



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.

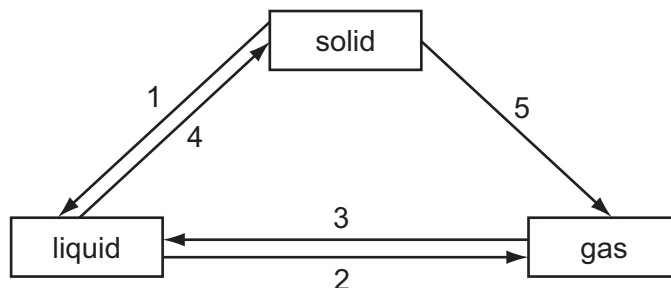
Read the instructions on the Answer Sheet very carefully.

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.

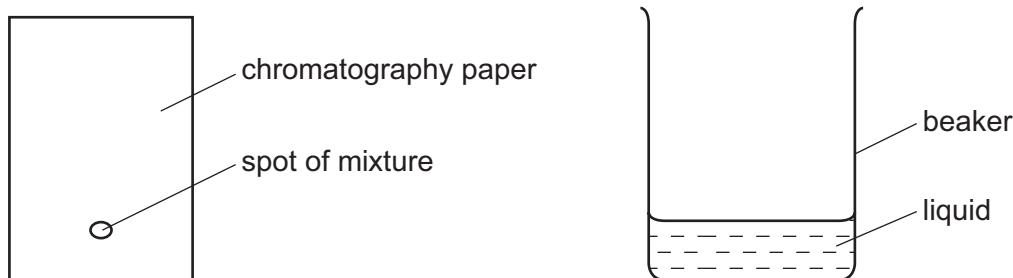
A white precipitate is produced in both tests.

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.

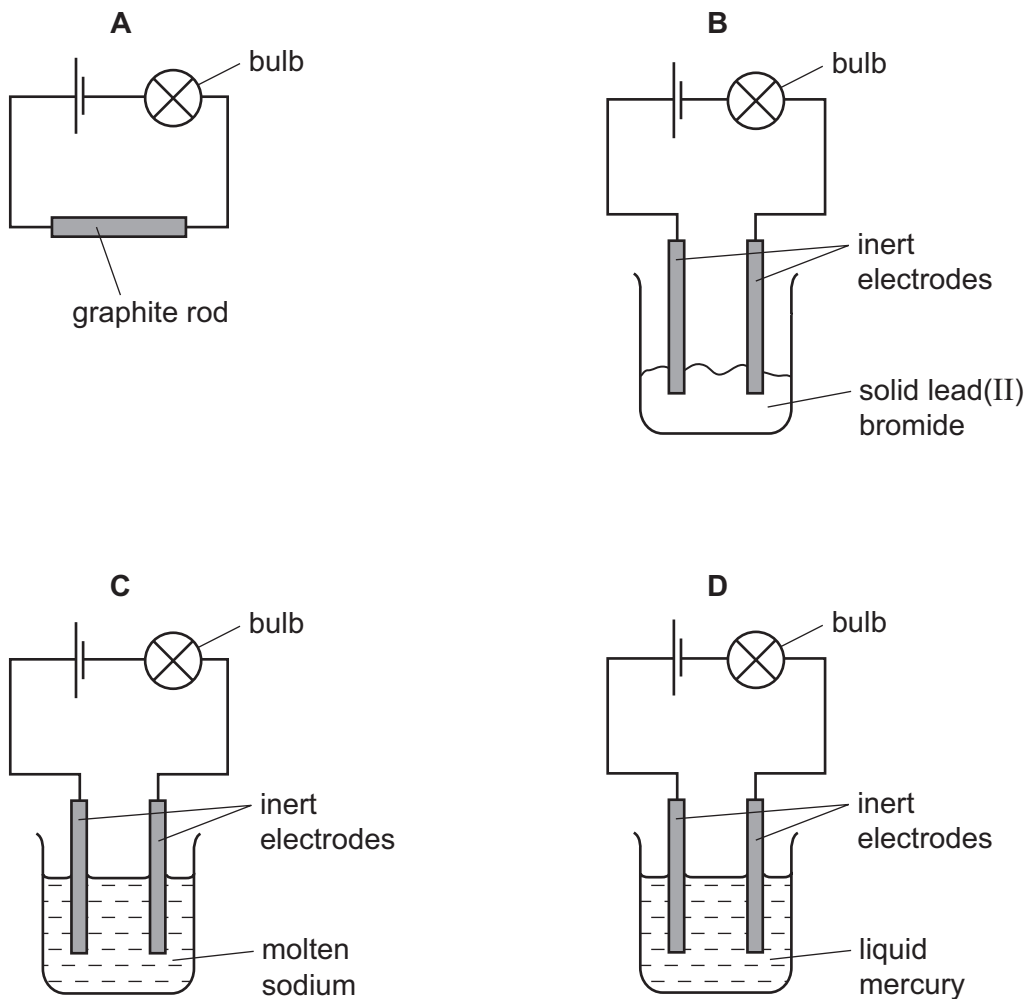
The paper is inserted into a beaker containing a liquid.



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.

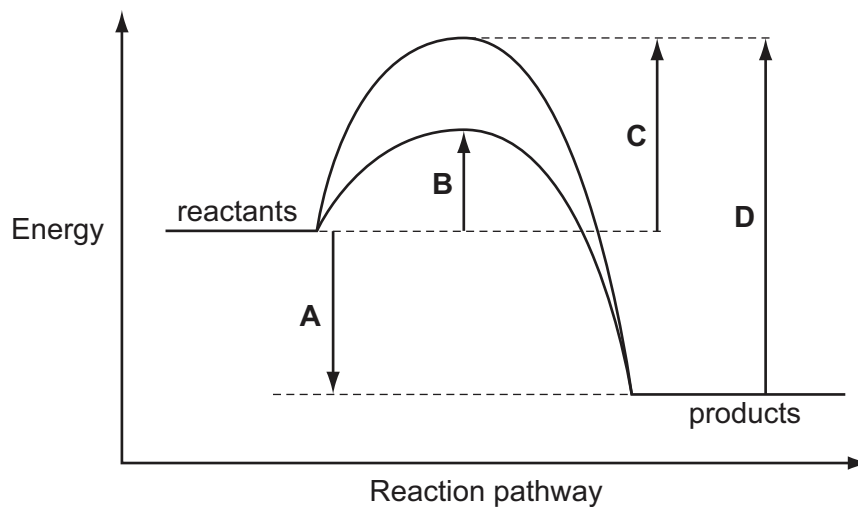
| substance | property |
|-----------|------------------------------------------------|
| W | does not conduct under any conditions |
| X | conducts only in aqueous solution |
| Y | conducts in both the molten and solid states |
| Z | conducts in both the molten and aqueous states |

What are these four substances?

| | W | X | Y | Z |
|----------|-----|------|------|------|
| A | HCl | S | NaCl | Pb |
| B | Pb | HCl | NaCl | S |
| C | S | HCl | Pb | NaCl |
| D | S | NaCl | HCl | Pb |

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

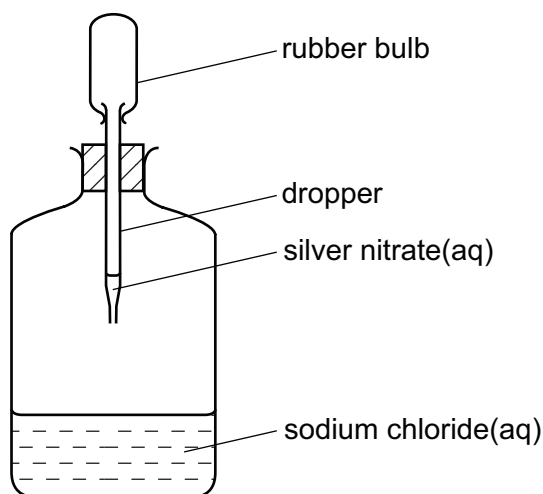
Which energy change is the activation energy for the catalysed reaction?



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 BaCl₂ + Na₂SO₄ → BaSO₄ + 2NaCl
B 3CuO + 2NH₃ → 3Cu + N₂ + 3H₂O
C 2FeCl₂ + Cl₂ → 2FeCl₃
D O₂ + 2SO₂ → 2SO₃

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 .

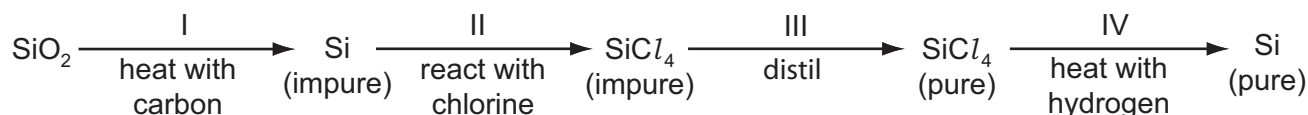
Where is **X** in the Periodic Table?

- 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

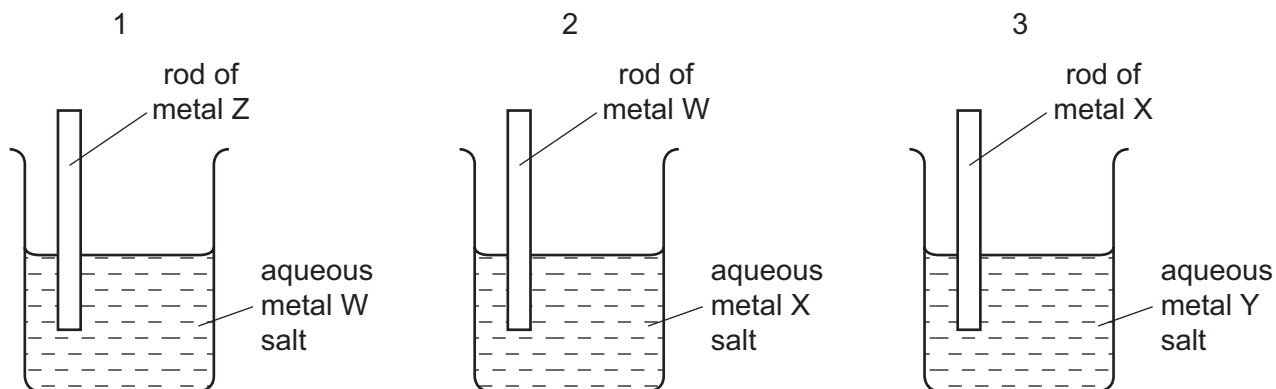
29 Which substance undergoes decomposition because of the high temperature in the blast furnace?

- 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 |
|----------|---------------|---|---|----------------|
| A | W | X | Y | Z |
| B | X | Y | W | Z |
| C | Z | W | X | Y |
| D | 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 |
|----------|--------------------|--------------------|
| A | aluminium | carbon dioxide |
| B | aluminium | oxygen |
| C | carbon dioxide | aluminium |
| D | 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?

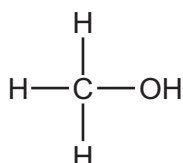
- A photosynthesis and fermentation
 - B photosynthesis only
 - C respiration and fermentation
 - D respiration only
- 34 Which process would destroy the bacteria in water?
- A chlorination
 - B desalination
 - C filtration
 - D treatment with carbon
- 35 Which compound has more than two carbon atoms 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 cm³ sample of a gaseous hydrocarbon is completely burnt in oxygen. The total volume of the products is 70 cm³. All gas volumes are measured at room temperature and pressure.

Which equation represents the combustion of the hydrocarbon?

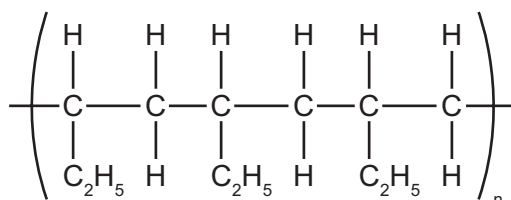
- A $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$
 B $\text{C}_2\text{H}_4(\text{g}) + 3\text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{g})$
 C $\text{C}_3\text{H}_8(\text{g}) + 5\text{O}_2(\text{g}) \rightarrow 3\text{CO}_2(\text{g}) + 4\text{H}_2\text{O}(\text{g})$
 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, CH₃COOH.

How many moles of hydrogen, H₂, 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 ₃ -CH=CH-CH ₃ | condensation |
| B | CH ₃ -CH ₂ -CH=CH ₂ | addition |
| C | CH ₃ -CH ₂ -CH ₂ -CH=CH ₂ | condensation |
| D | CH ₃ -CH=CH-CH ₃ | addition |

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DATA SHEET
The Periodic Table of the Elements

| | | Group | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| I | II | III | IV | V | VI | VII | 0 | | | | | 0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7 Li Lithium 3 | 9 Be Beryllium 4 | 1 H Hydrogen 1 | 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 | 101 Ru Ruthenium 44 | 106 Pd Palladium 46 | 112 Cd Cadmium 48 | 115 In Indium 49 | 119 Sn Tin 50 | 122 Sb Antimony 51 | 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 | 210 Po Polonium 84 | 210 At Astatine 85 | 226 Ra Radium 88 | 227 Ac Actinium 89 | 226 Fr Francium 87 | 226 Ra Radium 88 | 227 Ac Actinium 89 | 140 Ce Cerium 58 | 141 Pr Praseodymium 59 | 144 Nd Neodymium 60 | 146 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 | 232 Pa Protactinium 91 | 238 U Uranium 92 | 238 Np Neptunium 93 | 238 Pu Plutonium 94 | 238 Am Americium 95 | 238 Cm Curium 96 | 238 Bk Berkelium 97 | 238 Cf Californium 98 | 238 Es Einsteinium 99 | 238 Fm Fermium 100 | 238 Md Mendelevium 101 | 238 No Nobelium 102 | 238 Lr Lawrencium 103 |

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

Key

| | | |
|---|----------|----------------------------|
| a | X | a = relative atomic mass |
| b | X | 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.).

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