Cambridge Assessment International Education

# Cambridge IGCSE™

**COMBINED SCIENCE** **0653/22**

Paper 2 Multiple Choice (Extended) **February/March 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.




**[Turn over**

**1** Which row shows the features of a plant cell?

| | cell membrane surrounding the cell wall | cell wall surrounding the cell membrane | vacuole present |
|---|---|---|---|
| **A** | ✓ | ✗ | ✓ |
| **B** | ✗ | ✓ | ✓ |
| **C** | ✓ | ✗ | ✗ |
| **D** | ✗ | ✓ | ✗ |

**2** When an apple is cut, the cut surface quickly turns brown. This is due to enzyme action.

Which action destroys the enzyme?

**A** brushing the cut surface with a strong sugar solution

**B** cutting the apple into smaller pieces

**C** placing the cut apple in boiling water

**D** placing the cut apple in cold water

**3** Which vitamin and which mineral would a doctor recommend increasing in the diet of a patient with scurvy and anemia?

**A** vitamin C and calcium

**B** vitamin C and iron

**C** vitamin D and calcium

**D** vitamin D and iron

**4** Animals break down large, insoluble molecules into small, soluble molecules in the alimentary canal.

What is this process?

**A** chemical digestion

**B** chemical ingestion

**C** mechanical digestion

**D** mechanical ingestion

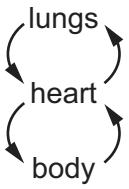
**5** The table shows how humidity may affect the rate of diffusion of water vapour from a plant to the surrounding air.

Which row will result in the highest rate of transpiration?

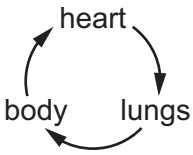
| | humidity | diffusion gradient for water |
|---|---|---|
| **A** | high | low |
| **B** | high | high |
| **C** | low | low |
| **D** | low | high |

**6** Which diagram shows how blood circulates in mammals?

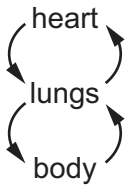
**A**



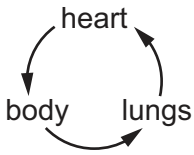

**B**




**C**




**D**




**7** Which component of tobacco smoke increases the risk of lung cancer?

**A** carbon dioxide

**B** carbon monoxide

**C** nicotine

**D** tar

**8** What is the equation for aerobic respiration?

**A** carbon dioxide + water → glucose + oxygen

**B** glucose + oxygen → carbon dioxide + water

**C** glucose + water → carbon dioxide + oxygen

**D** oxygen + water → carbon dioxide + glucose



**[Turn over**

**9** When an athlete prepares for the start of a sprint race, excitement causes the concentration of adrenaline in the blood to increase.

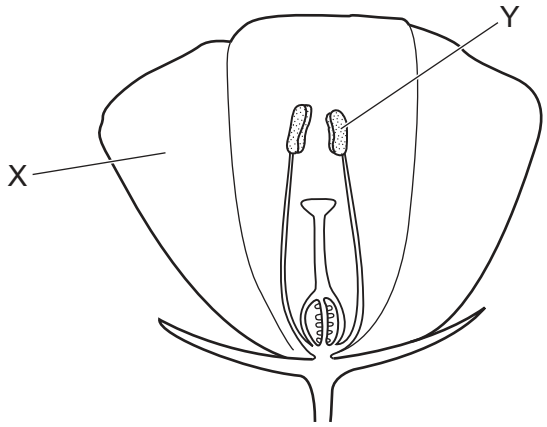
What effects does adrenaline have on the blood glucose concentration and the heart rate of the athlete?

| | blood glucose concentration | heart rate |
|---|---|---|
| **A** | decreases | decreases |
| **B** | decreases | increases |
| **C** | increases | decreases |
| **D** | increases | increases |

**10** Which row shows the responses of a young shoot to gravity and light?

| | gravity | light |
|---|---|---|
| **A** | negatively gravitropic | negatively phototropic |
| **B** | negatively gravitropic | positively phototropic |
| **C** | positively gravitropic | negatively phototropic |
| **D** | positively gravitropic | positively phototropic |

**11** The diagram shows a section through a flower.




What are the correct labels and functions for parts X and Y of the flower?

| | X | | Y | |
|---|---|---|---|---|
| | label | function | label | function |
| **A** | petal | attracts insects | anther | produces pollen grains |
| **B** | petal | protects flower | ovary | produces pollen grains |
| **C** | sepal | attracts insects | anther | contains egg cells |
| **D** | sepal | protects flower | ovary | contains egg cells |

**12** What gives the human embryo protection from mechanical shock?

**A** amniotic fluid

**B** amniotic sac

**C** placenta

**D** umbilical cord

**13** What is an undesirable effect of overuse of fertilisers in agriculture?

**A** acid rain

**B** deforestation

**C** eutrophication

**D** global warming

**14** What happens to water molecules when water is heated to 100 °C in a beaker?

**A** They gain energy and escape from the beaker.

**B** They gain energy and move more slowly.

**C** They lose energy and escape from the beaker.

**D** They lose energy and move more slowly.

**15** A dye contains four different coloured components.

The dye is separated by chromatography.

The table shows the colour and $R_f$ values of the four coloured components.

| colour | $R_f$ value |
|---|---|
| blue | 0.50 |
| green | 0.52 |
| red | 0.74 |
| yellow | 0.36 |

Which two dyes are furthest apart from each other on the final chromatogram?

**A** blue and green

**B** blue and yellow

**C** green and red

**D** red and yellow

**16** A mixture contains hydrogen, helium, neon and oxygen.

What does this mixture contain?

**A** elements and compounds

**B** elements only

**C** molecules and compounds

**D** molecules only

**17** Some information about a sodium ion is shown.

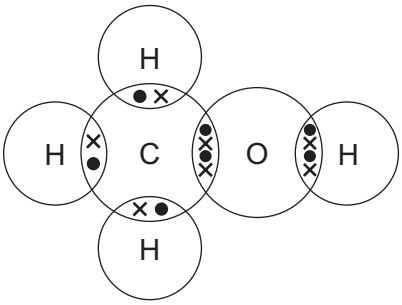
| particle | proton number | nucleon number | number of protons | number of neutrons | number of electrons |
|---|---|---|---|---|---|
| $Na^+$ | 11 | 23 | 11 | X | Y |

What are the values of X and Y?

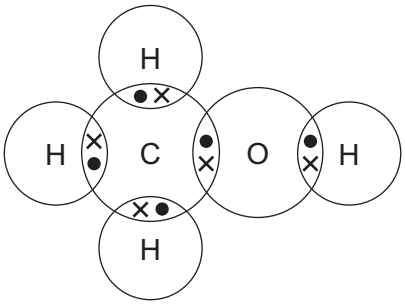
| | X | Y |
|---|---|---|
| **A** | 11 | 10 |
| **B** | 11 | 11 |
| **C** | 12 | 10 |
| **D** | 12 | 11 |

**18** Which diagram represents a molecule of methanol?

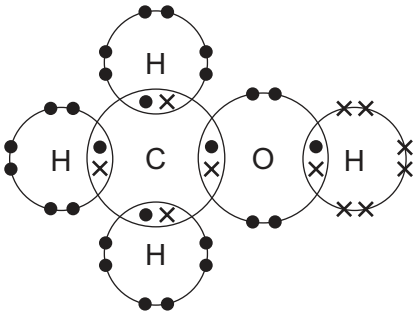
**A**



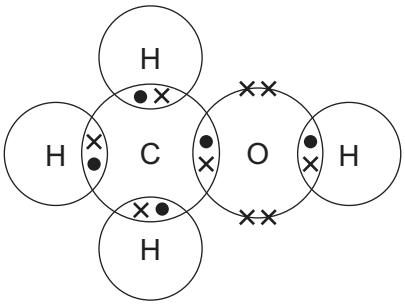

**B**




**C**




**D**



**19** Aqueous sodium sulfate reacts with aqueous barium chloride to make barium sulfate and sodium chloride.

What is the ionic equation for this reaction?

**A** $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(aq)$

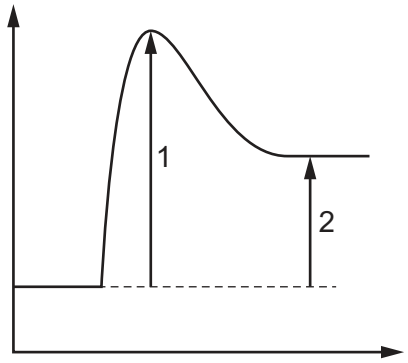
**B** $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$

**C** $Na^{+}(aq) + Cl^{-}(aq) \rightarrow NaCl(s)$

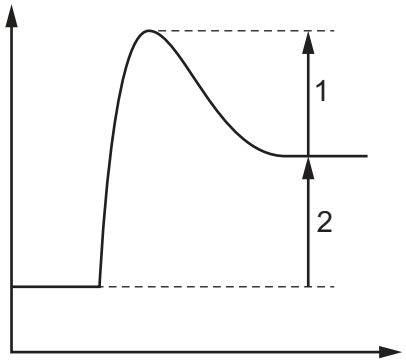
**D** $Na^{+}(aq) + Cl^{-}(aq) \rightarrow NaCl(aq)$

**20** Which energy level diagram identifies the activation energy and the energy change for an exothermic reaction?

**A**




**B**

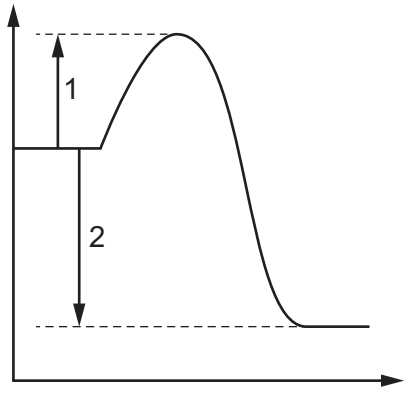



**key**

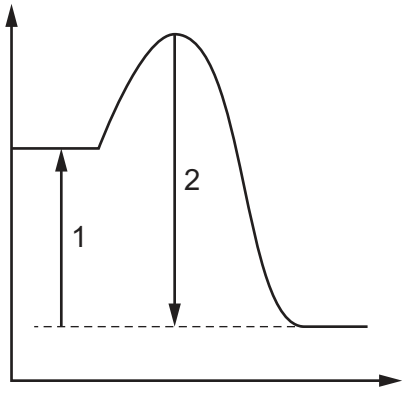
1 = activation energy

2 = energy change for the reaction

**C**




**D**




**21** Which process is a redox reaction?

**A** combustion of methane

**B** decomposition of calcium carbonate

**C** neutralisation of dilute hydrochloric acid by copper oxide

**D** precipitation by the addition of aqueous silver nitrate to aqueous chloride ions

**22** A solution of compound X produces a dark green precipitate when aqueous sodium hydroxide is added.

What is X?

**A** copper(II) chloride

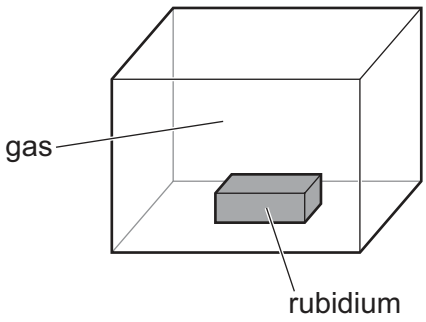
**B** copper(II) sulfate

**C** iron(II) sulfate

**D** iron(III) chloride

**23** Rubidium is a very reactive Group I metal.

It is kept in a sealed box surrounded by a gas.




Which gas does **not** react with rubidium?

**A** chlorine

**B** neon

**C** oxygen

**D** water vapour

**24** Which ionic equation represents a more reactive metal displacing a less reactive metal?

**A** $Cu + Mg^{2+} \rightarrow Cu^{2+} + Mg$

**B** $Mg + Ca^{2+} \rightarrow Mg^{2+} + Ca$

**C** $Zn + Mg^{2+} \rightarrow Zn^{2+} + Mg$

**D** $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu$

**25** Why is carbon used to extract some metals from their oxide ores?

**A** It oxidises the ore by removing oxygen.

**B** It prevents the oxygen of the air reacting with the ore.

**C** It reacts with impurities in the ore.

**D** It reduces the ore by removing oxygen.

**26** Which statement describes the structure of sodium chloride?

**A** It is composed of a regular arrangement of alternating positive and negative ions.

**B** It is composed of negatively charged sodium ions joined to positively charged chloride ions.

**C** It is composed of oppositely charged ions held together by strong covalent bonds.

**D** It is composed of sodium atoms joined to chlorine atoms by shared pairs of electrons.

**27** What is formed during the complete combustion of a hydrocarbon?

**A** carbon dioxide and water

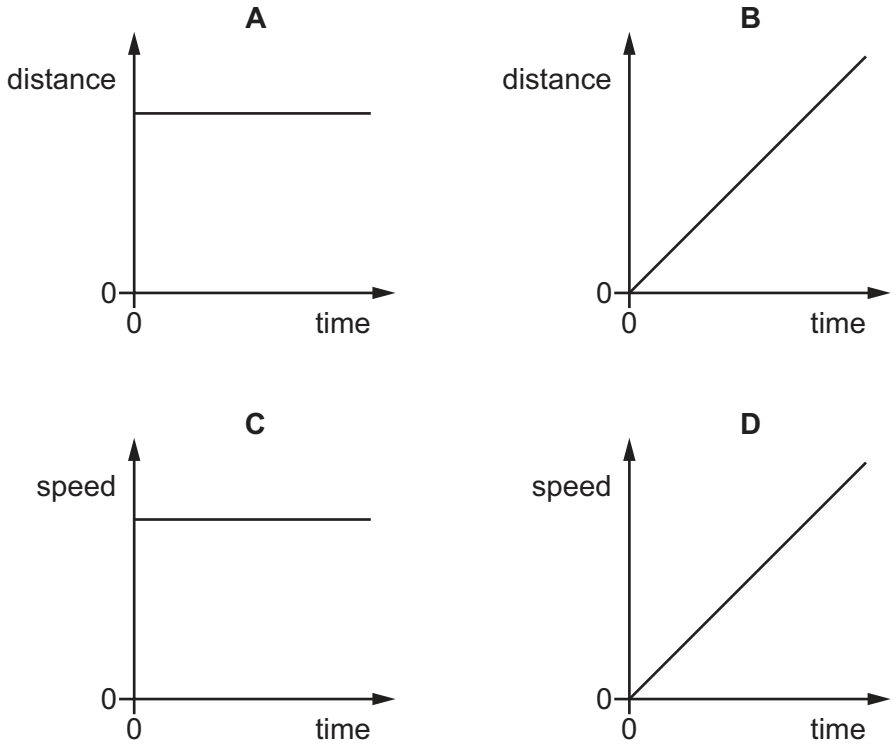
**B** carbon dioxide and hydrogen

**C** carbon monoxide and carbon dioxide

**D** carbon monoxide and water

**28** The diagrams show two distance–time graphs and two speed–time graphs.

Which graph represents the motion of an object that is moving with constant acceleration?



**29** A measuring cylinder contains 60 $cm^3$ of water.

A solid object of mass 120 g is lowered into the water until it is completely submerged.

The new reading on the measuring cylinder is 80 $cm^3$.

What is the density of the object?

**A** 0.50 $g/cm^3$ **B** 1.5 $g/cm^3$ **C** 2.0 $g/cm^3$ **D** 6.0 $g/cm^3$

**30** A heavy bag of flour is dragged against friction along a horizontal floor at a constant speed of 12 m/s for 2.0 s.

The energy input required is 3000 J.

What is the force due to friction?

**A** 125 N **B** 500 N **C** 18 000 N **D** 72 000 N

**31** A toy car rolls from rest down a slope and on to a horizontal bench.

The car stops before it reaches the end of the bench.

What energy changes take place during this journey?

**A** gravitational potential → kinetic → elastic potential

**B** gravitational potential → kinetic → thermal and sound

**C** kinetic → gravitational potential → elastic potential

**D** kinetic → gravitational potential → thermal and sound

**32** Which statement about a tidal energy power station is correct?

**A** It creates no environmental impact when being built.

**B** It does not work at night.

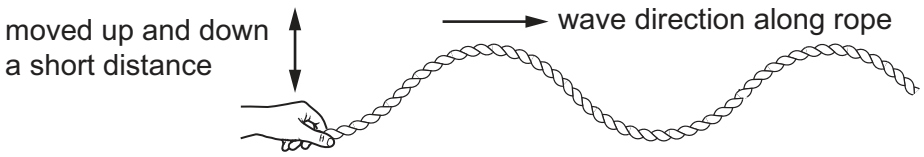
**C** It does not work when there is no wind.

**D** It supplies energy at predictable times.

**33** Which row describes the forces between molecules in a solid and the motion of the molecules in a solid?

| | forces | motion |
|---|---|---|
| **A** | strong | free to change places |
| **B** | strong | vibration only |
| **C** | weak | free to change places |
| **D** | weak | vibration only |

**34** A student moves one end of a long rope up and down through a short distance. A wave travels along the rope in the direction shown.




The student now moves the rope up and down through a larger distance. He also moves it up and down more times in each minute.

Which row shows the effects of these two changes?

| | amplitude of the wave | frequency of the wave |
|---|---|---|
| **A** | decreases | decreases |
| **B** | decreases | increases |
| **C** | increases | decreases |
| **D** | increases | increases |

**35** A student determines the speed of sound in air. She measures the time between making a sound and hearing the echo from a cliff.


She uses the equation: speed = $\frac{\text{distance}}{\text{time}}$.

Which type of sound does she make and which distance does she use in her calculation?

| | type of sound | distance used |
|---|---|---|
| **A** | continuous sound | 2 × distance to cliff |
| **B** | continuous sound | $\frac{1}{2}$ × distance to cliff |
| **C** | short, sharp sound | 2 × distance to cliff |
| **D** | short, sharp sound | $\frac{1}{2}$ × distance to cliff |

**36** A polythene rod is rubbed with a cloth. The rod becomes positively charged.

What has happened to the rod?

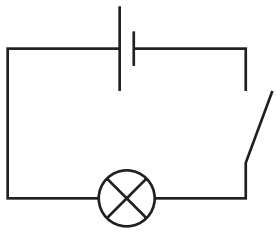
**A** It has gained electrons.

**B** It has gained protons.

**C** It has lost electrons.

**D** It has lost protons.

**37** In the circuit shown, the cell has an electromotive force (e.m.f.) of 1.5 V and the total resistance of the circuit is 12 Ω.



What is the total charge that flows through the cell in 2.0 minutes?

**A** 0.25 C **B** 15 C **C** 36 C **D** 2160 C

**38** In each of four circuits a lamp is connected to a battery using connecting wires that have resistance.

The wires are all made from the same metal but have different lengths and thicknesses.

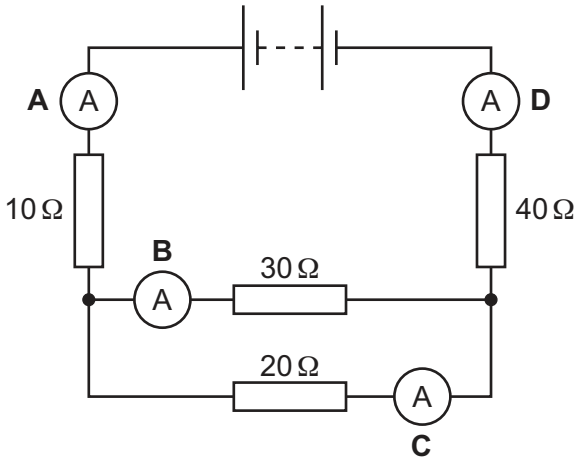
The lamps are all identical and the batteries are all identical.

In which circuit does the lamp shine most brightly?

| | length of connecting wires / cm | diameter of connecting wires / mm |
|---|---|---|
| **A** | 10 | 0.25 |
| **B** | 10 | 0.50 |
| **C** | 20 | 0.25 |
| **D** | 20 | 0.50 |

**39** The diagram shows a circuit containing four resistors and four ammeters.

Which ammeter has the smallest reading?




**40** An electric oven is connected to the mains supply using insulated copper wires. The wires become very warm.

Which change reduces the amount of heat produced in the connecting wires?

**A** Use thicker copper wires.

**B** Use thinner copper wires.

**C** Use thicker insulation.

**D** Use thinner insulation.

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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.).