



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

**CHEMISTRY**

**0620/12**

Paper 1 Multiple Choice (Core)

**October/November 2017**

**45 minutes**

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

\* 1 0 1 1 3 8 9 9 2 4 \*

**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 16.

Electronic calculators may be used.

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

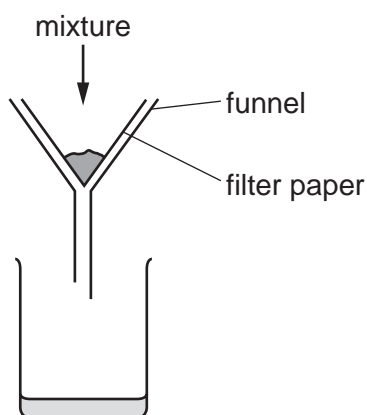
This document consists of **15** printed pages and **1** blank page.

- 1 The melting points and boiling points of four elements are shown.

element	melting point/°C	boiling point/°C
W	-7	60
X	-101	-34
Y	114	184
Z	39	688

In which elements do the particles vibrate about fixed positions at 0 °C?

- A** W and X      **B** W and Z      **C** X and Y      **D** Y and Z
- 2 The apparatus used to separate a mixture is shown.



What is the mixture?

- A** aqueous calcium chloride and aqueous calcium nitrate  
**B** calcium carbonate and aqueous calcium chloride  
**C** ethanol and water  
**D** sand and calcium carbonate
- 3 During an experiment a measurement is recorded in cm<sup>3</sup>.

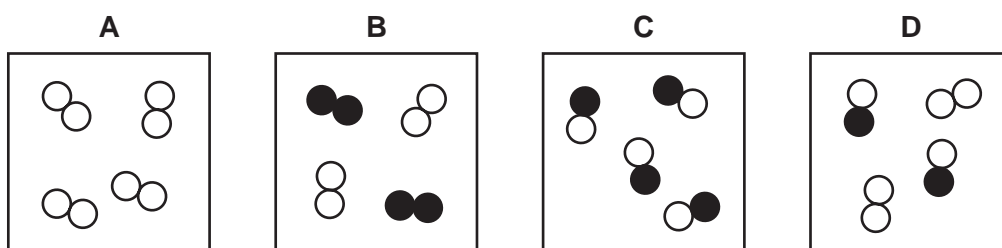
Which apparatus is used?

- A** balance  
**B** measuring cylinder  
**C** stopclock  
**D** thermometer

- 4 Substance Q boils at  $445^{\circ}\text{C}$  and is a yellow solid at room temperature.

Which temperature could be the melting point of pure Q?

- A  $-9^{\circ}\text{C}$   
 B  $72^{\circ}\text{C}$  to  $78^{\circ}\text{C}$   
 C  $116^{\circ}\text{C}$   
 D  $116^{\circ}\text{C}$  to  $126^{\circ}\text{C}$
- 5 Which diagram shows a mixture of an element and a compound?



- 6 Which pair of atoms contains the same number of neutrons?

- A  ${}_{27}^{59}\text{Co}$  and  ${}_{28}^{59}\text{Ni}$   
 B  ${}_{29}^{64}\text{Cu}$  and  ${}_{29}^{65}\text{Cu}$   
 C  ${}_{29}^{64}\text{Cu}$  and  ${}_{30}^{65}\text{Zn}$   
 D  ${}_{29}^{65}\text{Cu}$  and  ${}_{30}^{65}\text{Zn}$

- 7 In which row do the properties described match the type of bonding?

	melting point	electrical conductivity when liquid	type of bonding
<b>A</b>	high	does not conduct	ionic
<b>B</b>	low	conducts	covalent
<b>C</b>	low	conducts	ionic
<b>D</b>	low	does not conduct	covalent

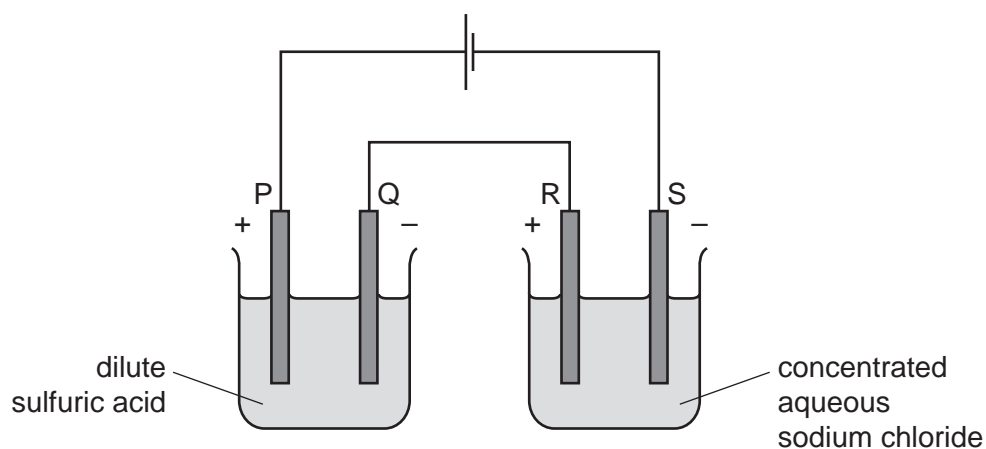
8 Which statement explains why graphite is used a lubricant?

- A All bonds between the atoms are weak.
- B It conducts electricity.
- C It has a low melting point.
- D Layers in the structure can slide over each other.

9 What is the relative formula mass of magnesium nitrate,  $\text{Mg}(\text{NO}_3)_2$ ?

- A 74
- B 86
- C 134
- D 148

10 The diagram shows the electrolysis of two solutions using inert electrodes.



Which substance is made at each electrode?

	P	Q	R	S
<b>A</b>	hydrogen	oxygen	chlorine	sodium
<b>B</b>	hydrogen	oxygen	sodium	chlorine
<b>C</b>	oxygen	hydrogen	chlorine	hydrogen
<b>D</b>	oxygen	hydrogen	hydrogen	chlorine

11 Two chemical processes are described.

- During the combustion of ethanol, energy is .....1..... .
- During the electrolysis of aqueous sodium chloride, energy is .....2..... .

Which words complete gaps 1 and 2?

	1	2
<b>A</b>	given out	given out
<b>B</b>	given out	taken in
<b>C</b>	taken in	given out
<b>D</b>	taken in	taken in

12 Water is added to anhydrous copper(II) sulfate in a test-tube.

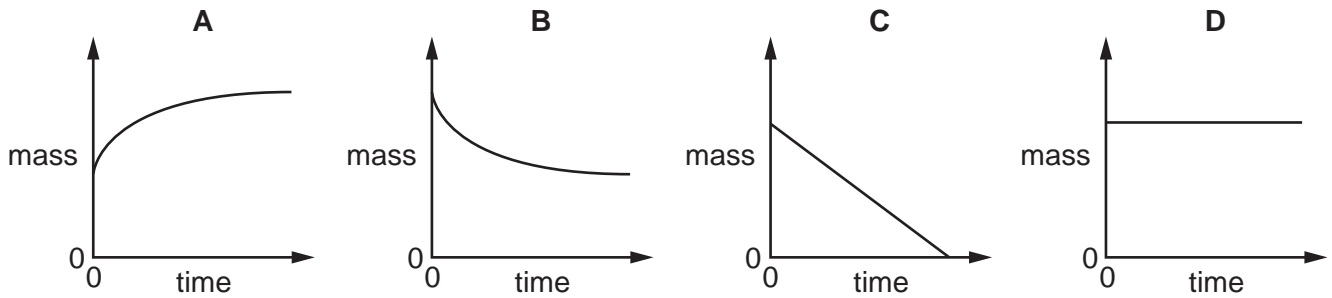
The mixture becomes hot.

Which type of reaction and energy level diagram apply to this reaction?

	type of reaction	energy level diagram
<b>A</b>	endothermic	
<b>B</b>	endothermic	
<b>C</b>	exothermic	
<b>D</b>	exothermic	

13 The mass of a beaker and its contents is plotted against time.

Which graph represents what happens when sodium carbonate reacts with an excess of dilute hydrochloric acid in an open beaker?



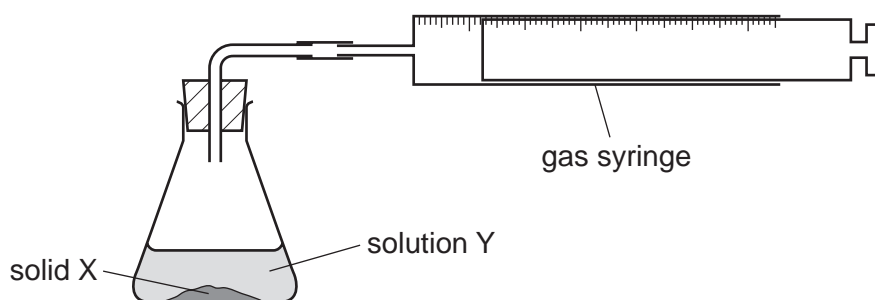
14 When blue copper(II) sulfate is heated, a white solid and water are formed.

The white solid turns blue and gives out heat when water is added to it.

Which terms describe the blue copper(II) sulfate and the reactions?

	the blue copper(II) sulfate is	reactions
<b>A</b>	a mixture	can be reversed
<b>B</b>	a mixture	cannot be reversed
<b>C</b>	hydrated	can be reversed
<b>D</b>	hydrated	cannot be reversed

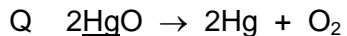
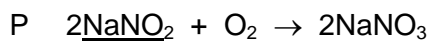
- 15 An experiment was carried out to find the rate of reaction when 1 g of solid X reacts with 100 cm<sup>3</sup> of solution Y.



The experiment took place too quickly for measurements to be made.

Which change could be made to slow down the reaction?

- A add a catalyst
  - B decrease the concentration of solution Y
  - C decrease the particle size of solid X
  - D increase the temperature
- 16 The equations for two reactions P and Q are given.



In which of these reactions does oxidation of the underlined substance occur?

	P	Q
A	✓	✓
B	✓	x
C	x	✓
D	x	x

- 17 What is **not** a typical characteristic of acids?

- A They react with alkalis producing water.
- B They react with **all** metals producing hydrogen.
- C They react with carbonates producing carbon dioxide.
- D They turn blue litmus paper red.

18 Elements Q and R both burn in air.

The oxides formed both dissolve in water.

The solution of the oxide formed from element Q turns Universal Indicator red.

The solution of the oxide formed from element R turns Universal Indicator blue.

What are Q and R?

	Q	R
A	carbon	sulfur
B	sodium	magnesium
C	sodium	sulfur
D	sulfur	sodium

19 Copper(II) sulfate can be prepared by adding excess copper(II) carbonate to sulfuric acid.

Why is an **excess** of copper(II) carbonate added?

- A to ensure all the copper(II) carbonate has reacted
- B to ensure all the sulfuric acid has reacted
- C to increase the rate of reaction
- D to increase the yield of copper(II) sulfate

20 Compound P reacts with hydrochloric acid to produce a gas that turns limewater milky.

What is P?

- A sodium carbonate
- B sodium chloride
- C sodium hydroxide
- D sodium sulfate

21 Which statement about nitrogen and phosphorus is **not** correct?

- A Both are in the same group of the Periodic Table.
- B Both are in the same period of the Periodic Table.
- C Both are non-metals.
- D Both have the same number of electrons in their outer shell.



22 Sodium and rubidium are elements in Group I of the Periodic Table.

Which statement is correct?

- A Sodium atoms have more electrons than rubidium atoms.
- B Sodium has a lower density than rubidium.
- C Sodium has a lower melting point than rubidium.
- D Sodium is more reactive than rubidium.

23 Which properties do the elements chromium, iron and vanadium have in common?

- 1 They all conduct electricity.
- 2 They, or their compounds, can act as catalysts.
- 3 They all form coloured compounds.

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

24 Why is argon gas used to fill electric lamps?

- A It conducts electricity.
- B It glows when heated.
- C It is less dense than air.
- D It is not reactive.

25 What is a property of **all** metals?

- A conduct electricity
- B hard
- C low melting points
- D react with water

26 Which process is used to extract iron from hematite in the blast furnace?

- A electrolysis
- B reduction with carbon monoxide
- C reduction with lime
- D thermal decomposition

27 Some reactions of three metals are listed in the table.

metal	metal reacts with dilute hydrochloric acid	metal oxide is reduced by carbon
P	yes	yes
Q	yes	no
R	no	yes

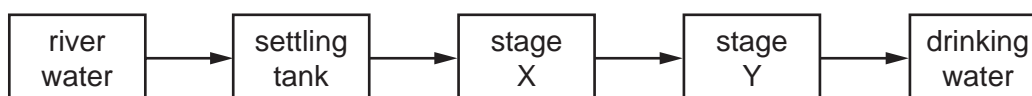
What is the order of reactivity of the metals?

	most reactive	→	least reactive
<b>A</b>	P	Q	R
<b>B</b>	P	R	Q
<b>C</b>	Q	P	R
<b>D</b>	R	P	Q

28 Which uses of the metals shown are both correct?

	aluminium	copper
<b>A</b>	aircraft bodies	electrical wiring
<b>B</b>	car bodies	aircraft bodies
<b>C</b>	chemical plant	cooking utensils
<b>D</b>	food containers	chemical plant

29 The flow chart shows stages in the treatment of river water to produce drinking water.



What occurs at stages X and Y?

	X	Y
<b>A</b>	distillation	chlorination
<b>B</b>	distillation	filtration
<b>C</b>	filtration	chlorination
<b>D</b>	filtration	distillation

30 Which element in Group VI is a component of air?

- A argon
- B nitrogen
- C oxygen
- D sulfur

31 Iron is a metal that rusts in the presence of oxygen and water.

Mild steel is used for .....1..... and is prevented from rusting by .....2..... .

Stainless steel does not rust. It is produced by .....3..... iron with another metal.

Which words complete gaps 1, 2 and 3?

	1	2	3
<b>A</b>	car bodies	greasing	covering
<b>B</b>	car bodies	painting	mixing
<b>C</b>	cutlery	greasing	covering
<b>D</b>	cutlery	painting	mixing

32 A chemical reaction is carried out on substance X.

A gas is produced that turns red litmus paper blue.

What is this reaction?

- A the reaction of an acid with a metal carbonate
- B the reaction of an acid with an ammonium salt
- C the reaction of an alkali with a metal carbonate
- D the reaction of an alkali with an ammonium salt

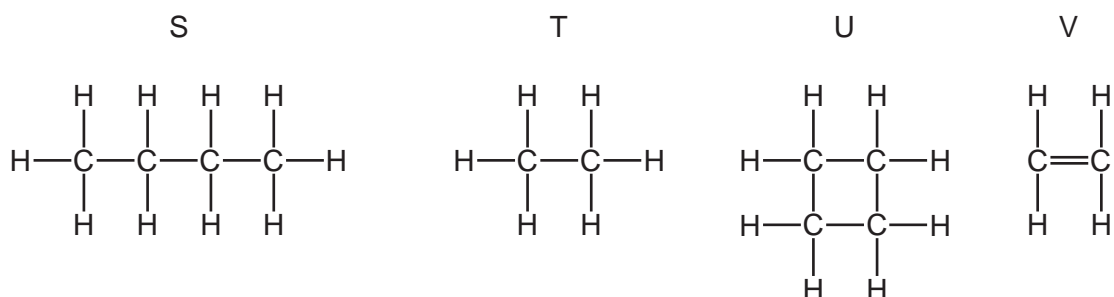
- 33 Some marble chips (calcium carbonate) are heated strongly and substances X and Y are formed.

Substance X is a white solid that reacts with water, giving out heat. Substance Y is a colourless gas.

What are substances X and Y?

	X	Y
<b>A</b>	calcium chloride	oxygen
<b>B</b>	calcium hydroxide	carbon dioxide
<b>C</b>	calcium oxide	carbon dioxide
<b>D</b>	calcium sulfate	oxygen

- 34 The structures of four organic compounds are shown.



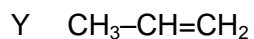
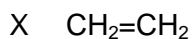
Which compounds are unsaturated?

- A** S only      **B** T and U      **C** U only      **D** V only
- 35 Which statement is **not** correct?
- A** Petroleum is a mixture of hydrocarbons.
- B** The main constituent of natural gas is ethane.
- C** The naphtha fraction of petroleum is used for making chemicals.
- D** When natural gas burns in air, carbon dioxide and water are formed.

- 36 Which equation represents the complete combustion of butane,  $\text{C}_4\text{H}_{10}$ ?

- A**  $2\text{C}_4\text{H}_{10} + 5\text{O}_2 \rightarrow 8\text{C} + 10\text{H}_2\text{O}$
- B**  $2\text{C}_4\text{H}_{10} + 9\text{O}_2 \rightarrow 8\text{CO} + 10\text{H}_2\text{O}$
- C**  $2\text{C}_4\text{H}_{10} + 13\text{O}_2 \rightarrow 8\text{CO}_2 + 10\text{H}_2\text{O}$
- D**  $\text{C}_4\text{H}_{10} + 4\text{O}_2 \rightarrow 4\text{CO}_2 + 5\text{H}_2$

37 X, Y and Z are three hydrocarbons.



What do compounds X, Y and Z have in common?

- 1 They are all alkenes.
- 2 They are all part of the same homologous series.
- 3 They all have the same boiling point.

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

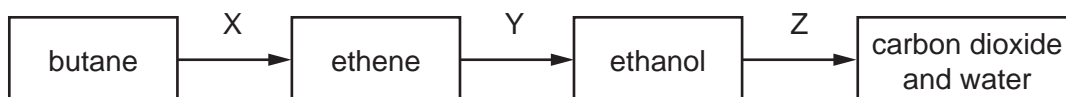
38 The table shows bonds that are present and bonds that are not present in compound X.

bond	
C–C	✓
C=C	x
C–H	✓
C–O	✓
C=O	✓
O–H	✓

What type of compound is X?

- A** a carboxylic acid  
**B** an alcohol  
**C** an alkane  
**D** an alkene

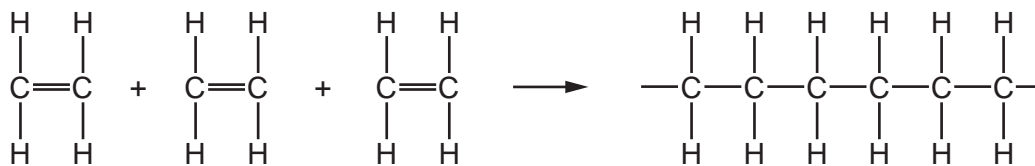
39 The diagram shows a reaction sequence.



Which row names the processes X, Y and Z?

	X	Y	Z
<b>A</b>	cracking	fermentation	respiration
<b>B</b>	cracking	hydration	combustion
<b>C</b>	distillation	fermentation	respiration
<b>D</b>	distillation	hydration	combustion

40 Molecules of a substance react together as shown.



Which type of reaction has taken place?

- A cracking
- B oxidation
- C polymerisation
- D reduction

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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	<b>Key</b>						2 <b>He</b> helium 4		
		atomic number atomic symbol name relative atomic mass								
11 <b>Na</b> sodium 23	12 <b>Mg</b> magnesium 24	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		
19 <b>K</b> potassium 39	20 <b>Ca</b> calcium 40	13 <b>Al</b> aluminium 27	14 <b>Si</b> silicon 28	15 <b>P</b> phosphorus 31	16 <b>S</b> sulfur 32	17 <b>Cl</b> chlorine 35.5	18 <b>Ar</b> argon 40			
37 <b>Rb</b> rubidium 85	38 <b>Sr</b> strontium 88	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			
55 <b>Cs</b> caesium 133	56 <b>Ba</b> barium 137	30 <b>Zn</b> zinc 65	47 <b>Cu</b> copper 64	48 <b>Cd</b> cadmium 112	49 <b>In</b> indium 115	51 <b>Sb</b> antimony 122	52 <b>Te</b> tellurium 128	54 <b>Xe</b> xenon 131		
87 <b>Fr</b> francium —	88 <b>Ra</b> radium —	81 <b>Tl</b> thallium 204	79 <b>Au</b> gold 197	80 <b>Hg</b> mercury 201	82 <b>Pb</b> lead 207	83 <b>Bi</b> bismuth 209	84 <b>Po</b> polonium —	86 <b>Rn</b> radon —		
		29 <b>Cu</b> copper 64	28 <b>Ni</b> nickel 59	27 <b>Co</b> cobalt 59	26 <b>Fe</b> iron 56	25 <b>Mn</b> manganese 55	24 <b>Cr</b> chromium 52	23 <b>V</b> vanadium 51	22 <b>Ti</b> titanium 48	
		46 <b>Ni</b> nickel 59	45 <b>Co</b> cobalt 59	44 <b>Ru</b> ruthenium 101	43 <b>Tc</b> technetium —	42 <b>Mo</b> molybdenum 96	41 <b>Nb</b> niobium 93	40 <b>Zr</b> zirconium 91	39 <b>Y</b> yttrium 89	
		78 <b>Pt</b> platinum 195	77 <b>Ir</b> iridium 192	76 <b>Os</b> osmium 190	75 <b>Re</b> rhenium 186	74 <b>W</b> tungsten 184	73 <b>Ta</b> tantalum 181	72 <b>Hf</b> hafnium 178	71 lanthanoids	
		111 <b>Rg</b> roentgenium —	110 <b>Ds</b> darmstadtium —	109 <b>Mt</b> meitnerium —	108 <b>Hs</b> hassium —	107 <b>Bh</b> bohrium —	106 <b>Sg</b> seaborgium —	105 <b>Db</b> dubnium —	104 <b>Rf</b> rutherfordium —	
		114 <b>F1</b> flerovium —	113 <b>Cn</b> copernicium —	112 <b>Cn</b> copernicium —	111 <b>Rg</b> roentgenium —	110 <b>Ds</b> darmstadtium —	109 <b>Mt</b> meitnerium —	108 <b>Hs</b> hassium —	107 <b>Bh</b> bohrium —	
		—	—	—	—	—	—	—	—	

		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
<b>lanthanoids</b>		66 <b>Dy</b> dysprosium 163	65 <b>Tb</b> terbium 159	64 <b>Gd</b> gadolinium 157	63 <b>Eu</b> europium 152	62 <b>Sm</b> samarium 150
		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 —
<b>actinoids</b>		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 —
		—	—	—	—	—

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