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

**CHEMISTRY** **0620/11**

Paper 1 Multiple Choice (Core) **May/June 2019**

**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.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level1/Level 2 Certificate.

This document consists of **15** printed pages and **1** blank page.

**1** Sodium chloride is a liquid at 900 °C.

How are the particles arranged and how do the particles move in sodium chloride at 900 °C?

| | arrangement of particles | motion of particles |
|---|---|---|
| **A** | regular | vibrate about a fixed point |
| **B** | regular | move randomly |
| **C** | random | vibrate about a fixed point |
| **D** | random | move randomly |

**2** 2.00 g of powdered calcium carbonate is added to 50.0 $cm^3$ of hydrochloric acid.

Which apparatus is used to measure the calcium carbonate and the hydrochloric acid?

| | calcium carbonate | hydrochloric acid |
|---|---|---|
| **A** | balance | burette |
| **B** | balance | thermometer |
| **C** | pipette | burette |
| **D** | pipette | thermometer |

**3** Rock salt is a mixture of sand and sodium chloride.

Sodium chloride is soluble in water but not in hexane.

Sand is insoluble in both water and hexane.

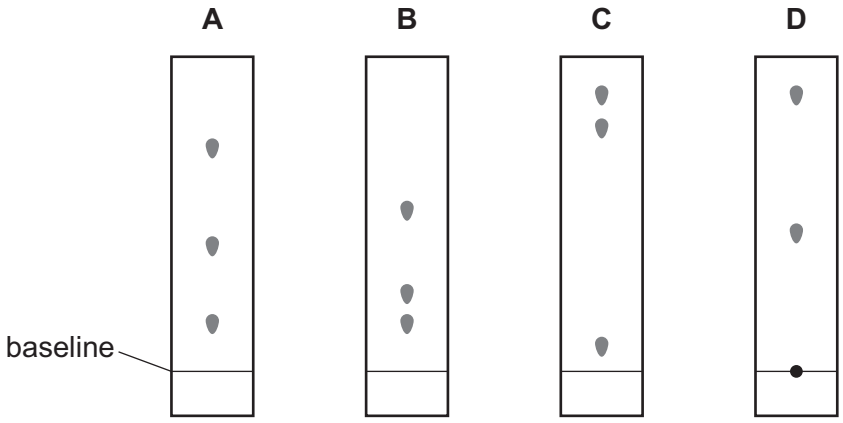
What is required to separate the sand from the sodium chloride?

1 filter paper
2 fractionating column
3 hexane
4 water

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

**4** The colours in four dyes are separated using chromatography.

Which chromatogram shows an insoluble colour?




**5** Which statement about an atom of fluorine, $^{19}_{9}F$, is correct?

**A** It contains more protons than neutrons.

**B** It contains a total of 28 protons, neutrons and electrons.

**C** Its isotopes contain different numbers of protons.

**D** Its nucleus contains 9 neutrons.

**6** Calcium reacts with chlorine to produce calcium chloride.

What happens when a calcium ion forms during this reaction?

**A** The calcium atom gains one electron.

**B** The calcium atom gains two electrons.

**C** The calcium atom loses one electron.

**D** The calcium atom loses two electrons.

**7** Which row describes the formation of single covalent bonds in methane?

| | | |
|---|---|---|
| **A** | atoms share a pair of electrons | both atoms gain a noble gas electronic structure |
| **B** | atoms share a pair of electrons | both atoms have the same number of electrons in their outer shell |
| **C** | electrons are transferred from one atom to another | both atoms gain a noble gas electronic structure |
| **D** | electrons are transferred from one atom to another | both atoms have the same number of electrons in their outer shell |



**[Turn over**

**8** Diamond and graphite have giant covalent structures of carbon atoms.

Which statement describes graphite?

**A** It has a strong, rigid three-dimensional structure.

**B** It has four strong covalent bonds between each carbon atom.

**C** It has layers, which can slide over each other.

**D** It has no free electrons, so does not conduct electricity.

**9** The compound magnesium nitrate has the formula $Mg(NO_3)_2$.

What is the relative formula mass of magnesium nitrate?

**A** 86 **B** 134 **C** 148 **D** 172

**10** Four substances are electrolysed using inert electrodes.

Which row describes the electrode products?

| | substance | anode product | cathode product |
|---|---|---|---|
| **A** | concentrated aqueous sodium chloride | hydrogen | chlorine |
| **B** | concentrated hydrochloric acid | chlorine | oxygen |
| **C** | dilute sulfuric acid | oxygen | hydrogen |
| **D** | molten lead bromide | lead | bromine |

**11** Dissolving ammonium chloride in water is an endothermic change.

Which row shows the energy change and temperature change of the mixture during the dissolving of ammonium chloride?

| | energy change | temperature change |
|---|---|---|
| **A** | energy is absorbed | decrease |
| **B** | energy is absorbed | increase |
| **C** | energy is released | decrease |
| **D** | energy is released | increase |

**12** Which process is a physical change?

**A** burning wood

**B** cooking an egg

**C** melting an ice cube

**D** rusting iron

**13** Hydrogen peroxide solution decomposes very slowly at room temperature to produce oxygen gas. This gas forms a rising foam when liquid detergent is added.

Five test-tubes are half filled with hydrogen peroxide solution. A drop of liquid detergent is added to each one.

Different metal oxides are added to four of the test-tubes and the height of the foam formed after 1 minute is measured. The results are shown.

| metal oxide | height of foam / cm |
|---|---|
| no metal oxide added | 0.1 |
| aluminium oxide | 0.1 |
| calcium oxide | 0.2 |
| copper(II) oxide | 2.3 |
| manganese(IV) oxide | 5.4 |

Which conclusion can be drawn from these results?

**A** Metal oxides do not affect the rate of this reaction.

**B** All metal oxides increase the rate of this reaction and act as catalysts.

**C** Manganese(IV) oxide is the best catalyst of the four metal oxides tested.

**D** Only transition element oxides increase the rate of this reaction.

**14** When blue-green crystals of nickel(II) sulfate are heated, water is produced and a yellow solid remains. When water is added to the yellow solid, the blue-green colour returns.

Which process describes these changes?

**A** combustion

**B** corrosion

**C** neutralisation

**D** reversible reaction



**[Turn over**

**15** In a blast furnace, iron is extracted when iron(III) oxide reacts with carbon monoxide.

The equation is shown.

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$

Which substance is oxidised and which is reduced?

| | oxidised | reduced |
|---|---|---|
| **A** | CO | $Fe_2O_3$ |
| **B** | $CO_2$ | Fe |
| **C** | Fe | $CO_2$ |
| **D** | $Fe_2O_3$ | CO |

**16** Four different solutions are separately tested with blue litmus and with methyl orange. Each solution is known to be either acidic or alkaline. The results are shown.

| solution | result with blue litmus | result with methyl orange |
|---|---|---|
| 1 | red | red |
| 2 | red | yellow |
| 3 | blue | yellow |
| 4 | blue | yellow |

Which statement is correct?

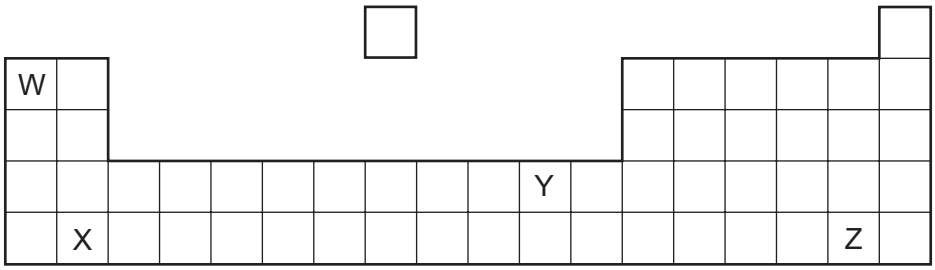
**A** Solutions 1 and 4 are acidic.

**B** Solutions 1 and 2 are alkaline.

**C** Solutions 3 and 4 are alkaline.

**D** Solutions 3 and 4 are acidic.

**17** The positions of elements W, X, Y and Z in the Periodic Table are shown.




Which elements form basic oxides?

**A** W, X and Y **B** W and X only **C** Y only **D** Z only

**18** How could crystals of a pure salt be prepared from dilute sulfuric acid?

**A** add an excess of aqueous sodium hydroxide, filter, evaporate the filtrate to crystallisation point

**B** add an excess of copper(II) carbonate, filter, evaporate the filtrate to dryness

**C** add an excess of copper metal, filter, evaporate the filtrate to crystallisation point

**D** add an excess of zinc oxide, filter, evaporate the filtrate to crystallisation point

**19** The results of two tests on a solution of compound Q are shown.

| test | observation |
|---|---|
| add ammonia solution | green precipitate formed |
| add dilute nitric acid followed by aqueous barium nitrate | white precipitate formed |

What is Q?

**A** iron(II) chloride

**B** iron(II) sulfate

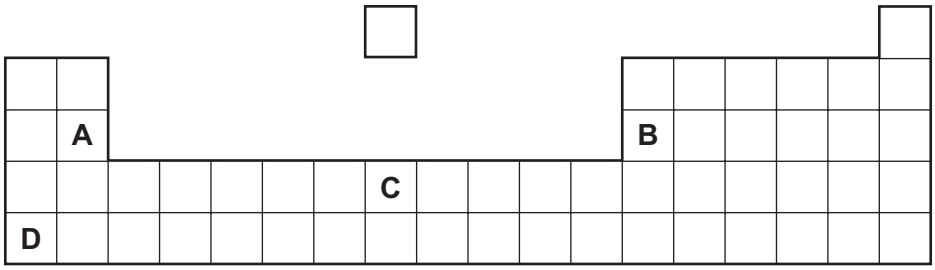
**C** iron(III) chloride

**D** iron(III) sulfate

**20** The properties of an element are shown.

| electrical conductivity | density | reaction with water |
|---|---|---|
| high | low | reacts violently with cold water |

Which element has these properties?




**21** Which statement about elements in Group I and Group VII of the Periodic Table is correct?

**A** Bromine reacts with potassium chloride to produce chlorine.

**B** Iodine is a monoatomic non-metal.

**C** Lithium has a higher melting point than potassium.

**D** Sodium is more reactive with water than potassium.

**22** Which row describes the properties of a transition element?

| | melting point | density | forms coloured compounds |
|---|---|---|---|
| **A** | high | low | no |
| **B** | high | high | yes |
| **C** | low | low | no |
| **D** | low | low | yes |

**23** Which statement about elements in Group VIII of the Periodic Table is correct?

**A** They all have a full outer shell of electrons.

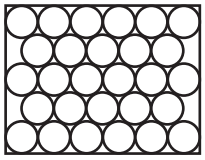
**B** They all react with Group I elements to form ionic compounds.

**C** They are all diatomic molecules.

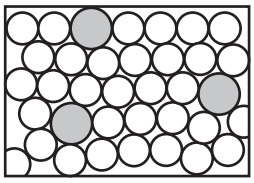
**D** They are all liquids at room temperature.

**24** The diagrams show the structure of two substances used to make electrical conductors.

X



Y



Which statement correctly describes X and Y?

**A** X is a pure metal and Y is a compound.

**B** X is a pure metal and Y is an alloy.

**C** X is a solid and Y is a liquid.

**D** X is harder and stronger than Y.

**25** The reactions of three metals, P, Q and R, are shown.

| | metal reacts with dilute hydrochloric acid | metal reacts with water |
|---|---|---|
| P | yes | no |
| Q | no | no |
| R | yes | yes |

What is the order of reactivity of the metals?

| | most reactive → | | least reactive |
|---|---|---|---|
| **A** | P | Q | R |
| **B** | Q | R | P |
| **C** | R | Q | P |
| **D** | R | P | Q |

**26** Iron is extracted from its ore in a blast furnace.

Hematite, coke, limestone and hot air are added to the furnace.

Which explanation is **not** correct?

**A** Coke burns and produces a high temperature.

**B** Hematite is the ore containing the iron as iron(III) oxide.

**C** Hot air provides the oxygen for the burning.

**D** Limestone reduces the iron(III) oxide to iron.

**27** Why is aluminium used to make containers for storing food?

**A** It conducts electricity.

**B** It has a high melting point.

**C** It is resistant to corrosion.

**D** It is strong.

**28** Water can be treated by filtration then chlorination.

Which uses do **not** need water of this quality?

1 water for cooling in industry

2 water for washing clothes

3 water for drinking

**A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

**29** Four sources of air pollution are listed.

1 burning fossil fuels containing sulfur

2 nitrogen reacting with oxygen in car engines

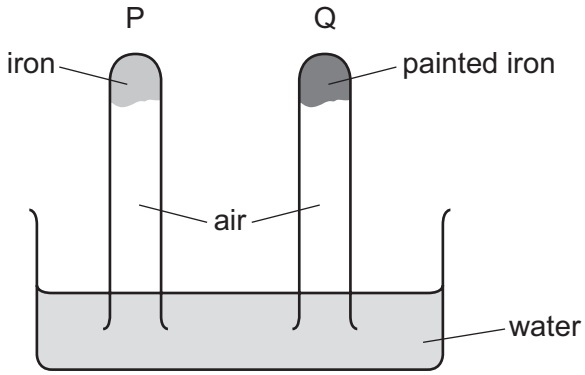
3 incomplete combustion of carbon fuels

4 adding lead compounds to petrol

Which sources produce acid rain?

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

**30** The diagram shows an experiment to investigate how paint affects the rusting of iron.

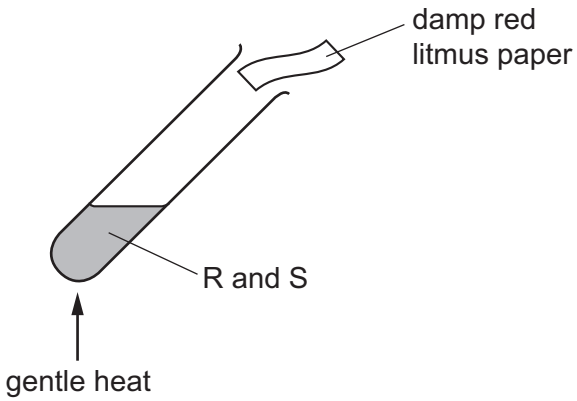



What happens to the water level in tubes P and Q?

| | tube P | tube Q |
|---|---|---|
| **A** | falls | rises |
| **B** | no change | rises |
| **C** | rises | falls |
| **D** | rises | no change |

**31** A mixture of two substances, R and S, is heated.

The damp red litmus paper turns blue.




What are R and S?

| | R | S |
|---|---|---|
| **A** | a basic oxide | ammonium chloride |
| **B** | a basic oxide | sodium nitrate |
| **C** | an acidic oxide | ammonium chloride |
| **D** | an acidic oxide | sodium nitrate |

**32** Which statement describes a disadvantage of sulfur dioxide?

**A** It can be used as a bleach when making wood pulp.

**B** It can be used to kill bacteria in food.

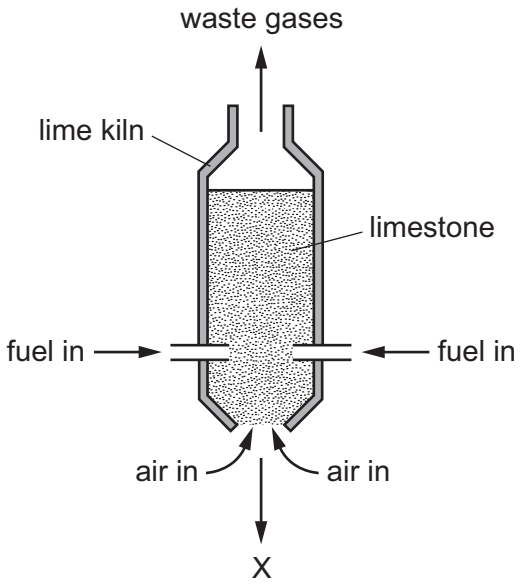
**C** It can be used to manufacture sulfuric acid.

**D** It dissolves in water to form acid rain.



**[Turn over**

**33** The diagram represents a lime kiln used to heat limestone to a very high temperature.




What leaves the kiln at X?

**A** calcium carbonate

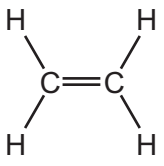
**B** calcium hydroxide

**C** calcium oxide

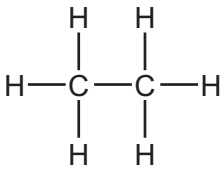
**D** calcium sulfate

**34** What is the structure of ethanol?

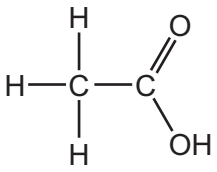
**A**



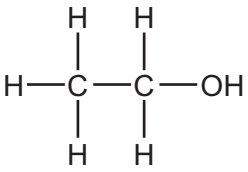
**B**



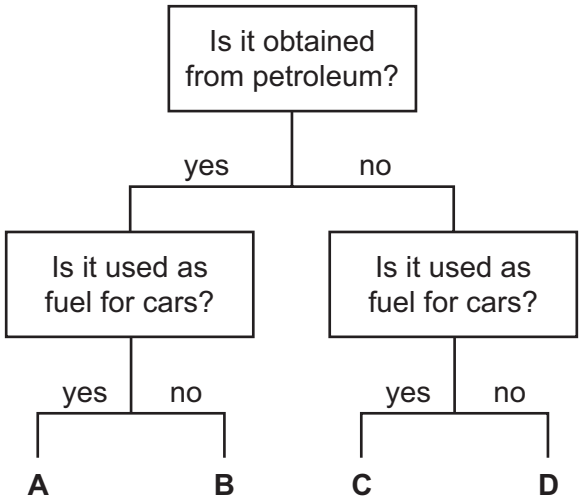
**C**



**D**



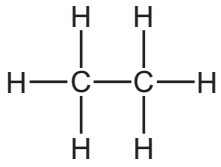
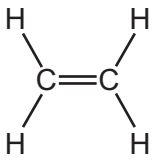
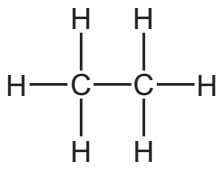
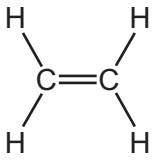
**35** Which fuel could be gasoline?




**36** A hydrocarbon W burns to form carbon dioxide and water.

W decolourises bromine water.

What is the name of W and what is its structure?

| | name of W | structure of W |
|---|---|---|
| **A** | ethane |  |
| **B** | ethane |  |
| **C** | ethene |  |
| **D** | ethene |  |

**37** Why is ethanol a member of the homologous series of alcohols but propane is **not**?

**A** Ethanol has two carbon atoms per molecule but propane has three.

**B** Ethanol can be made from ethene but propane is obtained from petroleum.

**C** Ethanol is a liquid but propane is a gas.

**D** Ethanol contains the same functional group as other alcohols but propane does not.

**38** Which statements about ethanol are correct?

1 It can be made by fermentation.

2 It is an unsaturated compound.

3 It burns in air and can be used as a fuel.

**A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

**39** Which statements about aqueous ethanoic acid are correct?

1 Ethanoic acid contains the functional group –COOH.

2 Ethanoic acid reacts with carbonates to produce hydrogen.

3 Ethanoic acid turns Universal Indicator paper blue.

4 Ethanoic acid has a pH lower than pH 7.

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

**40** Which naturally occurring polymers are found in foods?

1 complex carbohydrates

2 nylon

3 salts

4 proteins

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

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## The Periodic Table of Elements

| Group | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | II | | | | | | | | | | | III | IV | V | VI | VII | VIII |
| | | | | | | | 1 H hydrogen 1 | | | | | | | | | | 2 He helium 4 |
| 3 Li lithium 7 | 4 Be beryllium 9 | | | | | | | | | | | 5 B boron 11 | 6 C carbon 12 | 7 N nitrogen 14 | 8 O oxygen 16 | 9 F fluorine 19 | 10 Ne neon 20 |
| 11 Na sodium 23 | 12 Mg magnesium 24 | | | | | | | | | | | 13 Al aluminium 27 | 14 Si silicon 28 | 15 P phosphorus 31 | 16 S sulfur 32 | 17 Cl chlorine 35.5 | 18 Ar argon 40 |
| 19 K potassium 39 | 20 Ca calcium 40 | 21 Sc scandium 45 | 22 Ti titanium 48 | 23 V vanadium 51 | 24 Cr chromium 52 | 25 Mn manganese 55 | 26 Fe iron 56 | 27 Co cobalt 59 | 28 Ni nickel 59 | 29 Cu copper 64 | 30 Zn zinc 65 | 31 Ga gallium 70 | 32 Ge germanium 73 | 33 As arsenic 75 | 34 Se selenium 79 | 35 Br bromine 80 | 36 Kr krypton 84 |
| 37 Rb rubidium 85 | 38 Sr strontium 88 | 39 Y yttrium 89 | 40 Zr zirconium 91 | 41 Nb niobium 93 | 42 Mo molybdenum 96 | 43 Tc technetium – | 44 Ru ruthenium 101 | 45 Rh rhodium 103 | 46 Pd palladium 106 | 47 Ag silver 108 | 48 Cd cadmium 112 | 49 In indium 115 | 50 Sn tin 119 | 51 Sb antimony 122 | 52 Te tellurium 128 | 53 I iodine 127 | 54 Xe xenon 131 |
| 55 Cs caesium 133 | 56 Ba barium 137 | 57–71 lanthanoids | 72 Hf hafnium 178 | 73 Ta tantalum 181 | 74 W tungsten 184 | 75 Re rhenium 186 | 76 Os osmium 190 | 77 Ir iridium 192 | 78 Pt platinum 195 | 79 Au gold 197 | 80 Hg mercury 201 | 81 Tl thallium 204 | 82 Pb lead 207 | 83 Bi bismuth 209 | 84 Po polonium – | 85 At astatine – | 86 Rn radon – |
| 87 Fr francium – | 88 Ra radium – | 89–103 actinoids | 104 Rf rutherfordium – | 105 Db dubnium – | 106 Sg seaborgium – | 107 Bh bohrium – | 108 Hs hassium – | 109 Mt meitnerium – | 110 Ds darmstadtium – | 111 Rg roentgenium – | 112 Cn copernicium – | | 114 Fl flerovium – | | 116 Lv livermorium – | | |

**Key**

atomic number
atomic symbol
name
relative atomic mass

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| lanthanoids | 57 La lanthanum 139 | 58 Ce cerium 140 | 59 Pr praseodymium 141 | 60 Nd neodymium 144 | 61 Pm promethium – | 62 Sm samarium 150 | 63 Eu europium 152 | 64 Gd gadolinium 157 | 65 Tb terbium 159 | 66 Dy dysprosium 163 | 67 Ho holmium 165 | 68 Er erbium 167 | 69 Tm thulium 169 | 70 Yb ytterbium 173 | 71 Lu lutetium 175 |
| actinoids | 89 Ac actinium – | 90 Th thorium 232 | 91 Pa protactinium 231 | 92 U uranium 238 | 93 Np neptunium – | 94 Pu plutonium – | 95 Am americium – | 96 Cm curium – | 97 Bk berkelium – | 98 Cf californium – | 99 Es einsteinium – | 100 Fm fermium – | 101 Md mendelevium – | 102 No nobelium – | 103 Lr lawrencium – |

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