



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)



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

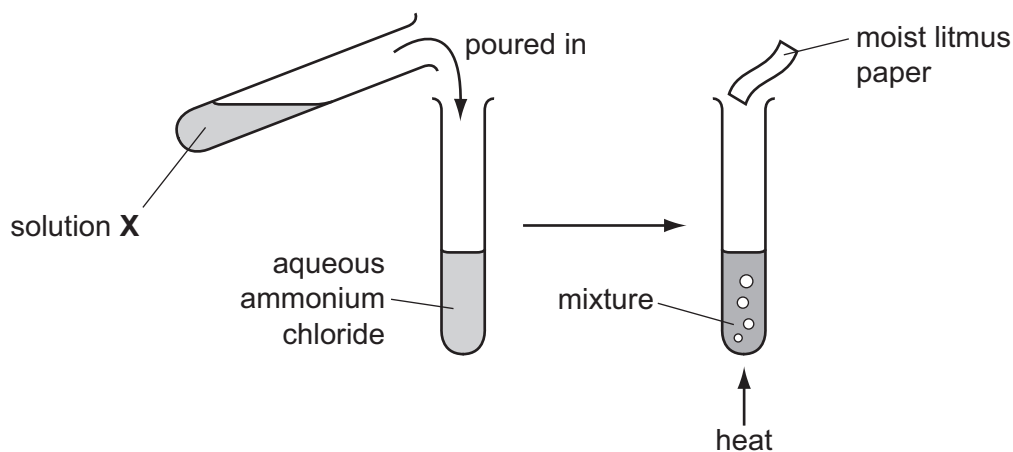
In which order are these processes used?

| | 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 |

- 4 What is the mass of oxygen contained in 72 g of pure water?
[Relative atomic masses: H = 1; O = 16]
- A 16g B 32g C 64g D 70g
- 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.

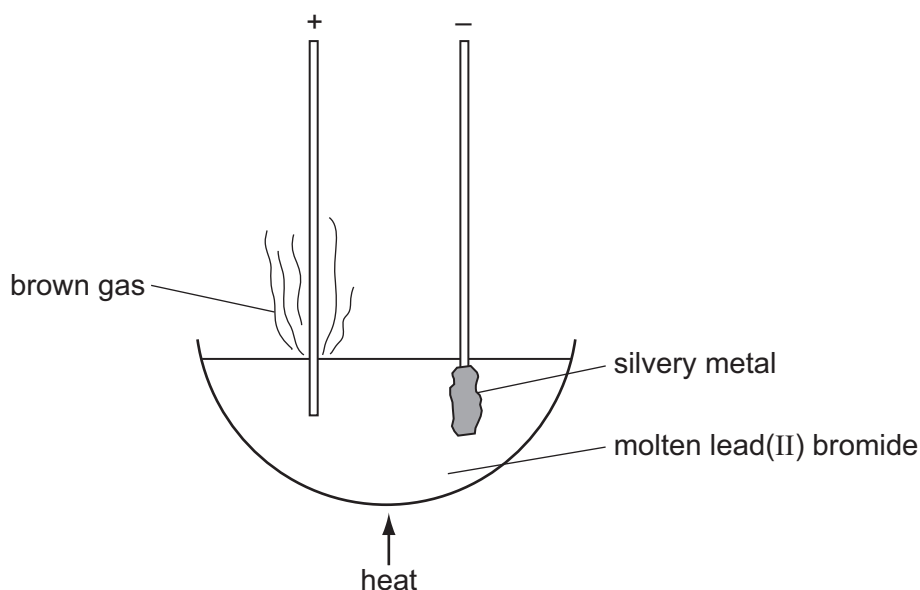
- 11 The equation for the reaction between calcium carbonate and hydrochloric acid is shown.



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 .)

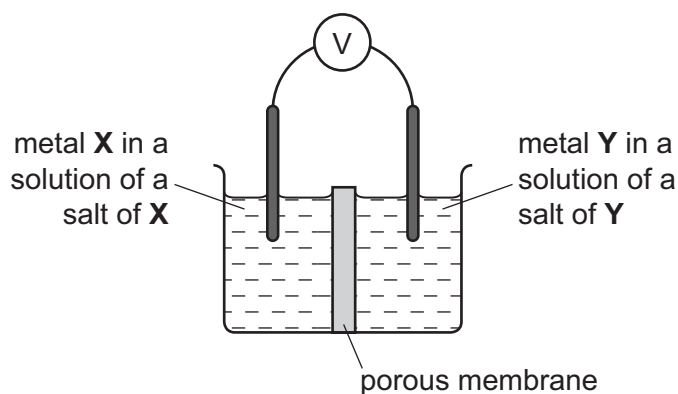
- A** 1 mol **B** 0.1 mol **C** 0.01 mol **D** 0.001 mol
- 12 The empirical formula of a liquid compound is $\text{C}_2\text{H}_4\text{O}$.
- To find the empirical formula, it is necessary to know the
- A** density of the compound.
B percentage composition of the compound.
C relative molecular mass of 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?

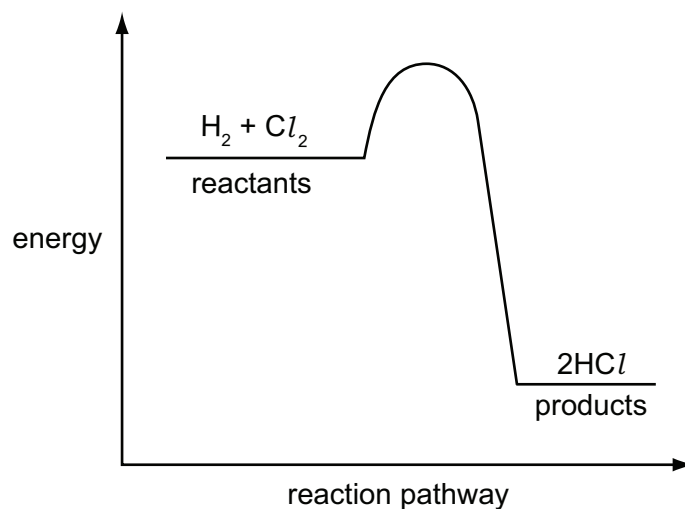
- A** Atoms change to ions.
B Covalent bonds are broken.
C Ions change to atoms.
D New compounds are formed.

- 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 |

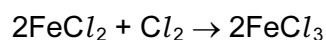
16 The following changes could be made to the conditions in the reaction between zinc and hydrochloric acid.

- 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.



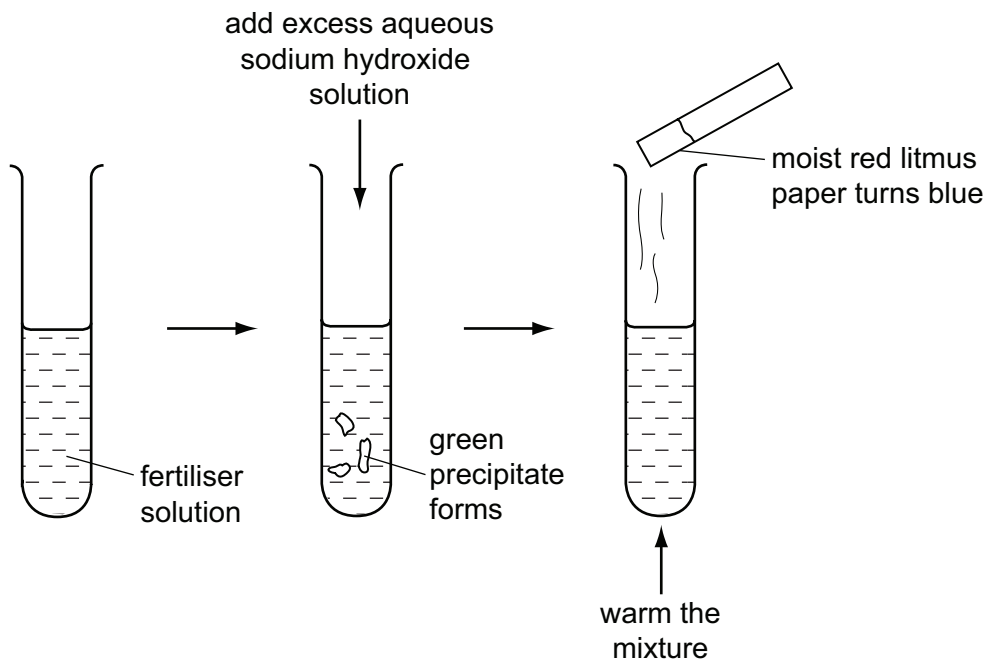
Which equation describes the reduction process in this reaction?

- A** $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$
- B** $\text{Cl}_2 + 2\text{e}^- \rightarrow 2\text{Cl}^-$
- C** $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{e}^-$
- D** $\text{Fe}^{3+} + \text{e}^- \rightarrow \text{Fe}^{2+}$

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

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

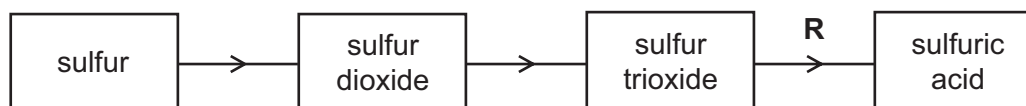
22 Which deduction about the element astatine, At, can be made from its position in Group VII?

- 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 |

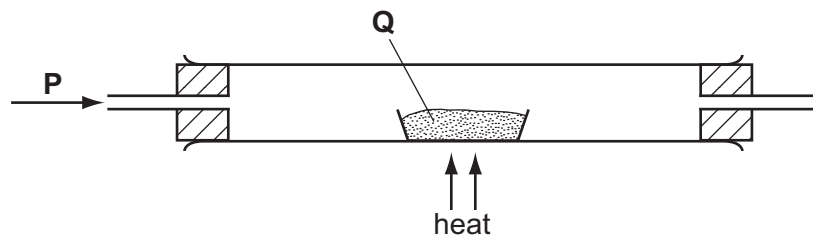
24 The diagram represents the manufacture of sulfuric acid by the Contact process.



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.

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?

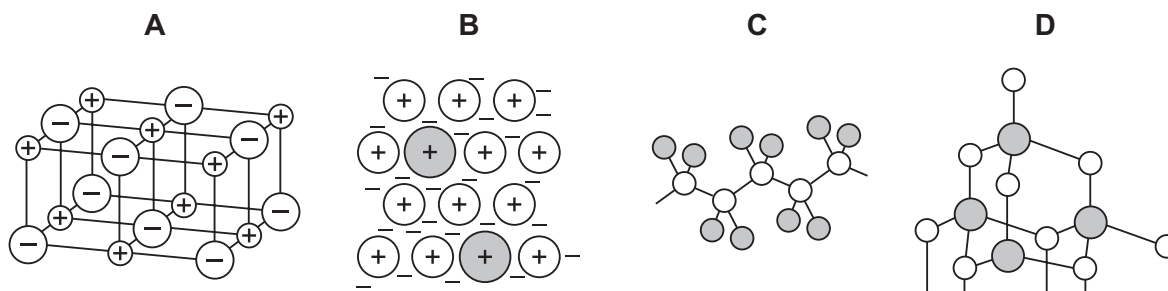
- A** calcium
- B** copper
- C** lead
- D** silver

28 Scrap iron is often recycled.

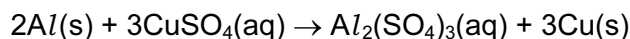
Which reason for recycling is **not** correct?

- 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?



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



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 |

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*?

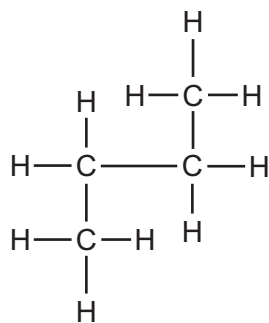
- A** C – O **B** C = O **C** N – C **D** N – H

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

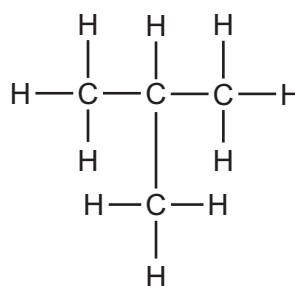
What could be the formulae of compounds X and Y?

| | 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} |

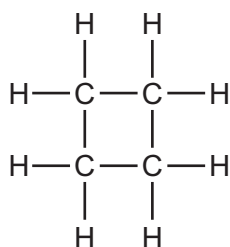
38 Four hydrocarbon structures are shown.



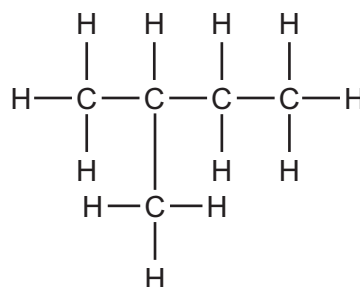
1



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** $\text{C}_2\text{H}_5\text{CO}_2\text{CH}_3$ **B** $\text{C}_3\text{H}_7\text{CO}_2\text{H}$ **C** $\text{CH}_3\text{CO}_2\text{C}_2\text{H}_5$ **D** $\text{C}_4\text{H}_9\text{OH}$

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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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 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 | 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 | 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 | 210 Rn Radon 86 | 226 Ra Radium 88 | 227 Ac Actinium 89 | 232 Th Thorium 90 | 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 | 140 Ce Cerium 58 | 141 Pr Praseodymium 59 | 144 Nd Neodymium 60 | 147 Pm Promethium 61 | 150 Sm Samarium 62 | 152 Eu Europium 63 | 157 Gd Gadolinium 64 | 162 Dy Dysprosium 66 | 165 Ho Holmium 67 | 167 Er Erbium 68 | 169 Tm Thulium 69 | 173 Yb Ytterbium 70 | 175 Lu Lutetium 71 |

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

| | | |
|---|----------|---|
| a | X | b |
|---|----------|---|

a = relative atomic mass
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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