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.

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, NH_3

B methane, CH_4

C oxygen, O_2

D nitrogen, N_2

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.

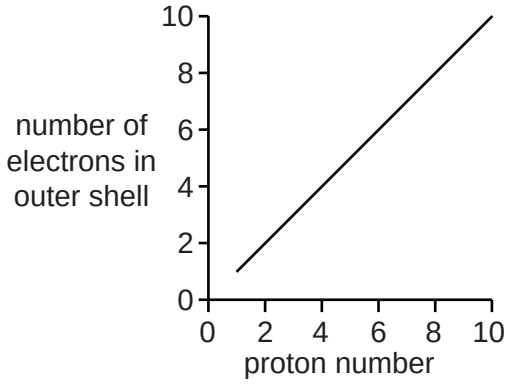
B An H^+ ion has more protons than an H^- ion.

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?

A



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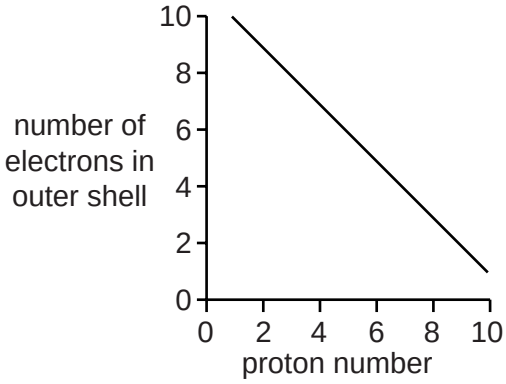

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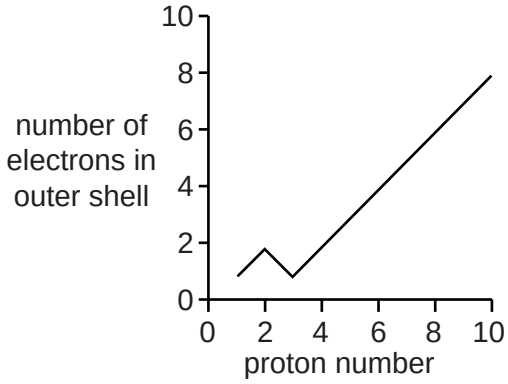

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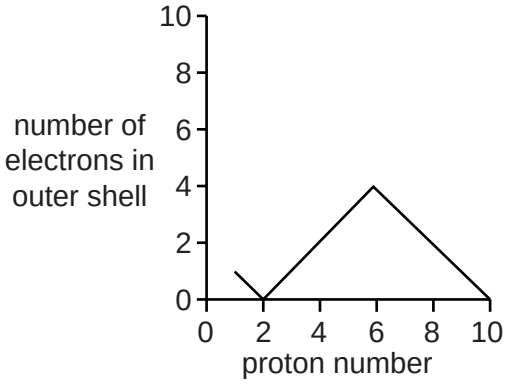


7 The symbols and electronic structures for some elements are shown below.

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?

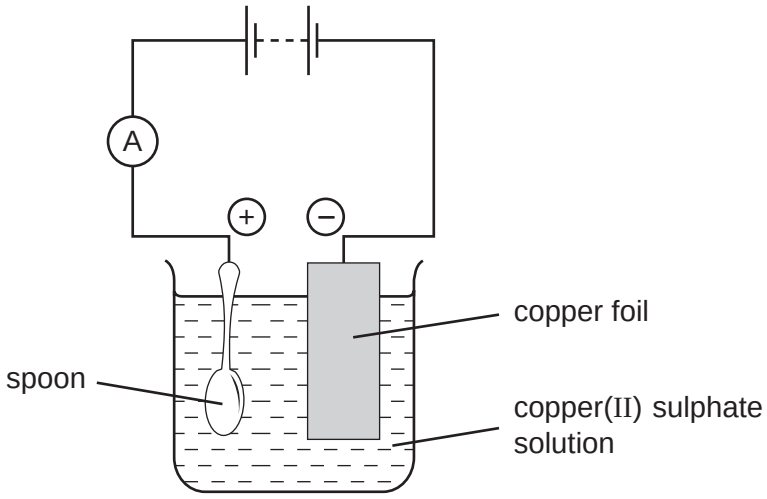
A 2.5 **B** 5 **C** 7 **D** 10

11 An 8 g sample of oxygen atoms contains the same number of atoms as 16 g 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?

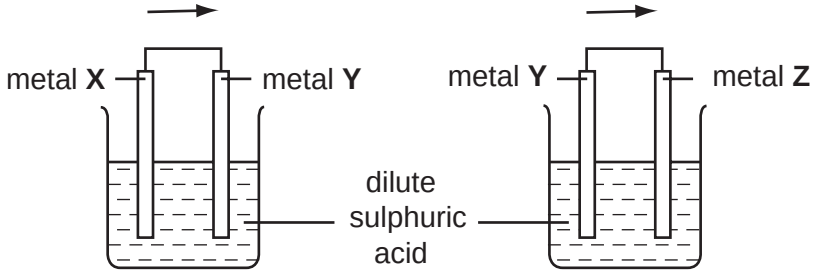
A carbon and oxygen

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.

$$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$$

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

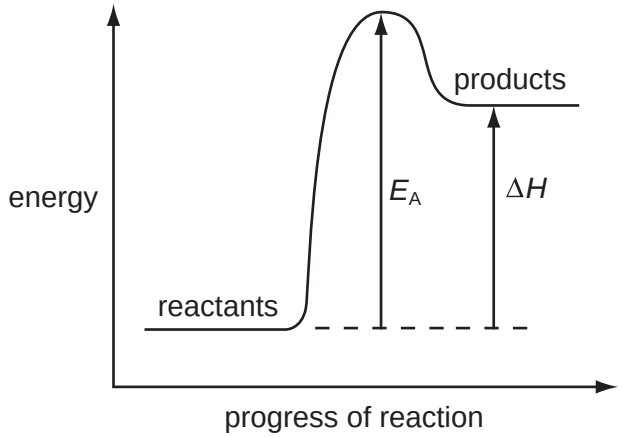
A Magnesium chloride is soluble in water.

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.

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$$

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.

$$CuSO_4 + Na_2CO_3 \rightarrow CuCO_3 + Na_2SO_4$$

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

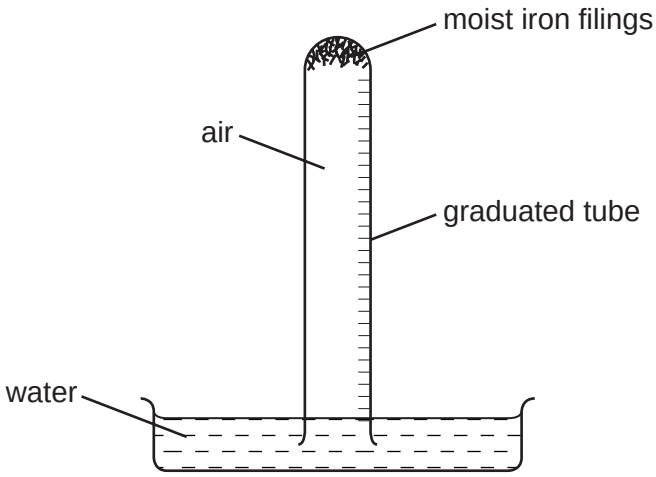
B copper(II) carbonate

C lead(II) carbonate

D zinc carbonate

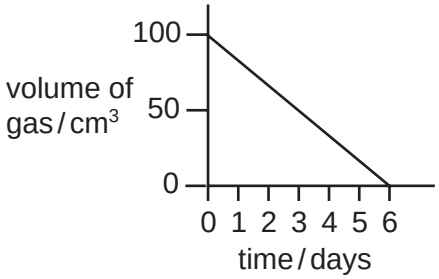
29 The apparatus shown was set up with 100 cm^3 volume of air in the tube.

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?

A



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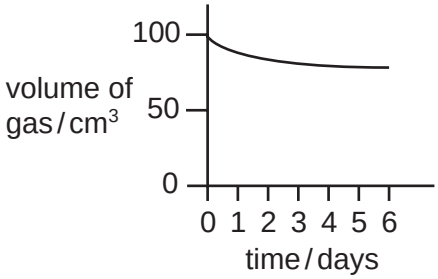

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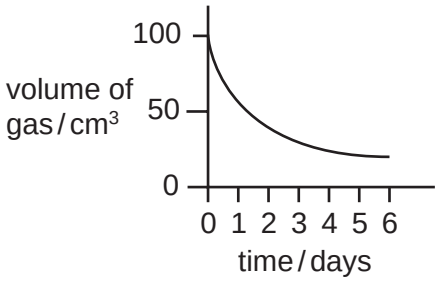

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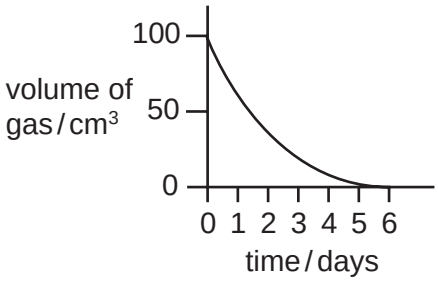


30 From your knowledge of the manufacture of both aluminium and iron, what is the order of chemical reactivity of aluminium, carbon and iron towards oxygen?

	most reactive ⟶ least reactive		
A	aluminium	carbon	iron
B	aluminium	iron	carbon
C	carbon	aluminium	iron
D	carbon	iron	aluminium

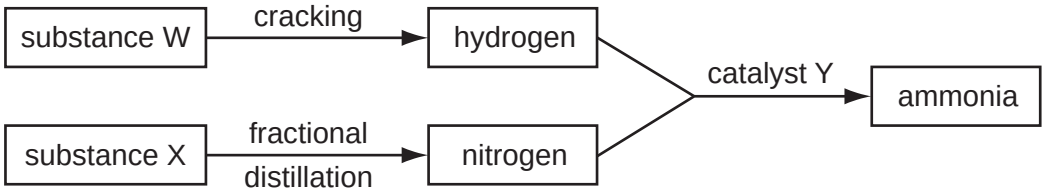
31 The molar heat of combustion, i.e. the heat given out when one mole of the alcohol is completely burned in oxygen, of a number of alcohols is given below.

alcohol	formula	heat of combustion kJ / mol
methanol	CH_3OH	750
ethanol	C_2H_5OH	1380
propanol	C_3H_7OH	2010
butanol	C_4H_9OH	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 cm^3 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

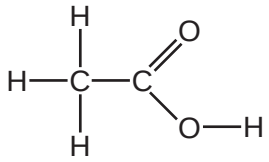
B nylon and fats

C nylon and proteins

D proteins and *Terylene*

39 The structures of four organic compounds are shown.

1



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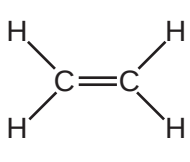

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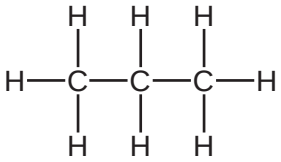

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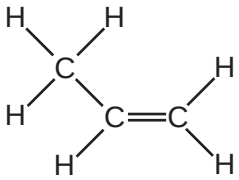


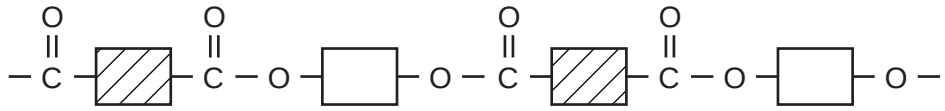
Which compounds decolourise bromine water?

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

40 Which polymer would hydrolyse to amino acids?

A

B



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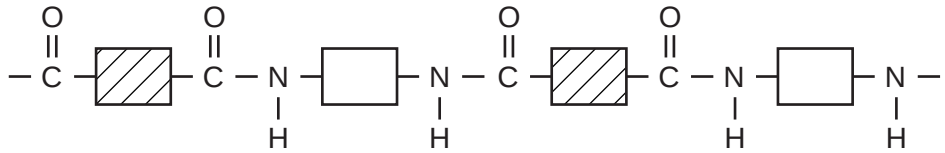

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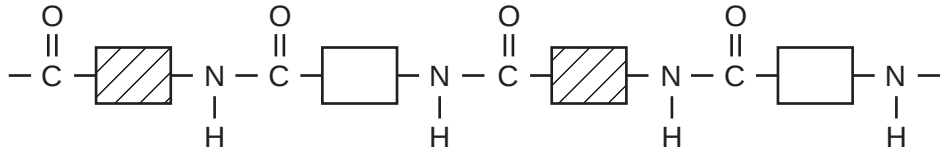

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DATA SHEET
The Periodic Table of the Elements

Group																		
I	II										III	IV	V	VI	VII	0
																4 **He** Helium 2
					1 **H** Hydrogen 1											
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** Sulphur 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 †															

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

Key

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

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