



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

**CHEMISTRY**

**0620/12**

Paper 1 Multiple Choice (Core)

**May/June 2016**

**45 Minutes**

Additional Materials:      Multiple Choice Answer Sheet  
   Soft clean eraser  
   Soft pencil (type B or HB is recommended)

\* 2 8 4 7 1 4 4 7 5 0 \*

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.  
Do not use staples, paper clips, glue or correction fluid.  
Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.  
**DO NOT WRITE IN ANY BARCODES.**

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 separate Answer Sheet.

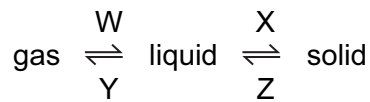
**Read the instructions on the Answer Sheet very carefully.**

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.  
Any rough working should be done in this booklet.  
A copy of the Periodic Table is printed on page 20.  
Electronic calculators may be used.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

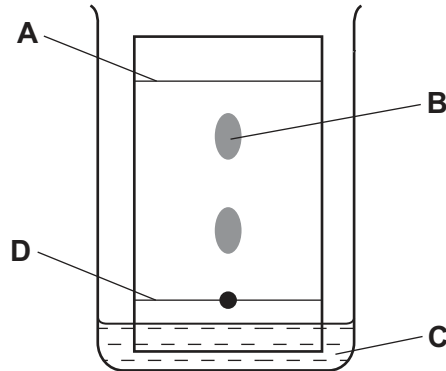
This document consists of **17** printed pages and **3** blank pages.

1 In which changes do the particles move further apart?



- A** W and X      **B** W and Z      **C** X and Y      **D** Y and Z

2 In the chromatography experiment shown, which label represents the solvent front?



3 One of the instructions for an experiment reads as follows.

Quickly add 50 cm<sup>3</sup> of acid.

What is the best piece of apparatus to use?

- A** a burette  
**B** a conical flask  
**C** a measuring cylinder  
**D** a pipette

4 Two statements about diamond are given.

- 1 Diamond has a giant three-dimensional covalent structure of carbon atoms.
- 2 Diamond is one of the hardest substances known.

Which is correct?

- A** Both statements are correct and statement 1 explains statement 2.  
**B** Both statements are correct but statement 2 does not explain statement 1.  
**C** Statement 1 is correct but statement 2 is incorrect.  
**D** Statement 2 is correct but statement 1 is incorrect.

- 5 The table shows the electronic structure of four atoms.

atom	electronic structure
W	2,8,1
X	2,8,4
Y	2,8,7
Z	2,8,8

Which two atoms combine to form a covalent compound?

- A** W and X      **B** W and Y      **C** X and Y      **D** X and Z
- 6 An atom of element Q contains 19 electrons, 19 protons and 20 neutrons.

What is Q?

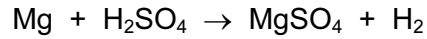
- A** calcium  
**B** potassium  
**C** strontium  
**D** yttrium
- 7 Lithium is in Group I of the Periodic Table. Nitrogen is in Group V of the Periodic Table.

Lithium reacts with nitrogen to form the ionic compound lithium nitride.

What happens to the electrons when lithium atoms and nitrogen atoms form ions?

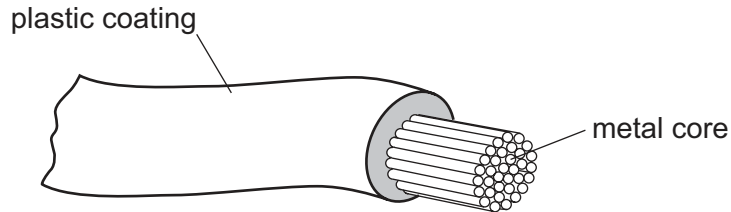
	lithium atoms	nitrogen atoms
<b>A</b>	each lithium atom loses one electron to form a $\text{Li}^+$ ion	each nitrogen atom gains three electrons to form an $\text{N}^{3-}$ ion
<b>B</b>	each lithium atom loses one electron to form a $\text{Li}^+$ ion	each nitrogen atom gains five electrons to form an $\text{N}^{5-}$ ion
<b>C</b>	each lithium atom gains one electron to form a $\text{Li}^-$ ion	each nitrogen atom loses three electrons to form an $\text{N}^{3+}$ ion
<b>D</b>	each lithium atom gains one electron to form a $\text{Li}^-$ ion	each nitrogen atom loses five electrons to form an $\text{N}^{5+}$ ion

- 8 The equation shows the reaction between magnesium and sulfuric acid.  
[A<sub>r</sub>: H, 1; O, 16; Mg, 24; S, 32]



In this reaction, which mass of magnesium sulfate is formed when 6 g of magnesium react with excess sulfuric acid?

- A** 8                      **B** 24                      **C** 30                      **D** 60
- 9 The diagram shows an electrical cable.

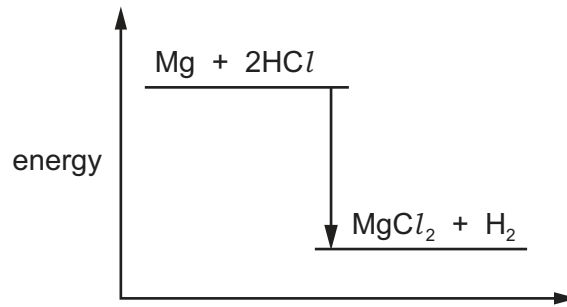


Which statement about the substances used is correct?

- A** The coating is plastic because it conducts electricity well.  
**B** The core is copper because it conducts electricity well.  
**C** The core is copper because it is cheap and strong.  
**D** The core is iron because it is cheap and strong.
- 10 What are the products at the electrodes when dilute sulfuric acid is electrolysed using inert electrodes?

	anode	cathode
<b>A</b>	hydrogen	oxygen
<b>B</b>	oxygen	hydrogen
<b>C</b>	sulfur	oxygen
<b>D</b>	sulfur dioxide	hydrogen

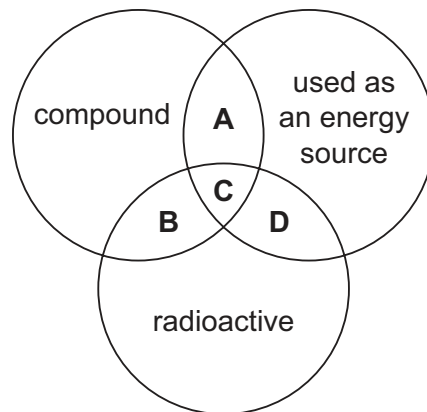
11 The energy level diagram for the reaction between magnesium and hydrochloric acid is shown.



Which statement about the reaction is **not** correct?

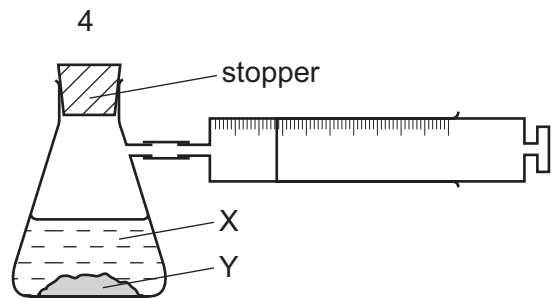
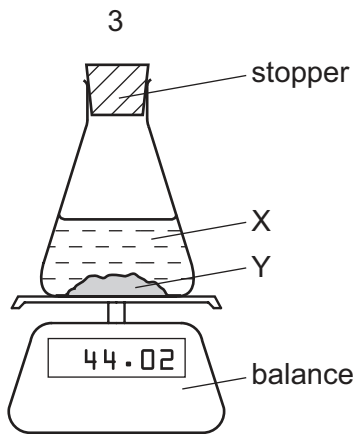
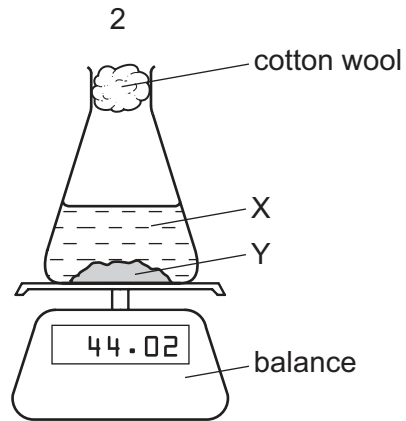
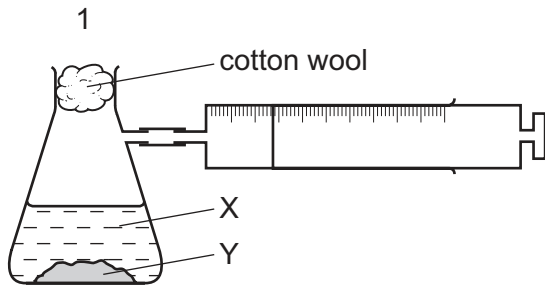
- A Energy is given out during the reaction.
  - B The products are at a lower energy level than the reactants.
  - C The reaction is endothermic.
  - D The temperature increases during the reaction.
- 12 The diagram shows some properties that substances may have.

To which labelled part of the diagram does  $^{235}\text{U}$  belong?



13 A liquid X reacts with solid Y to form a gas.

Which two diagrams show suitable methods for investigating the rate (speed) of the reaction?



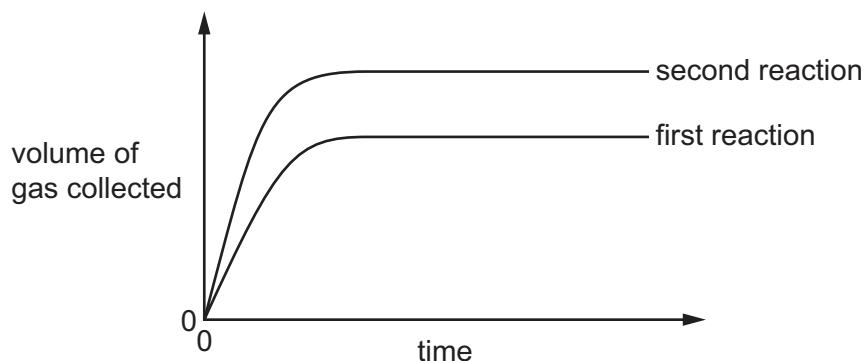
A 1 and 3

B 1 and 4

C 2 and 3

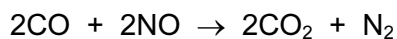
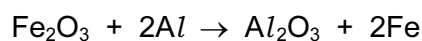
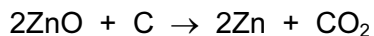
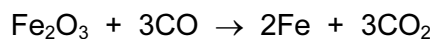
D 2 and 4

- 14 The results of two separate reactions between excess calcium carbonate and hydrochloric acid are shown.



Which statement explains the differences between the reactions?

- A** More calcium carbonate was used in the second reaction.  
**B** The same volume of more concentrated acid was used in the second reaction.  
**C** The second reaction was allowed to react for longer.  
**D** The temperature was higher in the second reaction.
- 15 The equations below all show redox reactions.



Which oxide is oxidised in these reactions?

- A**  $\text{Fe}_2\text{O}_3$       **B**  $\text{CO}$       **C**  $\text{ZnO}$       **D**  $\text{NO}$
- 16 In which reaction is the colour change from blue to white?

- A** heating hydrated cobalt(II) chloride  
**B** heating hydrated copper(II) sulfate  
**C** adding water to anhydrous cobalt(II) chloride  
**D** adding water to anhydrous copper(II) sulfate





20 The following tests are carried out on an aqueous solution of salt X.

test	observation
sodium hydroxide solution is added	a green precipitate is formed which dissolves in excess
a small piece of aluminium foil is then added to the mixture and the mixture is heated	a gas is given off which turns damp, red litmus paper blue

What is X?

- A aluminium nitrate
- B ammonium sulfate
- C chromium(III) nitrate
- D iron(II) nitrate

21 Where in the Periodic Table is the metallic character of the elements greatest?

	left or right side of a period	at the top or bottom of a group
A	left	bottom
B	left	top
C	right	bottom
D	right	top

22 Rubidium is a Group I metal.

Which statement about rubidium is **not** correct?

- A It has a higher melting point than lithium.
- B It has one electron in its outer shell.
- C It reacts vigorously with water.
- D It reacts with chlorine to form rubidium chloride,  $\text{RbCl}$ .



26 Some chemical properties of three metals W, X and Y and their oxides are shown.

metal	reaction with steam	reaction with dilute hydrochloric acid	reaction of metal oxide with carbon
W	reacts	reacts	reacts
X	no reaction	no reaction	reacts
Y	reacts	reacts	no reaction

What is the order of reactivity of these metals, most reactive first?

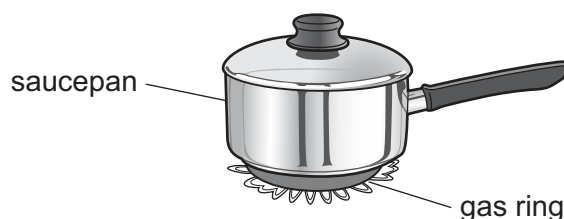
- A** W → Y → X  
**B** X → Y → W  
**C** Y → W → X  
**D** Y → X → W

27 Iron from a blast furnace is treated with oxygen and with calcium oxide to make steel.

Which substances in the iron are removed?

	oxygen removes	calcium oxide removes
<b>A</b>	carbon	acidic oxides
<b>B</b>	carbon	basic oxides
<b>C</b>	iron	acidic oxides
<b>D</b>	iron	basic oxides

28 Copper is sometimes used to make cooking utensils.



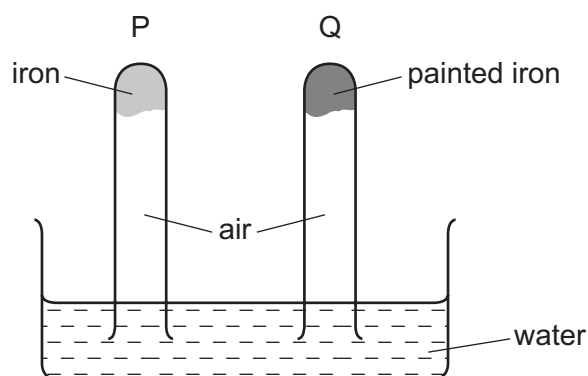
Three properties of copper are given.

- 1 corrosion resistant
- 2 good conductor of electricity
- 3 good conductor of heat

Which properties make copper a suitable metal for making cooking utensils?

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

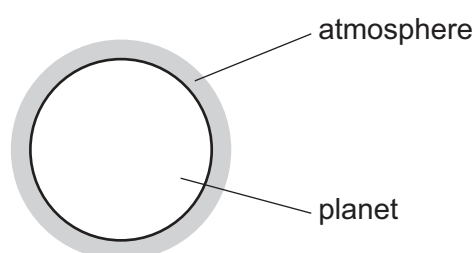
29 The diagram shows an experiment to investigate how paint affects the rusting of iron.



What happens to the water level in tubes P and Q?

	tube P	tube Q
<b>A</b>	falls	rises
<b>B</b>	no change	rises
<b>C</b>	rises	falls
<b>D</b>	rises	no change

30 A new planet has been discovered and its atmosphere has been analysed.



The table shows the composition of its atmosphere.

gas	percentage by volume
carbon dioxide	4
nitrogen	72
oxygen	24

Which gases are present in the atmosphere of the planet in a higher percentage than they are in the Earth's atmosphere?

- A** carbon dioxide and oxygen
- B** carbon dioxide only
- C** nitrogen and oxygen
- D** nitrogen only

31 Which of the following are tests for water?

- 1 It turns anhydrous copper(II) sulfate blue.
- 2 It boils at 100 °C.
- 3 It turns anhydrous cobalt(II) chloride paper blue.

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

32 Sulfur dioxide, carbon monoxide and oxides of nitrogen are common gaseous pollutants found in the air.

Which pollutants contribute to acid rain?

- A** carbon monoxide and sulfur dioxide
- B** oxides of nitrogen and sulfur dioxide
- C** oxides of nitrogen only
- D** sulfur dioxide only

33 Which compound is **not** used as a fertiliser?

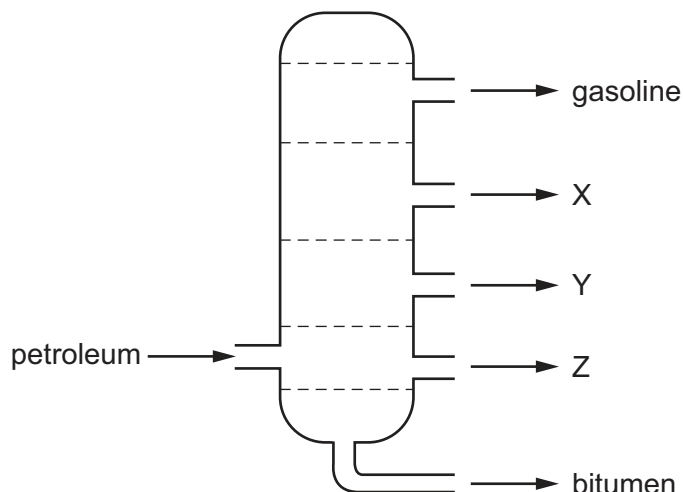
- A** ammonium phosphate
- B** ammonium sulfate
- C** calcium carbonate
- D** potassium nitrate

34 Lime (calcium oxide) is used to treat waste water from a factory.

Which substance is removed by the lime?

- A** ammonia
- B** sodium chloride
- C** sodium hydroxide
- D** sulfuric acid

35 The diagram shows the separation of petroleum into fractions.



What could X, Y and Z represent?

	X	Y	Z
<b>A</b>	diesel oil	lubricating fraction	paraffin
<b>B</b>	lubricating fraction	diesel oil	paraffin
<b>C</b>	paraffin	lubricating fraction	diesel oil
<b>D</b>	paraffin	diesel oil	lubricating fraction

36 Which compound is **not** an alkane,  $C_nH_{2n+2}$ ?

- A**  $CH_3CH_2CH_2CH_3$
- B**  $(CH_3)_2CHCH_3$
- C**  $CH_3CHCHCH_3$
- D**  $(CH_3)_3CH$

37 A hydrocarbon W burns to form carbon dioxide and water.

W decolourises bromine water.

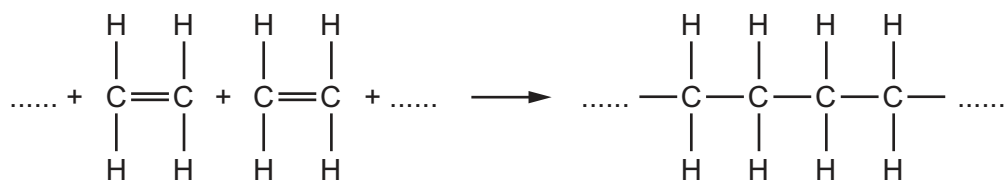
What is the name of W and what is its structure?

	name of W	structure of W
<b>A</b>	ethane	$  \begin{array}{c}  \text{H} \quad \text{H} \\    \quad   \\  \text{H}-\text{C}-\text{C}-\text{H} \\    \quad   \\  \text{H} \quad \text{H}  \end{array}  $
<b>B</b>	ethane	$  \begin{array}{c}  \text{H} \quad \text{H} \\  \diagdown \quad / \\  \text{C}=\text{C} \\  / \quad \diagdown \\  \text{H} \quad \text{H}  \end{array}  $
<b>C</b>	ethene	$  \begin{array}{c}  \text{H} \quad \text{H} \\    \quad   \\  \text{H}-\text{C}-\text{C}-\text{H} \\    \quad   \\  \text{H} \quad \text{H}  \end{array}  $
<b>D</b>	ethene	$  \begin{array}{c}  \text{H} \quad \text{H} \\  \diagdown \quad / \\  \text{C}=\text{C} \\  / \quad \diagdown \\  \text{H} \quad \text{H}  \end{array}  $

38 Which term describes the formation of ethanol from glucose?

- A** cracking
- B** distillation
- C** fermentation
- D** polymerisation

39 Ethene forms an addition polymer as shown.



Which terms describe this polymer?

- A a saturated compound called poly(ethane)
  - B a saturated compound called poly(ethene)
  - C an unsaturated compound called poly(ethane)
  - D an unsaturated compound called poly(ethene)
- 40 Which statement about carboxylic acids is **not** correct?
- A Aqueous ethanoic acid has a pH below pH 7.
  - B They contain the functional group  $-\text{COOH}$ .
  - C They produce carbon dioxide when reacted with a metal carbonate.
  - D Methyl orange turns yellow in aqueous ethanoic acid.







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## The Periodic Table of Elements

		Group															
I	II	III	IV	V	VI	VII	VIII										
3 <b>Li</b> lithium 7	4 <b>Be</b> beryllium 9	1 <b>H</b> hydrogen 1	5 <b>B</b> boron 11	6 <b>C</b> carbon 12	7 <b>N</b> nitrogen 14	8 <b>O</b> oxygen 16	9 <b>F</b> fluorine 19	10 <b>Ne</b> neon 20									
11 <b>Na</b> sodium 23	12 <b>Mg</b> magnesium 24	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: auto;"> <b>Key</b>            atomic number            atomic symbol            name            relative atomic mass         </div>															
19 <b>K</b> potassium 39	20 <b>Ca</b> calcium 40	21 <b>Sc</b> scandium 45	22 <b>Ti</b> titanium 48	23 <b>V</b> vanadium 51	24 <b>Cr</b> chromium 52	25 <b>Mn</b> manganese 55	26 <b>Fe</b> iron 56	27 <b>Co</b> cobalt 59	28 <b>Ni</b> nickel 59	29 <b>Cu</b> copper 64	30 <b>Zn</b> zinc 65	31 <b>Ga</b> gallium 70	32 <b>Ge</b> germanium 73	33 <b>As</b> arsenic 75	34 <b>Se</b> selenium 79	35 <b>Br</b> bromine 80	36 <b>Kr</b> krypton 84
37 <b>Rb</b> rubidium 85	38 <b>Sr</b> strontium 88	39 <b>Y</b> yttrium 89	40 <b>Zr</b> zirconium 91	41 <b>Nb</b> niobium 93	42 <b>Mo</b> molybdenum 96	43 <b>Tc</b> technetium —	44 <b>Ru</b> ruthenium 101	45 <b>Rh</b> rhodium 103	46 <b>Pd</b> palladium 106	47 <b>Ag</b> silver 108	48 <b>Cd</b> cadmium 112	49 <b>In</b> indium 115	50 <b>Sn</b> tin 119	51 <b>Sb</b> antimony 122	52 <b>Te</b> tellurium 128	53 <b>I</b> iodine 127	54 <b>Xe</b> xenon 131
55 <b>Cs</b> caesium 133	56 <b>Ba</b> barium 137	57–71 lanthanoids	72 <b>Hf</b> hafnium 178	73 <b>Ta</b> tantalum 181	74 <b>W</b> tungsten 184	75 <b>Re</b> rhenium 186	76 <b>Os</b> osmium 190	77 <b>Ir</b> iridium 192	78 <b>Pt</b> platinum 195	79 <b>Au</b> gold 197	80 <b>Hg</b> mercury 201	81 <b>Tl</b> thallium 204	82 <b>Pb</b> lead 207	83 <b>Bi</b> bismuth 209	84 <b>Po</b> polonium —	85 <b>At</b> astatine —	86 <b>Rn</b> radon —
87 <b>Fr</b> francium —	88 <b>Ra</b> radium —	89–103 actinoids	104 <b>Rf</b> rutherfordium —	105 <b>Db</b> dubnium —	106 <b>Sg</b> seaborgium —	107 <b>Bh</b> bohrium —	108 <b>Hs</b> hassium —	109 <b>Mt</b> meitnerium —	110 <b>Ds</b> darmstadtium —	111 <b>Rg</b> roentgenium —	112 <b>Cn</b> copernicium —	114 <b>Fl</b> flerovium —	116 <b>Lv</b> livermorium —	—	—	—	—

57 <b>La</b> lanthanum 139	58 <b>Ce</b> cerium 140	59 <b>Pr</b> praseodymium 141	60 <b>Nd</b> neodymium 144	61 <b>Pm</b> promethium —	62 <b>Sm</b> samarium 150	63 <b>Eu</b> europium 152	64 <b>Gd</b> gadolinium 157	65 <b>Tb</b> terbium 159	66 <b>Dy</b> dysprosium 163	67 <b>Ho</b> holmium 165	68 <b>Er</b> erbium 167	69 <b>Tm</b> thulium 169	70 <b>Yb</b> ytterbium 173	71 <b>Lu</b> lutetium 175
89 <b>Ac</b> actinium —	90 <b>Th</b> thorium 232	91 <b>Pa</b> protactinium 231	92 <b>U</b> uranium 238	93 <b>Np</b> neptunium —	94 <b>Pu</b> plutonium —	95 <b>Am</b> americium —	96 <b>Cm</b> curium —	97 <b>Bk</b> berkelium —	98 <b>Cf</b> californium —	99 <b>Es</b> einsteinium —	100 <b>Fm</b> fermium —	101 <b>Md</b> mendelevium —	102 <b>No</b> nobelium —	103 <b>Lr</b> lawrencium —

lanthanoids

actinoids

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.)