**Cambridge International Examinations**
Cambridge International General Certificate of Secondary Education

**CHEMISTRY** **0620/13**

Paper 1 Multiple Choice **October/November 2015**

**45 Minutes**

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, 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.
DO **NOT** WRITE IN ANY BARCODES.

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.
Electronic calculators may be used.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **16** printed pages.

**1** In which process do particles move closer together but remain in motion?

**A** condensation

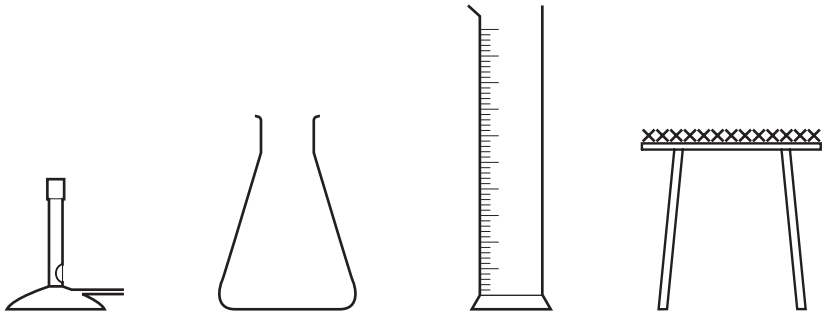
**B** diffusion

**C** evaporation

**D** freezing

**2** A student was asked to measure the rate of reaction between dilute hydrochloric acid and marble chips at different temperatures.

Some of the apparatus used is shown.



Which two other pieces of apparatus would be needed?

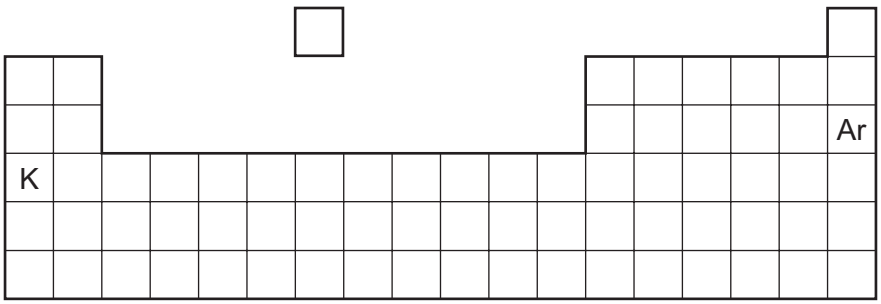
**A** balance and pipette

**B** balance and stopclock

**C** beaker and stopclock

**D** burette and pipette

**3** Argon, Ar, has a higher relative atomic mass than potassium, K, but appears before it in the Periodic Table.




Why is argon listed before potassium in the Periodic Table?

**A** Argon has fewer neutrons than potassium.

**B** Argon has fewer protons than potassium.

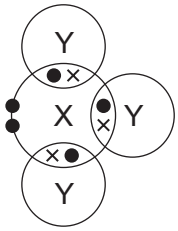
**C** Argon has more neutrons than potassium.

**D** Argon has more protons than potassium.

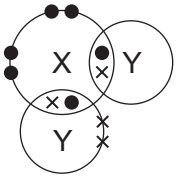
**4** In the following diagrams, X and Y are atoms of different elements.

Which diagram correctly shows the arrangement of outer electrons in a molecule of methane?

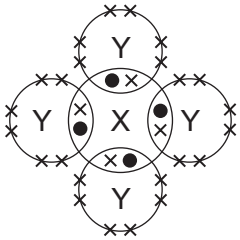
**A**



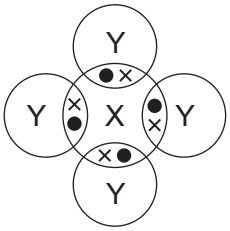

**B**




**C**




**D**




**5** What do the nuclei of $^{1}_{1}H$ hydrogen atoms contain?

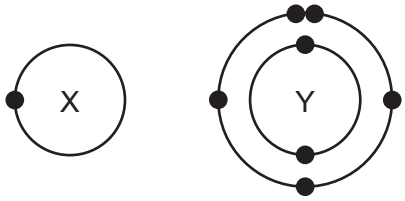
**A** electrons and neutrons

**B** electrons and protons

**C** neutrons only

**D** protons only

**6** The electronic structures of atoms X and Y are shown.




X and Y form a covalent compound.

What is its formula?

**A** $XY_5$ **B** $XY_3$ **C** XY **D** $X_3Y$

**7** Copper(II) oxide reacts with ammonia.

The left hand side of the balanced equation for this reaction is:

$$3CuO + 2NH_3 \rightarrow$$

What completes the equation?

**A** $3Cu + 2HNO_3$

**B** $3Cu + 2N + 3H_2O$

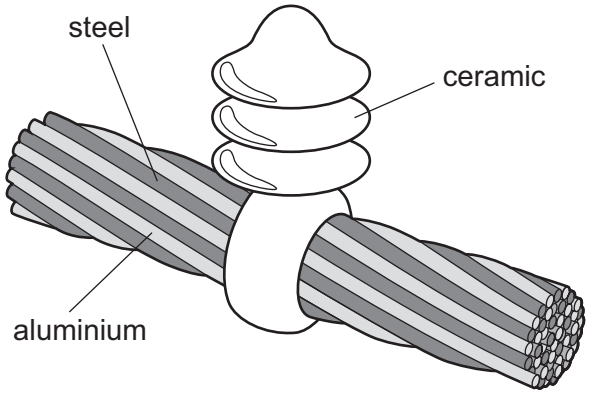
**C** $3Cu + N_2 + 3H_2O$

**D** $3Cu + 2NO + 3H_2O$

**8** What are the electrode products when molten silver iodide is electrolysed between inert electrodes?

| | cathode | anode |
|---|---|---|
| **A** | hydrogen | iodine |
| **B** | iodine | silver |
| **C** | silver | iodine |
| **D** | silver | oxygen |

**9** The diagram shows a section of an overhead power cable.




Which statement explains why a particular substance is used?

**A** Aluminium has a low density and is a good conductor of electricity.

**B** Ceramic is a good conductor of electricity.

**C** Steel can rust in damp air.

**D** Steel is more dense than aluminium.

**10** Which reaction is endothermic?

**A** the burning of magnesium ribbon

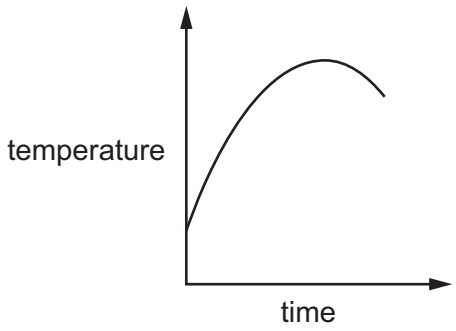
**B** the combustion of methane

**C** the decomposition of calcium carbonate

**D** the reaction of water with anhydrous copper(II) sulfate

**11** A metal reacts with an aqueous solution.

The graph shows the temperature before, during and after the reaction.




Which row describes the reaction?

| | reaction | energy change |
|---|---|---|
| **A** | combustion | endothermic |
| **B** | combustion | exothermic |
| **C** | thermal decomposition | endothermic |
| **D** | thermal decomposition | exothermic |

**12** Which of the following changes decreases the rate of the reaction between magnesium and dilute hydrochloric acid?

1 diluting the acid

2 using larger pieces of magnesium

3 cooling the mixture

**A** 1, 2 and 3

**B** 1 and 2 only

**C** 1 and 3 only

**D** 2 and 3 only

**13** The element vanadium, V, forms several oxides.

In which change is oxidation taking place?

**A** $VO_2 \rightarrow V_2O_3$

**B** $V_2O_5 \rightarrow VO_2$

**C** $V_2O_3 \rightarrow VO$

**D** $V_2O_3 \rightarrow V_2O_5$

**14** If anhydrous copper(II) sulfate is added to water, which colour change is observed?

**A** blue to pink

**B** blue to white

**C** pink to blue

**D** white to blue

**15** Element X is in Group I of the Periodic Table.

Which row shows the type of oxide and whether element X is metallic or non-metallic?

| | type of oxide | metallic or non-metallic |
|---|---|---|
| **A** | acidic | metallic |
| **B** | acidic | non-metallic |
| **C** | basic | metallic |
| **D** | basic | non-metallic |

**16** Three liquids, P, Q and R, are added to a mixture of hydrochloric acid and Universal Indicator solution.

The following observations are made.

P the colour of the indicator turns purple.

Q the colour of the indicator does not change.

R there is effervescence and the indicator turns blue.

What are P, Q and R?

| | P | Q | R |
|---|---|---|---|
| **A** | sodium carbonate solution | water | sodium hydroxide solution |
| **B** | sodium hydroxide solution | water | sodium carbonate solution |
| **C** | water | sodium carbonate solution | sodium hydroxide solution |
| **D** | water | sodium hydroxide solution | sodium carbonate solution |

**17** Which property is **not** characteristic of a base?

**A** It reacts with a carbonate to form carbon dioxide.

**B** It reacts with an acid to form a salt.

**C** It reacts with an ammonium salt to form ammonia.

**D** It turns universal indicator paper blue.

**18** Zinc sulfate is a soluble salt and can be prepared by reacting excess zinc carbonate with dilute sulfuric acid.

Which piece of equipment would **not** be required in the preparation of zinc sulfate crystals?

**A** beaker

**B** condenser

**C** evaporating dish

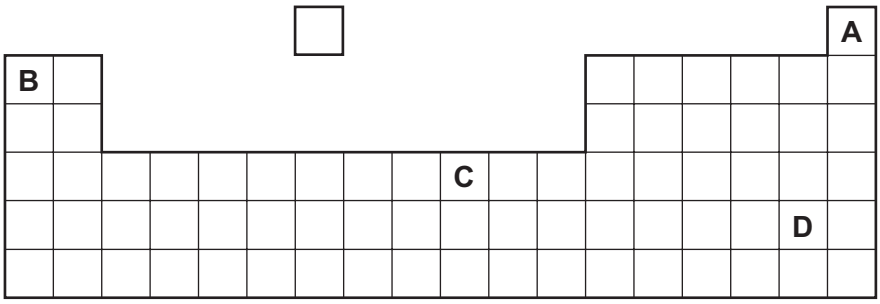
**D** filter funnel

**19** An element, X, is a dark grey crystalline solid at room temperature.

It has a melting point of 114 °C and a density of 4.9 g / $cm^3$.

When heated gently it forms a purple vapour.

Where in the Periodic Table is X found?



**20** J and K are two elements from the same period in the Periodic Table.

The table gives some properties of J and K.

| | J | K |
|---|---|---|
| appearance | shiny grey | dull yellow |
| electrical conductivity when solid | good | poor |
| malleability | malleable | brittle |

Which statement about J and K is correct?

**A** J forms an acidic oxide.

**B** J is found to the left of K in the Periodic Table.

**C** K forms positive ions when it reacts.

**D** K is more metallic than J.

**21** The table gives information about four elements.

Which element is a transition metal?

| | electrical conductivity | density in $g/cm^3$ | melting point in °C |
|---|---|---|---|
| **A** | good | 0.97 | 98 |
| **B** | good | 7.86 | 1535 |
| **C** | poor | 2.33 | 1410 |
| **D** | poor | 3.12 | –7 |

**22** Hydrogen and helium have both been used to fill balloons.

Which property of helium makes it the preferred choice to hydrogen?

**A** easily compressed into a gas cylinder

**B** forms monatomic molecules

**C** lower density

**D** unreactive

**23** Which statement is true for **all** metals?

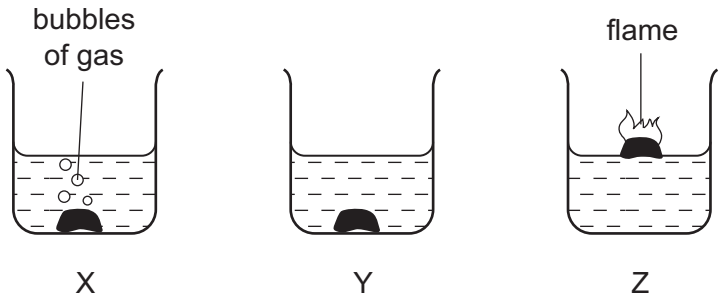
**A** Their atoms lose one or more electrons when they react.

**B** They are brittle.

**C** They do not conduct electricity when solid.

**D** They melt at low temperatures when they are heated.

**24** The diagrams show what happens when three different metals are added to water.




What are X, Y and Z?

| | X | Y | Z |
|---|---|---|---|
| **A** | calcium | copper | potassium |
| **B** | copper | calcium | potassium |
| **C** | potassium | calcium | copper |
| **D** | potassium | copper | calcium |

**25** The table show three uses of aluminium and a reason why aluminium is used for that purpose.

| | use | reason |
|---|---|---|
| 1 | aircraft manufacture | high tensile strength |
| 2 | overhead electricity cables | low density |
| 3 | food containers | resistance to corrosion |

Which reasons explain the use?

**A** 1, 2 and 3

**B** 1 and 2 only

**C** 1 and 3 only

**D** 2 and 3 only

**26** Which conditions are necessary to make mild steel from iron?

**A** add calcium oxide and blow oxygen through it

**B** heat with calcium oxide

**C** heat with carbon and limestone

**D** heat with nickel and chromium

**27** Which statements about water are correct?

1 Household water may contain salts in solution.

2 Water for household use is filtered to remove soluble impurities.

3 Water is treated with chlorine to kill bacteria.

4 Water is used in industry for cooling.

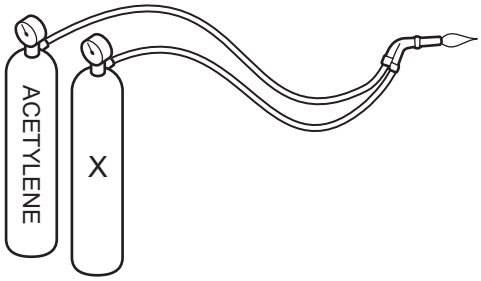
**A** 1, 2, 3 and 4

**B** 1, 2 and 3 only

**C** 1, 3 and 4 only

**D** 2, 3 and 4 only

**28** The diagram shows the flame produced from burning a hydrocarbon, acetylene, in a welding torch.




Which gas is X?

**A** hydrogen

**B** methane

**C** nitrogen

**D** oxygen

**29** Carbon monoxide is an air pollutant produced when petrol is burned in a car engine.

Why is carbon monoxide considered to be an air pollutant?

**A** It causes climate change.

**B** It causes the corrosion of buildings.

**C** It is a significant greenhouse gas.

**D** It is poisonous.

**30** Which compound is **not** a fertiliser?

**A** ammonium sulfate, $(NH_4)_2SO_4$

**B** calcium hydroxide, $Ca(OH)_2$

**C** potassium chloride, $KCl$

**D** urea, $CO(NH_2)_2$

**31** In which reaction is carbon dioxide **not** produced?

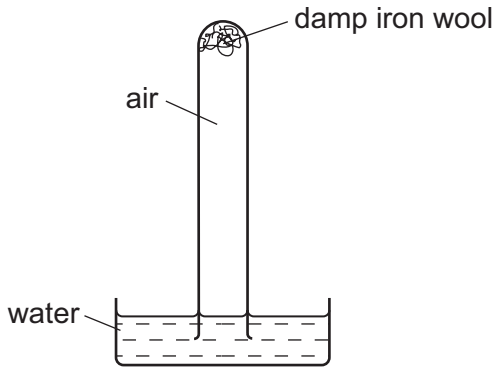
**A** complete combustion of petrol

**B** hydrochloric acid reacting with magnesium

**C** respiration

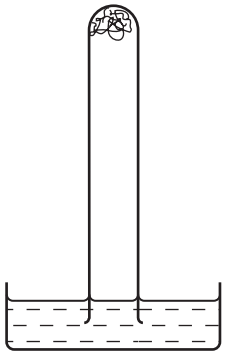
**D** thermal decomposition of limestone

**32** The apparatus shown is set up and left for a week.

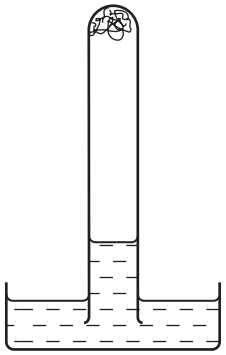



Which diagram shows the level of the water at the end of the week?

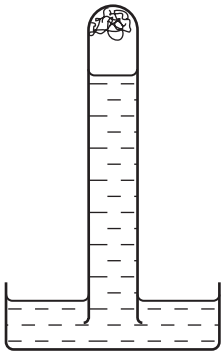
**A**



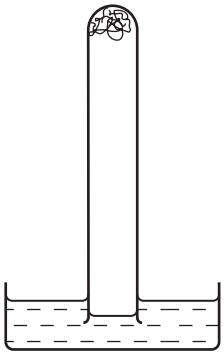
**B**



**C**



**D**



**33** Unwanted vegetation is sometimes placed in a bin where it decays to form compost. This compost can be used to fertilise soils.

Which gas is likely to be present in a higher percentage inside the bin than in the air outside the bin?

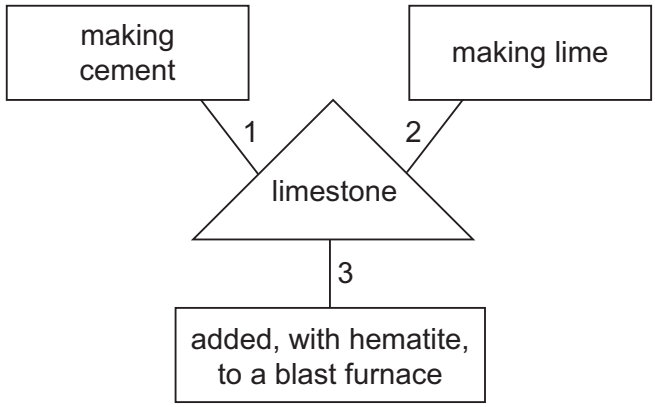
**A** carbon monoxide

**B** methane

**C** oxygen

**D** sulfur dioxide

**34** A student is asked to draw a diagram showing the uses of limestone.




Which numbered lines show a correct use of limestone?

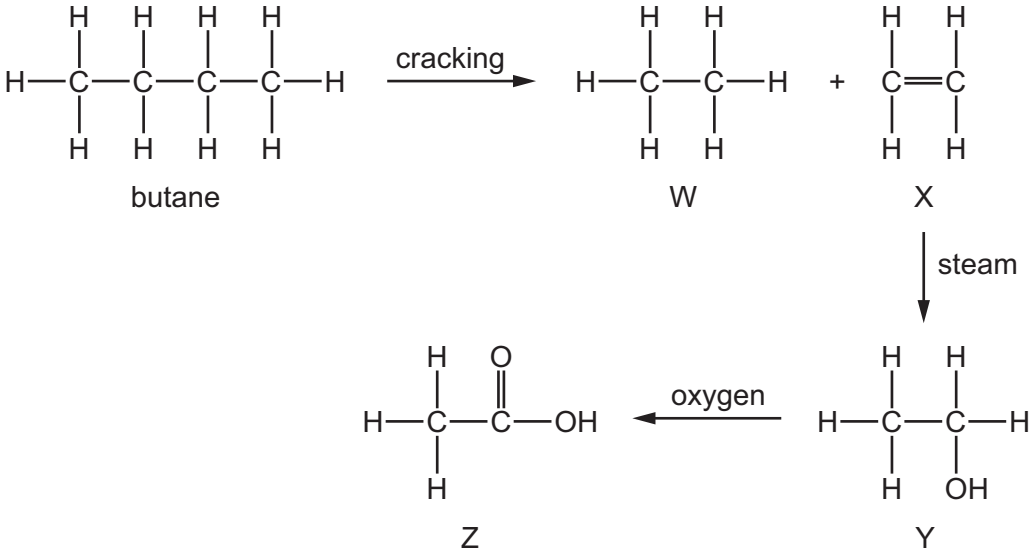
**A** 1, 2 and 3

**B** 1 and 2 only

**C** 1 and 3 only

**D** 2 and 3 only

**35** What are the names of the compounds shown in the reaction scheme below?




| | W | X | Y | Z |
|---|---|---|---|---|
| **A** | ethane | ethene | ethanol | ethanoic acid |
| **B** | ethane | ethene | ethanoic acid | ethanol |
| **C** | ethene | ethane | ethanol | ethanoic acid |
| **D** | ethene | ethane | ethanoic acid | ethanol |



**[Turn over**

**36** Which row describes the formation of a polymer?

| | monomer | polymer |
|---|---|---|
| **A** | ethane | poly(ethane) |
| **B** | ethane | poly(ethene) |
| **C** | ethene | poly(ethane) |
| **D** | ethene | poly(ethene) |

**37** Which row shows the correct use of a fraction obtained by the fractional distillation of petroleum?

| | fraction | use |
|---|---|---|
| **A** | bitumen | making waxes and polishes |
| **B** | fuel oil | aircraft fuel |
| **C** | kerosene | fuel for ships |
| **D** | naphtha | making chemicals |

**38** Ethanol can be formed by

1 fermentation

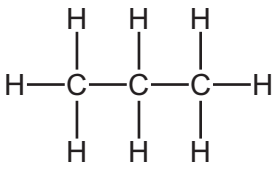
2 reaction between steam and ethene

Which of these processes uses a catalyst?

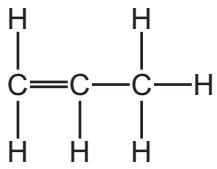
| | 1 | 2 |
|---|---|---|
| **A** | ✓ | ✓ |
| **B** | ✓ | ✗ |
| **C** | ✗ | ✓ |
| **D** | ✗ | ✗ |

**39** The structures of four compounds are shown.

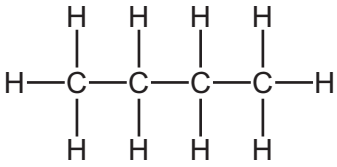
W



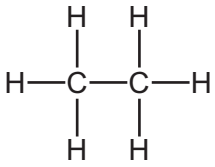
X



Y



Z



Which are members of the same homologous series?

**A** W, X, Y and Z

**B** W and X only

**C** W, Y and Z only

**D** X and Z only

**40** During the process of cracking hydrocarbons, an ..... 1 ..... is converted into an ..... 2 ..... .

The presence of an ..... 3 ..... can be shown by a visible reaction with ..... 4 ..... .

Which words complete gaps 1, 2, 3 and 4?

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| **A** | alkane | alkene | alkene | bromine |
| **B** | alkane | alkene | alkene | steam |
| **C** | alkene | alkane | alkane | bromine |
| **D** | alkene | alkane | alkane | steam |

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

| Group | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | II | | | | | | | | | | III | IV | V | VI | VII | 0 |
| | | | | | | | 1 H Hydrogen 1 | | | | | | | | | 4 He Helium 2 |
| 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 = relative atomic mass; **X** = atomic symbol; b = proton (atomic) number

The volume of one mole of any gas is 24 $dm^3$ at room temperature and pressure (r.t.p.).