UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY **0620/13**

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)

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.

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1 In which substance are the particles close together and slowly moving past each other?

A air

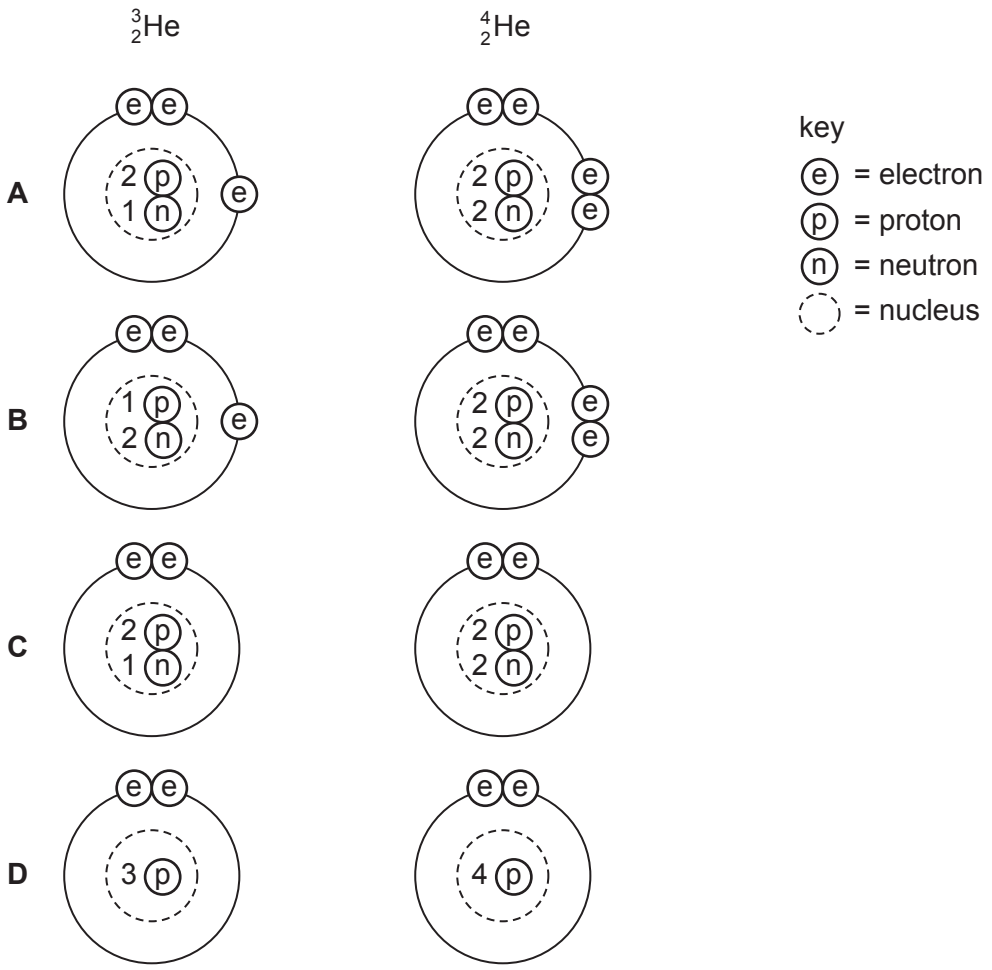
B ice

C steam

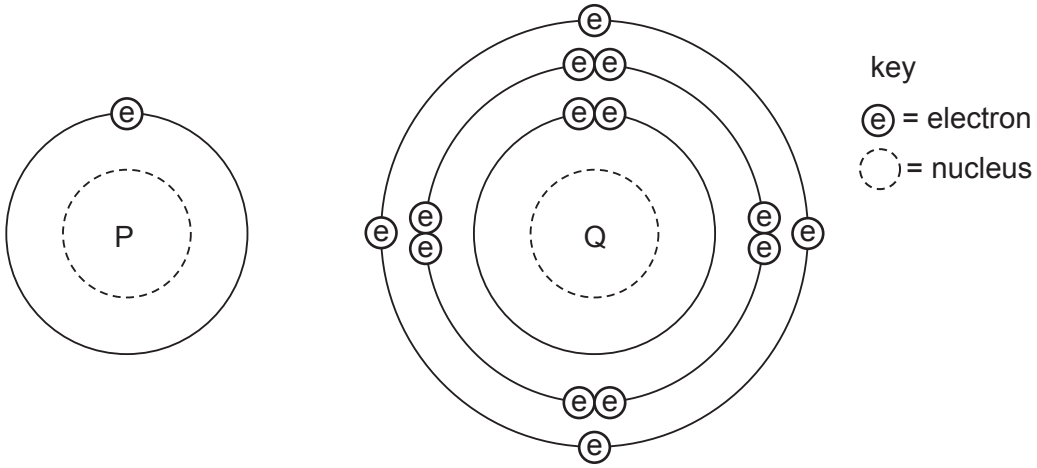
D water

2 Two isotopes of helium are $^{3}_{2}He$ and $^{4}_{2}He$.

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



3 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

4 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 cm^3 liquid

B 10.5 g solid and 25 °C

C 24.8 cm^3 liquid and 45 seconds

D 25 °C and 45 seconds

5 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

6 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^+

7 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

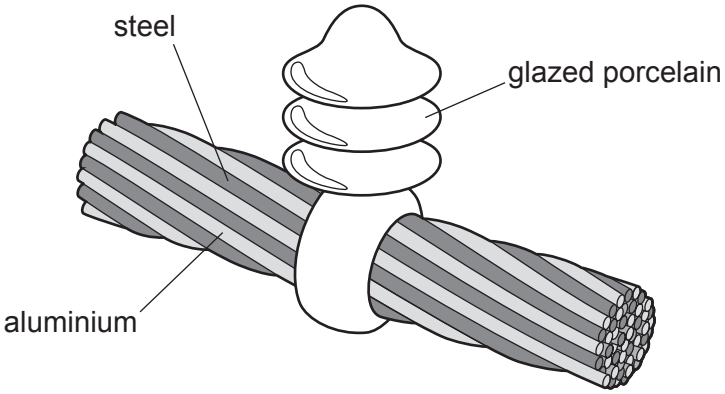
8 The table describes the structures of four particles.

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

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.

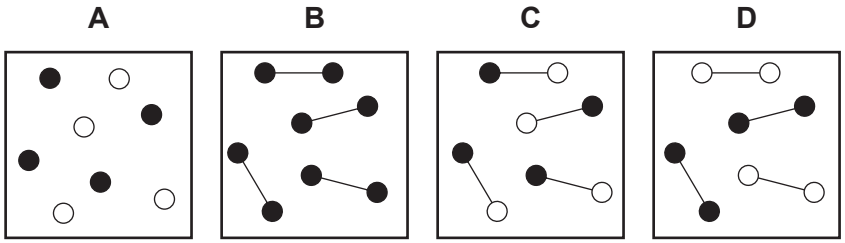
B Porcelain is a good conductor of electricity.

C Steel can rust in damp air.

D Steel is more dense than aluminium.

10 Two elements, represented by ○ and ●, form a compound.

Which diagram shows molecules of the compound?



11 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

12 The sign $\rightleftharpoons$ is used in some equations to show that a reaction is reversible.

Two incomplete equations are given.

	reactants	products
P	$CoCl_2 + 2H_2O$	$CoCl_2.2H_2O$
Q	$C + O_2$	CO_2

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

	P	**Q**
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

13 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

14 Some reactions are listed.

methane + oxygen → carbon dioxide + water

sodium + water → sodium hydroxide + hydrogen

magnesium + hydrochloric acid → magnesium chloride + hydrogen

Which word correctly describes all of these reactions?

A combustion

B endothermic

C exothermic

D neutralisation

15 Which type of reaction always forms a salt and water?

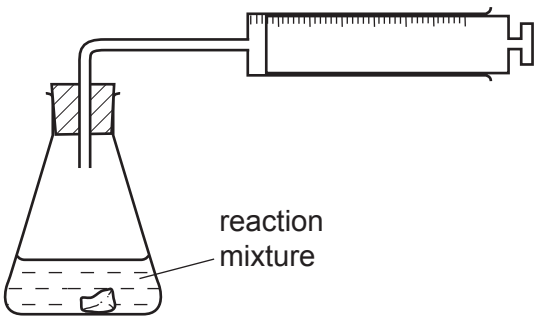
A exothermic

B neutralisation

C oxidation

D polymerisation

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



Which reaction is being studied?

A $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$

B $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

C $NaCl + AgNO_3 \rightarrow NaNO_3 + AgCl$

D $NaOH + HCl \rightarrow NaCl + H_2O$

17 Copper(II) carbonate reacts with dilute sulfuric acid.

$$CuCO_3(s) + H_2SO_4(aq) \rightarrow CuSO_4(aq) + CO_2(g) + H_2O(l)$$

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

18 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

19 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

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20 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

21 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.

22 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.

23 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.

24 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

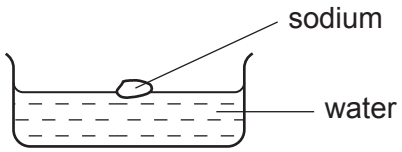
25 Alloy X is strong and has a low density.

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

26 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’

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27 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

28 A chemical engineer plans to produce hydrochloric acid.

Which metal is best for the reaction container?

A copper

B iron

C magnesium

D zinc

29 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.

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

What is the metal and how is the oxide reduced?

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

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 is prevented from rusting by ……3…… it with another metal.

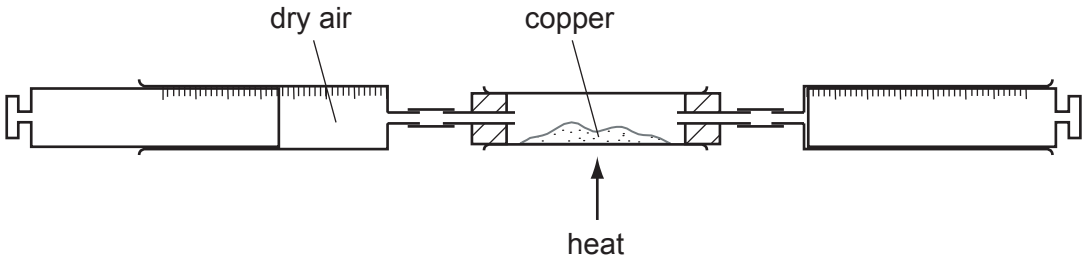
Which words correctly complete gaps 1, 2 and 3?

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

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 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

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

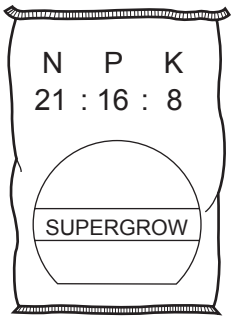
A carbon monoxide

B methane

C nitrogen oxide

D sulfur dioxide

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



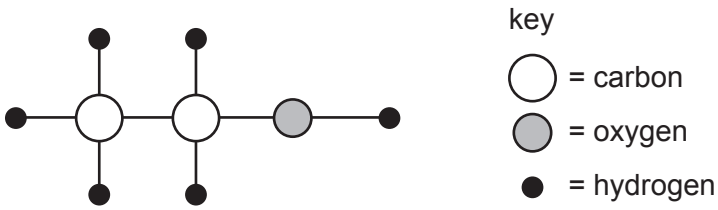
A NH_4NO_3, $Ca_3(PO_4)_2$

B NH_4NO_3, $CO(NH_2)_2$

C NH_4NO_3, K_2SO_4, $(NH_4)_2SO_4$

D $(NH_4)_3PO_4$, KCl

36 The diagram represents the molecule of an organic compound.



What is the name of the compound?

A ethane

B ethanoic acid

C ethanol

D ethene

37 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

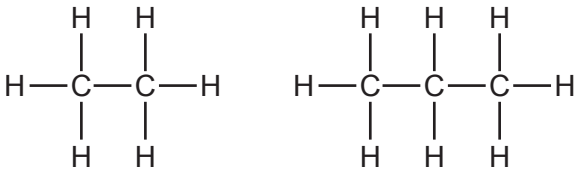
B Arabian Light

C Iranian Heavy

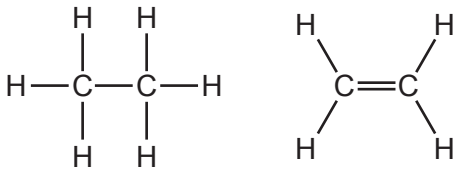
D North Sea

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

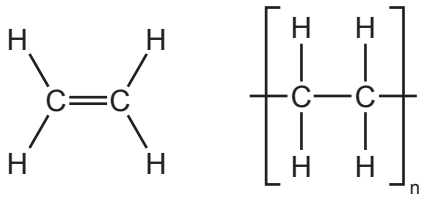
A



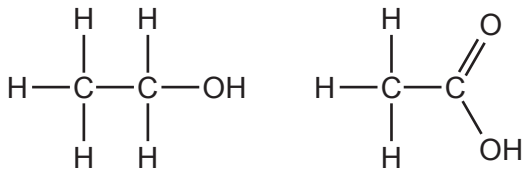
B



C



D



39 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

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	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 **H** Hydrogen 1										4 **He** Helium 2
7 **Li** Lithium 3	9 **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 **Na** Sodium 11	24 **Mg** Magnesium 12											27 **Al** Aluminium 13	28 **Si** Silicon 14	31 **P** Phosphorus 15	32 **S** Sulfur 16	35.5 **Cl** Chlorine 17	40 **Ar** Argon 18
39 **K** Potassium 19	40 **Ca** Calcium 20	45 **Sc** Scandium 21	48 **Ti** Titanium 22	51 **V** Vanadium 23	52 **Cr** Chromium 24	55 **Mn** Manganese 25	56 **Fe** Iron 26	59 **Co** Cobalt 27	59 **Ni** Nickel 28	64 **Cu** Copper 29	65 **Zn** Zinc 30	70 **Ga** Gallium 31	73 **Ge** Germanium 32	75 **As** Arsenic 33	79 **Se** Selenium 34	80 **Br** Bromine 35	84 **Kr** Krypton 36
85 **Rb** Rubidium 37	88 **Sr** Strontium 38	89 **Y** Yttrium 39	91 **Zr** Zirconium 40	93 **Nb** Niobium 41	96 **Mo** Molybdenum 42	**Tc** Technetium 43	101 **Ru** Ruthenium 44	103 **Rh** Rhodium 45	106 **Pd** Palladium 46	108 **Ag** Silver 47	112 **Cd** Cadmium 48	115 **In** Indium 49	119 **Sn** Tin 50	122 **Sb** Antimony 51	128 **Te** Tellurium 52	127 **I** Iodine 53	131 **Xe** Xenon 54
133 **Cs** Caesium 55	137 **Ba** Barium 56	139 **La** Lanthanum 57 *	178 **Hf** Hafnium 72	181 **Ta** Tantalum 73	184 **W** Tungsten 74	186 **Re** Rhenium 75	190 **Os** Osmium 76	192 **Ir** Iridium 77	195 **Pt** Platinum 78	197 **Au** Gold 79	201 **Hg** Mercury 80	204 **Tl** Thallium 81	207 **Pb** Lead 82	209 **Bi** Bismuth 83	**Po** Polonium 84	**At** Astatine 85	**Rn** Radon 86
Fr Francium 87	226 **Ra** Radium 88	227 **Ac** Actinium 89 †															

140 **Ce** Cerium 58	141 **Pr** Praseodymium 59	144 **Nd** Neodymium 60	**Pm** Promethium 61	150 **Sm** Samarium 62	152 **Eu** Europium 63	157 **Gd** Gadolinium 64	159 **Tb** Terbium 65	162 **Dy** Dysprosium 66	165 **Ho** Holmium 67	167 **Er** Erbium 68	169 **Tm** Thulium 69	173 **Yb** Ytterbium 70	175 **Lu** Lutetium 71
232 **Th** Thorium 90	**Pa** Protactinium 91	238 **U** Uranium 92	**Np** Neptunium 93	**Pu** Plutonium 94	**Am** Americium 95	**Cm** Curium 96	**Bk** Berkelium 97	**Cf** Californium 98	**Es** Einsteinium 99	**Fm** Fermium 100	**Md** Mendelevium 101	**No** Nobelium 102	**Lr** Lawrencium 103

*58-71 Lanthanoid series
†90-103 Actinoid series

Key

a
X
b

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

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

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