



Cambridge IGCSE™

CHEMISTRY

0620/12

Paper 1 Multiple Choice (Core)

May/June 2020

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

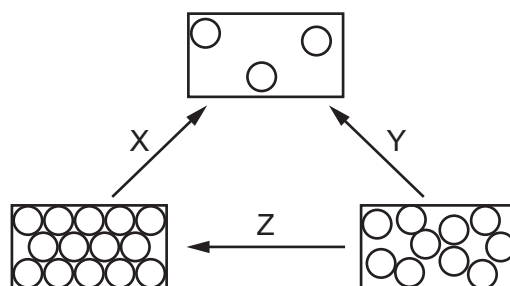
- The total mark for this paper is 40.
- Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Blank pages are indicated.



1 Each rectangle shows the arrangement of particles in each of the three states of matter.

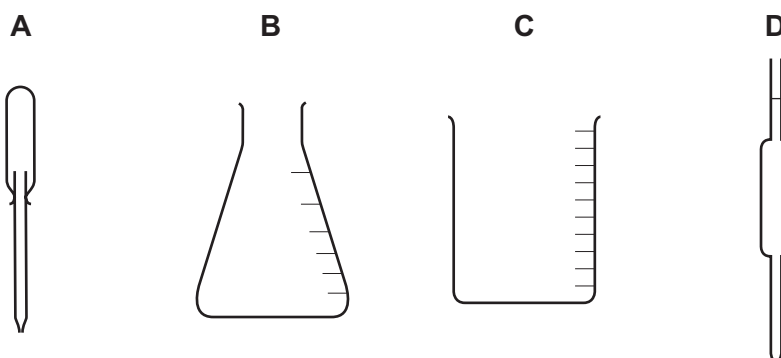
X, Y and Z represent the processes needed to change from one state to another.



What are the processes X, Y and Z?

| | X | Y | Z |
|----------|-------------|-------------|------------|
| A | evaporating | subliming | condensing |
| B | evaporating | subliming | freezing |
| C | subliming | evaporating | condensing |
| D | subliming | evaporating | freezing |

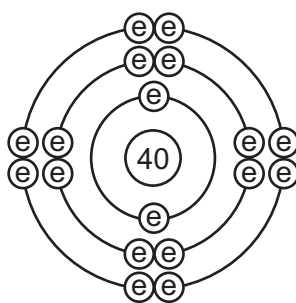
2 Which piece of apparatus is used to measure 25.0 cm^3 of aqueous sodium hydroxide?



3 Which process is used to produce drinking water from sea water?

- A** crystallisation
- B** distillation
- C** filtration
- D** chlorination

- 4 The diagram shows the electronic structure of a particle with a nucleon number (mass number) of 40.

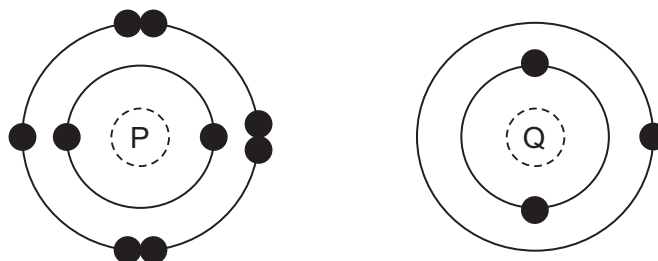


The table shows the suggestions that three students, 1, 2 and 3, made to identify the particle.

| | student | | |
|----------|---------|----|------------------|
| | 1 | 2 | 3 |
| particle | Ar | Cl | Ca ²⁺ |

Which students are correct?

- A** 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3
- 5 The Group I element sodium forms an ionic bond with the Group VII element fluorine.
- Which two ions are produced?
- A** Na⁺ and F⁺ **B** Na⁺ and F⁻ **C** Na⁻ and F⁻ **D** Na⁻ and F⁺
- 6 The electronic structures of two atoms, P and Q, are shown.



P and Q combine together to form a compound.

What is the type of bonding in the compound and what is the formula of the compound?

| | type of bonding | formula |
|----------|-----------------|-----------------|
| A | ionic | PQ |
| B | ionic | PQ ₂ |
| C | covalent | PQ ₂ |
| D | covalent | PQ |

7 Graphite is a macromolecule.

Which statements about graphite are correct?

- 1 Carbon atoms form four covalent bonds with neighbouring atoms.
- 2 There are free electrons between layers of carbon atoms.
- 3 Graphite is a useful lubricant.
- 4 Graphite is a good conductor of electricity.

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

8 Aluminium oxide has the formula Al_2O_3 .

Which statement about aluminium oxide is correct?

- A** 2g of aluminium atoms are combined with 3g of oxygen atoms.
B 2g of aluminium atoms are combined with 3g of oxygen molecules.
C Aluminium oxide has a relative formula mass of 102.
D Pure aluminium oxide contains a higher mass of oxygen than of aluminium.

9 Dilute sulfuric acid is electrolysed using carbon electrodes.

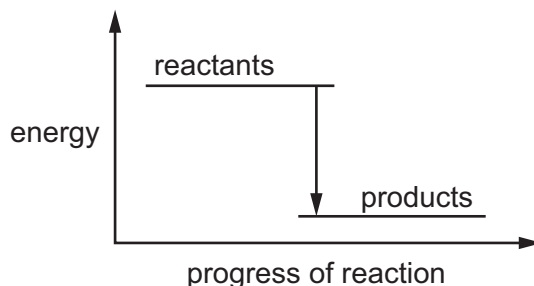
Which row shows the products formed at each electrode?

| | anode | cathode |
|----------|----------|----------|
| A | hydrogen | oxygen |
| B | hydrogen | sulfur |
| C | oxygen | hydrogen |
| D | oxygen | sulfur |

10 Which fuel does **not** rely on combustion to release energy?

- A** gasoline
B hydrogen
C methane
D uranium

11 The energy level diagram shows the energy of the reactants and products in a chemical reaction.



Which row correctly describes the energy change and the type of reaction shown?

| | description of energy change | type of reaction |
|----------|--|------------------|
| A | energy is given out to the surroundings | endothermic |
| B | energy is given out to the surroundings | exothermic |
| C | energy is taken in from the surroundings | endothermic |
| D | energy is taken in from the surroundings | exothermic |

12 Which list contains **only** chemical changes?

- A** melting, evaporating, dissolving
- B** rusting, freezing, subliming
- C** neutralisation, polymerisation, combustion
- D** boiling, condensing, distillation

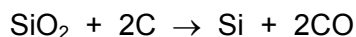
13 Which row shows the changes that **all** increase the rate of a chemical reaction?

| | concentration of reactants | temperature | particle size |
|----------|----------------------------|-------------|---------------|
| A | decrease | decrease | decrease |
| B | decrease | increase | increase |
| C | increase | decrease | increase |
| D | increase | increase | decrease |

14 Which reaction is reversible?

- A an iron nail rusting when left in moist air
- B limestone reacting with an acid to form carbon dioxide gas
- C magnesium burning in air to produce a white ash
- D white anhydrous copper(II) sulfate turning blue when water is added

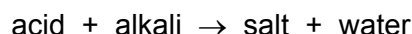
15 When heated strongly, silicon(IV) oxide reacts with carbon.



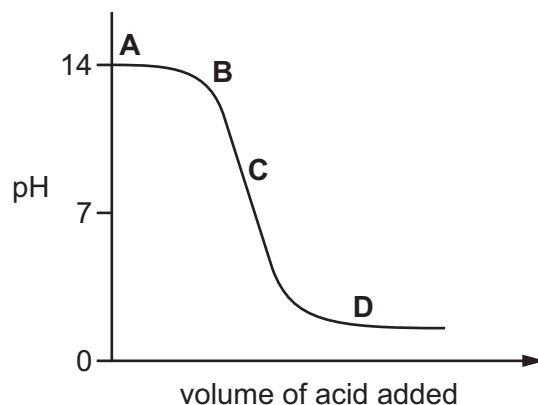
Which term describes what happens to silicon(IV) oxide?

- A thermal decomposition
- B neutralisation
- C oxidation
- D reduction

16 The graph shows how the pH of a solution changes as an acid is added to an alkali.



Which letter represents the area of the graph where both acid and salt are present?

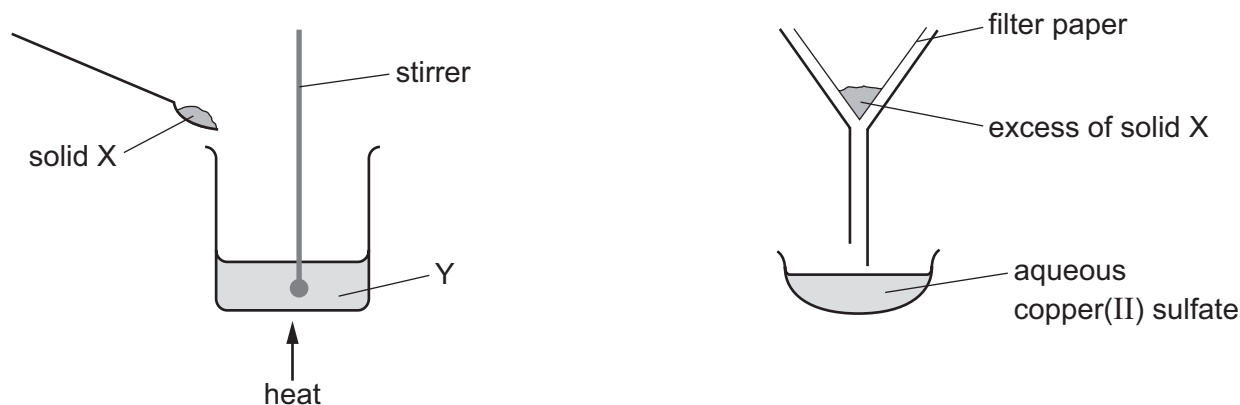


17 Element G is a metal in Group I of the Periodic Table and element H is a non-metal in Group VII. Both of these elements form oxides.

Which statement about their oxides is correct?

- A Both oxides are acidic.
- B Both oxides are basic.
- C The oxide of G is acidic and the oxide of H is basic.
- D The oxide of H is acidic and the oxide of G is basic.

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 | dilute sulfuric acid |
| C | copper(II) oxide | dilute sulfuric acid |
| D | sulfur | aqueous copper(II) chloride |

19 An aqueous solution of a compound M is tested.

The results are shown.

- It gave a lilac colour in a flame test.
- It produced a white precipitate when tested with acidified barium nitrate.

What is M?

- A** copper(II) chloride
- B** copper(II) sulfate
- C** potassium carbonate
- D** potassium sulfate

- 20 The character of the elements and charges on the ions of the elements change across the Periodic Table.

Which row describes the elements on the left of the table and the elements on the right?

| | elements on the left | | elements on the right | |
|----------|----------------------|---------------|-----------------------|---------------|
| | character | charge on ion | character | charge on ion |
| A | metallic | positive | non-metallic | negative |
| B | metallic | negative | non-metallic | positive |
| C | non-metallic | positive | metallic | negative |
| D | non-metallic | negative | metallic | positive |

- 21 Which statement about Group I and Group VII elements is correct?

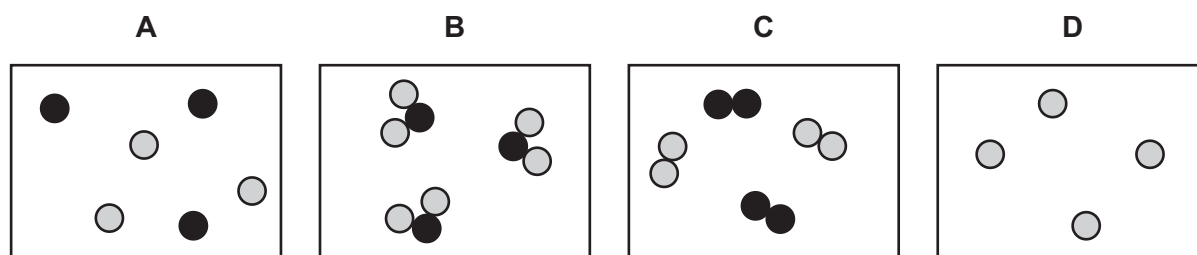
- A** Group VII elements are monoatomic non-metals.
- B** Lithium is more reactive with water than caesium.
- C** The melting points of Group I metals increase down the group.
- D** Potassium bromide reacts with chlorine to produce an orange solution.

- 22 The properties of the element titanium, Ti, can be predicted from its position in the Periodic Table.

Which row identifies the properties of titanium?

| | can be used as a catalyst | conducts electricity when solid | has low density | forms coloured compounds |
|----------|---------------------------|---------------------------------|-----------------|--------------------------|
| A | ✓ | ✓ | ✓ | ✗ |
| B | ✓ | ✓ | ✗ | ✓ |
| C | ✓ | ✗ | ✓ | ✓ |
| D | ✗ | ✓ | ✓ | ✓ |

- 23 Which diagram shows a mixture of noble gases?



24 Which property is shown by **all** metals?

- A They are extracted from their ores by heating with carbon.
- B They conduct electricity.
- C They form acidic oxides.
- D They react with hydrochloric acid to form hydrogen.

25 The reactions of four metals, W, X, Y and Z, are shown.

| metal | observations |
|-------|--|
| W | reacts with steam and hydrochloric acid but not cold water |
| X | reacts with hydrochloric acid but not with steam or cold water |
| Y | reacts with hydrochloric acid and cold water |
| Z | does not react with hydrochloric acid |

What is the order of reactivity for metals W, X, Y and Z?

| | most reactive | | → | least reactive | |
|----------|---------------|---|---|----------------|---|
| A | Y | W | | X | Z |
| B | Y | X | | W | Z |
| C | Z | W | | X | Y |
| D | Z | X | | W | Y |

26 Molten iron from the blast furnace contains impurities.

The process of turning the impure iron into steel involves blowing oxygen into the molten iron and adding calcium oxide.

What are the reasons for blowing in oxygen and adding calcium oxide?

| | blowing in oxygen | adding calcium oxide |
|----------|---|---|
| A | carbon is removed by reacting with oxygen | reacts with acidic impurities making slag |
| B | carbon is removed by reacting with oxygen | reacts with slag and so removes it |
| C | iron reacts with the oxygen | reacts with acidic impurities making slag |
| D | iron reacts with the oxygen | reacts with slag and so removes it |

27 Which statement about mild steel explains why it is a good choice for car bodies?

- A It is cheap and strong.
- B It is a good conductor.
- C It is low density.
- D It resists rusting.

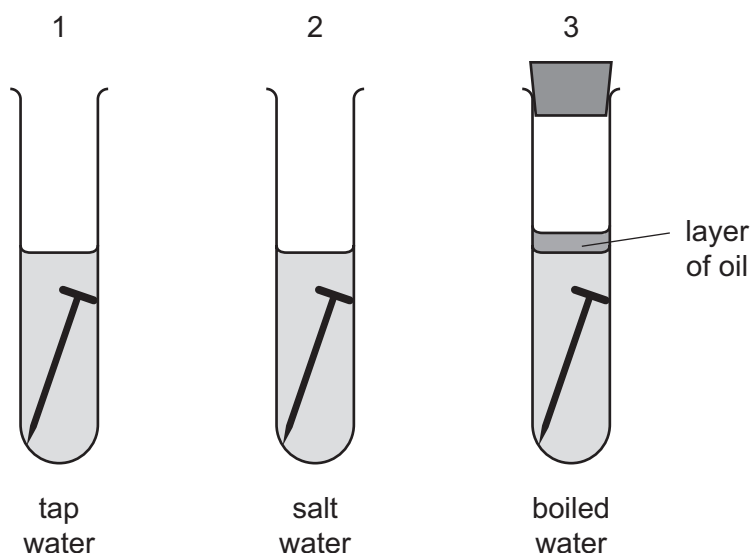
28 Which statement about pure water is **not** correct?

- A It condenses at 100 °C.
- B It freezes at 0 °C.
- C It turns cobalt(II) chloride paper blue.
- D It turns anhydrous copper(II) sulfate blue.

29 Which compounds **both** contribute to 'acid rain'?

- A carbon monoxide and lead compounds
- B carbon monoxide and oxides of nitrogen
- C oxides of nitrogen and sulfur dioxide
- D sulfur dioxide and lead compounds

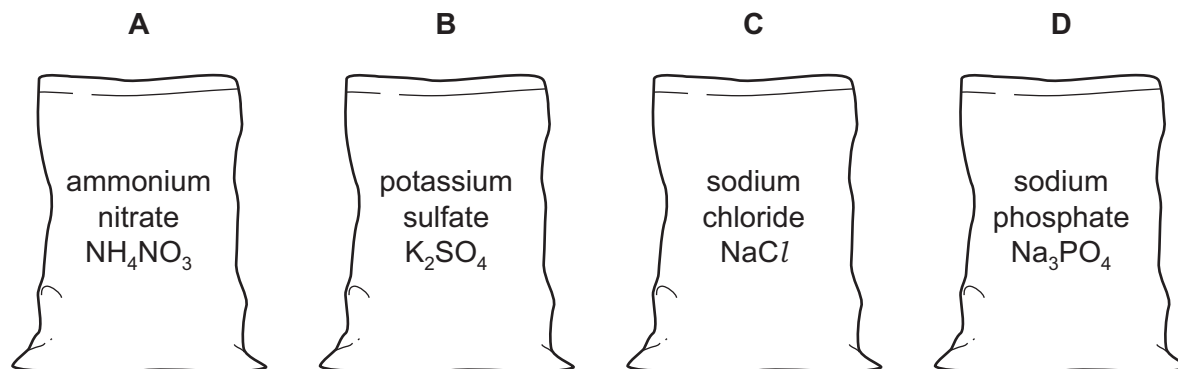
30 The diagrams show experiments to investigate rusting of iron nails.



In which test-tubes do the nails rust?

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

31 Which bag is **not** suitable for use as a fertiliser?



32 X is a colourless greenhouse gas.

It is a waste product from digestion in animals.

It is generally unreactive, but it can be burnt.

What is X?

- A** carbon dioxide
- B** methane
- C** nitrogen
- D** sulfur dioxide

33 The list shows four methods that were suggested for the formation of carbon dioxide.

- 1 cracking methane using steam
- 2 action of heat on a carbonate
- 3 complete combustion of methane
- 4 reaction of a carbonate with oxygen

Which methods would result in the production of carbon dioxide?

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

34 A student suggests three uses of calcium carbonate (limestone).

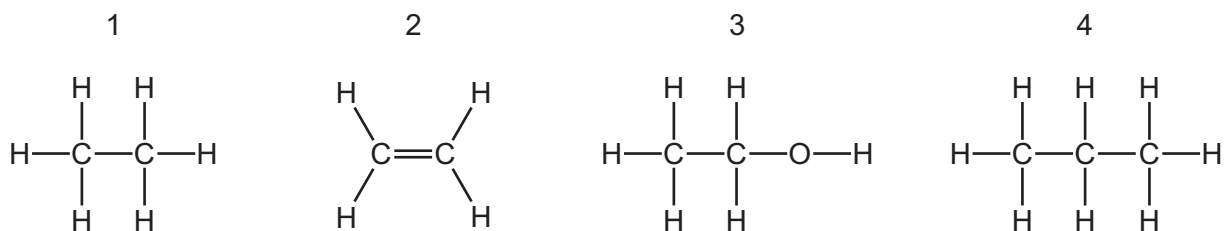
- 1 manufacture of cement
- 2 manufacture of iron
- 3 treating alkaline soils

Which suggestions are correct?

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

- 35 Which list shows the fractions obtained from distilling petroleum, in order of increasing boiling point?
- A** bitumen → diesel oil → fuel oil → lubricating oil
B diesel oil → gasoline → naphtha → kerosene
C gasoline → naphtha → kerosene → diesel oil
D kerosene → lubricating oil → naphtha → refinery gas

- 36 The structures of four compounds are shown.



Which compounds are members of the same homologous series?

- A** 1 and 2 only **B** 1 and 4 **C** 1, 2 and 3 **D** 2 and 4
- 37 Increasing the number of atoms in one molecule of a hydrocarbon increases the amount of energy released when it burns.

What is the correct order?

| | less energy released | → | more energy released |
|----------|----------------------|---|----------------------|
| A | ethene | | ethane |
| B | ethene | | methane |
| C | methane | | ethane |
| D | methane | | ethene |

- 38 Which statement about alcohols is correct?

- A** Alcohols and carboxylic acids have the same functional group.
B Ethanoic acid is produced from the reduction of ethanol.
C Ethanol is produced in an addition reaction between ethene and hydrogen.
D Water is produced from the combustion of alcohols.

39 An organic compound, P, reacts with zinc to produce a gas, Q.

What are P and Q?

| | P | Q |
|----------|---------------|----------------|
| A | ethanoic acid | carbon dioxide |
| B | ethanoic acid | hydrogen |
| C | ethanol | carbon dioxide |
| D | ethanol | hydrogen |

40 Which substances are natural polymers?

- 1 proteins
- 2 carbohydrates
- 3 nylon
- 4 poly(ethene)

A 1 and 2

B 1 and 3

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 | | | | | | | | | | |
| 3 Li lithium 7 | 4 Be beryllium 9 | 1 H hydrogen 1 | 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 | <p>Key</p> <p>atomic number</p> <p>atomic symbol</p> <p>name</p> <p>relative atomic mass</p> | | | | | | | | | | | | | | | |
| 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 — | 118 Og oganeson — | 119 Uue unbinilium — | 120 Uub unbinilium — | 121 Uut ununilium — |

| | | | | | | | | | | | | | | | |
|-------------|------------------------------|----------------------------|---------------------------------|------------------------------|-----------------------------|-----------------------------|-----------------------------|-------------------------------|----------------------------|-------------------------------|------------------------------|---------------------------|-------------------------------|------------------------------|------------------------------|
| 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.).