

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY

0620/01

Paper 1 Multiple Choice

October/November 2004

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.

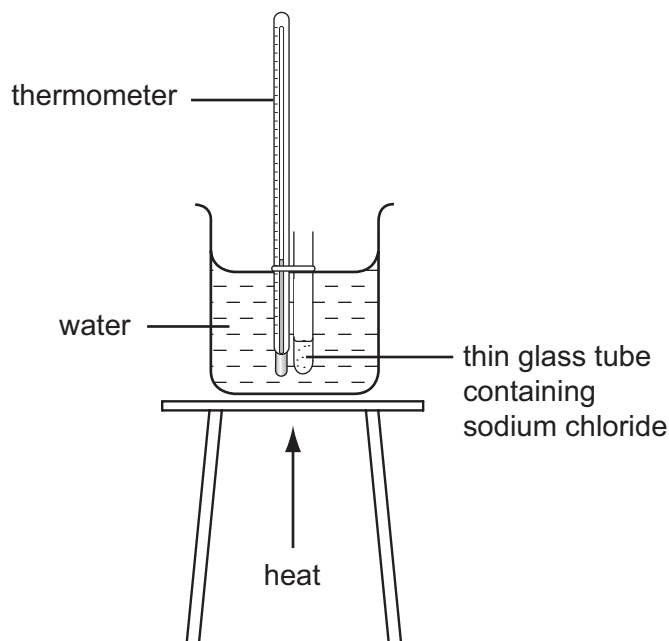


- 1 When steam at 100°C condenses to water at 25°C , what happens to the water molecules?
- A They move faster and closer together.
 - B They move faster and further apart.
 - C They move slower and closer together.
 - D They move slower and further apart.
- 2 The melting points and boiling points of four substances are shown.

Which substance is liquid at 100°C ?

substance	melting point/ $^{\circ}\text{C}$	boiling point/ $^{\circ}\text{C}$
A	-203	-17
B	-25	50
C	11	181
D	463	972

- 3 The apparatus shown **cannot** be used to determine the melting point of sodium chloride, Na^+Cl^- .



Why is this?

	melting point of sodium chloride is greater than 100°C	sodium chloride dissolves in the water
A	✓	✓
B	✓	x
C	x	✓
D	x	x

- 4 A student wishes to extract a coloured solution from some berries to make an indicator solution.

Which of the listed instructions should the student follow?

1	crush the berries
2	add acid
3	add a solvent
4	filter the mixture
5	distil the filtrate

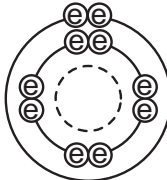
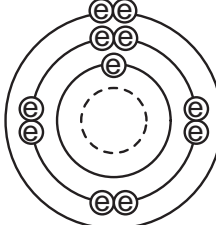
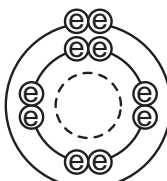
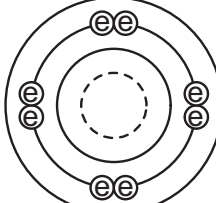
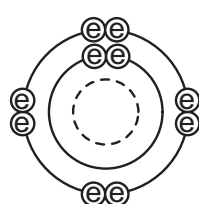
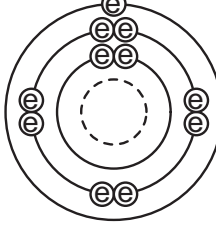
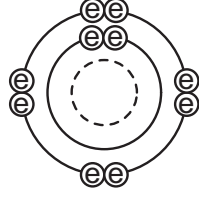
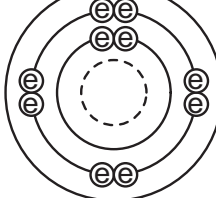
- A** 1, 2 and 4
- B** 1, 3 and 4
- C** 2, 3 and 5
- D** 2, 4 and 5

5 Hydrogen and helium have isotopes, as shown.

In which of these isotopes does the nucleus have twice as many neutrons as protons?

- A ${}^2_1\text{H}$
- B ${}^3_1\text{H}$
- C ${}^3_2\text{He}$
- D ${}^4_2\text{He}$

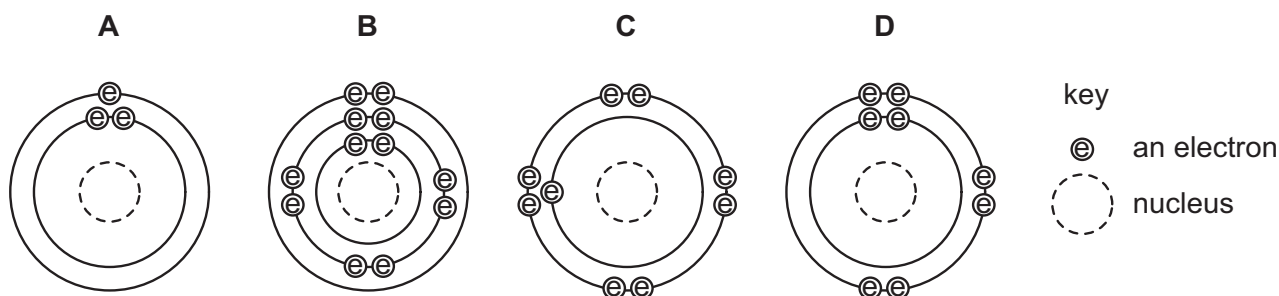
6 How are the electrons arranged in a neon **atom**, Ne, and a sodium **ion**, Na^+ ?

	neon atom	sodium ion	
A			key ⊖ electron ○ nucleus
B			
C			
D			

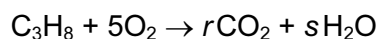
7 Which compound has ionic bonds?

- A hydrogen chloride
- B methane
- C sodium chloride
- D water

8 Which diagram shows an atom in the same group of the Periodic Table as sodium?



9 When propane is burned, carbon dioxide and water are formed, as shown.



Which values of r and s balance the equation?

	r	s
A	1	3
B	1	5
C	3	4
D	3	8

10 Which formula represents a compound containing three atoms?

- A** HNO_3 **B** H_2O **C** LiF **D** ZnSO_4

11 A substance **X** is heated in an evaporating basin until there is no further change.

	mass of basin and contents
before heating	25.52 g
after heating	26.63 g

What could **X** be?

- A** copper
B copper(II) carbonate
C copper(II) oxide
D hydrated copper(II) sulphate

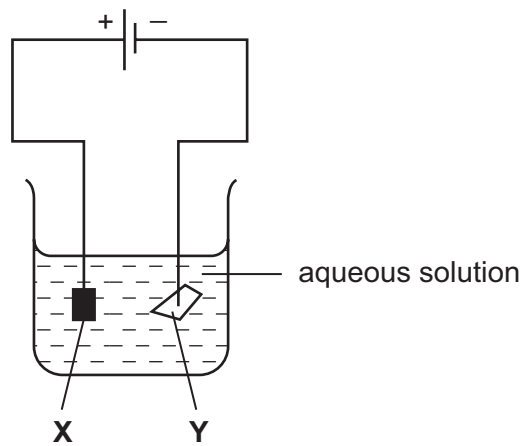
12 Aluminium is extracted from its oxide by electrolysis.

Which words correctly complete the spaces?

The oxide is dissolved in1..... cryolite and aluminium is deposited at the2.....

	space 1	space 2
A	aqueous	negative cathode
B	aqueous	positive anode
C	molten	negative cathode
D	molten	positive anode

13 The diagram shows an electrolysis experiment using metals **X** and **Y** as electrodes.



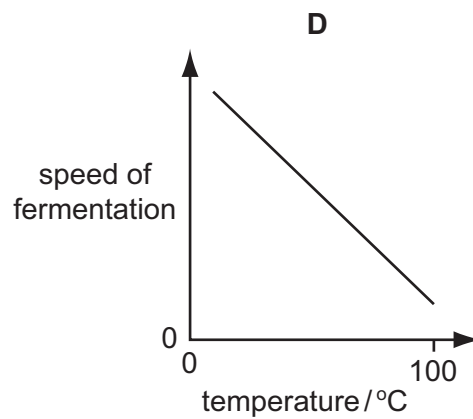
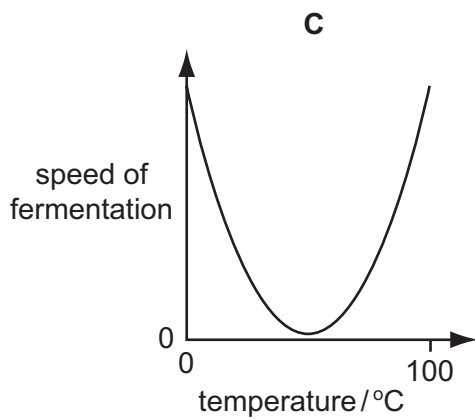
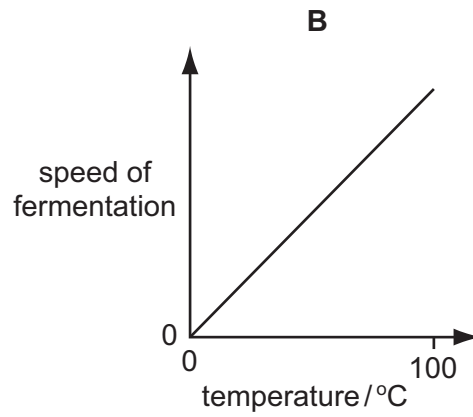
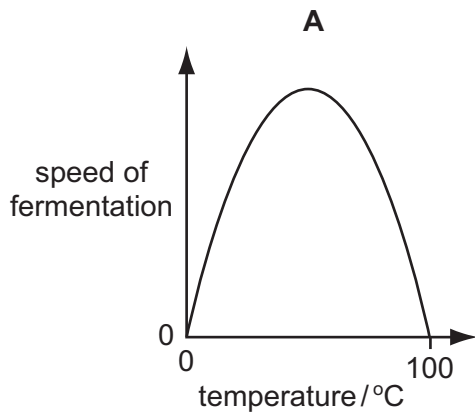
One of the metals becomes coated with copper.

Which metal becomes coated and which aqueous solution is used?

	metal	aqueous solution
A	X	CrCl_3
B	X	CuCl_2
C	Y	CrCl_3
D	Y	CuCl_2

14 The solvent ethanol is produced by the fermentation of sugar, using yeast.

Which graph correctly shows how the speed of fermentation changes with temperature?



15 In which process does an endothermic change take place?

- A combustion
- B evaporation
- C filtration
- D neutralisation

16 The sign \rightleftharpoons is used in some equations to show that a reaction can be reversed.

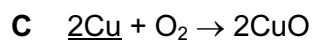
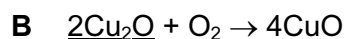
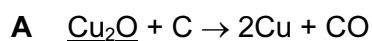
Two incomplete equations are given.

	reagents	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

17 In which reaction does reduction of the underlined substance take place?



18 In which experiment is the rate of reaction between hydrochloric acid and calcium carbonate **slowest**?

A

water at 30°C

dilute hydrochloric acid

lumps of calcium carbonate

B

water at 60°C

dilute hydrochloric acid

powdered calcium carbonate

C

water at 30°C

concentrated hydrochloric acid

lumps of calcium carbonate

D

water at 60°C

concentrated hydrochloric acid

powdered calcium carbonate

19 Aqueous ammonia is added to a solution of a metal sulphate.

A green precipitate that is insoluble in excess of the aqueous ammonia forms.

Which metal ion is present?

- A Ca^{2+} B Cu^{2+} C Fe^{3+} D Fe^{2+}

20 The chart shows the colour ranges of four different indicators.

Which indicator is blue in an acidic solution?

indicator	pH value														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
A	yellow		←————→											blue	
B	— red —————→							blue	←———— yellow —————						
C	— red —————→							←	blue —————						
D	— colourless —————→										←	blue —————			

21 An ion X in solution is identified as shown.

Diagram 1: A test tube containing 'solution X + NaOH(aq)' is heated. A strip of 'damp red litmus' is held in the mouth of the tube. The label indicates 'damp red litmus stays red'.

Diagram 2: A test tube containing 'solution X + NaOH(aq)' is heated. A strip of 'damp red litmus' is held in the mouth of the tube. The label indicates 'damp red litmus turns blue'. At the bottom of the test tube, there is a layer of 'metal powder'.

What is ion X?

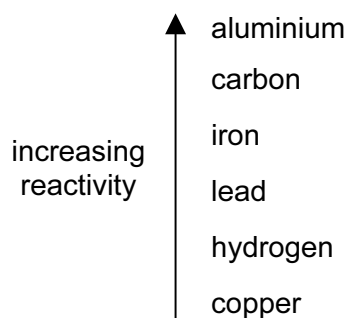
- A $\text{Al}^{3+}(\text{aq})$ B $\text{NH}_4^+(\text{aq})$ C $\text{NO}_3^-(\text{aq})$ D $\text{SO}_4^{2-}(\text{aq})$

22 Metals can be joined together by welding them at a high temperature.

Why is an argon atmosphere often used?

- A Argon has a low density.
- B Argon is colourless.
- C Argon is inexpensive.
- D Argon is unreactive.

23 Part of the reactivity series is outlined below.

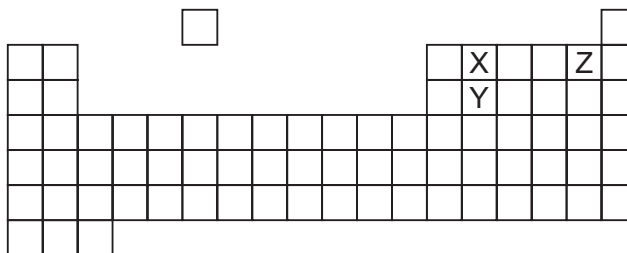


Electrolysis is an expensive way of extraction.

Which metal has to be extracted from its ore by electrolysis?

- A aluminium
- B copper
- C lead
- D iron

24 The diagram shows part of the Periodic Table.



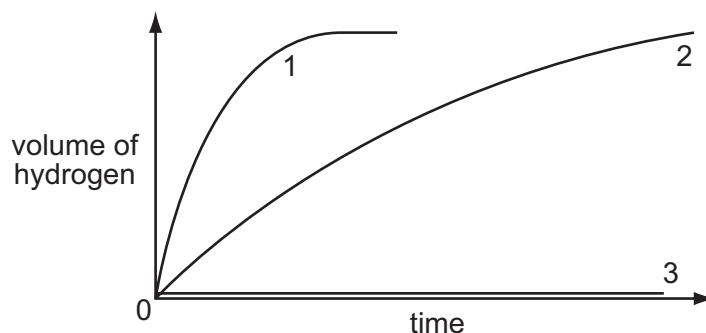
Which statement about elements X, Y and Z is correct?

The proton number of X is

- A seven less than that of Z.
- B three less than that of Z.
- C one less than that of Y.
- D sixteen less than that of Y.

25 Three different metals, Cu, Fe and Mg, are each added to an excess of dilute hydrochloric acid.

The graph shows how rapidly hydrogen is given off.



Which metal gives which curve?

	1	2	3
A	Fe	Cu	Mg
B	Fe	Mg	Cu
C	Mg	Cu	Fe
D	Mg	Fe	Cu

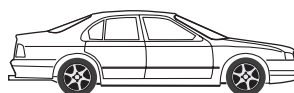
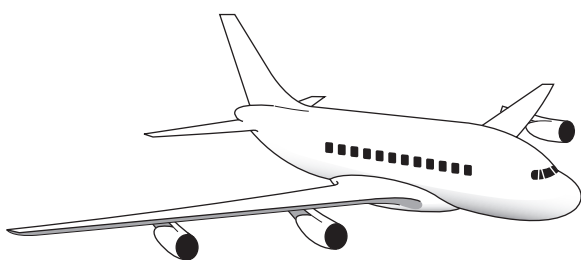
26 Which substance is a metal?

	electrical conductivity (solid)	electrical conductivity (molten)
A	high	high
B	high	low
C	low	high
D	low	low

27 Which changes occur when impure iron is made into stainless steel?

	carbon	chromium
A	added	added
B	added	removed
C	removed	added
D	removed	removed

28 The bodies of an aeroplane, a car and a wheelbarrow are made of metal.



Which metal is used for which body?

	aeroplane	car	wheelbarrow
A	aluminium	iron	steel
B	aluminium	steel	iron
C	steel	aluminium	iron
D	steel	iron	aluminium

29 What is used to test for the presence of water?

- A** anhydrous copper(II) sulphate
- B** aqueous barium chloride
- C** aqueous sodium hydroxide
- D** Universal indicator paper

30 A candle is burned in a fixed volume of air.

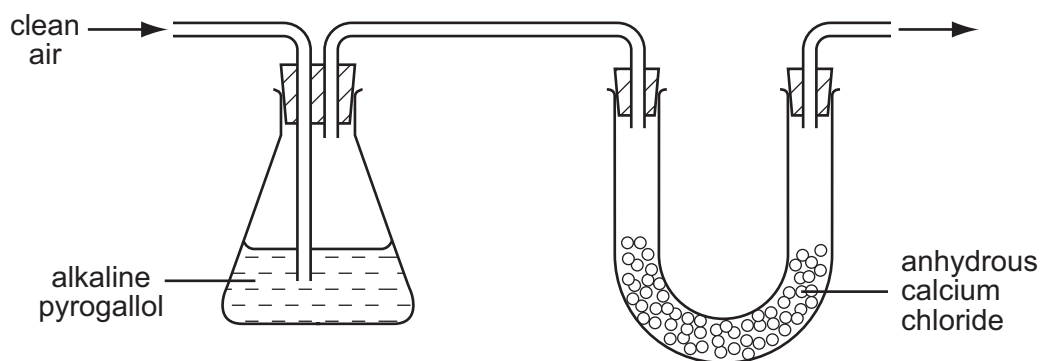
How do the percentages (%) of carbon dioxide and oxygen change?

	carbon dioxide	oxygen
A	fall	fall
B	fall	rise
C	rise	fall
D	rise	rise

31 Anhydrous calcium chloride is used as a drying agent.

An alkaline solution of pyrogallol absorbs oxygen and carbon dioxide.

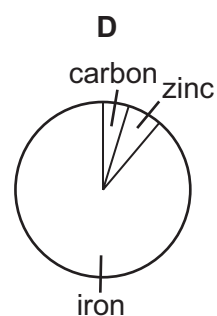
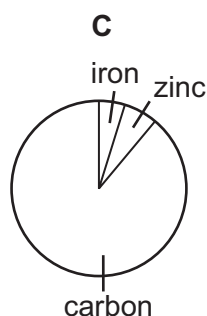
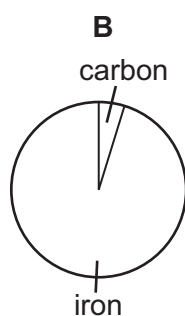
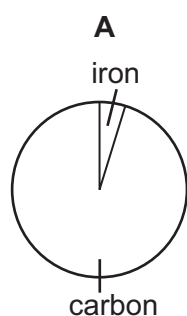
Clean air is passed through the apparatus shown.



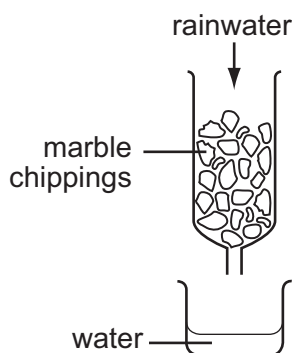
Which gases are present in the air leaving the apparatus?

	argon	nitrogen	hydrogen
A	✓	✓	✓
B	✓	x	✓
C	x	✓	✓
D	✓	✓	x

32 Which chart could represent the composition of a galvanised roof?

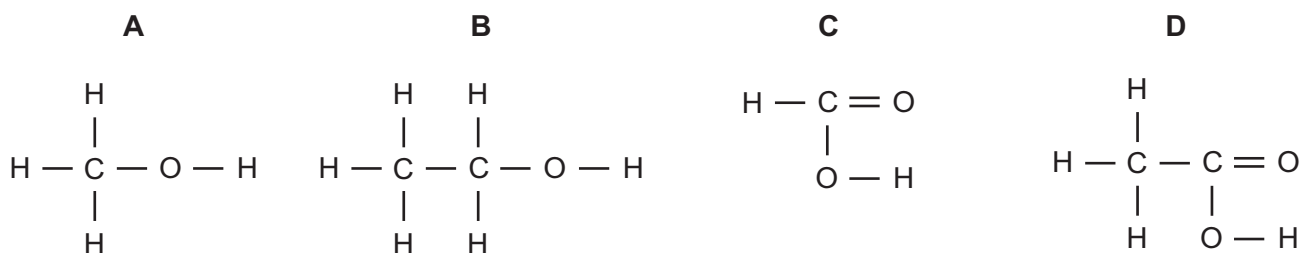


- 33 Which statement explains why iron is used as the catalyst in the manufacture of ammonia?
- A More ammonia is produced in a given time.
 B The catalyst is unchanged at the end of the reaction.
 C The catalyst neutralises the ammonia.
 D The purity of the ammonia is improved.
- 34 A sample of acid rainwater (pH = 4) is passed down a glass column packed with marble chippings (calcium carbonate). The water coming from the bottom of the column is collected in a beaker. The pH is now 6.



What causes the change in pH?

- A The acid has been filtered.
 B The acid has been neutralised.
 C The acid is made more concentrated.
 D The acid is precipitated.
- 35 What are the products when limestone (calcium carbonate) is strongly heated?
- A calcium hydroxide and carbon dioxide
 B calcium hydroxide and carbon monoxide
 C calcium oxide and carbon dioxide
 D calcium oxide and carbon monoxide
- 36 Which compound is ethanol?



37 What is petroleum?

- A an aircraft fuel
- B a central heating fuel
- C a mixture of carbohydrates
- D a mixture of hydrocarbons

38 Methanol and ethanol belong to the same homologous series.

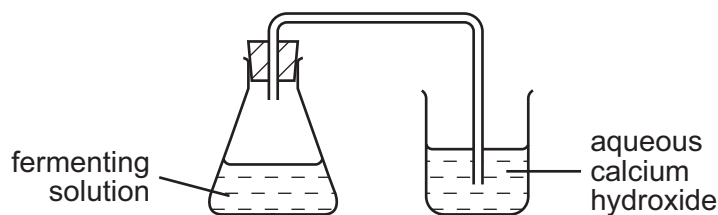
What does this mean?

- A Their molecules contain atoms only of carbon and hydrogen.
- B Their molecules have the same number of carbon atoms.
- C They have the same functional group.
- D They have the same relative molecular mass.

39 Which substances can be obtained by cracking hydrocarbons?

- A ethanol and ethene
- B ethanol and hydrogen
- C ethene and hydrogen
- D ethene and poly(ethene)

40 The apparatus shown may be used to study the products of fermentation.



What is the purpose of the aqueous calcium hydroxide?

- A to absorb any excess of yeast
- B to condense the ethanol produced
- C to prevent air entering the system
- D to show that carbon dioxide is produced

DATA SHEET
The Periodic Table of the Elements

		Group																	
		I	II	III	IV	V	VI	VII	VIII	IX	X								
7	9	Li Lithium 3	Be Beryllium 4	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">H Hydrogen 1</td> </tr> </table>								1	H Hydrogen 1	11	12	14	16	19	20
1	H Hydrogen 1																		
23	24	Na Sodium 11	Mg Magnesium 12	B Boron 5	C Carbon 6	N Nitrogen 7	O Oxygen 8	F Fluorine 9	Ne Neon 10										
39	40	K Potassium 19	Ca Calcium 20	Al Aluminium 13	Si Silicon 14	P Phosphorus 15	S Sulphur 16	Cl Chlorine 17	Ar Argon 18										
85	88	Rb Rubidium 37	Sr Strontium 38	Ga Gallium 31	Ge Germanium 32	As Arsenic 33	Se Selenium 34	Br Bromine 35	Kr Krypton 36										
133	137	Cs Caesium 55	Ba Barium 56	Zn Zinc 30	Ga Gallium 31	Ge Germanium 32	As Arsenic 33	Se Selenium 34	Br Bromine 35										
226	227	Fr Francium 87	Ra Radium 88	Cu Copper 29	Zn Zinc 30	Ga Gallium 31	Ge Germanium 32	As Arsenic 33	Se Selenium 34										
				59	64	70	75	79	84										
				Ni Nickel 28	Cu Copper 29	Zn Zinc 30	Ga Gallium 31	Ge Germanium 32	As Arsenic 33										
				106	108	112	115	119	122										
				Pd Palladium 46	Ag Silver 47	Cd Cadmium 48	In Indium 49	Sn Tin 50	Sb Antimony 51										
				192	195	201	204	207	209										
				Ir Iridium 77	Pt Platinum 78	Au Gold 79	Tl Thallium 81	Pb Lead 82	Bi Bismuth 83										
				186	190	201	204	207	209										
				Re Rhenium 75	Os Osmium 76	Hg Mercury 80	Tl Thallium 81	Pb Lead 82	Bi Bismuth 83										
				144	150	157	162	165	167										
				Nd Neodymium 60	Sm Samarium 62	Gd Gadolinium 64	Dy Dysprosium 66	Ho Holmium 67	Er Erbium 68										
				238	232	232	232	232	232										
				U Uranium 92	Pu Plutonium 94	Am Americium 95	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100										
				141	141	152	159	169	173										
				Pr Praseodymium 59	Sm Samarium 62	Eu Europium 63	Tb Terbium 65	Th Thulium 69	Yb Ytterbium 70										
				91	91	95	97	101	102										
				Pa Protactinium 91	Pu Plutonium 94	Am Americium 95	Bk Berkelium 97	Md Mendelevium 101	No Nobelium 102										
				140	140	152	159	169	173										
				Ce Cerium 58	Pr Praseodymium 59	Eu Europium 63	Tb Terbium 65	Lu Lutetium 71	Lu Lutetium 71										
				90	90	95	97	101	102										
				Th Thorium 90	Pa Protactinium 91	Am Americium 95	Bk Berkelium 97	Md Mendelevium 101	No Nobelium 102										
				175	175	183	188	197	201										
				Lu Lutetium 71	Lu Lutetium 71	Lu Lutetium 71	Lu Lutetium 71	Lu Lutetium 71	Lu Lutetium 71										
				86	86	91	93	101	102										
				Rn Radon 86	Rn Radon 86	Rn Radon 86	Rn Radon 86	Rn Radon 86	Rn Radon 86										

*58-71 Lanthanoid series
90-103 Actinoid series

	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.).