



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

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CHEMISTRY

0620/11

Paper 1 Multiple Choice

October/November 2011

45 Minutes

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

* 4 5 2 4 7 2 9 8 5 1 *

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, 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.

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.

You may use a calculator.

This document consists of **16** printed pages.



- 1 In which substance are the particles close together and slowly moving past each other?
- A air
 - B ice
 - C steam
 - D water

- 2 A student was provided with only a thermometer, a stopwatch and a beaker.

What could the student measure?

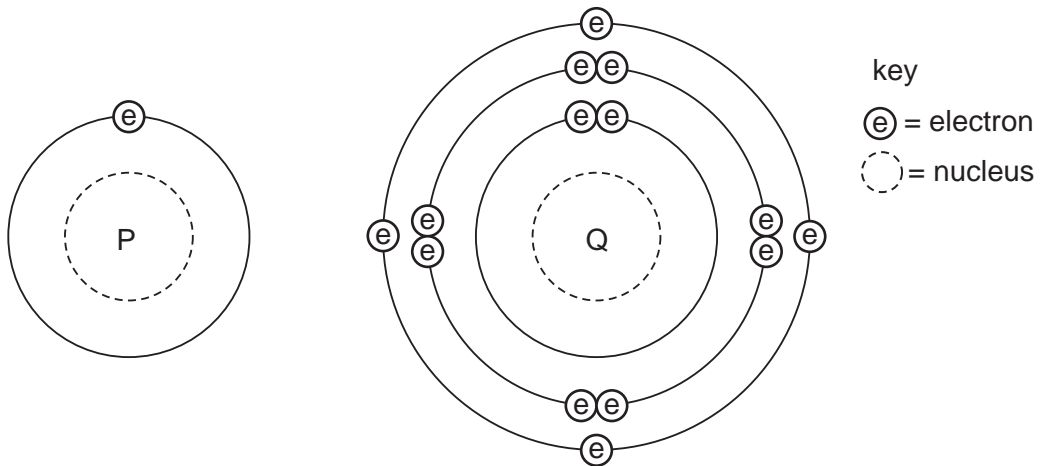
- A 10.5 g solid and 24.8 cm³ liquid
 - B 10.5 g solid and 25 °C
 - C 24.8 cm³ liquid and 45 seconds
 - D 25 °C and 45 seconds
- 3 Mixture 1 contains sand and water.

Mixture 2 contains salt and water.

Which method of separation could be used to obtain each of the required products from each mixture?

	mixture 1		mixture 2	
	to obtain sand	to obtain water	to obtain salt	to obtain water
A	crystallisation	distillation	filtration	filtration
B	crystallisation	filtration	filtration	distillation
C	filtration	distillation	crystallisation	filtration
D	filtration	filtration	crystallisation	distillation

4 The diagram shows the electronic structures of atoms P and Q.



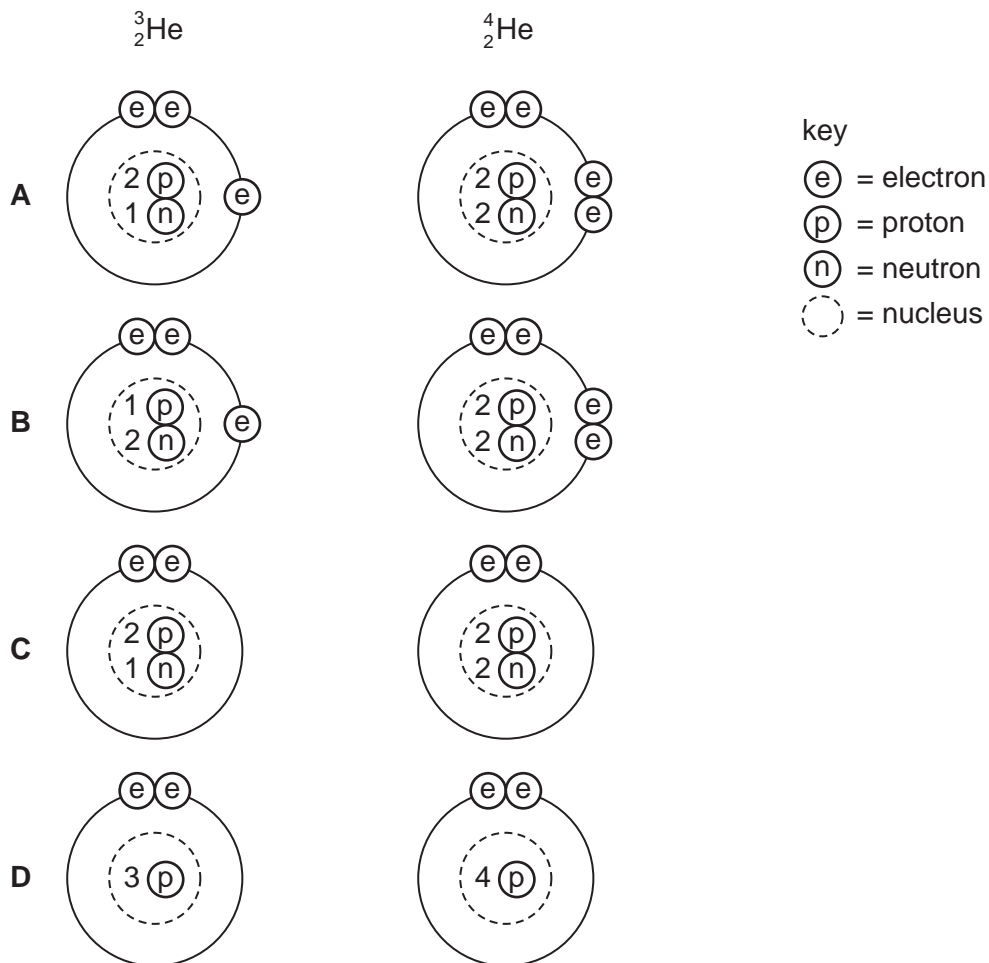
P and Q combine to form a molecule.

What is the formula of this molecule?

- A** PQ_4 **B** PQ **C** P_2Q **D** P_4Q

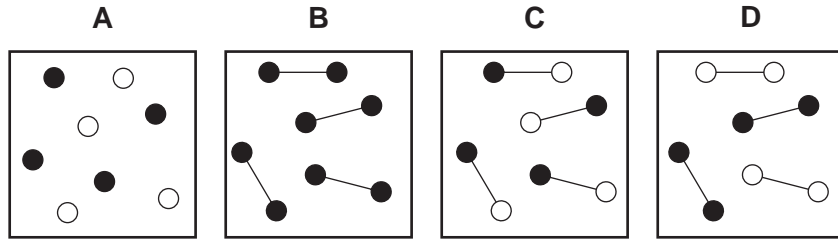
5 Two isotopes of helium are ${}^3_2\text{He}$ and ${}^4_2\text{He}$.

Which two diagrams show the arrangement of particles in these two isotopes?



- 6 Two elements, represented by \bigcirc and \bullet , form a compound.

Which diagram shows molecules of the compound?



- 7 The table describes the structures of four particles.

particle	number of protons	number of neutrons	number of electrons
O	8	8	8
O ²⁻	8	8	X
Na	11	Y	11
Na ⁺	11	12	Z

What are the correct values of **X**, **Y** and **Z**?

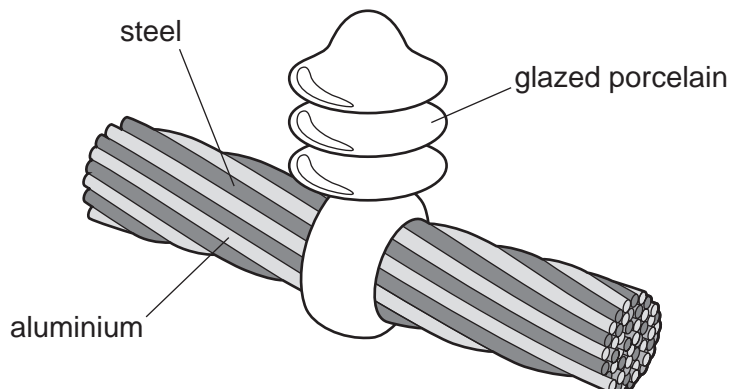
	X	Y	Z
A	9	11	10
B	9	11	11
C	10	12	10
D	10	12	11

- 8 The relative formula mass, M_r , of copper(II) sulfate, CuSO_4 , is 160.

Which mass of sulfur is present in 160 g of copper(II) sulfate?

- A** 16 g **B** 32 g **C** 64 g **D** 128 g

- 9 The diagram shows a section of an overhead power cable.



Which statement explains why a particular substance is used?

- A** Aluminium has a low density and is a good conductor of electricity.
B Porcelain is a good conductor of electricity.
C Steel can rust in damp air.
D Steel is more dense than aluminium.
- 10 Metals could be extracted from their molten chlorides using electrolysis.

Which substances are formed at each electrode?

	anode	cathode
A	chlorine	hydrogen
B	chlorine	metal
C	hydrogen	metal
D	metal	chlorine

- 11 Concentrated aqueous potassium bromide solution is electrolysed using inert electrodes.

The ions present in the solution are K^+ , Br^- , H^+ and OH^- .

To which electrodes are the ions attracted during this electrolysis?

	attracted to anode	attracted to cathode
A	Br^- and K^+	H^+ and OH^-
B	Br^- and OH^-	H^+ and K^+
C	H^+ and K^+	Br^- and OH^-
D	H^+ and OH^-	Br^- and K^+

- 12 Which fuel needs oxygen in order to produce heat energy and which type of reaction produces the energy?

	fuel	type of reaction
A	a radioactive isotope	endothermic
B	a radioactive isotope	exothermic
C	hydrogen	endothermic
D	hydrogen	exothermic

- 13 Some reactions are listed.

methane + oxygen \rightarrow carbon dioxide + water

sodium + water \rightarrow sodium hydroxide + hydrogen

magnesium + hydrochloric acid \rightarrow magnesium chloride + hydrogen

Which word correctly describes all of these reactions?

- A** combustion
B endothermic
C exothermic
D neutralisation
- 14 The sign \rightleftharpoons is used in some equations to show that a reaction is reversible.

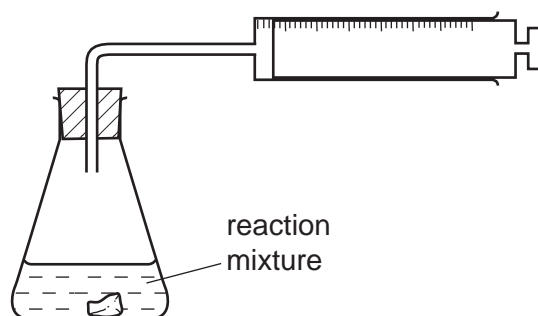
Two incomplete equations are given.

	reactants	products
P	$\text{CoCl}_2 + 2\text{H}_2\text{O}$	$\text{CoCl}_2 \cdot 2\text{H}_2\text{O}$
Q	$\text{C} + \text{O}_2$	CO_2

For which of these reactions can a \rightleftharpoons sign be correctly used to complete the equation?

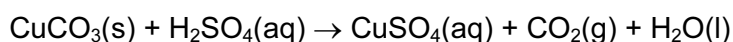
	P	Q
A	✓	✓
B	✓	x
C	x	✓
D	x	x

- 15 An experiment to determine the rate of a chemical reaction could be carried out using the apparatus shown.



Which reaction is being studied?

- A** $\text{Cl}_2 + 2\text{KBr} \rightarrow 2\text{KCl} + \text{Br}_2$
B $\text{Mg} + \text{H}_2\text{SO}_4 \rightarrow \text{MgSO}_4 + \text{H}_2$
C $\text{NaCl} + \text{AgNO}_3 \rightarrow \text{NaNO}_3 + \text{AgCl}$
D $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
- 16 Copper(II) carbonate reacts with dilute sulfuric acid.



The speed of the reaction can be changed by varying the conditions.

Which conditions would always increase the speed of this chemical reaction?

- 1 Increase the concentration of the reactants.
- 2 Increase the size of the pieces of copper(II) carbonate.
- 3 Increase the temperature.
- 4 Increase the volume of sulfuric acid.

- A** 1, 3 and 4 **B** 1 and 3 only **C** 2 and 3 **D** 3 and 4 only
- 17 Which type of reaction always forms a salt and water?
- A** exothermic
B neutralisation
C oxidation
D polymerisation

18 Which property is **not** characteristic of a base?

- A It reacts with a carbonate to form carbon dioxide.
- B It reacts with an acid to form a salt.
- C It reacts with an ammonium salt to form ammonia.
- D It turns universal indicator paper blue.

19 An alloy contains copper and zinc.

Some of the zinc has become oxidised to zinc oxide.

What is the result of adding an excess of dilute sulfuric acid to the alloy?

- A A blue solution and a white solid remains.
- B A colourless solution and a pink/brown solid remains.
- C The alloy dissolves completely to give a blue solution.
- D The alloy dissolves completely to give a colourless solution.

20 The results of three tests on a solution of compound **X** are shown.

test	result
aqueous sodium hydroxide added	white precipitate formed, soluble in excess
aqueous ammonia added	white precipitate formed, soluble in excess
dilute hydrochloric acid added	bubbles of gas

What is compound **X**?

- A aluminium carbonate
- B aluminium chloride
- C zinc carbonate
- D zinc chloride

21 Statement 1: Helium is a reactive gas.

Statement 2: Helium can be used to fill balloons.

Which is correct?

- A Both statements are correct and statement 2 explains statement 1.
- 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.

22 An element has the following properties.

- It forms coloured compounds.
- It acts as a catalyst.
- It melts at 1539 °C.

In which part of the Periodic Table is the element found?

- A Group I
- B Group IV
- C Group VII
- D transition elements

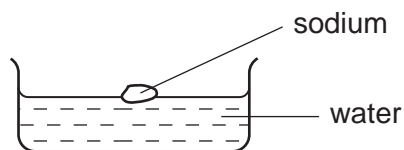
23 The table shows some properties of two elements in Group VII of the Periodic Table.

element	state at 20 °C	density/g per cm ³	melting point/°C
chlorine	gas	0.0032	-101
bromine	liquid	3.1	-7

Which properties is fluorine likely to have?

	state at 20 °C	density/g per cm ³	melting point/°C
A	gas	0.0017	-220
B	gas	0.17	-188
C	liquid	0.0017	-220
D	liquid	0.17	-188

24 When sodium reacts with water, a solution and a gas are produced.



The solution is tested with litmus paper and the gas is tested with a splint.

What happens to the litmus paper and to the splint?

	litmus paper	splint
A	blue to red	glowing splint relights
B	blue to red	lighted splint 'pops'
C	red to blue	glowing splint relights
D	red to blue	lighted splint 'pops'

25 Which statements are correct?

- 1 Metals are often used in the form of alloys.
- 2 Stainless steel is an alloy of iron.
- 3 Alloys always contain more than two metals.

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

26 Which statement is true about **all** metals?

- A** They are attracted to a magnet.
- B** They are weak and brittle.
- C** They may be used to form alloys.
- D** They react with water.

27 A chemical engineer plans to produce hydrochloric acid.

Which metal is best for the reaction container?

- A** copper
- B** iron
- C** magnesium
- D** zinc

28 Alloy X is strong and has a low density.

Alloy Y is heavy but is resistant to corrosion.

Which could be uses of X and Y?

	bridge supports	aircraft	overhead cables
A	X	X	Y
B	X	Y	Y
C	Y	X	X
D	Y	Y	X

29 A metal is extracted from hematite, its oxide ore.

What is the metal and how is the oxide reduced?

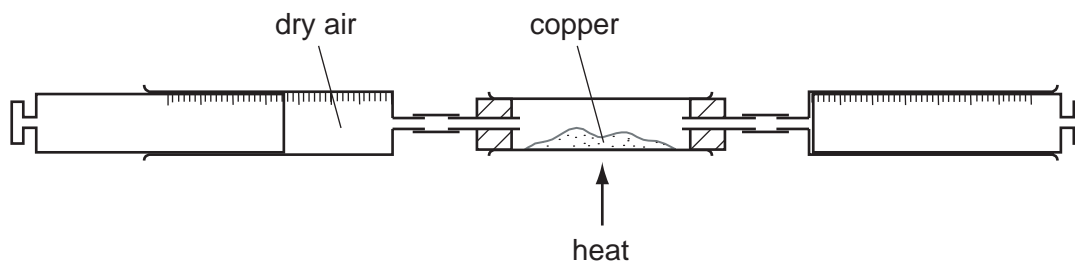
	metal	method of reduction
A	Al	electrolysis
B	Al	heating with carbon
C	Fe	electrolysis
D	Fe	heating with carbon

30 A liquid turns white anhydrous copper sulfate blue and has a boiling point of 103°C.

Which could be the identity of the liquid?

- A** alcohol
- B** petrol
- C** salt solution
- D** pure water

31 Dry air is passed over hot copper until all the oxygen has reacted.



The volume of gas at the end of the reaction is 120 cm^3 .

What is the starting volume of dry air?

- A** 132 cm^3 **B** 150 cm^3 **C** 180 cm^3 **D** 600 cm^3

32 In which row is the air pollutant **not** correctly matched with its source?

	air pollutant	source
A	carbon monoxide	incomplete combustion of fuels
B	lead compounds	burning petrol in cars
C	nitrogen oxides	decomposing vegetation
D	sulfur dioxide	burning coal and other fossil fuels

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

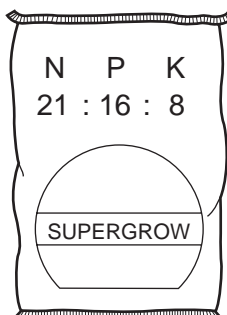
Mild steel is used for1..... and is prevented from rusting by2..... .

Stainless steel is prevented from rusting by3..... it with another metal.

Which words correctly complete gaps 1, 2 and 3?

	1	2	3
A	car bodies	greasing	covering
B	car bodies	painting	mixing
C	cutlery	greasing	covering
D	cutlery	painting	mixing

34 Which combination of chemical compounds could be used to produce the fertiliser shown?

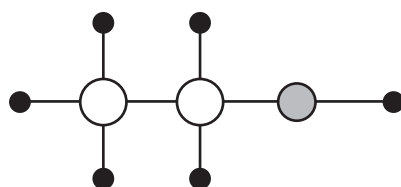


- A NH_4NO_3 , $\text{Ca}_3(\text{PO}_4)_2$
- B NH_4NO_3 , $\text{CO}(\text{NH}_2)_2$
- C NH_4NO_3 , K_2SO_4 , $(\text{NH}_4)_2\text{SO}_4$
- D $(\text{NH}_4)_3\text{PO}_4$, KCl

35 Which pollutant gas is produced by the decomposition of vegetation?

- A carbon monoxide
- B methane
- C nitrogen oxide
- D sulfur dioxide

36 The diagram represents the molecule of an organic compound.



key

- = carbon
- = oxygen
- = hydrogen

What is the name of the compound?

- A ethane
- B ethanoic acid
- C ethanol
- D ethene

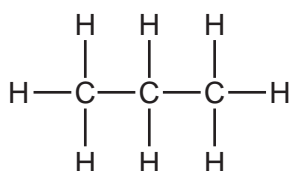
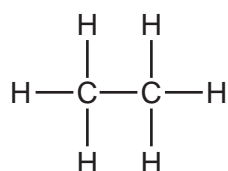
37 Petroleum is a very important raw material that is separated into more useful products.

Which terms describe petroleum and the method used to separate it?

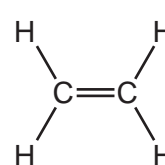
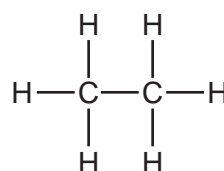
	petroleum is a	method used to separate petroleum
A	compound	cracking
B	compound	fractional distillation
C	mixture	cracking
D	mixture	fractional distillation

38 Which pair of compounds are members of the same homologous series?

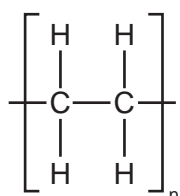
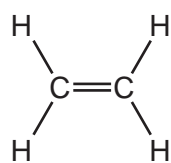
A



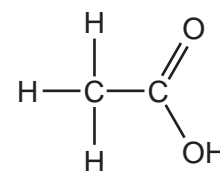
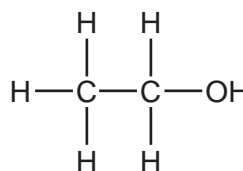
B



C



D



39 The table shows the composition of four different types of petroleum (crude oil).

fraction	Arabian Heavy /%	Arabian Light /%	Iranian Heavy /%	North Sea /%
gasoline	18	21	21	23
kerosene	11.5	13	13	15
diesel	18	20	20	24
fuel oil	52.5	46	46	38

Which type of petroleum is best for the motor vehicle industry?

- A Arabian Heavy
- B Arabian Light
- C Iranian Heavy
- D North Sea

40 When glucose is fermented, ethanol is formed together with

- A carbon dioxide.
- B ethene.
- C methane.
- D oxygen.

DATA SHEET
The Periodic Table of the Elements

		Group												
		I	II	III	IV	V	VI	VII	VIII	IX	X			
		1 H Hydrogen 1												
		4 He Helium 2												
7	3	9 Li Lithium 4	24 Be Beryllium 4	11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10					
23	11	13 Na Sodium 11	12 Mg Magnesium 12	13 Al Aluminium 13	14 Si Silicon 14	15 P Phosphorus 15	16 S Sulfur 16	17 Cl Chlorine 17	18 Ar Argon 18					
39	19	20 K Potassium 19	21 Ca Calcium 20	26 Fe Iron 26	27 Co Cobalt 27	28 Ni Nickel 28	29 Cu Copper 29	30 Zn Zinc 30	31 Ga Gallium 31	32 Ge Germanium 32	33 As Arsenic 33	34 Se Selenium 34	35 Br Bromine 35	36 Kr Krypton 36
85	37	38 Rb Rubidium 37	39 Sr Strontium 38	44 Ru Ruthenium 44	45 Rh Rhodium 45	46 Pd Palladium 46	47 Ag Silver 47	48 Cd Cadmium 48	49 In Indium 49	50 Sn Tin 50	51 Sb Antimony 51	52 Te Tellurium 52	53 I Iodine 53	54 Xe Xenon 54
133	55	56 Cs Caesium 55	57 Ba Barium 56	76 Os Osmium 76	77 Ir Iridium 77	78 Pt Platinum 78	79 Au Gold 79	80 Hg Mercury 80	81 Tl Thallium 81	82 Pb Lead 82	83 Bi Bismuth 83	84 Po Polonium 84	85 At Astatine 85	86 Rn Radon 86
226	87	88 Ra Radium 88	89 Ac Actinium 89											
		*58-71 Lanthanoid series †90-103 Actinoid series												
140	58	59 Ce Cerium 58	60 Pr Praseodymium 59	61 Pm Promethium 61	62 Sm Samarium 62	63 Eu Europium 63	64 Gd Gadolinium 64	65 Tb Terbium 65	66 Dy Dysprosium 66	67 Ho Holmium 67	68 Er Erbium 68	69 Tm Thulium 69	70 Yb Ytterbium 70	71 Lu Lutetium 71
232	90	91 Th Thorium 90	92 Pa Protactinium 91	93 Np Neptunium 93	94 Pu Plutonium 94	95 Am Americium 95	96 Cm Curium 96	97 Bk Berkelium 97	98 Cf Californium 98	99 Es Einsteinium 99	100 Fm Fermium 100	101 Md Mendelevium 101	102 No Nobelium 102	103 Lr Lawrencium 103

a **X** b
 Key a = relative atomic mass
 X = atomic symbol
 b = proton (atomic) number

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

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