UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY **5070/11**

Paper 1 Multiple Choice **May/June 2011**

1 hour

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

* 2 6 5 9 2 0 9 7 0 2 *

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.

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International Examinations

1 Copper(II) sulfate crystals are separated from sand using the four processes listed below.

In which order are these processes used?

	1st	2nd	3rd	4th
A	filtering	dissolving	crystallising	evaporating
B	filtering	dissolving	evaporating	crystallising
C	dissolving	evaporating	filtering	crystallising
D	dissolving	filtering	evaporating	crystallising

2 A drop of liquid bromine is placed in the bottom of a gas jar. Brown fumes of bromine vapour slowly spread through the covered gas jar.

Why does this happen?

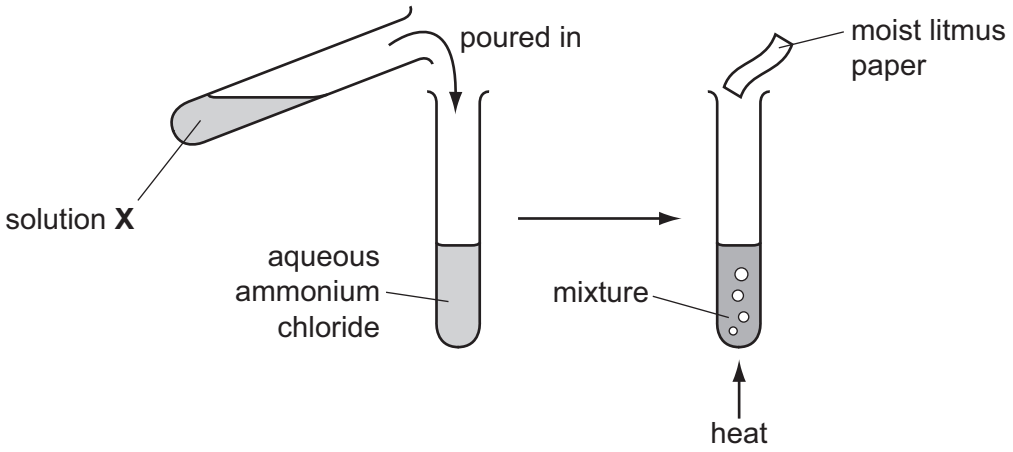
A Bromine vapour is less dense than air.

B Bromine molecules and the molecules in air are always moving around.

C Bromine molecules are smaller than the molecules in air.

D Bromine molecules move faster than the molecules in air.

3 The diagrams show an experiment with aqueous ammonium chloride.



A gas, **Y**, is produced and the litmus paper changes colour.

What are solution **X** and gas **Y**?

	solution **X**	gas **Y**
A	aqueous sodium hydroxide	ammonia
B	aqueous sodium hydroxide	chlorine
C	dilute sulfuric acid	ammonia
D	dilute sulfuric acid	chlorine

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4 What is the mass of oxygen contained in 72 g of pure water?
[Relative atomic masses: H = 1; O = 16]

A 16 g **B** 32 g **C** 64 g **D** 70 g

5 A student tested a solution by adding aqueous sodium hydroxide. A precipitate was not seen because the reagent was added too quickly.

What could **not** have been present in the solution?

A Al^{3+} **B** Ca^{2+} **C** NH_4^+ **D** Zn^{2+}

6 Which molecule has the **largest** number of electrons involved in covalent bonds?

A C_2H_4 **B** CO_2 **C** CH_3OH **D** N_2

7 In which of the following is there a lattice of positive ions in a 'sea of electrons'?

A liquid potassium chloride

B sand

C solid graphite

D solid magnesium

8 Which statement about both chlorine atoms and chloride ions is correct?

A They are chemically identical.

B They are isotopes of chlorine.

C They have the same number of protons.

D They have the same physical properties.

9 Element *X* has the electronic structure 2,8,5. Element *Y* has the electronic structure 2,8,7.

What is the likely formula of a compound containing only *X* and *Y*?

A XY_3 **B** X_2Y_3 **C** X_3Y **D** X_3Y_2

10 A covalent bond is formed by

A electron sharing between metals and non-metals.

B electron sharing between non-metals.

C electron transfer between non-metals.

D electron transfer from metals to non-metals.

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11 The equation for the reaction between calcium carbonate and hydrochloric acid is shown.

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$$

How many moles of calcium carbonate will give 24 cm^3 of carbon dioxide when reacted with an excess of the acid?

(Assume one mole of carbon dioxide occupies 24 dm^3.)

A 1 mol **B** 0.1 mol **C** 0.01 mol **D** 0.001 mol

12 The empirical formula of a liquid compound is C_2H_4O.

To find the empirical formula, it is necessary to know the

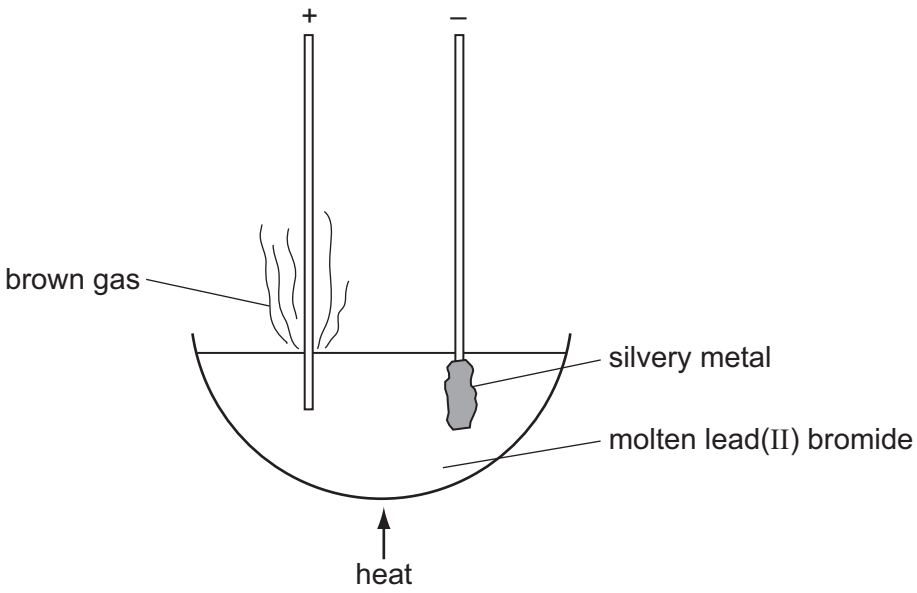
A density of the compound.

B percentage composition of the compound.

C relative molecular mass of the compound.

D volume occupied by 1 mole of the compound.

13 The diagram shows the electrolysis of molten lead(II) bromide using inert electrodes.



What happens during this electrolysis?

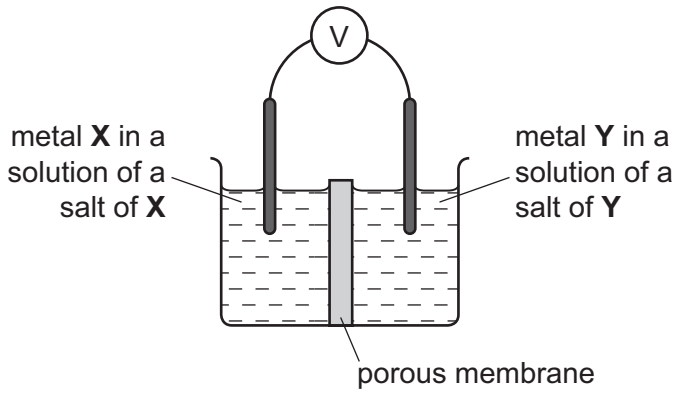
A Atoms change to ions.

B Covalent bonds are broken.

C Ions change to atoms.

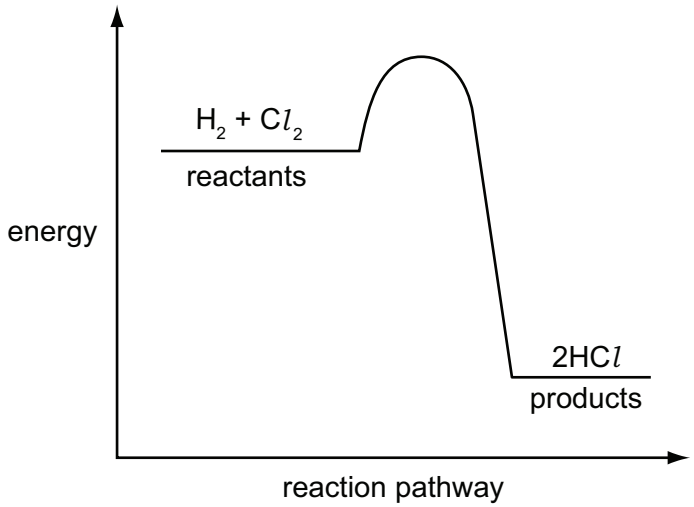
D New compounds are formed.

14 Which pair of metals **X** and **Y** will produce the highest voltage when used as electrodes in a simple cell?



	metal **X**	metal **Y**
A	copper	silver
B	magnesium	silver
C	magnesium	zinc
D	zinc	copper

15 The energy profile diagram for the reaction between hydrogen and chlorine is shown.



What information about this reaction does the diagram show?

	type of reaction	sign of enthalpy change, ΔH
A	endothermic	negative
B	endothermic	positive
C	exothermic	negative
D	exothermic	positive

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16 The following changes could be made to the conditions in the reaction between zinc and hydrochloric acid.

1 increase in concentration of the acid

2 increase in particle size of the zinc

3 increase in pressure on the system

4 increase in temperature of the system

Which pair of changes will increase the rate of reaction?

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

17 The equation shows what happens in a redox reaction between iron(II) chloride and chlorine gas.

$$2FeCl_2 + Cl_2 \rightarrow 2FeCl_3$$

Which equation describes the reduction process in this reaction?

A $2Cl^- \rightarrow Cl_2 + 2e^-$

B $Cl_2 + 2e^- \rightarrow 2Cl^-$

C $Fe^{2+} \rightarrow Fe^{3+} + e^-$

D $Fe^{3+} + e^- \rightarrow Fe^{2+}$

18 Which acid and base react together to produce an **insoluble** salt?

A hydrochloric acid and sodium hydroxide

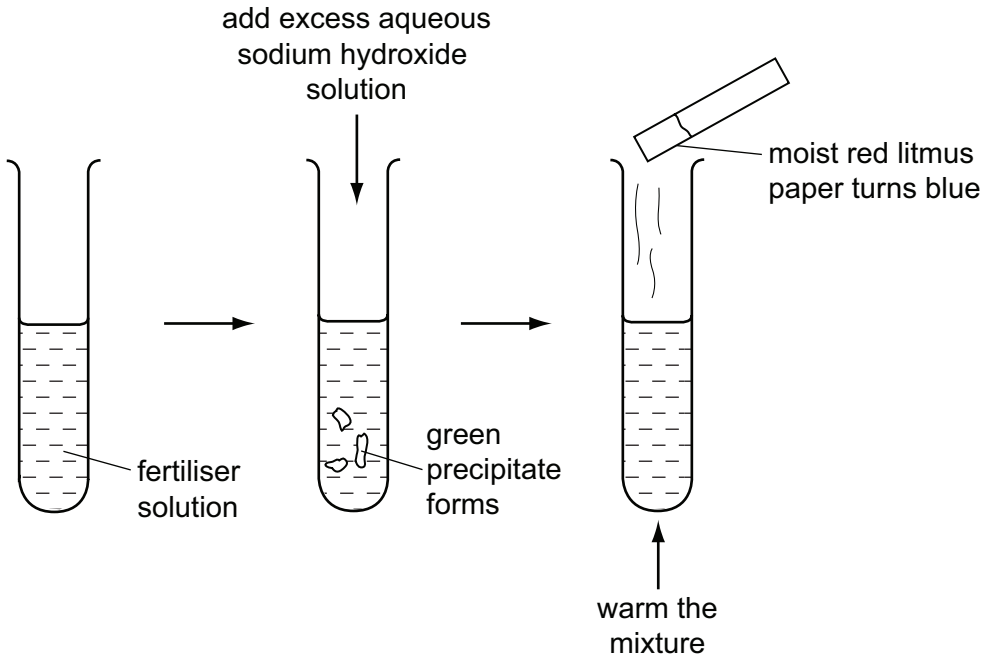
B nitric acid and calcium oxide

C sulfuric acid and barium hydroxide

D sulfuric acid and zinc oxide

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19 A solution of fertiliser was tested as shown.



Which ions must be present in the fertiliser?

A Fe^{2+} and SO_4^{2-}

B Fe^{3+} and NO_3^-

C NH_4^+ and Fe^{2+}

D NH_4^+ and NO_3^-

20 Carbon and silicon are both in Group IV of the Periodic Table.

Which statement is correct for both carbon dioxide and silicon dioxide?

A They are acidic oxides.

B They are readily soluble in water.

C They contain ionic bonds.

D They have giant molecular structures.

21 Which calcium compound does **not** increase the pH of acidic soils?

A calcium carbonate

B calcium hydroxide

C calcium oxide

D calcium sulfate

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22 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 a gas.

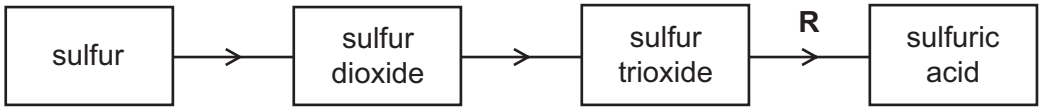
C It is displaced from aqueous potassium astatide, KAt, by chlorine.

D It is more reactive than iodine.

23 Which pair of properties are **both** correct for a typical transition element?

	property 1	property 2
A	forms coloured compounds	soluble in water
B	high density	has variable oxidation states
C	low density	high melting point
D	low melting point	can act as a catalyst

24 The diagram represents the manufacture of sulfuric acid by the Contact process.



What is used in step **R**?

A concentrated sulfuric acid followed by water

B vanadium(V) oxide

C water followed by concentrated sulfuric acid

D water only

25 What happens when zinc foil is placed in an aqueous solution of copper(II) sulfate?

A Copper(II) ions are oxidised.

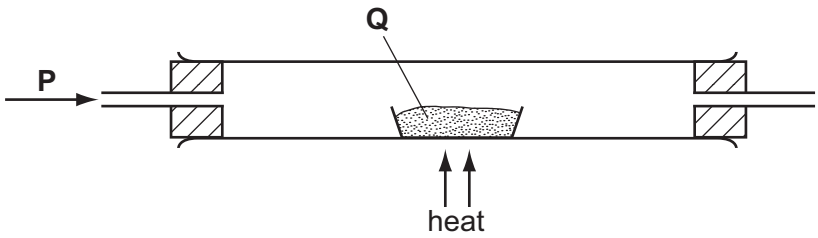
B There is no reaction.

C Zinc atoms are oxidised.

D Zinc sulfate is precipitated.

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26 In the apparatus shown, gas **P** is passed over solid **Q**.



No reaction occurs if **P** and **Q** are

	P	Q
A	hydrogen	lead(II) oxide
B	hydrogen	magnesium oxide
C	oxygen	carbon
D	oxygen	sulfur

27 Which element can only be extracted from its ore using electrolysis?

A calcium

B copper

C lead

D silver

28 Scrap iron is often recycled.

Which reason for recycling is **not** correct?

A It reduces the amount of pollution at the site of the ore extraction.

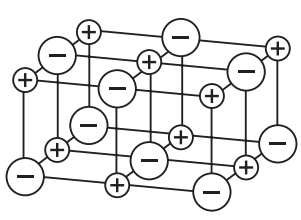
B It reduces the amount of waste taken to landfill sites.

C It reduces the need to collect the scrap iron.

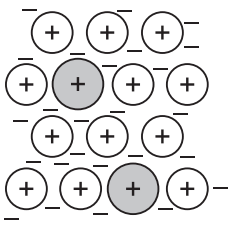
D It saves natural resources.

29 Which diagram represents the structure of an alloy?

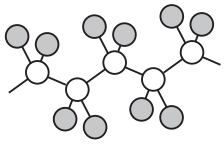
A



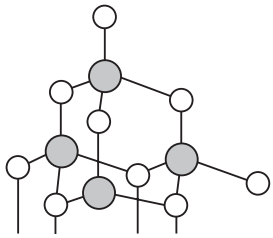
B



C



D



30 Aluminium is higher than copper in the reactivity series so the following displacement reaction should be feasible.

$$2Al(s) + 3CuSO_4(aq) \rightarrow Al_2(SO_4)_3(aq) + 3Cu(s)$$

The reaction does not take place at room temperature.

What is the reason for this?

A Aluminium has an inert coating all over it.

B The compound aluminium sulfate does not exist.

C The reaction is exothermic.

D The reaction needs to be warmed to take place.

31 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.

32 When a volcano erupts, which gas is produced in significant amounts?

A carbon monoxide

B chlorofluorocarbons

C methane

D sulfur dioxide

33 Compound X is a hydrocarbon. It reacts with steam to form an alcohol.

Which type of compound is X and what would be its effect on bromine water?

	type of compound	effect on bromine water
A	alkane	turns from brown to colourless
B	alkane	turns from colourless to brown
C	alkene	turns from brown to colourless
D	alkene	turns from colourless to brown

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34 Useful fractions are obtained by the fractional distillation of petroleum.

Which fraction is matched by its use?

	fraction	use
A	bitumen	fuel in cars
B	lubricating oils	for making waxes and polishes
C	paraffin (kerosene)	for making roads
D	petrol (gasolene)	aircraft fuel

35 Which statement about ethanoic acid is correct?

A It contains three carbon atoms per molecule.

B It contains five hydrogen atoms per molecule.

C It is insoluble in water.

D It reacts with ethanol to form a sweet-smelling compound.

36 Which bond is present in both nylon and *Terylene*?

A C – O **B** C = O **C** N – C **D** N – H

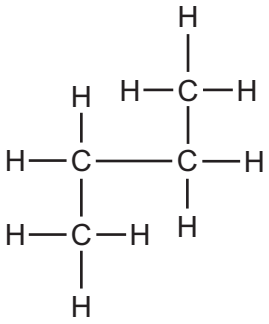
37 Compounds X and Y are both alkanes. Compound X has a higher boiling point than compound Y.

What could be the formulae of compounds X and Y?

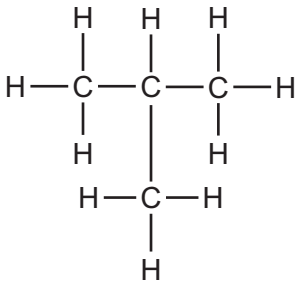
	compound X	compound Y
A	C_8H_{16}	C_9H_{18}
B	C_8H_{18}	C_9H_{20}
C	C_9H_{18}	C_8H_{16}
D	C_9H_{20}	C_8H_{18}

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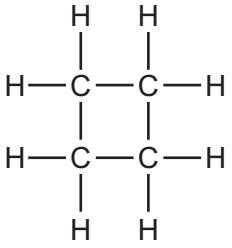
38 Four hydrocarbon structures are shown.



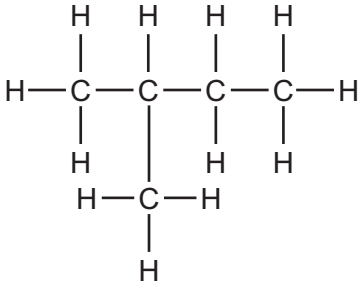
1



2



3



4

Which hydrocarbons are isomers of each other?

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

39 With which substance will ethene react to form more than one product?

A bromine

B hydrogen

C oxygen

D steam

40 When a compound X is reacted with sodium carbonate, carbon dioxide gas is evolved.

What could be the formula of compound X?

A $C_2H_5CO_2CH_3$ **B** $C_3H_7CO_2H$ **C** $CH_3CO_2C_2H_5$ **D** C_4H_9OH

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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** 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	a = relative atomic mass
X	**X** = atomic symbol
b	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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