



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY

0620/12

Paper 1 Multiple Choice (Core)

October/November 2016

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

* 5 9 6 7 8 0 9 3 3 7 *



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 **15** printed pages and **1** blank page.

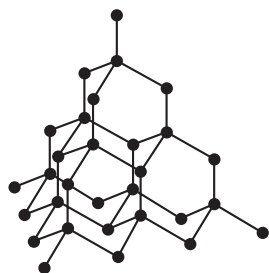
4 The table shows information about four different particles.

| particle | proton number | nucleon number | number of protons | number of neutrons | number of electrons |
|-----------------|---------------|----------------|-------------------|--------------------|---------------------|
| Na | 11 | 23 | 11 | W | 11 |
| Na ⁺ | 11 | 23 | 11 | 12 | X |
| O | 8 | 16 | 8 | Y | 8 |
| O ²⁻ | 8 | 16 | 8 | 8 | Z |

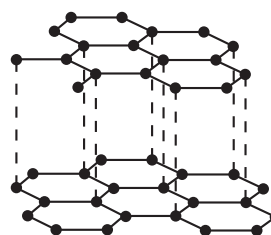
What are the values of W, X, Y and Z?

| | W | X | Y | Z |
|----------|----|----|----|----|
| A | 11 | 10 | 10 | 8 |
| B | 11 | 11 | 8 | 10 |
| C | 12 | 10 | 8 | 10 |
| D | 12 | 11 | 10 | 8 |

5 Which pair of statements about diamond and graphite is correct?



diamond



graphite

- A** Diamond and graphite are both pure carbon. They are both macromolecules.
- B** Diamond and graphite can both be used as electrodes. Graphite is also used as a lubricant.
- C** Diamond has covalent bonds. Graphite has ionic bonds.
- D** Diamond is hard with a high melting point. Graphite is soft with a low melting point.

- 6 Which row shows the electronic structure of the sodium ion and the chloride ion in sodium chloride?

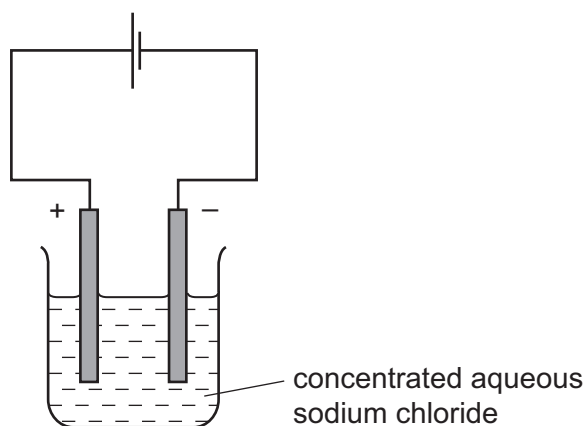
| | sodium ion | chloride ion |
|----------|------------|--------------|
| A | 2,8 | 2,8,7 |
| B | 2,8 | 2,8,8 |
| C | 2,8,1 | 2,8,7 |
| D | 2,8,1 | 2,8,8 |

- 7 A molecule of X contains two bromine atoms, three carbon atoms, six hydrogen atoms and one oxygen atom.

What is the formula of X?

- A** CHBrO **B** C₃H₆Br₂O **C** C₃H₆Br₂O **D** C₃H₆Br₂O

- 8 The diagram shows the electrolysis of concentrated aqueous sodium chloride using inert electrodes.

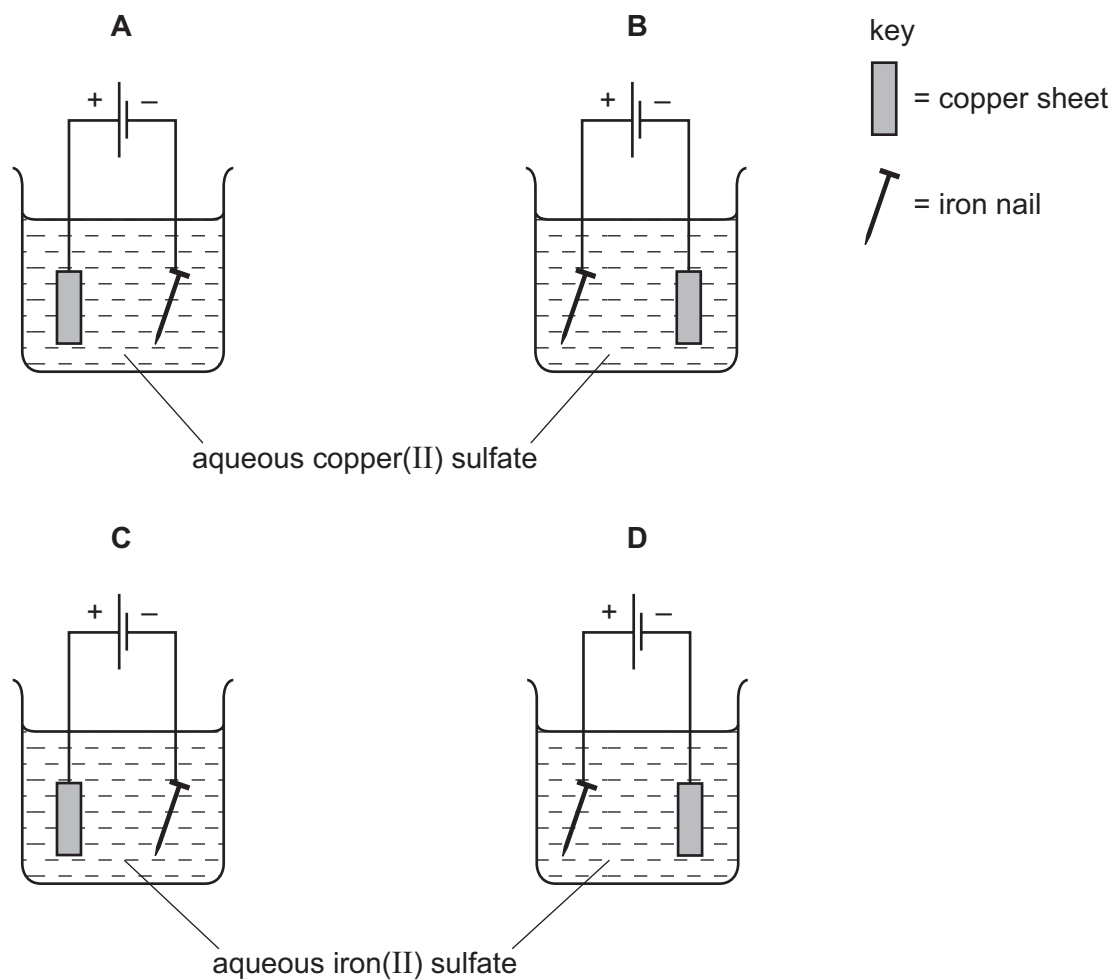


Which substances are produced at the electrodes?

| | anode | cathode |
|----------|----------------|----------------|
| A | colourless gas | colourless gas |
| B | colourless gas | green gas |
| C | green gas | colourless gas |
| D | green gas | green gas |

5

9 Which apparatus could be used to electroplate an iron nail with copper?



10 Which experiment is the most exothermic?

| | initial temperature / °C | final temperature / °C |
|----------|--------------------------|------------------------|
| A | 20 | 5 |
| B | 20 | 32 |
| C | 25 | 12 |
| D | 25 | 34 |

11 Which substance is **not** used as a fuel?

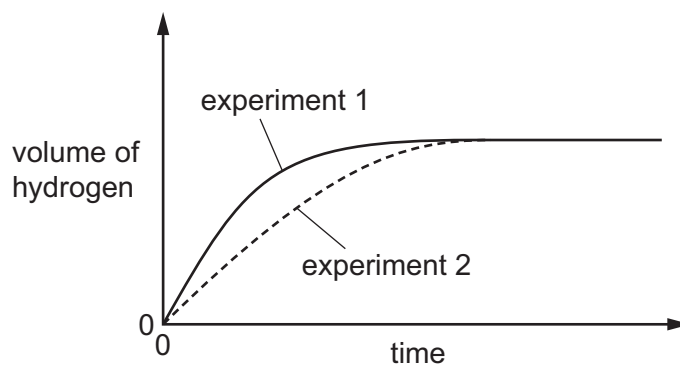
- A** bitumen
- B** diesel
- C** gasoline
- D** hydrogen

12 Zinc granules are reacted with excess dilute hydrochloric acid.

The volume of hydrogen given off is measured at different times.

The results are shown on the graph, labelled experiment 1.

The results for a second experiment are also shown on the graph, labelled experiment 2.



Which change to the conditions was made in experiment 2?

- A The concentration of the hydrochloric acid was decreased.
 - B The size of the zinc granules was decreased.
 - C The surface area of the zinc granules was increased.
 - D The temperature was increased.
- 13 When green crystals of nickel(II) sulfate are heated, water is given off and a yellow solid remains. When water is added to the yellow solid, the green colour returns.

Which process describes these changes?

- A combustion
 - B corrosion
 - C neutralisation
 - D reversible reaction
- 14 In which reaction is the copper compound reduced?
- A $\text{CuCO}_3 \rightarrow \text{CuO} + \text{CO}_2$
 - B $\text{CuO} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O}$
 - C $\text{CuSO}_4 + 2\text{NaOH} \rightarrow \text{Cu}(\text{OH})_2 + \text{Na}_2\text{SO}_4$
 - D $2\text{CuO} + \text{C} \rightarrow 2\text{Cu} + \text{CO}_2$

- 15 The element selenium forms the oxide SeO_2 . This oxide dissolves in concentrated aqueous sodium hydroxide.

The element zirconium forms the oxide ZrO_2 . This oxide dissolves in concentrated sulfuric acid.

How are the elements selenium and zirconium classified?

| | selenium | zirconium |
|----------|-----------|-----------|
| A | metal | metal |
| B | metal | non-metal |
| C | non-metal | metal |
| D | non-metal | non-metal |

- 16 Aqueous sodium hydroxide was added slowly, until in excess, to separate solutions of W, X, Y and Z.

The results are shown.

| solution | initial observation with aqueous sodium hydroxide | final observation with excess aqueous sodium hydroxide |
|----------|---|--|
| W | white precipitate formed | precipitate dissolves |
| X | white precipitate formed | no change |
| Y | pale blue precipitate formed | no change |
| Z | green precipitate formed | no change |

Which row identifies the metal ions in the solutions?

| | metal ion in solution W | metal ion in solution X | metal ion in solution Y | metal ion in solution Z |
|----------|-------------------------|-------------------------|-------------------------|-------------------------|
| A | aluminium | calcium | copper(II) | iron(II) |
| B | aluminium | calcium | iron(II) | copper(II) |
| C | aluminium | iron(II) | calcium | copper(II) |
| D | calcium | aluminium | copper(II) | iron(II) |

17 Acids can react with metal oxides, carbonates and metals.

Which reactions produce a gas?

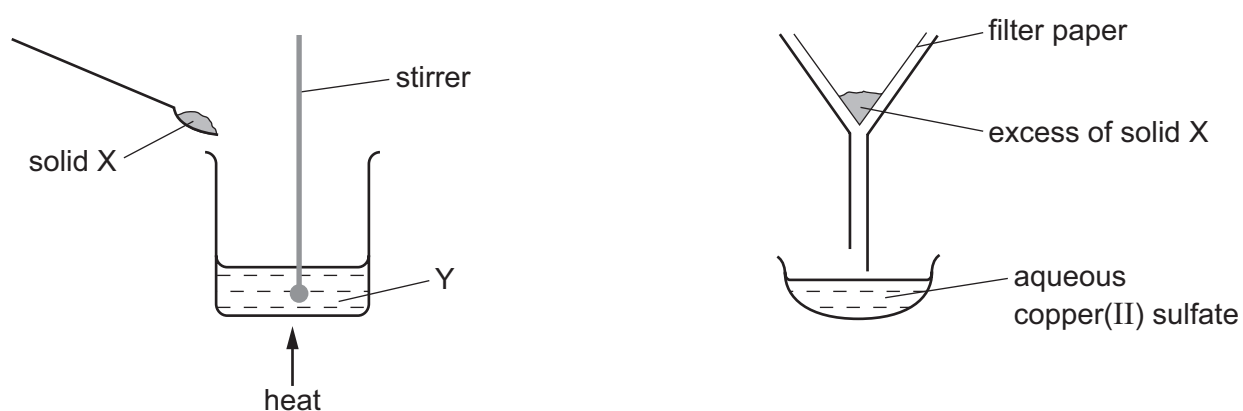
| | acid with metal oxide | acid with carbonate | acid with metal |
|----------|-----------------------|---------------------|-----------------|
| A | ✓ | ✓ | ✓ |
| B | ✓ | x | x |
| C | x | ✓ | ✓ |
| D | x | ✓ | x |

key

✓ = gas is produced

x = no gas is produced

18 The apparatus shown is used to prepare aqueous copper(II) sulfate.



What are X and Y?

| | X | Y |
|----------|---------------------|-----------------------------|
| A | copper | aqueous iron(II) sulfate |
| B | copper(II) chloride | sulfuric acid |
| C | copper(II) oxide | sulfuric acid |
| D | sulfur | aqueous copper(II) chloride |

19 Part of the Periodic Table is shown.

| | | | | | | | | | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|--|---|---|
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| V | | | | | | | | | | | | | | | | | W | |
| X | | | | | | | | | | | | | | | | | Y | Z |
| | | | | | | | | | | | | | | | | | | |

Which statement about the elements is correct?

- A** V has a higher melting point than X.
- B** X is less reactive than V.
- C** Y has less metallic character than Z.
- D** Z is more reactive than W.
- 20 What is **not** a property of Group I metals?
- A** They are soft and can be cut with a knife.
- B** They react when exposed to oxygen in the air.
- C** They produce an acidic solution when they react with water.
- D** They react rapidly with water producing hydrogen gas.
- 21 Which gas is **not** a noble gas?
- A** fluorine
- B** helium
- C** radon
- D** xenon
- 22 Which element is a transition element?

| | colour of chloride | melting point of element / °C |
|----------|--------------------|-------------------------------|
| A | orange | 113 |
| B | orange | 1535 |
| C | white | 113 |
| D | white | 1535 |

23 Which statement about the elements in Group VII is **not** correct?

- A Br_2 is less reactive than I_2 .
- B Cl_2 is used for water treatment.
- C F_2 is a covalent molecule.
- D I_2 forms a purple vapour when warmed.

24 Four metals are listed in decreasing order of reactivity.

magnesium

zinc

iron

copper

Titanium reacts with acid and cannot be extracted from its ore by heating with carbon.

Where should titanium be placed in the list?

- A below copper
- B between iron and copper
- C between magnesium and zinc
- D between zinc and iron

25 Impurities in iron obtained from the blast furnace include carbon, phosphorus and silicon.

Which impurities are removed from the molten iron as gases when it is made into steel?

- A carbon and phosphorus
- B carbon and silicon
- C carbon only
- D phosphorus and silicon

26 A student added dilute hydrochloric acid to four metals and recorded the results.

Some of the results are **not** correct.

| | results | |
|---|-----------|---------------|
| | metal | gas given off |
| 1 | copper | yes |
| 2 | iron | yes |
| 3 | magnesium | no |
| 4 | zinc | yes |

Which **two** results are correct?

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

27 What is a common use of mild steel?

- A** aircraft manufacture
B electrical wiring
C making car bodies
D making cutlery

28 River water contains soluble impurities, insoluble impurities and bacteria.

River water is made safe to drink by filtration and chlorination.

Which statement is correct?

- A** Filtration removes bacteria and insoluble impurities, and chlorination removes soluble impurities.
B Filtration removes insoluble impurities, and chlorination kills the bacteria.
C Filtration removes soluble and insoluble impurities, and chlorination kills the bacteria.
D Filtration removes soluble impurities and bacteria, and chlorination removes insoluble impurities.

29 Air is a mixture of gases.

Which gas is present in the largest amount?

- A** argon
B carbon dioxide
C nitrogen
D oxygen

30 Which information about carbon dioxide and methane is correct?

| | | carbon dioxide | methane |
|----------|-----------------------------------|----------------|---------|
| A | formed when vegetation decomposes | ✓ | ✗ |
| B | greenhouse gas | ✓ | ✓ |
| C | present in unpolluted air | ✗ | ✗ |
| D | produced during respiration | ✗ | ✓ |

key
 ✓ = true
 ✗ = false

31 Aqueous sodium hydroxide is added to a sample of a fertiliser and the mixture warmed.

Ammonia gas is given off.

Which ion does the fertiliser contain?

- A** ammonium
- B** nitrate
- C** phosphate
- D** potassium

32 Which reaction would **not** result in the production of carbon dioxide?

- A** combustion of methane
- B** fermentation
- C** reaction between an acid and a metal
- D** respiration

33 Which substance gives off carbon dioxide on heating?

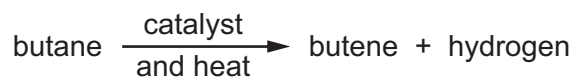
- A** lime
- B** limestone
- C** limewater
- D** slaked lime

34 Petroleum is separated into fractions.

Which statement is **not** correct?

- A** Each fraction contains a mixture of hydrocarbon molecules.
- B** Fuel oil burns easily and is used as fuel in cars.
- C** Refinery gas is the fraction containing the smallest molecules.
- D** The fractions are separated depending on their boiling point range.

35 Butane reacts as shown.



What is this type of reaction?

- A combustion
 - B cracking
 - C polymerisation
 - D reduction
- 36 Which compound is **not** a member of the alkene homologous series?

- A CH_3CHCH_2
- B $\text{CH}_3\text{CH}_2\text{CHCH}_2$
- C $\text{CH}_3\text{CHCHCH}_3$
- D $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$

37 Which compound decolourises aqueous bromine?

- A 2-methylpropane
- B butane
- C cyclohexane
- D hexene

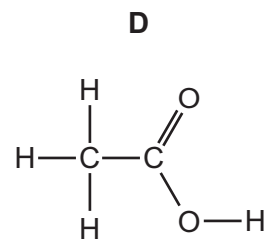
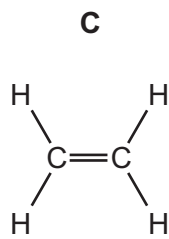
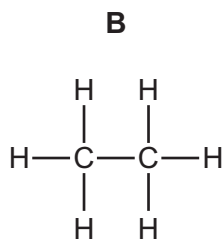
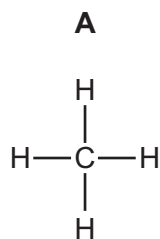
38 The equation represents the fermentation of X.



What is X?

- A ethanoic acid
- B ethene
- C glucose
- D methanol

39 Which molecule can be polymerised?



40 Which equation for the complete combustion of ethanol is correct?

- A** $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$
- B** $2C_2H_5OH + 7O_2 \rightarrow 4CO_2 + 6H_2O$
- C** $2C_2H_5OH + 5O_2 \rightarrow 2CO_2 + 6H_2O$
- D** $4C_2H_5OH + 7O_2 \rightarrow 4CO_2 + 10H_2O$

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The Periodic Table of Elements

| | | Group | | | | | | | | | | | | | | | |
|-----------------------------------|------------------------------------|--|--|------------------------------------|-------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|---------------------------------------|--------------------------------------|--------------------------------------|------------------------------------|--------------------------------------|------------------------------------|-------------------------------------|----------------------------------|-------------------------------------|
| I | II | | | | | | | | | | | III | IV | V | VI | VII | VIII |
| 3 Li lithium 7 | 4 Be beryllium 9 | <div style="border: 1px solid black; padding: 5px; text-align: center;"> Key atomic number atomic symbol name relative atomic mass </div> | | | | | | | | | | 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 | | | | | | | | | | | 1 H hydrogen 1 | 13 Al aluminium 27 | 14 Si silicon 28 | 15 P phosphorus 31 | 16 S sulfur 32 | 17 Cl chlorine 35.5 |
| 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 — | — | — | — | — |

| | | | | | | | | | | | | | | | |
|-------------|-------------------------------------|-----------------------------------|--|-------------------------------------|------------------------------------|------------------------------------|------------------------------------|--------------------------------------|-----------------------------------|--------------------------------------|-------------------------------------|----------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|
| 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 dm³ at room temperature and pressure (r.t.p.)