Cambridge Assessment International Education

Cambridge O Level

CHEMISTRY **5070/12**

Paper 1 Multiple Choice **May/June 2025**

1 hour

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.

[Turn over

1 At temperature X, the volume of samples of hexane and pentane are **not** affected by changing the pressure from 1 atm to 2 atm.

At temperature X, the pentane molecules are free to move.

At temperature X, the hexane molecules are in fixed positions.

What are the states of hexane and pentane at temperature X?

	hexane	pentane
A	liquid	solid
B	liquid	gas
C	solid	liquid
D	solid	gas

2 A gas is produced by a chemical reaction at one side of a laboratory.

After a few minutes, the gas is detected at the other side of the laboratory.

Which process explains why the gas is detected at the other side of the laboratory?

A condensation

B diffusion

C dissolving

D evaporation

3 Which statement is correct?

A All compounds are ionic.

B All compounds conduct electricity when molten.

C Each atom of an element contains the same number of protons.

D In a mixture of substances, the proportions of the substances are always the same.

4 Atoms of element Q form positive ions.

An ion of Q has 10 electrons and 14 neutrons.

Which statement is correct?

A An atom of Q has only two occupied electron shells.

B Q is a non-metal.

C The atomic number of Q is 10.

D The mass number of Q is greater than 24.

5 Which particle contains the greatest number of electrons?

A Mg^{2+} **B** N^{3-} **C** Ne **D** S^{2-}

6 The table shows data about the two isotopes in a sample of the element europium.

relative mass of isotope	percentage abundance of isotope
150.92	47.81
152.92	52.19

What is the relative atomic mass of this sample of europium?

A 151.88 **B** 151.96 **C** 152.00 **D** 152.04

7 Which statement about magnesium oxide is correct?

A It has a high melting point and good electrical conductivity at r.t.p.

B It is made up of magnesium anions and oxygen cations.

C It is an ionic compound and has good electrical conductivity when molten.

D It is strongly bonded because of electrons shared between magnesium atoms and oxygen atoms.

8 Which statement about silicon(IV) oxide is correct?

A It conducts electricity.

B It has a giant covalent structure.

C It is an alloy.

D It is ionically bonded.

9 Which compound has the highest relative formula mass, M_r?

[A_r: K, 39; N, 14; O, 16; Ca, 40; C, 12; Li, 7; S, 32; Mg, 24; C*l*, 35.5]

A calcium carbonate

B lithium sulfate

C magnesium chloride

D potassium nitrate

10 100 cm^3 of ethene is completely combusted in 400 cm^3 of oxygen. The volumes of both gases are measured at r.t.p.

What is the final volume of gas in the mixture measured at r.t.p.?

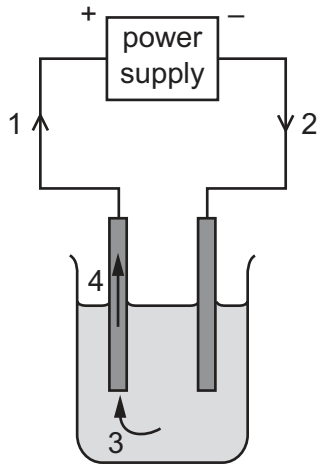
A 200 cm^3 **B** 250 cm^3 **C** 300 cm^3 **D** 500 cm^3

11 The formula of hydrated sodium carbonate is $Na_2CO_3 \cdot 10H_2O$.

What is the percentage composition by mass of oxygen in hydrated sodium carbonate?

A 16.8 **B** 22.4 **C** 55.9 **D** 72.7

12 The diagram shows the electrolysis of molten lead bromide with inert electrodes.



Which row identifies the particles that carry charge along each arrow?

	1	2	3	4
A	bromide ions	electrons	lead ions	electrons
B	electrons	electrons	bromide ions	lead ions
C	electrons	electrons	bromide ions	electrons
D	electrons	electrons	electrons	electrons

13 What are the products formed at the two electrodes when aqueous copper(II) sulfate is electrolysed using copper electrodes?

	anode product	cathode product
A	aqueous copper(II) ions	copper metal
B	aqueous copper(II) ions	hydrogen gas
C	oxygen gas	copper metal
D	oxygen gas	hydrogen gas

14 Which statement about a hydrogen–oxygen fuel cell is correct?

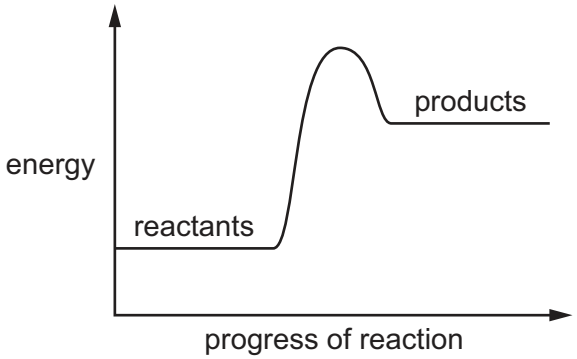
A It uses a chemical reaction that has only one product.

B It works by burning hydrogen in air.

C It requires a continuous input of electrical energy.

D It is less efficient than a petrol engine.

15 A reaction pathway diagram is shown.



Which equation does the reaction pathway diagram show?

A $2H(g) + O(g) \rightarrow H_2O(g)$

B $H_2(g) \rightarrow 2H(g)$

C $H_2O(g) \rightarrow H_2O(l)$

D $2O(g) \rightarrow O_2(g)$

16 Which process is a chemical change?

A the distillation of aqueous ethanol

B the evaporation of water from aqueous sodium chloride

C the melting of wax

D the rusting of iron

[Turn over

17 Aqueous sodium thiosulfate reacts with hydrochloric acid. The rate of the reaction increases if the concentration of both reactants is increased.

Nitrogen gas reacts with hydrogen gas. The rate of the reaction increases if the pressure in the reaction vessel is increased.

Which row correctly explains why the given change increases the rate of the reaction?

	increasing the concentration of aqueous sodium thiosulfate and hydrochloric acid	increasing the pressure in the reaction vessel containing nitrogen and hydrogen
A	higher frequency of collisions between particles	higher frequency of collisions between particles
B	higher frequency of collisions between particles	the activation energy is decreased
C	the activation energy is decreased	higher frequency of collisions between particles
D	the activation energy is decreased	the activation energy is decreased

18 Magnesium reacts with dilute sulfuric acid.

$$Mg(s) + H_2SO_4(aq) \rightarrow MgSO_4(aq) + H_2(g)$$

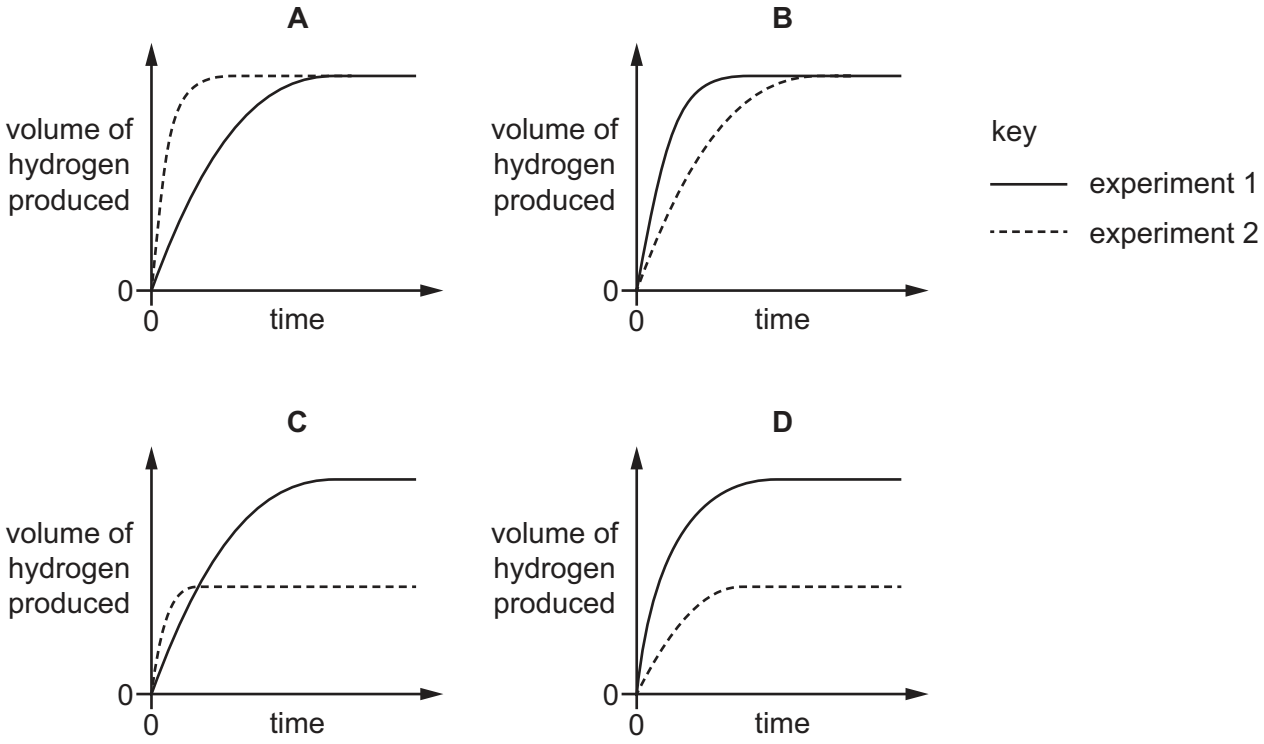
Two experiments are carried out at 25 °C.

experiment 1 24.0 g of powdered magnesium is reacted with 100 cm^3 of 1.0 mol/dm^3 sulfuric acid.

experiment 2 24.0 g of powdered magnesium is reacted with 50 cm^3 of 2.0 mol/dm^3 sulfuric acid.

During each experiment, the volume of hydrogen produced is measured at regular time intervals. The results are plotted on a graph.

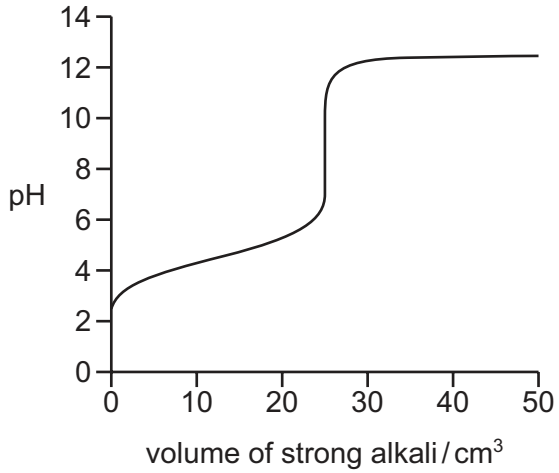
Which graph is correct?



19 Which row gives the catalyst for each of the two processes?

	Contact process	Haber process
A	iron	iron
B	iron	nickel
C	vanadium(V) oxide	iron
D	vanadium(V) oxide	nickel

20 The diagram shows the change in pH as a strong alkali is added to a weak acid.



40 cm^3 of a strong alkali is added to a weak acid and a sample of the solution is tested separately with methyl orange and thymolphthalein.

Which row is correct?

	methyl orange test	thymolphthalein test
A	red	colourless
B	yellow	colourless
C	red	blue
D	yellow	blue

21 Which row shows the equations for the dissociation of methanoic acid and of nitric acid?

	methanoic acid	nitric acid
A	$HCOOH(aq) \rightarrow H^+(aq) + HCOO^-(aq)$	$HNO_3(aq) \rightarrow H^+(aq) + NO_3^-(aq)$
B	$HCOOH(aq) \rightarrow H^+(aq) + HCOO^-(aq)$	$HNO_3(aq) \rightleftharpoons H^+(aq) + NO_3^-(aq)$
C	$HCOOH(aq) \rightleftharpoons H^+(aq) + HCOO^-(aq)$	$HNO_3(aq) \rightleftharpoons H^+(aq) + NO_3^-(aq)$
D	$HCOOH(aq) \rightleftharpoons H^+(aq) + HCOO^-(aq)$	$HNO_3(aq) \rightarrow H^+(aq) + NO_3^-(aq)$

22 Which statement about elements in the Periodic Table is correct?

A Across a period, elements at the left-hand side of the Periodic Table are more metallic than those at the right-hand side.

B Down a group, elements at the top of the group lose electrons more readily than those at the bottom of the group.

C Elements in the same group of the Periodic Table have the same number of completed shells of electrons.

D Elements in the same period of the Periodic Table have the same number of electrons in the outer shell.

23 Rubidium and caesium are both elements in Group I of the Periodic Table.

Which prediction comparing rubidium and caesium is correct?

A Caesium has the higher density and the greater reactivity.

B Caesium has the higher density; rubidium has the greater reactivity.

C Rubidium has the higher density and the greater reactivity.

D Rubidium has the higher density; caesium has the greater reactivity.

24 Three statements about the halogens are listed.

1 All halogens are non-metallic diatomic molecules.

2 Chlorine displaces both bromine and iodine from aqueous solutions of their salts.

3 The halogens become more reactive on descending Group VII of the Periodic Table.

Which statements are correct?

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

25 Which statements about neon are correct?

1 It is unreactive.

2 It has strong intermolecular forces.

3 It has a full outer shell of electrons.

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

26 Substance X has the following properties.

- melting point 1237 °C
- boiling point 2595 °C
- malleable
- good electrical and thermal conductivity at r.t.p.

What is the structure of substance X?

A giant covalent

B giant ionic lattice

C giant metallic lattice

D simple molecular

27 Which statement explains why objects manufactured from aluminium corrode very slowly?

A Aluminium is above hydrogen in the reactivity series.

B Aluminium is below hydrogen in the reactivity series.

C The objects become coated with a protective layer of aluminium nitride.

D The objects become coated with a protective layer of aluminium oxide.

28 The iron(III) oxide used in a blast furnace contains the impurity silicon(IV) oxide, SiO_2.

Which reaction removes the silicon(IV) oxide?

A $3SiO_2 + Fe_2O_3 \rightarrow 2Fe + 3SiO_3$

B $SiO_2 + C \rightarrow Si + CO_2$

C $SiO_2 + CaO \rightarrow CaSiO_3$

D $2SiO_2 + N_2 \rightarrow 2Si + 2NO_2$

29 The domestic water supply is treated before it is supplied to houses. Three treatments are listed.

- sedimentation and filtration
- treatment with chlorine
- treatment with carbon

Which row shows the purpose of the treatments?

	sedimentation and filtration	treatment with chlorine	treatment with carbon
A	kills microbes	removes solids	removes unpleasant tastes and odours
B	removes solids	kills microbes	removes unpleasant tastes and odours
C	removes solids	removes unpleasant tastes and odours	kills microbes
D	removes unpleasant tastes and odours	kills microbes	removes solids

30 Nitrates and ammonium salts are used as fertilisers.

Which fertiliser contains the greatest mass of nitrogen in 50 kg of the compound?

[A_r: H, 1; N, 14; O, 16; S, 32; Cl, 35.5; K, 39]

A NH_4Cl **B** NH_4NO_3 **C** $(NH_4)_2SO_4$ **D** KNO_3

31 Which strategy reduces methane emissions?

A flue gas desulfurisation

B planting more trees

C reduction in livestock farming

D use of catalytic converters

32 Compound P is an alcohol with the molecular formula $C_4H_{10}O$.

How many structural isomers are there of compound P?

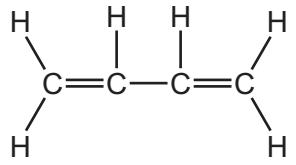
A 2 **B** 3 **C** 4 **D** 5

33 Alkanes undergo a substitution reaction with chlorine.

Which row shows two correct statements about the reaction between alkanes and chlorine?

	statement 1	statement 2
A	a carbon atom is replaced by a chlorine atom	the reaction requires thermal energy
B	a hydrogen atom is replaced by a chlorine atom	the reaction requires thermal energy
C	a carbon atom is replaced by a chlorine atom	the reaction requires ultraviolet light
D	a hydrogen atom is replaced by a chlorine atom	the reaction requires ultraviolet light

34 A molecule of the compound C_4H_6 is shown.



This molecule undergoes two separate addition reactions. It undergoes an addition reaction with excess bromine and an addition reaction with steam.

One molecule of C_4H_6 reacts with .....1..... of bromine.

When C_4H_6 reacts with steam, ...2..... is formed.

Which words complete gaps 1 and 2?

	1	2
A	one molecule	an alcohol
B	one molecule	a carboxylic acid
C	two molecules	an alcohol
D	two molecules	a carboxylic acid

35 Which statement about members of the homologous series of alcohols is correct?

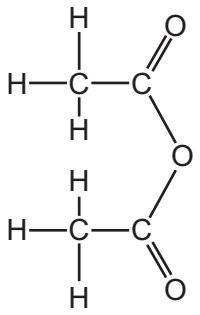
A An alcohol with two carbon atoms in each molecule is called methanol.

B Butanol can be combusted to give carbon dioxide and water only.

C Ethanol is the only alcohol that can be oxidised to a carboxylic acid.

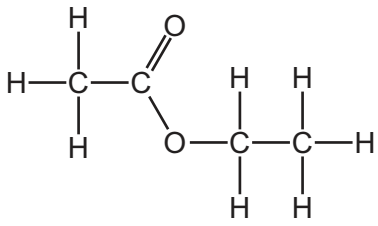
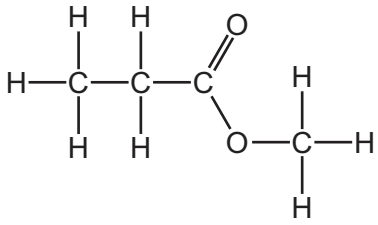
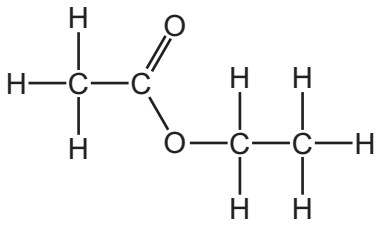
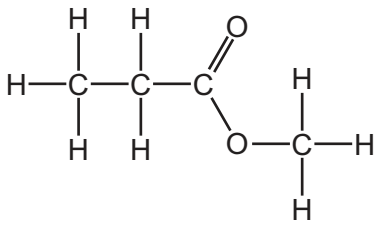
D Propanol can be made by the catalysed addition of steam to ethene.

36 The diagram shows the structure of a compound called ethanoic anhydride.



1 mol of ethanoic anhydride reacts with water to form 2 mol of a carboxylic acid only. This carboxylic acid reacts with ethanol to form an ester.

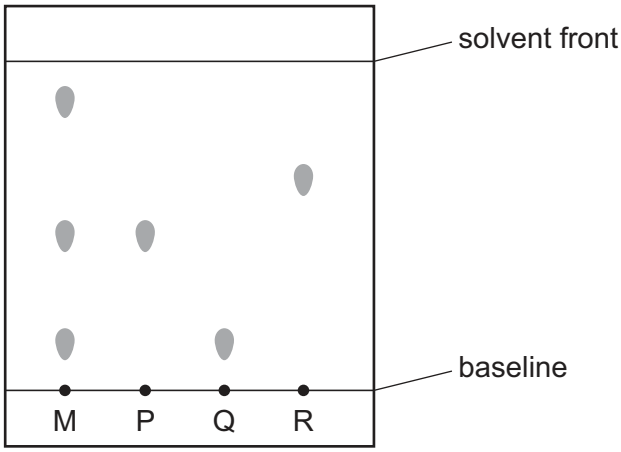
How many moles of water react with 1 mol of the ethanoic anhydride and what is the structure of the ester?

	number of moles of water	structure of the ester
A	1	
B	1	
C	2	
D	2	

37 Four samples are analysed using paper chromatography.

P, Q and R are pure substances.

M is a mixture of different substances.



Which substances does mixture M contain?

A P, Q and R

B P, Q and another substance

C P and Q only

D P and R only

38 A student is making a sample of aqueous copper(II) sulfate. The student adds an excess of copper(II) oxide powder to warm sulfuric acid and stirs the mixture.

Which apparatus is used to separate aqueous copper(II) sulfate from the excess copper(II) oxide?

A burette

B distillation apparatus

C filter funnel and paper

D measuring cylinder

39 How can a pure sample of barium sulfate be obtained from barium carbonate?

A Dissolve it in dilute hydrochloric acid, add dilute sulfuric acid, filter and crystallise.

B Dissolve it in dilute hydrochloric acid, add dilute sulfuric acid, filter and wash.

C Dissolve it in water, add dilute sulfuric acid, filter and crystallise.

D Dissolve it in water, add dilute sulfuric acid, filter and wash.

40 A sample of a white powder, X, is dissolved in water.

Tests are done on separate portions of this solution and the observations are shown in the table.

test	observation
add aqueous sodium hydroxide a drop at a time until in excess	white precipitate forms, soluble in excess, giving a colourless solution
acidify with dilute nitric acid then add aqueous silver nitrate	white precipitate forms
acidify with dilute nitric acid then add aqueous barium nitrate	the solution remains colourless

What is X?

A aluminium chloride

B aluminium sulfate

C calcium chloride

D calcium sulfate

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.).