

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
<b>A</b>	-114	-80
<b>B</b>	120	445
<b>C</b>	750	1407
<b>D</b>	1610	2230

- 2 Which gas has the slowest rate of diffusion?

- A** ammonia, NH<sub>3</sub>
- B** methane, CH<sub>4</sub>
- C** oxygen, O<sub>2</sub>
- D** nitrogen, N<sub>2</sub>

- 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
<b>A</b>	increase	7
<b>B</b>	increase	10
<b>C</b>	decrease	7
<b>D</b>	decrease	5

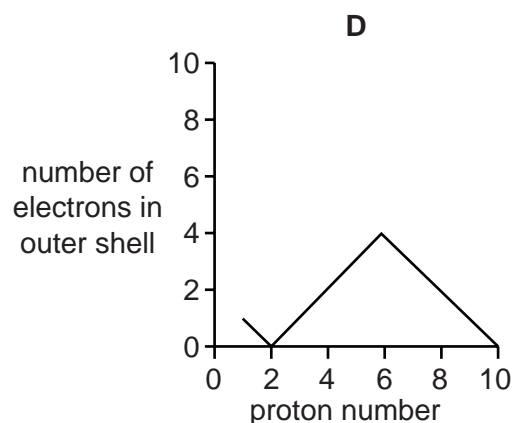
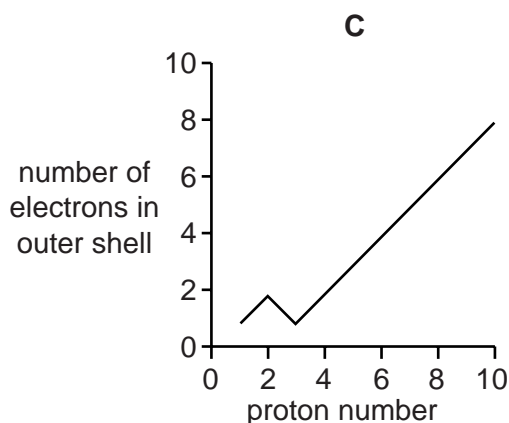
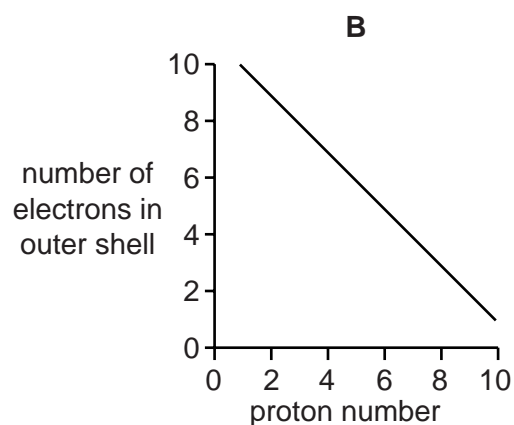
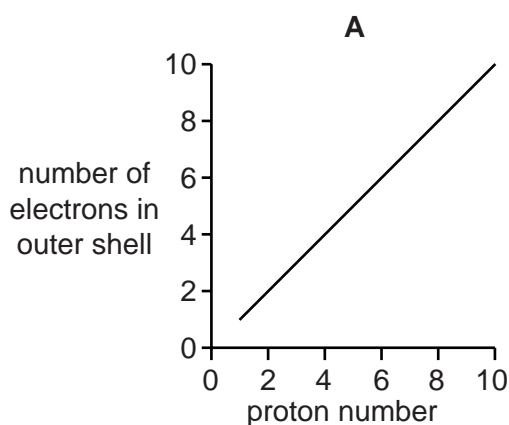
- 4 Which test could be used to show that a sample of water is pure?

- 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  $2\text{ dm}^3$  of aqueous sodium hydroxide of concentration  $5\text{ mol/dm}^3$  were required for an experiment.

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

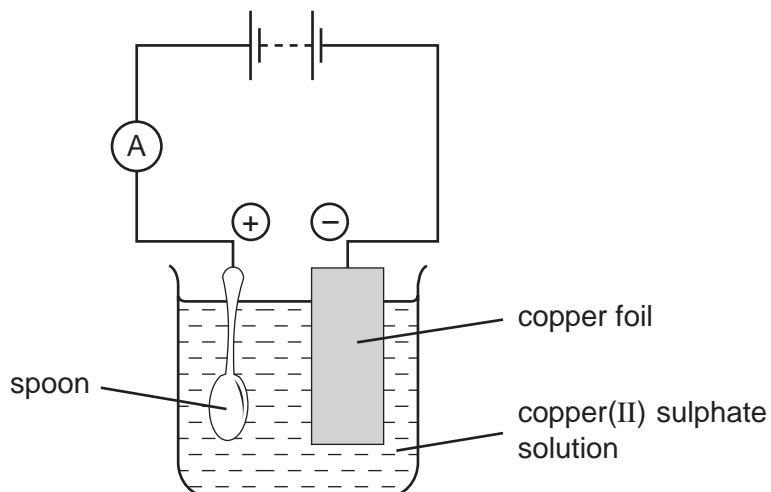
- A 2.5                      B 5                      C 7                      D 10

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.

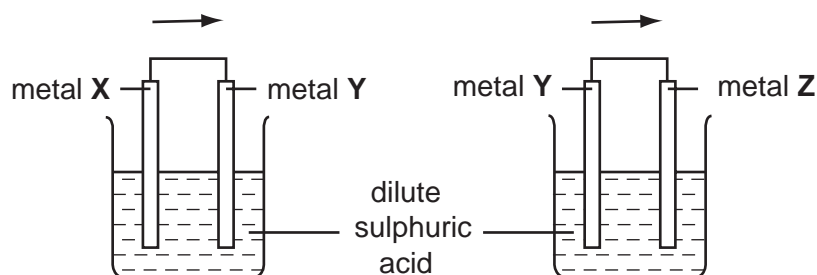


The experiment did **not** work.

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

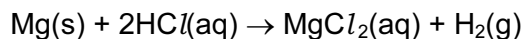
- 14 Two cells were set up as shown in the diagram. The arrows show the direction of electron flow in the external circuits.



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

	metal X	metal Y	metal Z
<b>A</b>	Ag	Cu	Zn
<b>B</b>	Ag	Zn	Cu
<b>C</b>	Cu	Zn	Ag
<b>D</b>	Zn	Cu	Ag

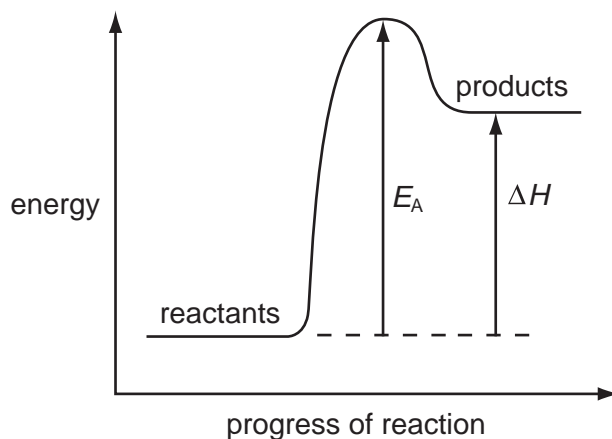
- 15 The equation below shows an exothermic reaction.



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.

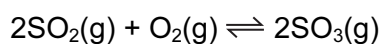
16 The diagram shows the energy profile for a chemical reaction.



What is the correct description of the reaction?

	sign of $\Delta H$	overall energy change	sign of $E_A$
<b>A</b>	–	exothermic	–
<b>B</b>	+	endothermic	+
<b>C</b>	+	endothermic	–
<b>D</b>	+	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.

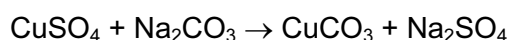
Which change would increase the amount of sulphur trioxide produced at equilibrium?

- 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  $\text{Ca}^{2+}$                       B  $\text{Cu}^{2+}$                       C  $\text{Fe}^{3+}$                       D  $\text{Zn}^{2+}$
- 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 <sub>2</sub>	70	soluble
D	RbCl <sub>2</sub>	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

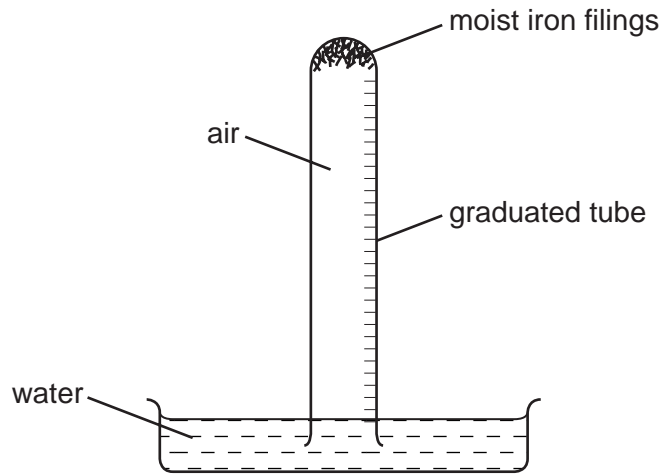
- 28 Metal carbonates decompose when heated.

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

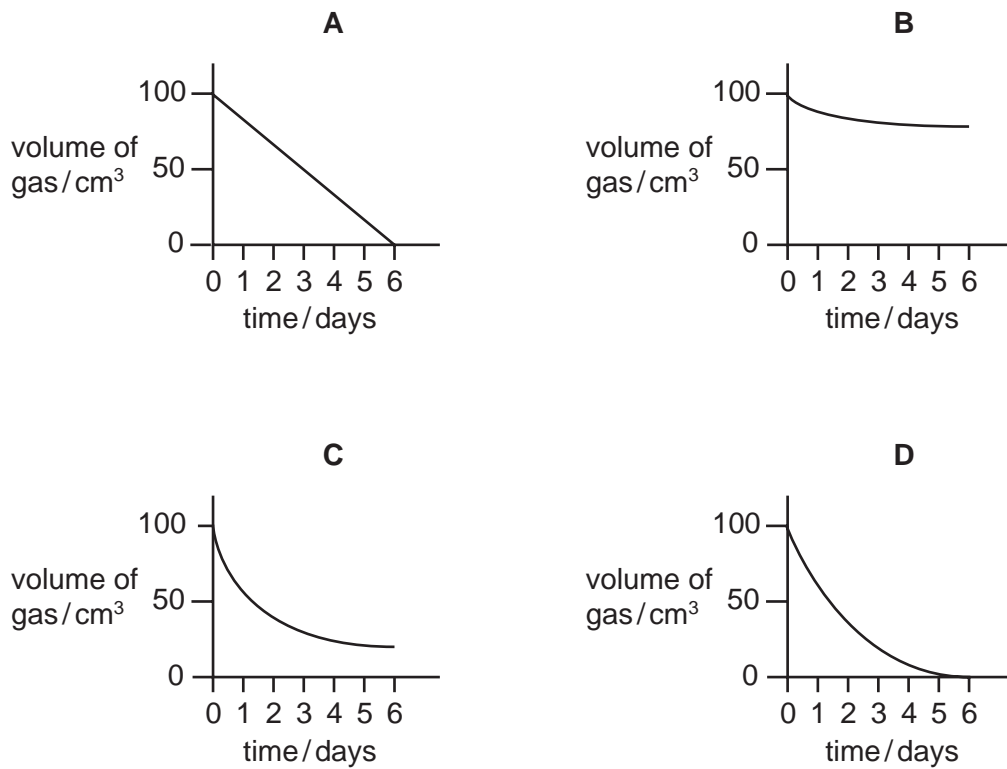
- A calcium carbonate
- B copper(II) carbonate
- C lead(II) carbonate
- D zinc carbonate

29 The apparatus shown was set up with  $100 \text{ cm}^3$  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		
<b>A</b>	aluminium	carbon	iron
<b>B</b>	aluminium	iron	carbon
<b>C</b>	carbon	aluminium	iron
<b>D</b>	carbon	iron	aluminium

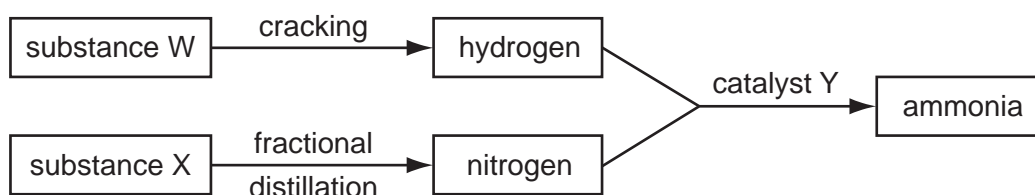
- 31 The molar heat of combustion, i.e. the heat given out when one mole of the alcohol is completely burned in oxygen, of a number of alcohols is given below.

alcohol	formula	heat of combustion kJ/mol
methanol	CH <sub>3</sub> OH	750
ethanol	C <sub>2</sub> H <sub>5</sub> OH	1380
propanol	C <sub>3</sub> H <sub>7</sub> OH	2010
butanol	C <sub>4</sub> H <sub>9</sub> 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
<b>A</b>	5	11
<b>B</b>	5	12
<b>C</b>	6	13
<b>D</b>	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
<b>A</b>	air	oil	iron
<b>B</b>	air	oil	vanadium(V) oxide
<b>C</b>	oil	air	iron
<b>D</b>	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
<b>A</b>	CFCs	cause destruction of the ozone layer
<b>B</b>	CH <sub>4</sub>	forms photochemical smog
<b>C</b>	CO	is poisonous to humans
<b>D</b>	NO <sub>2</sub>	forms acid rain

36 A student investigated the reaction of different vegetable oils with hydrogen. 100 cm<sup>3</sup> 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 <sup>3</sup>
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



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**DATA SHEET**  
**The Periodic Table of the Elements**

		Group																																																																																			
I	II	III	IV	V	VI	VII	0																																																																														
1 <b>H</b> Hydrogen 1											2 <b>He</b> Helium 2																																																																										
3 <b>Li</b> Lithium 3	4 <b>Be</b> Beryllium 4	5 <b>B</b> Boron 5	6 <b>C</b> Carbon 6	7 <b>N</b> Nitrogen 7	8 <b>O</b> Oxygen 8	9 <b>F</b> Fluorine 9	10 <b>Ne</b> Neon 10	11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	13 <b>Al</b> Aluminium 13	14 <b>Si</b> Silicon 14	15 <b>P</b> Phosphorus 15	16 <b>S</b> Sulphur 16	17 <b>Cl</b> Chlorine 17	18 <b>Ar</b> Argon 18	19 <b>F</b> Fluorine 9	20 <b>Ne</b> Neon 10																																																																				
19 <b>K</b> Potassium 19	20 <b>Ca</b> Calcium 20	21 <b>Sc</b> Scandium 21	22 <b>Ti</b> Titanium 22	23 <b>V</b> Vanadium 23	24 <b>Cr</b> Chromium 24	25 <b>Mn</b> Manganese 25	26 <b>Fe</b> Iron 26	27 <b>Co</b> Cobalt 27	28 <b>Ni</b> Nickel 28	29 <b>Cu</b> Copper 29	30 <b>Zn</b> Zinc 30	31 <b>Ga</b> Gallium 31	32 <b>Ge</b> Germanium 32	33 <b>As</b> Arsenic 33	34 <b>Se</b> Selenium 34	35 <b>Br</b> Bromine 35	36 <b>Kr</b> Krypton 36	37 <b>Rb</b> Rubidium 37	38 <b>Sr</b> Strontium 38	39 <b>Y</b> Yttrium 39	40 <b>Zr</b> Zirconium 40	41 <b>Nb</b> Niobium 41	42 <b>Mo</b> Molybdenum 42	43 <b>Tc</b> Technetium 43	44 <b>Ru</b> Ruthenium 44	45 <b>Rh</b> Rhodium 45	46 <b>Pd</b> Palladium 46	47 <b>Ag</b> Silver 47	48 <b>Cd</b> Cadmium 48	49 <b>In</b> Indium 49	50 <b>Sn</b> Tin 50	51 <b>Sb</b> Antimony 51	52 <b>Te</b> Tellurium 52	53 <b>I</b> Iodine 53	54 <b>Xe</b> Xenon 54	55 <b>Cs</b> Caesium 55	56 <b>Ba</b> Barium 56	57 <b>La</b> Lanthanum 57	72 <b>Hf</b> Hafnium 72	73 <b>Ta</b> Tantalum 73	74 <b>W</b> Tungsten 74	75 <b>Re</b> Rhenium 75	76 <b>Os</b> Osmium 76	77 <b>Ir</b> Iridium 77	78 <b>Pt</b> Platinum 78	79 <b>Au</b> Gold 79	80 <b>Hg</b> Mercury 80	81 <b>Tl</b> Thallium 81	82 <b>Pb</b> Lead 82	83 <b>Bi</b> Bismuth 83	84 <b>Po</b> Polonium 84	85 <b>At</b> Astatine 85	86 <b>Rn</b> Radon 86	87 <b>Fr</b> Francium 87	88 <b>Ra</b> Radium 88	89 <b>Ac</b> Actinium 89	90 <b>Th</b> Thorium 90	91 <b>Pa</b> Protactinium 91	92 <b>U</b> Uranium 92	93 <b>Np</b> Neptunium 93	94 <b>Pu</b> Plutonium 94	95 <b>Am</b> Americium 95	96 <b>Cm</b> Curium 96	97 <b>Bk</b> Berkelium 97	98 <b>Cf</b> Californium 98	99 <b>Es</b> Einsteinium 99	100 <b>Fm</b> Fermium 100	101 <b>Md</b> Mendelevium 101	102 <b>No</b> Nobelium 102	103 <b>Lr</b> Lawrencium 103	104 <b>Rf</b> Rutherfordium 104	105 <b>Db</b> Dubnium 105	106 <b>Sg</b> Seaborgium 106	107 <b>Bh</b> Bohrium 107	108 <b>Hs</b> Hassium 108	109 <b>Mt</b> Meitnerium 109	110 <b>Ds</b> Darmstadtium 110	111 <b>Rg</b> Roentgenium 111	112 <b>Cn</b> Copernicium 112	113 <b>Nh</b> Nihonium 113	114 <b>Fl</b> Flerovium 114	115 <b>Mc</b> Moscovium 115	116 <b>Lv</b> Livermorium 116	117 <b>Ts</b> Tennessine 117	118 <b>Og</b> Oganesson 118
		*58-71 Lanthanoid series		†90-103 Actinoid series																																																																																	

Key

a	<b>X</b>
b	

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

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