



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**CHEMISTRY**

**5070/12**

Paper 1 Multiple Choice

**May/June 2012**

**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.

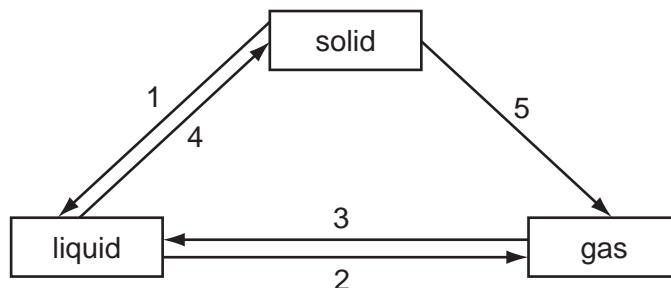
Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 16.

This document consists of **13** printed pages and **3** blank pages.



- 1 The diagram shows some of the changes of state.



Which statement is correct?

- A** Although the change is not shown on the diagram, a gas can change directly to a solid.
- B** The changes 1 and 3 involve particles moving closer together.
- C** The changes 2 and 4 involve particles moving further apart.
- D** The changes 3, 4 and 5 all involve the release of energy.
- 2 Which gas is **not** obtained industrially by fractional distillation?
- A** ammonia
- B** argon
- C** nitrogen
- D** oxygen
- 3 When dilute hydrochloric acid is added to a white powder a gas is produced.

The solution remaining is tested separately with small volumes of both aqueous ammonia and aqueous sodium hydroxide.

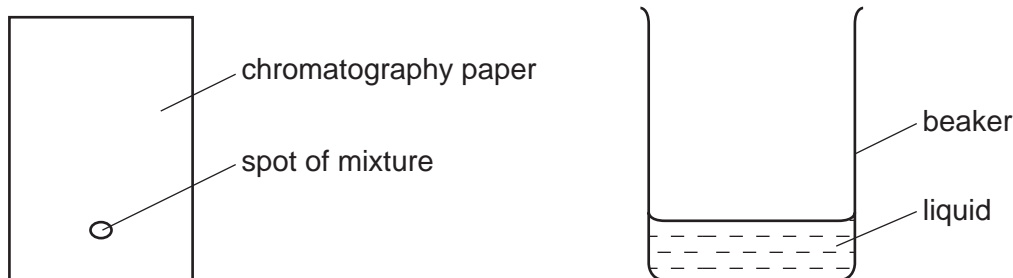
A white precipitate is produced in both tests.

What is the white powder?

- A** aluminium oxide
- B** calcium oxide
- C** copper(II) carbonate
- D** zinc carbonate

- 4 A mixture of two substances is spotted onto a piece of chromatography paper.

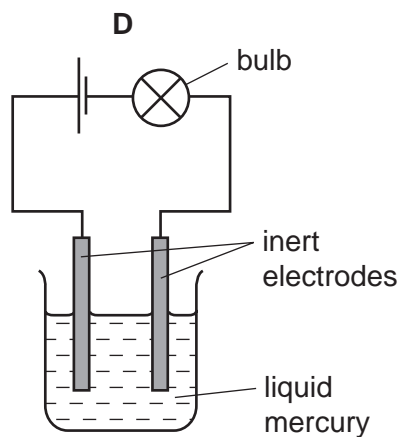
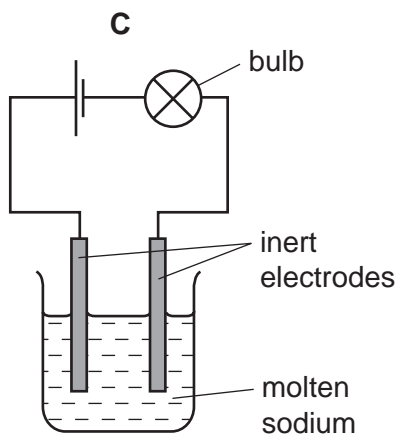
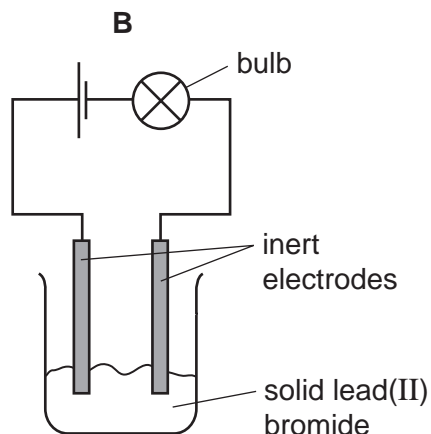
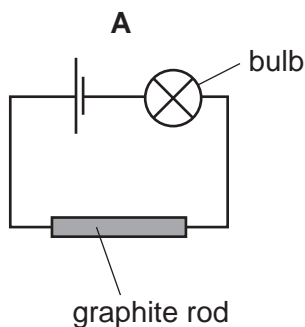
The paper is inserted into a beaker containing a liquid.



For separation of the substances to occur the spot of mixture must

- A be placed so that the spot is just below the level of the liquid.
  - B be soluble in the liquid.
  - C contain substances of the same  $R_f$  values.
  - D contain substances that are coloured.
- 5 Which reagent could be used to distinguish between dilute nitric acid and dilute hydrochloric acid?
- A aqueous barium chloride
  - B aqueous silver nitrate
  - C aqueous sodium hydroxide
  - D copper(II) carbonate
- 6 What is the structure of sand?
- A a macromolecule
  - B an ionic lattice
  - C a polymer
  - D a simple molecule
- 7 Pentane,  $C_5H_{12}$ , has a higher boiling point than propane,  $C_3H_8$ . Which statement explains the difference in boiling point?
- A Carbon-carbon single bonds are stronger than carbon-hydrogen bonds.
  - B Pentane has more covalent bonds to break.
  - C Pentane does not burn as easily as propane.
  - D The forces of attraction between pentane molecules are stronger than those between propane molecules

8 In which set of apparatus will the bulb be **least** bright?



9 Four substances have the following electrical properties.

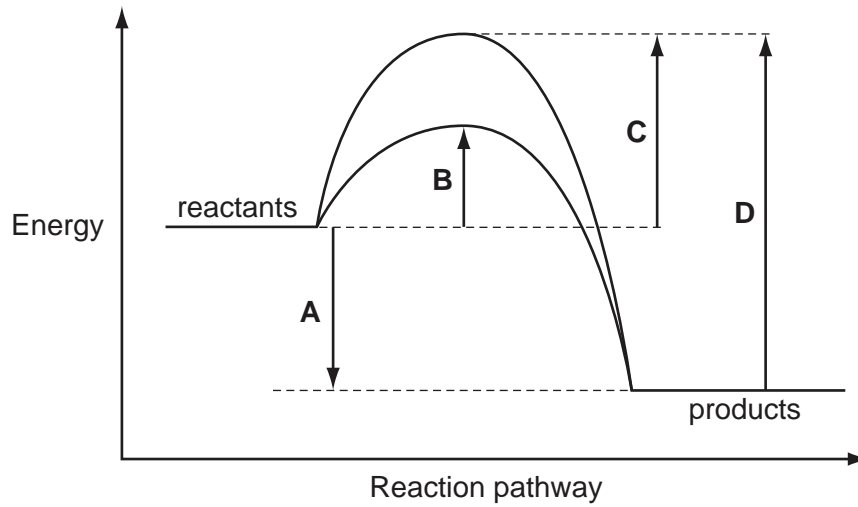
substance	property
W	does not conduct under any conditions
X	conducts only in aqueous solution
Y	conducts in both the molten and solid states
Z	conducts in both the molten and aqueous states

What are these four substances?

	W	X	Y	Z
<b>A</b>	HCl	S	NaCl	Pb
<b>B</b>	Pb	HCl	NaCl	S
<b>C</b>	S	HCl	Pb	NaCl
<b>D</b>	S	NaCl	HCl	Pb

10 The energy profile diagram shows the pathways for a reaction with and without a catalyst.

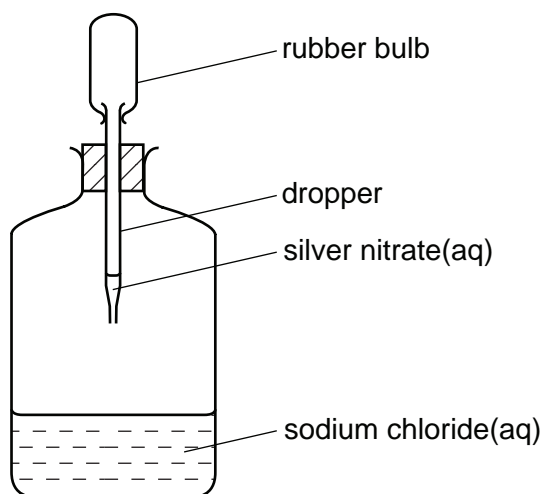
Which energy change is the activation energy for the catalysed reaction?



11 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.

- 12 When the rubber bulb of the dropper in the diagram is squeezed, the aqueous silver nitrate drops into the aqueous sodium chloride and a white precipitate of silver chloride is formed.



What happens to the total mass of the bottle and contents?

- A** It increases due to the formation of the heavy precipitate.
- B** It remains the same because only a physical change has taken place.
- C** It decreases because heat is evolved.
- D** It remains the same because none of the products escapes from the bottle.
- 13 What has the same mass as 0.25 mol of copper atoms?
- A** 0.5 mol of oxygen molecules
- B** 1 mol of sulfur dioxide molecules
- C** 1.5 mol of water molecules
- D** 2 mol of oxygen atoms
- 14 Which change **always** takes place when an aqueous solution of copper(II) sulfate is electrolysed?
- A** Copper is deposited at the negative electrode.
- B** Oxygen is evolved at the positive electrode.
- C** Sulfate ions move towards the negative electrode.
- D** The colour of the solution fades.

15 Which substance will conduct electricity without being chemically changed?

- A sodium chloride solution
- B solid iron
- C solid sodium chloride
- D solid sulfur

16 A sample of air was bubbled into water. The pH of the water slowly changed from 7 to 6.

Which gas in the sample caused this change?

- A carbon dioxide
- B carbon monoxide
- C nitrogen
- D oxygen

17 The oxide Q dissolves in water to form a colourless solution. This solution reacts with sodium carbonate to produce carbon dioxide.

What is Q?

- A copper(II) oxide
- B sodium oxide
- C sulfur dioxide
- D zinc oxide

18 The following statements about dilute sulfuric acid are **all** correct.

- 1 Addition of Universal Indicator shows that the solution has a pH value of less than 7.0.
- 2 A white precipitate is formed when aqueous barium nitrate is added.
- 3 The solution reacts with copper(II) oxide, forming a blue solution.
- 4 The solution turns anhydrous copper(II) sulfate from white to blue.

Which two statements confirm the acidic nature of the solution?

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

19 Which ion reacts with aqueous ammonia to give a precipitate that dissolves in an excess of ammonia?

- A  $Al^{3+}(aq)$       B  $Fe^{2+}(aq)$       C  $Fe^{3+}(aq)$       D  $Zn^{2+}(aq)$

20 Which element is **most** likely to be used as an industrial catalyst?

- A Li                      B Cs                      C Rh                      D Po

21 Which compound when reacted with sulfuric acid produces a product which is used as a fertiliser?

- A ammonia  
 B calcium carbonate  
 C calcium hydroxide  
 D sodium hydroxide

22 In which reaction is the underlined substance behaving as an oxidising agent?

- A BaCl<sub>2</sub> + Na<sub>2</sub>SO<sub>4</sub> → BaSO<sub>4</sub> + 2NaCl  
 B 3CuO + 2NH<sub>3</sub> → 3Cu + N<sub>2</sub> + 3H<sub>2</sub>O  
 C 2FeCl<sub>2</sub> + Cl<sub>2</sub> → 2FeCl<sub>3</sub>  
 D O<sub>2</sub> + 2SO<sub>2</sub> → 2SO<sub>3</sub>

23 Which statements are true about **all** the noble gases?

- 1 The number of protons in their atoms equals the number of neutrons.
- 2 The number of protons in their atoms does not equal the number of electrons.
- 3 They all have eight electrons in their outer shell.
- 4 They do not react to form ionic compounds.

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

24 How many electrons and protons are in an **ion** of an element in Group 2 of the Periodic Table?

	Number of electrons	Number of protons
A	6	4
B	10	12
C	22	20
D	139	137



25 A metal **X** forms oxides with the formulae  $XO$  and  $X_2O_3$ .

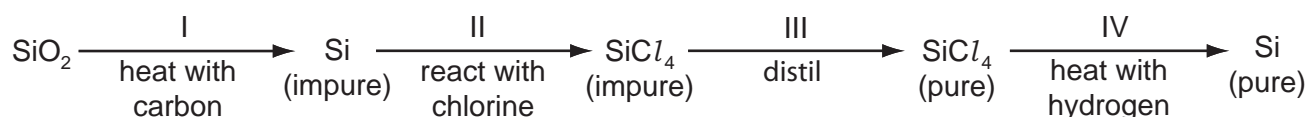
Where is **X** in the Periodic Table?

- A in Group II
- B in Group III
- C the second Period
- D in the transition elements

26 What is a characteristic of a weak acid?

- A It does not react with sodium carbonate.
- B It forms an aqueous solution with a pH of 8.
- C It is only partially ionised when added to water.
- D It turns litmus solution blue.

27 The reaction scheme represents the process for obtaining pure silicon.



In which of the stages is the silicon reduced?

- A I only
- B I and II
- C I and IV
- D II and III

28 Which metal can be obtained from its oxide using hydrogen?

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

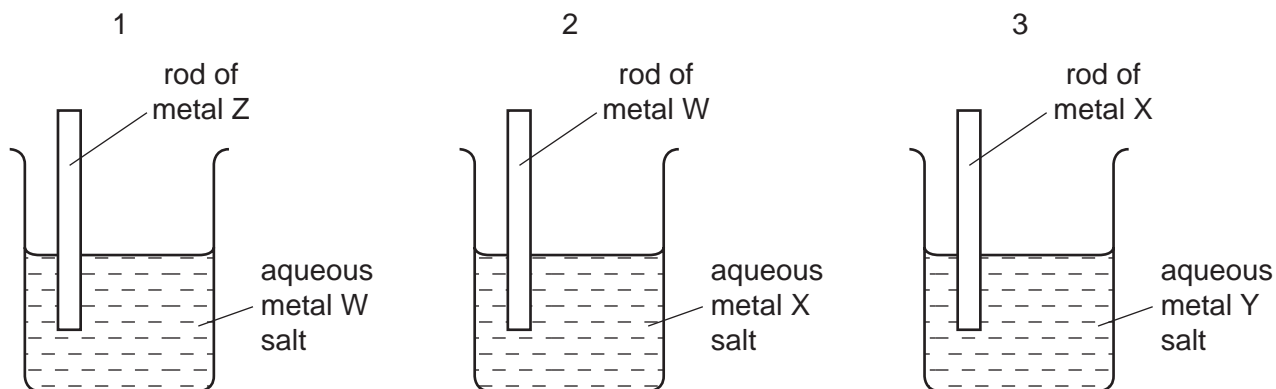
29 Which substance undergoes decomposition because of the high temperature in the blast furnace?

- A coke
- B calcium carbonate
- C calcium silicate
- D slag

30 Which reaction occurring in the blast furnace is an acid base reaction?

- A  $C + CO_2 \rightarrow 2CO$   
 B  $C + O_2 \rightarrow CO_2$   
 C  $CaO + SiO_2 \rightarrow CaSiO_3$   
 D  $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

31 Three different beakers are set up as shown.



In beaker 1 metal W is displaced from solution.

In beaker 2 metal X is displaced from solution.

In beaker 3 metal Y is displaced from solution.

What is the order of **decreasing** reactivity of the four metals?

	most reactive	→		least reactive
<b>A</b>	W	X	Y	Z
<b>B</b>	X	Y	W	Z
<b>C</b>	Z	W	X	Y
<b>D</b>	Z	X	W	Y

32 Aluminium is manufactured by the electrolysis of aluminium oxide.

Which substances are formed at the electrodes?

	positive electrode	negative electrode
<b>A</b>	aluminium	carbon dioxide
<b>B</b>	aluminium	oxygen
<b>C</b>	carbon dioxide	aluminium
<b>D</b>	oxygen	carbon dioxide

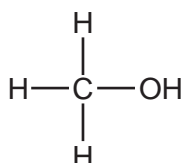
- 33 The processes photosynthesis, respiration and fermentation all change the amount of carbon dioxide in the atmosphere.

Which processes increase the amount of carbon dioxide in the atmosphere?

- A photosynthesis and fermentation  
 B photosynthesis only  
 C respiration and fermentation  
 D respiration only
- 34 Which process would destroy the bacteria in water?
- A chlorination  
 B desalination  
 C filtration  
 D treatment with carbon
- 35 Which compound has more than two carbon atoms per molecule?
- A ethanoic acid  
 B ethanol  
 C ethene  
 D ethyl ethanoate
- 36 The equations show some reactions of organic compounds.

Which is an addition reaction?

- A  $\text{CH}_4 + \text{Br}_2 \rightarrow \text{CH}_3\text{Br} + \text{HBr}$   
 B  $\text{C}_2\text{H}_5\text{OH} + \text{O}_2 \rightarrow \text{CH}_3\text{CO}_2\text{H} + \text{H}_2\text{O}$   
 C  $\text{C}_2\text{H}_5\text{OH} + \text{CH}_3\text{CO}_2\text{H} \rightarrow \text{CH}_3\text{CO}_2\text{C}_2\text{H}_5 + \text{H}_2\text{O}$   
 D  $\text{C}_4\text{H}_4 + 2\text{Br}_2 \rightarrow \text{C}_4\text{H}_4\text{Br}_4$
- 37 Which statement about methanol is correct?
- A It can be oxidised to form methanoic acid.  
 B It is a constituent of alcoholic drinks.  
 C It is formed by fermentation.  
 D Its fully displayed structural formula is



- 38 A 10 cm<sup>3</sup> sample of a gaseous hydrocarbon is completely burnt in oxygen. The total volume of the products is 70 cm<sup>3</sup>. All gas volumes are measured at room temperature and pressure.

Which equation represents the combustion of the hydrocarbon?

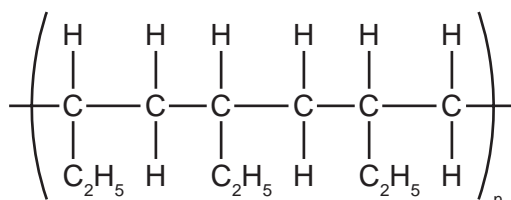
- A  $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$   
 B  $\text{C}_2\text{H}_4(\text{g}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$   
 C  $\text{C}_3\text{H}_8(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 3\text{CO}_2(\text{g}) + 4\text{H}_2\text{O}(\text{g})$   
 D  $2\text{C}_2\text{H}_6(\text{g}) + 7\text{O}_2(\text{g}) \rightarrow 4\text{CO}_2(\text{g}) + 6\text{H}_2\text{O}(\text{g})$

- 39 One mole of magnesium is dissolved in excess aqueous ethanoic acid, CH<sub>3</sub>COOH.

How many moles of hydrogen, H<sub>2</sub>, will be produced?

- A 0.5                      B 1                      C 2                      D 4

- 40 The section of a polymer chain is shown.



Which molecule would produce this polymer and by which type of polymerisation?

	molecule	type of polymerisation
A	CH <sub>3</sub> -CH=CH-CH <sub>3</sub>	condensation
B	CH <sub>3</sub> -CH <sub>2</sub> -CH=CH <sub>2</sub>	addition
C	CH <sub>3</sub> -CH <sub>2</sub> -CH <sub>2</sub> -CH=CH <sub>2</sub>	condensation
D	CH <sub>3</sub> -CH=CH-CH <sub>3</sub>	addition







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

		Group																																																																		
I	II	III	IV	V	VI	VII	0																																																													
7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4	1 <b>H</b> Hydrogen 1	11 <b>B</b> Boron 5	12 <b>C</b> Carbon 6	14 <b>N</b> Nitrogen 7	16 <b>O</b> Oxygen 8	19 <b>F</b> Fluorine 9	20 <b>Ne</b> Neon 10	23 <b>Na</b> Sodium 11	24 <b>Mg</b> Magnesium 12	27 <b>Al</b> Aluminium 13	28 <b>Si</b> Silicon 14	31 <b>P</b> Phosphorus 15	32 <b>S</b> Sulfur 16	35.5 <b>Cl</b> Chlorine 17	40 <b>Ar</b> Argon 18	39 <b>K</b> Potassium 19	40 <b>Ca</b> Calcium 20	45 <b>Sc</b> Scandium 21	48 <b>Ti</b> Titanium 22	51 <b>V</b> Vanadium 23	55 <b>Mn</b> Manganese 25	56 <b>Fe</b> Iron 26	59 <b>Co</b> Cobalt 27	59 <b>Ni</b> Nickel 28	64 <b>Cu</b> Copper 29	65 <b>Zn</b> Zinc 30	70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	80 <b>Br</b> Bromine 35	84 <b>Kr</b> Krypton 36	85 <b>Rb</b> Rubidium 37	88 <b>Sr</b> Strontium 38	89 <b>Y</b> Yttrium 39	91 <b>Zr</b> Zirconium 40	93 <b>Nb</b> Niobium 41	101 <b>Ru</b> Ruthenium 44	103 <b>Rh</b> Rhodium 45	106 <b>Pd</b> Palladium 46	112 <b>Cd</b> Cadmium 48	115 <b>In</b> Indium 49	119 <b>Sn</b> Tin 50	122 <b>Sb</b> Antimony 51	128 <b>Te</b> Tellurium 52	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54	133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56	139 <b>La</b> Lanthanum 57	178 <b>Hf</b> Hafnium 72	181 <b>Ta</b> Tantalum 73	184 <b>W</b> Tungsten 74	190 <b>Os</b> Osmium 76	192 <b>Ir</b> Iridium 77	195 <b>Pt</b> Platinum 78	197 <b>Au</b> Gold 79	201 <b>Hg</b> Mercury 80	204 <b>Tl</b> Thallium 81	207 <b>Pb</b> Lead 82	209 <b>Bi</b> Bismuth 83	210 <b>Po</b> Polonium 84	210 <b>At</b> Astatine 85	210 <b>Rn</b> Radon 86	226 <b>Ra</b> Radium 88	227 <b>Ac</b> Actinium 89	†
												140 <b>Ce</b> Cerium 58	141 <b>Pr</b> Praseodymium 59	144 <b>Nd</b> Neodymium 60	146 <b>Pm</b> Promethium 61	150 <b>Sm</b> Samarium 62	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	159 <b>Tb</b> Terbium 65	162 <b>Dy</b> Dysprosium 66	165 <b>Ho</b> Holmium 67	167 <b>Er</b> Erbium 68	169 <b>Tm</b> Thulium 69	173 <b>Yb</b> Ytterbium 70	175 <b>Lu</b> Lutetium 71	232 <b>Th</b> Thorium 90	238 <b>U</b> Uranium 92	238 <b>Np</b> Neptunium 93	238 <b>Pu</b> Plutonium 94	238 <b>Am</b> Americium 95	238 <b>Cm</b> Curium 96	238 <b>Bk</b> Berkelium 97	238 <b>Cf</b> Californium 98	238 <b>Es</b> Einsteinium 99	238 <b>Fm</b> Fermium 100	238 <b>Md</b> Mendelevium 101	238 <b>No</b> Nobelium 102	238 <b>Lr</b> Lawrencium 103																														

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

a = relative atomic mass

X = atomic symbol

b = proton (atomic) number

Key

X

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

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