

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY

5070/01

Paper 1 Multiple Choice

May/June 2006

1 hour

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.

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



1 The table gives data about four substances.

Which substance has particles in a disorderly arrangement at room temperature?

	melting point/°C	boiling point/°C
A	-114	-80
B	120	445
C	750	1407
D	1610	2230

2 Which gas has the slowest rate of diffusion?

A ammonia, NH₃

B methane, CH₄

C oxygen, O₂

D nitrogen, N₂

3 An excess of calcium hydroxide is added to an acidic soil.

What happens to the pH of the soil?

	change in pH	final pH
A	increase	7
B	increase	10
C	decrease	7
D	decrease	5

4 Which test could be used to show that a sample of water is pure?

A It freezes at exactly 0°C.

B It turns anhydrous copper(II) sulphate blue.

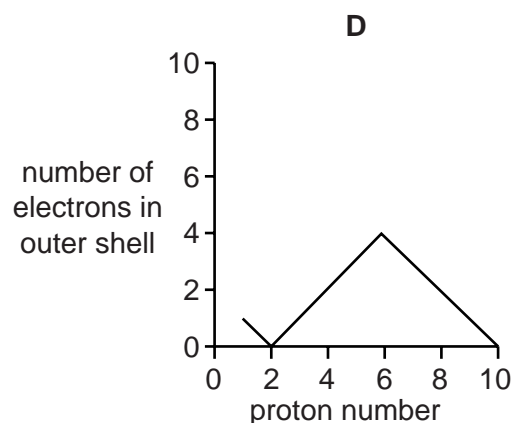
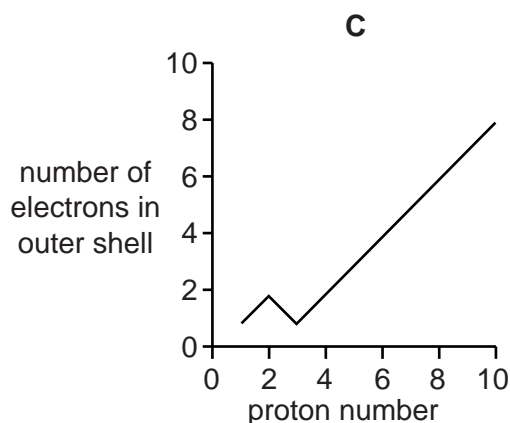
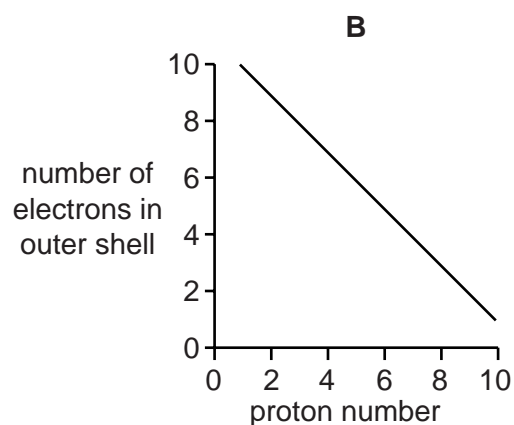
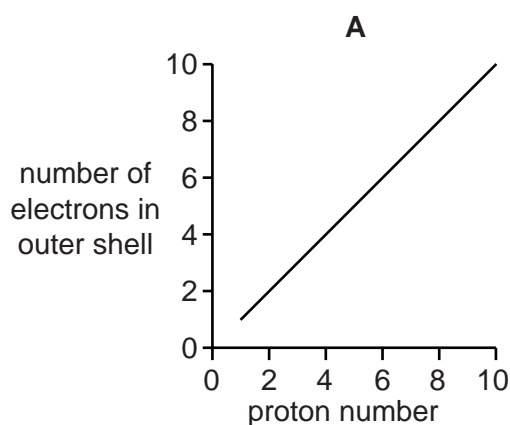
C It turns cobalt(II) chloride paper pink.

D When it evaporates, it leaves no residue.

- 5 Hydrogen can form both H^+ ions and H^- ions.

Which statement about these two ions is correct?

- A** An H^+ ion has no electrons in its first shell.
B An H^+ ion has more protons than an H^- ion.
C An H^- ion has one more electron than an H^+ ion.
D An H^- ion is formed when a hydrogen atom loses an electron.
- 6 Which graph shows the number of electrons in the outer shell of an atom, plotted against the proton (atomic) number for the first ten elements in the Periodic Table?



- 7 The symbols and electronic structures for some elements are shown below.

silicon, Si (2,8,4)

oxygen, O (2,6)

hydrogen, H (1)

fluorine, F (2,7)

nitrogen, N (2,5)

Which formula is correct for a compound containing silicon?

- A** Si_4F **B** SiH_4 **C** SiN_5 **D** Si_2O

8 Substance **X** conducts electricity when in the solid state.

X reacts with hydrochloric acid.

Which substance could **X** be?

- A copper(II) oxide
- B silicon(IV) oxide
- C sodium chloride
- D zinc

9 Rubidium is in Group I and bromine is in Group VII of the Periodic Table.

How is a compound formed between rubidium and bromine?

- A Each atom of bromine shares an electron with an atom of rubidium.
- B Each atom of bromine shares a pair of electrons with an atom of rubidium.
- C Each atom of bromine gives an electron to an atom of rubidium.
- D Each atom of bromine receives an electron from an atom of rubidium.

10 2 dm^3 of aqueous sodium hydroxide of concentration 5 mol/dm^3 were required for an experiment.

How many moles of sodium hydroxide were needed to make up this solution?

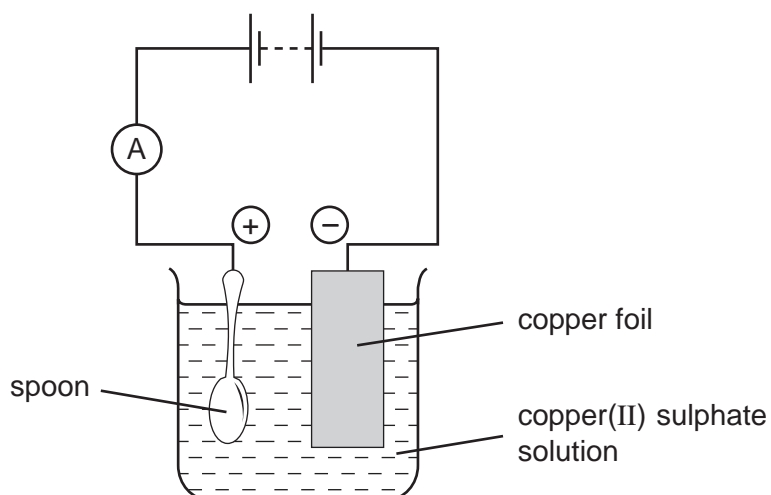
- A 2.5 B 5 C 7 D 10

11 An 8g sample of oxygen atoms contains the same number of atoms as 16g of element **X**.

What is the relative atomic mass, A_r , of **X**?

- A 4 B 8 C 16 D 32

12 The apparatus shown below was set up to copper plate the metal spoon.

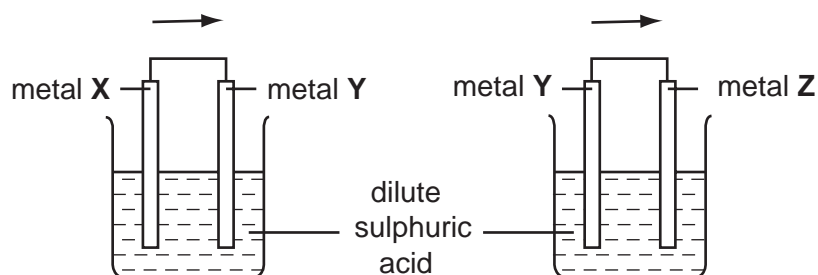


The experiment did **not** work.

What was the mistake in the apparatus?

- A A variable resistor should be included in the electrical circuit.
 - B Dilute sulphuric acid should be used as the electrolyte.
 - C The copper electrode should all be in the solution.
 - D The spoon should be the negative electrode.
- 13 Which pair of substances act as reducing agents in the blast furnace?
- A carbon and oxygen
 - B carbon monoxide and carbon dioxide
 - C carbon and carbon monoxide
 - D carbon dioxide and oxygen

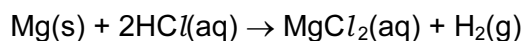
- 14 Two cells were set up as shown in the diagram. The arrows show the direction of electron flow in the external circuits.



Which set of metals would give the electron flows in the directions shown?

	metal X	metal Y	metal Z
A	Ag	Cu	Zn
B	Ag	Zn	Cu
C	Cu	Zn	Ag
D	Zn	Cu	Ag

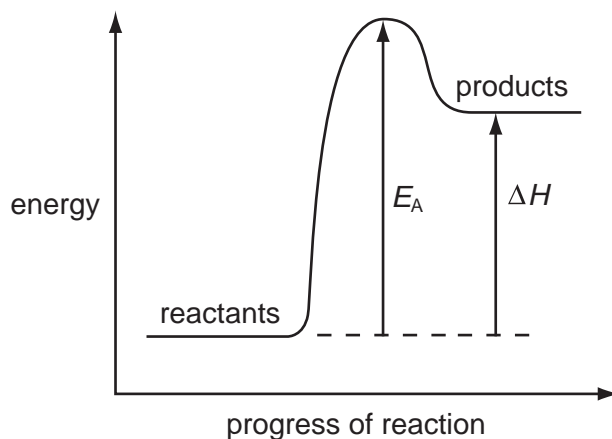
- 15 The equation below shows an exothermic reaction.



Which statement about this exothermic reaction is **not** correct?

- A** Magnesium chloride is soluble in water.
- B** Magnesium is above hydrogen in the reactivity series.
- C** One mole of magnesium produces one mole of hydrogen gas.
- D** The total energy of the products is greater than that of the reactants.

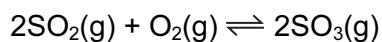
16 The diagram shows the energy profile for a chemical reaction.



What is the correct description of the reaction?

	sign of ΔH	overall energy change	sign of E_A
A	–	exothermic	–
B	+	endothermic	+
C	+	endothermic	–
D	+	exothermic	+

17 In the Contact process for making sulphuric acid, one step involves the oxidation of sulphur dioxide as shown below.



The forward reaction is exothermic.

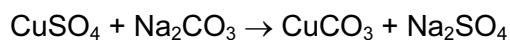
Which change would increase the amount of sulphur trioxide produced at equilibrium?

- A** increasing the temperature
- B** decreasing the temperature
- C** decreasing the pressure
- D** adding a catalyst

18 Which statement about conduction of electricity is correct?

- A** Electricity is conducted in aqueous solution by electrons.
- B** Electricity is conducted in a metal wire by ions.
- C** Electricity is conducted in a molten electrolyte by electrons.
- D** Electricity is conducted in an acid solution by ions.

- 19 Which change is an example of oxidation?
- A chloride ions to chlorine atoms
 - B copper(II) ions to copper atoms
 - C iron(III) ions to iron(II) ions
 - D oxygen atoms to oxide ions
- 20 Which cation, on reaction with aqueous sodium hydroxide, forms a precipitate that dissolves in excess sodium hydroxide?
- A Ca^{2+} B Cu^{2+} C Fe^{3+} D Zn^{2+}
- 21 Which of the following is a reaction of dilute sodium hydroxide?
- A It reacts with ammonium chloride to produce ammonia.
 - B It reacts with calcium carbonate to produce carbon dioxide.
 - C It reacts with copper(II) oxide to produce water.
 - D It reacts with Universal Indicator solution turning it red.
- 22 The equation for one method of making copper carbonate is shown below.



The reaction is an example of

- A neutralisation.
 - B oxidation and reduction.
 - C precipitation.
 - D synthesis.
- 23 A lump of element **X** can be cut by a knife.
- During its reaction with water **X** floats and melts.
- What is **X**?
- A calcium
 - B copper
 - C magnesium
 - D potassium

- 24 Which deduction about the element astatine, At, can be made from its position in Group VII?
- A It forms covalent compounds with sodium.
 - B It is displaced from aqueous potassium astatide, KAt, by chlorine.
 - C It is a gas.
 - D It is more reactive than iodine.

- 25 Which atom has the same electronic configuration as the strontium ion?

- A calcium
- B krypton
- C rubidium
- D selenium

- 26 Rubidium is in Group I of the Periodic Table.

What are properties of rubidium chloride?

	formula	approximate melting point / °C	solubility in water
A	RbCl	70	insoluble
B	RbCl	700	soluble
C	RbCl ₂	70	soluble
D	RbCl ₂	700	insoluble

- 27 Iron pipes corrode rapidly when exposed to sea water.

Which metal, when attached to the iron, would **not** offer protection against corrosion?

- A aluminium
- B copper
- C magnesium
- D zinc

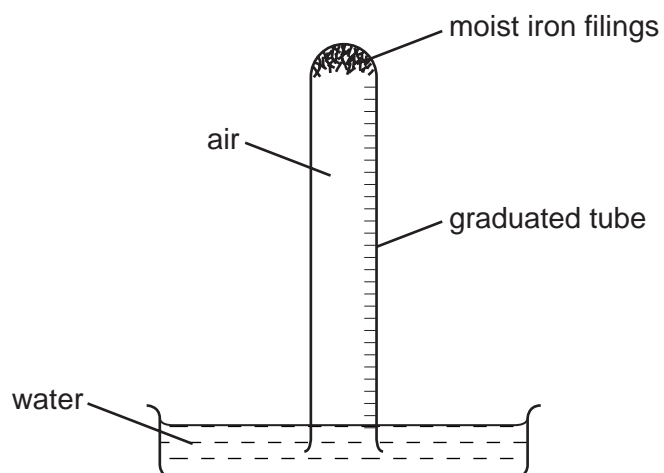
- 28 Metal carbonates decompose when heated.

Which carbonate is **most** stable to heat?

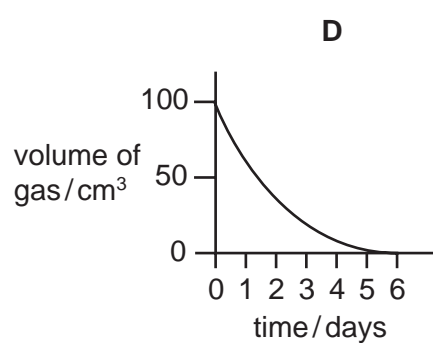
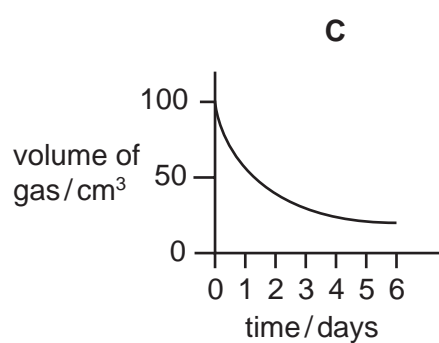
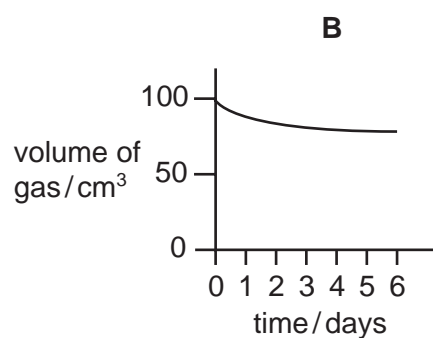
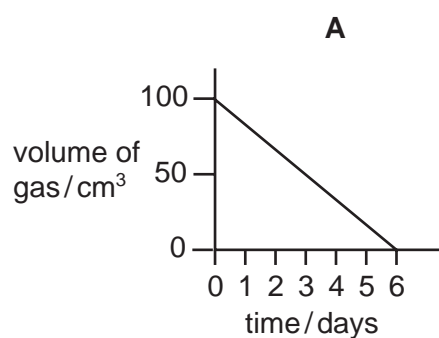
- A calcium carbonate
- B copper(II) carbonate
- C lead(II) carbonate
- D zinc carbonate

29 The apparatus shown was set up with 100 cm^3 volume of air in the tube.

The volume of gas in the tube was measured at intervals for six days.



Which graph best represents how the volume of gas changes with time?



- 30 From your knowledge of the manufacture of both aluminium and iron, what is the order of chemical reactivity of aluminium, carbon and iron towards oxygen?

	most reactive \longrightarrow least reactive		
A	aluminium	carbon	iron
B	aluminium	iron	carbon
C	carbon	aluminium	iron
D	carbon	iron	aluminium

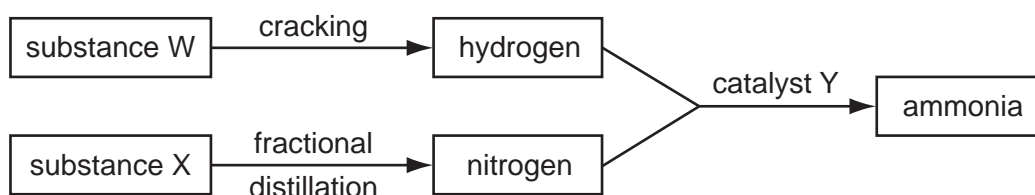
- 31 The molar heat of combustion, i.e. the heat given out when one mole of the alcohol is completely burned in oxygen, of a number of alcohols is given below.

alcohol	formula	heat of combustion kJ/mol
methanol	CH ₃ OH	750
ethanol	C ₂ H ₅ OH	1380
propanol	C ₃ H ₇ OH	2010
butanol	C ₄ H ₉ OH	2640

How many carbon and hydrogen atoms would there be in an alcohol that has a molar heat of combustion of 3900 kJ/mol?

	number of carbon atoms	number of hydrogen atoms
A	5	11
B	5	12
C	6	13
D	6	14

32 The diagram shows processes that take place in the manufacture of ammonia.



What are substances W and X and catalyst Y?

	W	X	Y
A	air	oil	iron
B	air	oil	vanadium(V) oxide
C	oil	air	iron
D	oil	air	vanadium(V) oxide

33 Element **R** reacts with oxygen to form a gas, **T**.

T changes the colour of damp litmus paper from blue to red.

T is used to kill bacteria in the preservation of dried fruit.

What is **R**?

- A** carbon
- B** chlorine
- C** nitrogen
- D** sulphur

34 The gases coming from a car's exhaust contain oxides of nitrogen.

How are these oxides formed?

- A** Nitrogen reacts with carbon dioxide.
- B** Nitrogen reacts with carbon monoxide.
- C** Nitrogen reacts with oxygen.
- D** Nitrogen reacts with petrol.

35 The table shows pollutants and their possible effects.

Which line is **not** correct?

	pollutant	effect
A	CFCs	cause destruction of the ozone layer
B	CH ₄	forms photochemical smog
C	CO	is poisonous to humans
D	NO ₂	forms acid rain

36 A student investigated the reaction of different vegetable oils with hydrogen. 100 cm³ of hydrogen was passed through 1 g samples of vegetable oils containing a suitable catalyst.

The volume of hydrogen remaining after each reaction was recorded.

vegetable oil	volume of hydrogen remaining / cm ³
P	100
Q	87
R	63
S	0

Which vegetable oils are unsaturated?

- A** P only
- B** Q and R only
- C** Q, R and S only
- D** S only

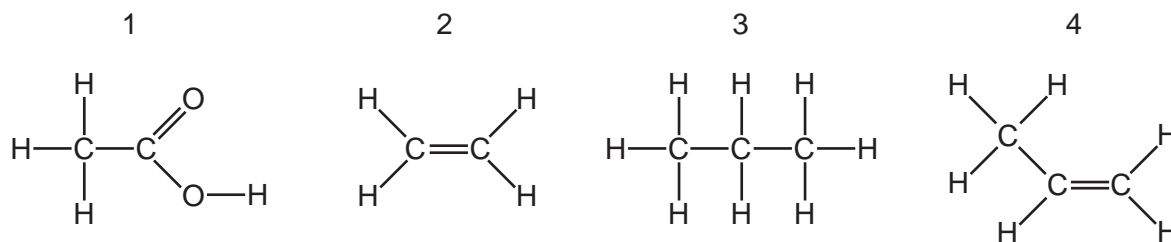
37 In the polymerisation of ethene to form poly(ethene), which of the following does **not** change?

- A** boiling point
- B** density
- C** empirical formula
- D** molecular mass

38 In which pair of macromolecules are the linkages the same?

- A fats and proteins
- B nylon and fats
- C nylon and proteins
- D proteins and *Terylene*

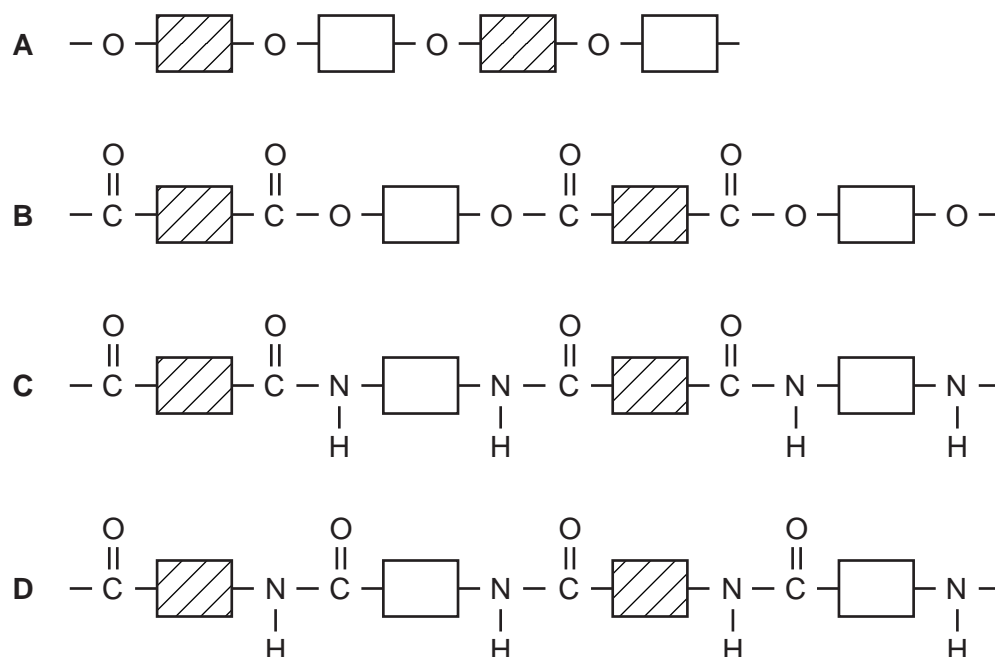
39 The structures of four organic compounds are shown.



Which compounds decolourise bromine water?

- A 1 and 2
- B 2 and 4
- C 3 only
- D 3 and 4

40 Which polymer would hydrolyse to amino acids?



DATA SHEET
The Periodic Table of the Elements

		Group																	
I	II											III	IV	V	VI	VII	0		
7 Li Lithium 3	9 Be Beryllium 4	1 H Hydrogen 1																	4 He Helium 2
23 Na Sodium 11	24 Mg Magnesium 12											5 B Boron 5	6 C Carbon 6	7 N Nitrogen 7	8 O Oxygen 8	9 F Fluorine 9	10 Ne Neon 10		
39 K Potassium 19	40 Ca Calcium 20	51 V Vanadium 23	48 Ti Titanium 22	45 Sc Scandium 21	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	93 Nb Niobium 41	91 Zr Zirconium 40	89 Y Yttrium 39	96 Mo Molybdenum 42	101 Ru Ruthenium 44	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	181 Ta Tantalum 73	178 Hf Hafnium 72	139 La Lanthanum 57	184 W Tungsten 74	190 Os Osmium 76	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86				
87 Fr Francium 87	226 Ra Radium 88											227 Ac Actinium 89							
		*58-71 Lanthanoid series										†90-103 Actinoid series							
		140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	61 Pm Promethium	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	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	91 Pa Protactinium	92 U Uranium	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkelium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium	103 Lr Lawrencium				

Key

a	X	†
a		†
b		†

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.).