion of colliding particles with the activation energy increases.

21 Compound X reacts with compound Y to form sodium sulfate, water and carbon dioxide.

What are X and Y?

	X	Y
A	sodium carbonate	hydrochloric acid
B	sodium carbonate	sulfuric acid
C	sodium hydroxide	hydrochloric acid
D	sodium hydroxide	sulfuric acid

22 A piece of damp blue litmus paper is placed in a gas.

The litmus paper turns red and then turns white.

What is the gas?

A chlorine

B hydrogen

C carbon dioxide

D oxygen

23 Which statement explains why the elements in Group VIII of the Periodic Table are unreactive?

A They are gases.

B They are non-metals.

C They have equal numbers of protons and electrons in their atoms.

D They have a full outer shell of electrons.

24 Which metal can be obtained by passing hydrogen over its heated metal oxide?

A copper

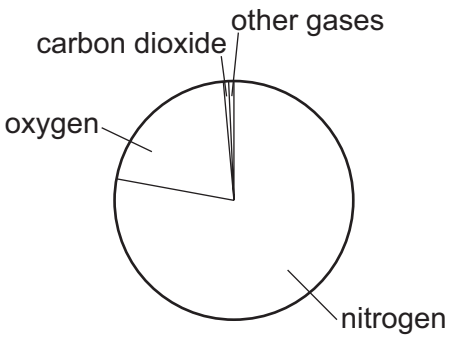
B magnesium

C iron

D zinc

25 Which pie chart shows the composition of clean air?

A



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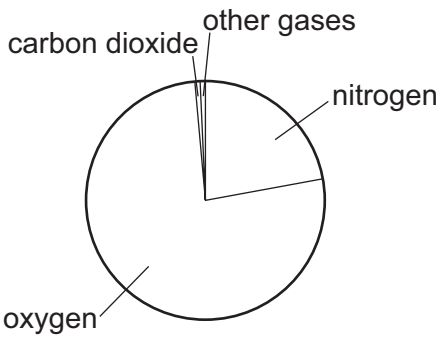

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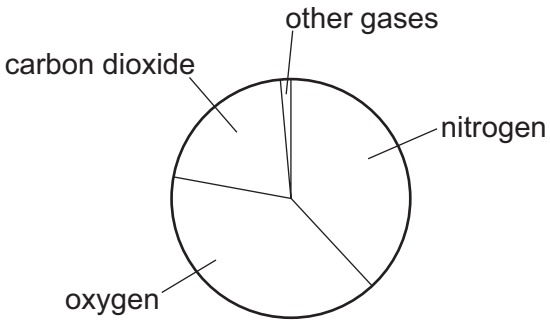

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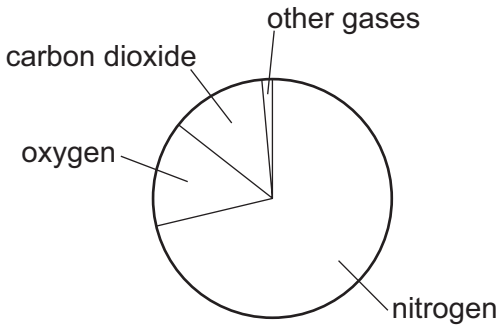


26 Which statements about the alkanes are correct?

1 They are saturated hydrocarbons.

2 They produce carbon monoxide and water during complete combustion.

3 They are generally unreactive, except in terms of burning.

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

27 Which statement about cracking is correct?

A Alkanes are produced, which are used to make polymers.

B Low temperatures are used.

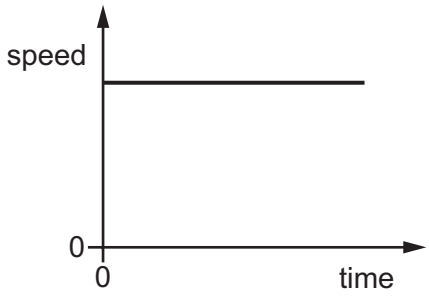
C Alkenes are the only products.

D A catalyst is used.

28 A car is moving downhill along a road at a constant speed.

Which graph is the speed–time graph for the car?

A



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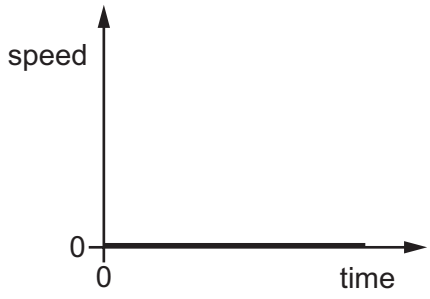

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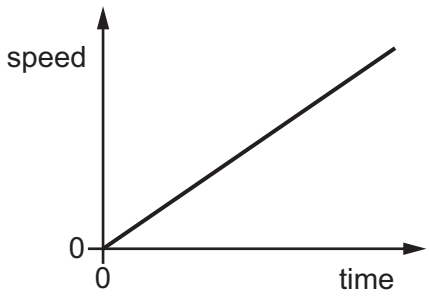
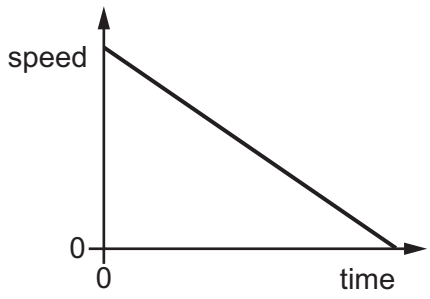


D



29 A cube is made of material with a density of $5.0\,g/cm^3$.

Which row shows the length of one side and the mass of the cube?

	length of one side of cube / cm	mass of cube / g
A	2.0	0.62
B	2.0	40
C	4.0	20
D	4.0	80

30 A block of weight 65 N rests on a horizontal surface.

The pressure on the surface due to the block is 10 Pa.

What is the area of contact between the block and the surface?

A $6.5\,cm^2$ **B** $6.5\,m^2$ **C** $650\,cm^2$ **D** $650\,m^2$

31 A wind-powered generator is used to charge a car battery.

In which form is energy stored in the moving air, and in which form is energy stored in the charged battery?

	energy in moving air	energy in charged battery
A	kinetic	chemical
B	kinetic	electrical
C	thermal	chemical
D	thermal	electrical

32 For which energy resource is the Sun the main source of energy?

A geothermal

B nuclear

C tidal

D wind

33 A gas changes state to become a liquid.

How do the forces between the molecules and the distances between the molecules change?

	forces between molecules	distances between molecules
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

34 A small coloured crystal is at the bottom of a beaker of water at room temperature. The beaker is gently heated from underneath the crystal, and the crystal dissolves slowly.

Coloured water just above the crystal is observed to rise up through the water in the beaker.

Which process is being observed, and which density change causes it?

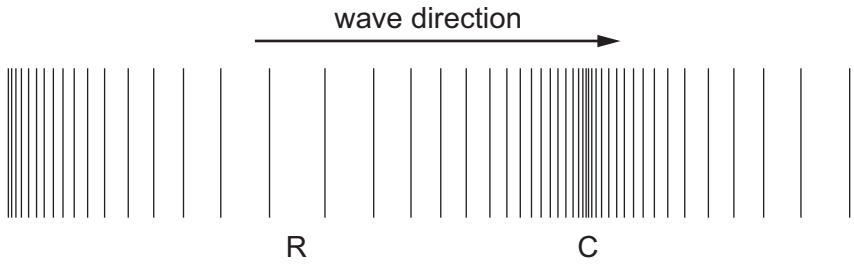
	process	density change
A	conduction	Water becomes less dense when heated.
B	conduction	Water becomes more dense when heated.
C	convection	Water becomes less dense when heated.
D	convection	Water becomes more dense when heated.

35 A thin converging lens is used as a magnifying glass.

Where is the object positioned, and is the image real or virtual?

	position of object	image
A	closer to the lens than the principal focus	real
B	closer to the lens than the principal focus	virtual
C	further away from the lens than the principal focus	real
D	further away from the lens than the principal focus	virtual

36 The diagram represents a sound wave travelling from left to right in a solid.



R is a rarefaction, and C is a compression.

In which direction do R and C move, and in which direction do the particles in the solid vibrate?

	direction of movement of R and C	direction of vibration of particles
A	same as wave direction	parallel to wave direction
B	same as wave direction	perpendicular to wave direction
C	opposite to wave direction	perpendicular to wave direction
D	opposite to wave direction	parallel to wave direction

37 A resistor of resistance 3.0 Ω is connected to a 6.0 V power supply.

What is the rate of flow of charge through the resistor?

A 0.50 C / min **B** 2.0 C / min **C** 30 C / min **D** 120 C / min

38 A power supply causes a current in a circuit.

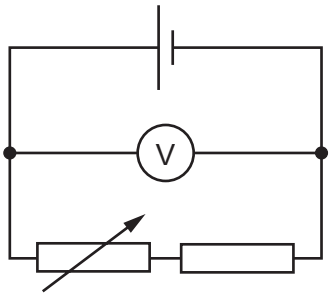
The electromotive force (e.m.f.) of the power supply and the resistance of the circuit are both changed.

Which two changes **must** result in a smaller current in the circuit?

	e.m.f.	resistance
A	decrease	decrease
B	decrease	increase
C	increase	decrease
D	increase	increase

39 Which circuit shows a voltmeter that measures the potential difference (p.d.) across a variable resistor?

A



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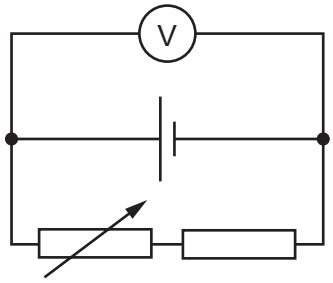

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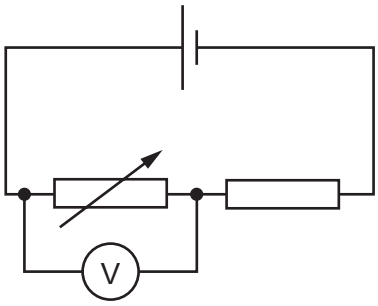

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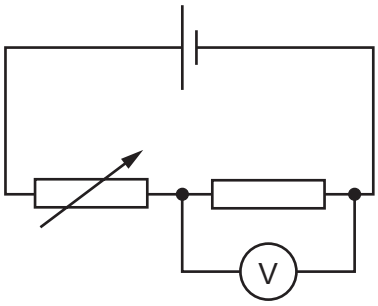
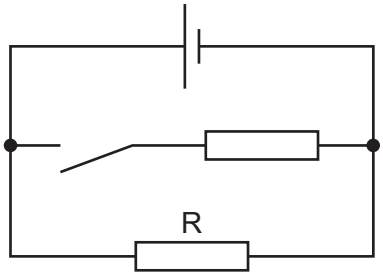


40 An electric circuit contains two resistors connected to a cell.

One resistor is labelled R. The switch is shown open.



The switch is now closed.

What happens to the potential difference (p.d.) across resistor R, and what happens to the current in resistor R?

A The p.d. decreases and the current increases.

B The p.d. decreases and the current remains the same.

C The p.d. remains the same and the current increases.

D The p.d. remains the same and the current remains the same.

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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 –	113 Nh nihonium –	114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

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.).