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Cambridge Assessment International Education

Cambridge IGCSE™

COMBINED SCIENCE **0653/22**

Paper 2 Multiple Choice (Extended) **February/March 2025**

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)

1663978869

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.
- Take the weight of 1.0 kg to be 9.8 N (acceleration of free fall = 9.8 m / s^2).

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.

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1 Which characteristic of living organisms describes the taking in of materials for energy, growth and development?

A excretion

B nutrition

C photosynthesis

D respiration

2 Which structures are found in bacterial cells but **not** in animal cells?

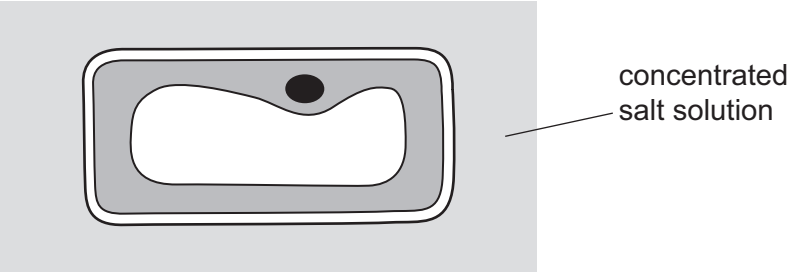
A cell membrane and plasmids

B nucleus and cytoplasm

C nucleus and ribosomes

D plasmids and cell wall

3 The diagram shows a plant cell in a concentrated salt solution.



Which row shows the net movement of water molecules and the effect on the plant cell?

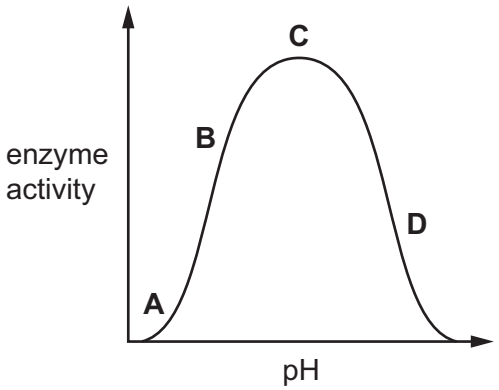
	net movement of water molecules	effect on the plant cell
A	out of cell	becomes turgid
B	out of cell	becomes flaccid
C	into cell	becomes turgid
D	into cell	becomes flaccid

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4 The graph shows the effect of pH on the activity of an enzyme.

Which label shows where collisions between enzyme and substrate are the most effective?

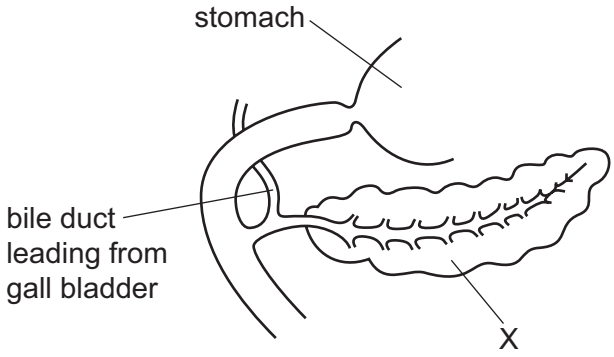


5 Carbon dioxide is needed for photosynthesis.

How many molecules of carbon dioxide are needed to make five molecules of glucose?

A 6 **B** 12 **C** 30 **D** 36

6 The diagram shows part of the human digestive system.



Which row identifies structure X, an enzyme secreted by structure X and the action of this enzyme?

	structure X	enzyme	action of enzyme
A	liver	amylase	converts proteins to amino acids
B	pancreas	amylase	converts starch to simple sugars
C	liver	protease	converts proteins to amino acids
D	pancreas	protease	converts starch to simple sugars

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7 What is a function of the large surface area of root hair cells?

A to increase the uptake of mineral ions by active transport

B to increase the uptake of water by active transport

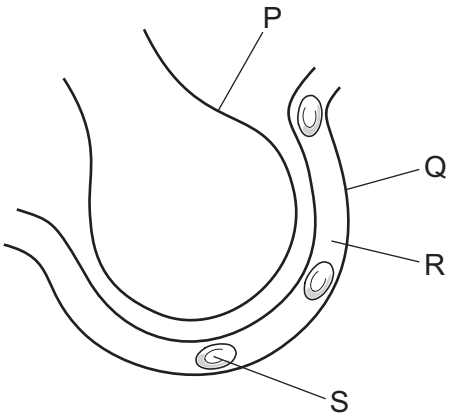
C to decrease the rate of transpiration by diffusion

D to decrease the uptake of oxygen by diffusion

8 Which row shows how blood is pumped out of the heart to the lungs?

	atria	ventricles
A	left atrium contracts	left ventricle relaxes
B	left atrium relaxes	left ventricle contracts
C	right atrium contracts	right ventricle relaxes
D	right atrium relaxes	right ventricle contracts

9 The diagram shows part of the breathing system.



Which row identifies structures P, Q, R and S?

	alveolus	capillary	plasma	red blood cell
A	P	Q	R	S
B	Q	R	S	P
C	R	S	P	Q
D	S	P	Q	R

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10 Which molecule is broken down in aerobic respiration?

A starch

B glucose

C glycogen

D water

11 Which row describes structural adaptations of insect-pollinated and wind-pollinated flowers?

	insect-pollinated flowers	wind-pollinated flowers
A	the flowers have large, colourful petals	the anthers hang on long filaments outside the flower
B	the flowers have large, colourful sepals	the stigma is feathery and hangs outside the flower
C	the flowers have large, colourful petals	the anthers are on short filaments inside the flower
D	the flowers have large, colourful sepals	the stigma is sticky and is inside the flower

12 Which statement about consumers is correct?

A They feed on other organisms to get their energy.

B They make their own organic nutrients.

C They only get their energy by feeding on producers.

D They use energy from sunlight for photosynthesis.

13 Which methods can be used to conserve an endangered species?

1 captive breeding programmes

2 introducing a new species

3 monitoring species

4 protecting habitats

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

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14 When a substance is heated, it absorbs energy and changes from a solid to a liquid.

Which statement explains how the absorbed energy causes the change from a solid to a liquid?

A The energy decreases the average kinetic energy of the particles.

B The energy increases the temperature of the substance.

C The energy makes the particles move closer together.

D The energy overcomes attractive forces between the particles.

15 Elements X and Y are among the first 20 elements in the Periodic Table.

Element Y has 9 more protons than X.

Which statement about these two elements **must** be correct?

A They are both metallic elements.

B They are in the same group of the Periodic Table.

C They are in different periods of the Periodic Table.

D The number of electrons in their outer shell differs by 9.

16 Which statement about sodium ions and chloride ions in sodium chloride is **not** correct?

A They are strongly attracted to each other.

B They both have noble gas electronic configurations.

C They are arranged in a regular lattice.

D They share pairs of electrons.

17 Which dot-and-cross diagram shows the outer-shell electrons in a molecule of carbon dioxide?

A



B



C



D



18 Calcium carbonate reacts with dilute hydrochloric acid to make calcium chloride, carbon dioxide and water.

What is the balanced symbol equation and correct state symbols for this reaction?

A $CaCO_3(s) + HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$

B $CaCO_3(s) + HCl(l) \rightarrow CaCl_2(s) + CO_2(g) + H_2O(aq)$

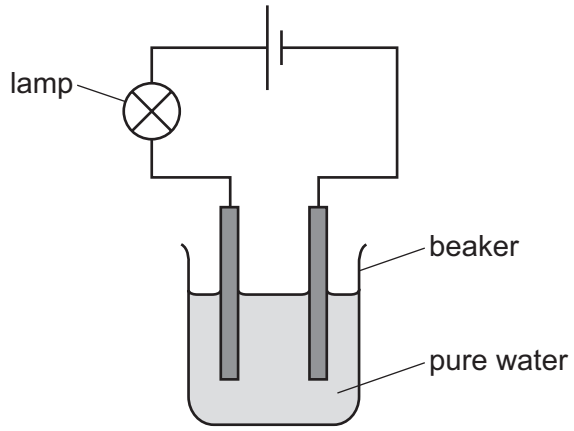
C $CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + CO_2(g) + H_2O(l)$

D $CaCO_3(s) + 2HCl(l) \rightarrow CaCl_2(s) + CO_2(g) + H_2O(aq)$

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19 The apparatus shown is used to test a property of compound R.



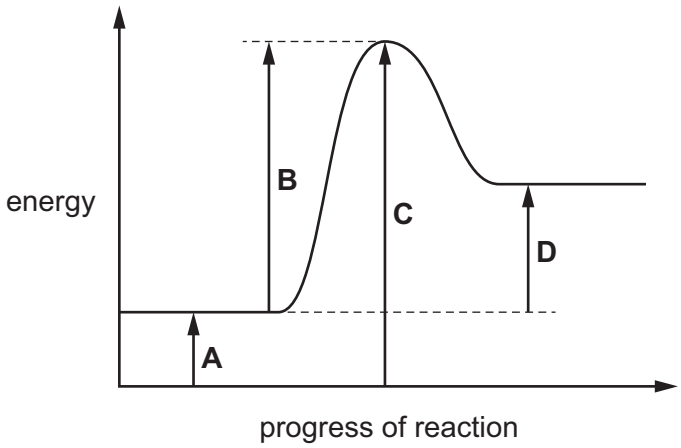
The lamp does **not** light when the beaker contains pure water.

When compound R is dissolved in the water, the lamp lights.

Which row describes compound R?

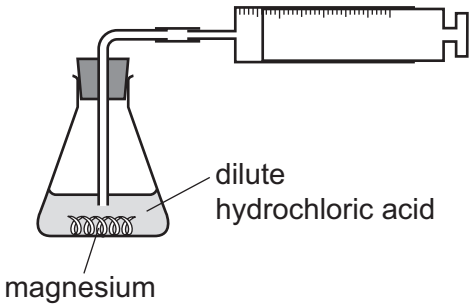
	type of bonding	elements of compound R
A	covalent	a metal and a non-metal
B	covalent	non-metals only
C	ionic	non-metals only
D	ionic	a metal and a non-metal

20 Which label represents the activation energy for an endothermic reaction?

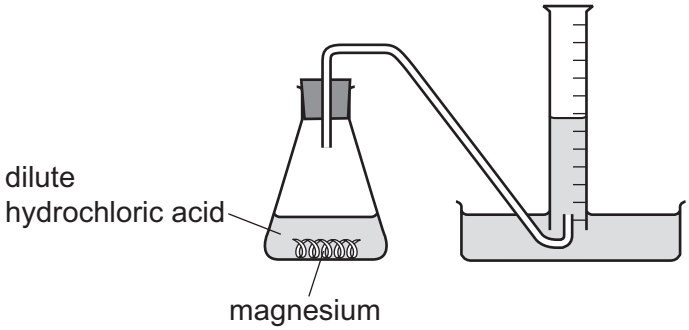


21 Which diagram shows apparatus correctly assembled to determine the rate of reaction between magnesium and dilute hydrochloric acid?

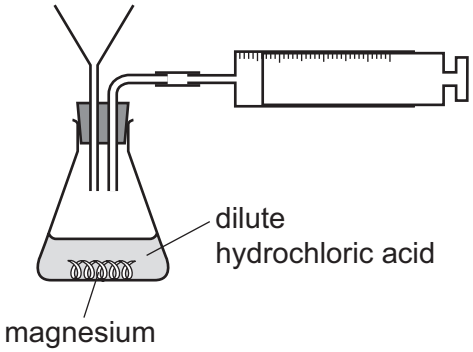
A



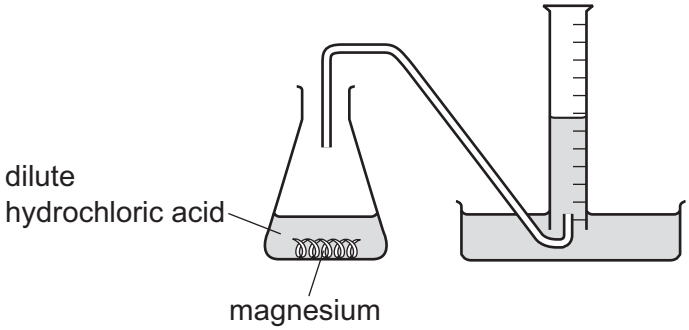
B



C



D



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22 Information about some elements in Group I, Group II and Group VII of the Periodic Table is shown.

Group I element melting point / °C	Group II element melting point / °C	Group VII element boiling point / °C
lithium = 181 potassium = 63	beryllium = 1278 calcium = 839	fluorine = –188 bromine = 59

A metal halide is formed when a metal in either Group I or Group II reacts with a Group VII element.

The metal has a melting point of 769 °C.

The Group VII element has a boiling point of –35 °C.

What is the metal halide?

A sodium chloride

B sodium iodide

C strontium chloride

D strontium iodide

23 Which statement describes a chemical test for water?

A Water boils at 100 °C.

B Water turns blue cobalt(II) chloride pink.

C Water turns blue copper(II) sulfate white.

D Water turns red litmus paper blue.

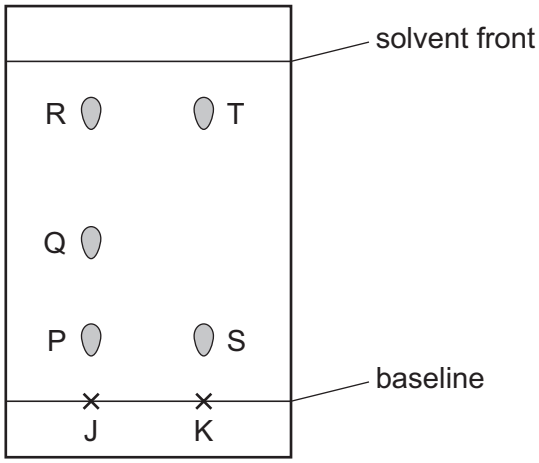
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24 Dyes J and K are analysed using chromatography.

Dye J contains coloured substances, P, Q and R.

Dye K contains coloured substances, S and T.



Which conclusions can be made using the chromatogram?

1 Dye K does **not** contain substance Q.

2 Dye J contains at least three substances.

3 The R_f of Q is less than the R_f of S.

4 R and T are different substances.

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

25 Which tests are used to identify the ions in aqueous iron(II) sulfate?

1 add acidified aqueous silver nitrate

2 add acidified aqueous barium nitrate

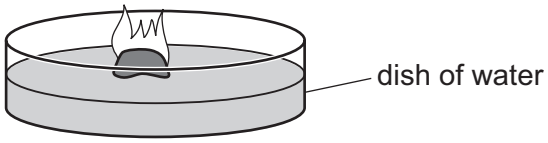
3 add aqueous sodium hydroxide

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

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26 The diagram shows a solid element dropped into a dish of water. The element catches fire and burns with a lilac flame.



What is the element?

A copper

B lithium

C potassium

D sodium

27 Carbon dioxide is a greenhouse gas.

Which statements describe why carbon dioxide leads to increased global warming?

1 Carbon dioxide absorbs thermal energy from the Earth's surface.

2 Carbon dioxide reduces the loss of thermal energy into space.

3 Carbon dioxide dissolves in water to produce acid rain.

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

28 On Earth, the acceleration of free fall is $9.8\,m/s^2$.

On Mars, the acceleration of free fall is $3.7\,m/s^2$.

The weight of a robot on Earth is 784 N.

The robot is taken to Mars.

What is the weight of the robot on Mars?

A 21.6 N **B** 212 N **C** 296 N **D** 784 N

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29 Four objects, P, Q, R and S, are moving.

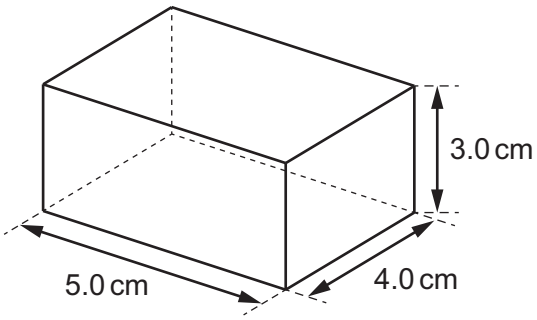
The table shows the mass and speed of each object.

	mass / kg	speed / m/s
P	1.0	4.0
Q	2.0	1.0
R	1.0	2.0
S	4.0	1.0

Which two objects have equal kinetic energies?

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

30 The solid block shown is made of a metal with density 7.0 g / cm^3.



What is the mass of the block?

A 4.7 g **B** 8.6 g **C** 84 g **D** 420 g

31 A liquid evaporates.

Which particles leave the surface of the liquid and what happens to the temperature of the remaining liquid?

A The less energetic particles leave and the temperature increases.

B The less energetic particles leave and the temperature decreases.

C The more energetic particles leave and the temperature decreases.

D The more energetic particles leave and the temperature increases.

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32 Which statement explains why metals are good thermal conductors?

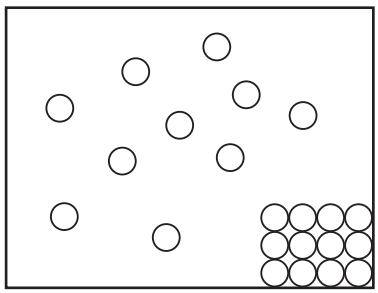
A Metals contain delocalised electrons that are free to move.

B Metal surfaces are shiny.

C The distance between metal atoms increases when the metal is heated.

D The nuclei of metal atoms are positively charged.

33 A student draws the diagram shown. The circles represent particles.



Which states of matter are represented in the diagram?

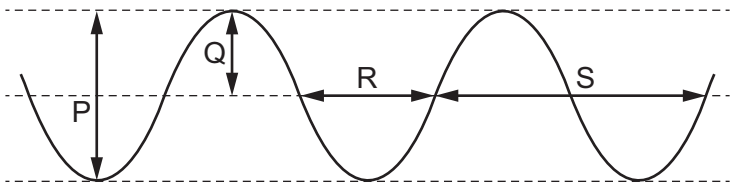
A gas and liquid only

B gas and solid only

C liquid and solid only

D gas, liquid and solid

34 The diagram represents a wave at one moment.



Which labelled arrows represent the amplitude and the wavelength of the wave?

	amplitude	wavelength
A	P	R
B	P	S
C	Q	R
D	Q	S

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35 Which statement about longitudinal waves and transverse waves is correct?

A Longitudinal waves cannot travel in a vacuum, but some transverse waves can.

B Transverse waves cannot travel in a vacuum, but some longitudinal waves can.

C Particles in a transverse wave oscillate parallel to the direction of travel of the wave.

D Particles in a longitudinal wave oscillate perpendicular to the direction of travel of the wave.

36 Which terms are used to describe the nature of sound waves in air?

A compressions and crests

B compressions and rarefactions

C crests and rarefactions

D crests and troughs

37 What are the two types of electric charge?

A left and right

B north and south

C positive and negative

D up and down

38 A charge of 12 C flows through a resistor in 5.0 minutes.

What is the current in the resistor?

A 0.040 A **B** 2.4 A **C** 25 A **D** 3600 A

39 A 6.0 Ω resistor is connected in parallel with a 12 Ω resistor.

What is the combined resistance of the two resistors in parallel?

A 0.25 Ω **B** 4.0 Ω **C** 18 Ω **D** 72 Ω

40 Which reaction releases energy in a stable star?

A combustion of hydrogen

B combustion of methane

C nuclear fission of helium

D nuclear fusion of hydrogen

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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.).

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