



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CO-ORDINATED SCIENCES

0654/11

Paper 1 Multiple Choice (Core)

October/November 2017

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 document consists of **16** printed pages.

1 A child blows into a rubber balloon.

What is the percentage of oxygen inside the balloon?

- A** 0% **B** 4% **C** 16% **D** 21%

2 A seedling is placed with its root horizontal to the ground. Three days later, the root is longer and curves towards the earth.

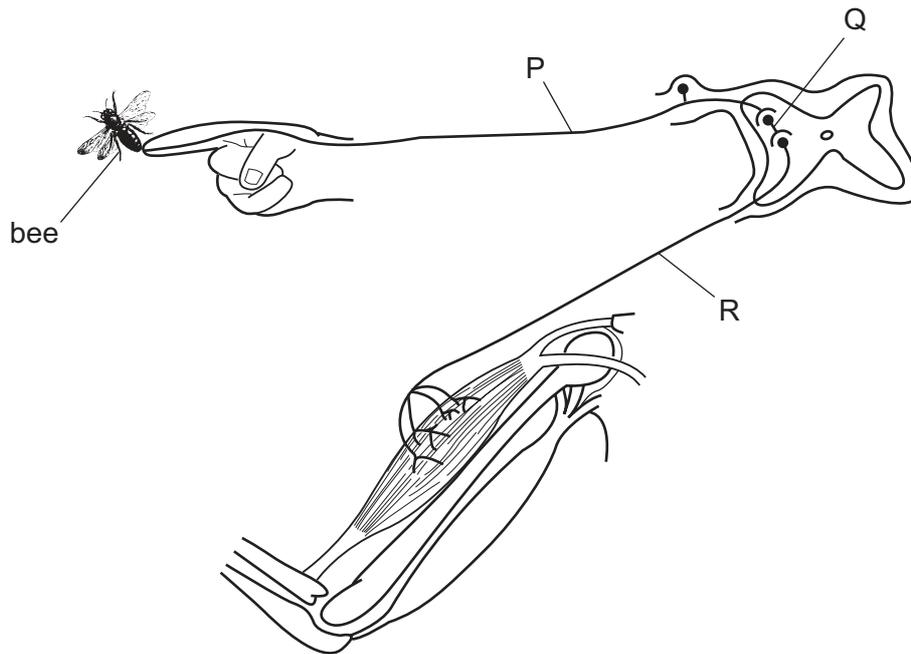
Which characteristics of living things does this show?

- A** growth, nutrition and movement
B growth, sensitivity and movement
C movement, nutrition and respiration
D nutrition, sensitivity and respiration

3 What is homeostasis?

- A** the maintenance of the body's external environment
B the maintenance of the body's internal environment
C the processes that produce heat in the body
D the removal of wastes from the body

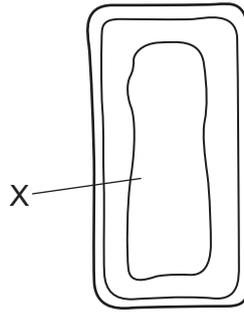
4 The diagram shows a reflex arc.



If the neurone at R is stimulated, what effect does this have on the neurones at P and Q?

| | effect on P | effect on Q |
|----------|-------------|-------------|
| A | no effect | no effect |
| B | no effect | stimulated |
| C | stimulated | no effect |
| D | stimulated | stimulated |

- 5 The diagram shows parts of a mesophyll cell.



What is found in the part labelled X?

- A chloroplasts and nucleus
 - B chloroplasts only
 - C nucleus only
 - D watery solution
- 6 A human baby develops inside its mother attached to the wall of her uterus by the placenta and umbilical cord.

Which structure becomes embedded in the uterus wall to establish this connection?

- A a ball of cells grown from the zygote
 - B a sperm
 - C the unfertilised egg
 - D the zygote
- 7 Water enters root hair cells from the soil.

What happens to most of this water after it has entered the cells?

- A It is used in photosynthesis in the root cells.
- B It moves out again when the soil is dry.
- C It moves to the leaves and is lost by transpiration.
- D The cell uses it in respiration.

8 Food tests are performed on four substances.

Which substance contains fat and protein?

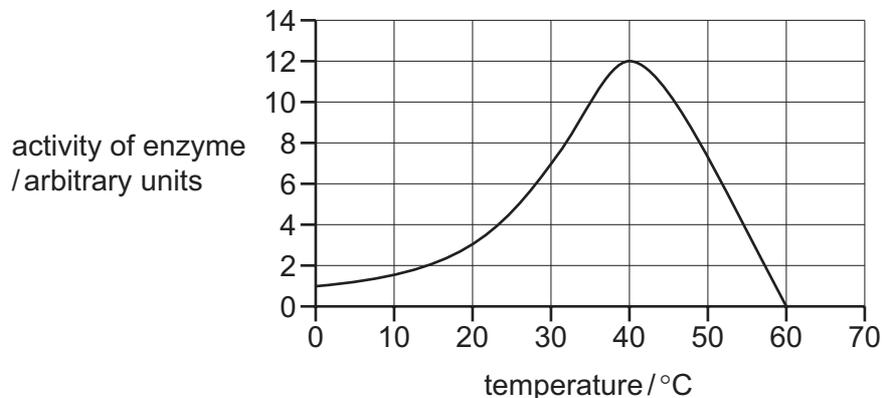
| | test reagent | | | |
|----------|--------------|--------|---------|--------|
| | Benedict's | biuret | ethanol | iodine |
| A | ✓ | ✓ | x | x |
| B | ✓ | x | x | ✓ |
| C | x | ✓ | ✓ | x |
| D | x | x | ✓ | ✓ |

key

✓ = positive test result

x = negative test result

9 The graph shows the effect of temperature on the activity of a mammalian enzyme.



Which conclusion can be drawn from the graph?

- A** The activity increases in a linear manner up to 35 °C.
- B** The activity is four times greater at 40 °C than at 20 °C.
- C** The enzyme has a higher activity at 60 °C than at 0 °C.
- D** The optimum temperature for this enzyme is 37 °C.

10 What is the main result of natural selection?

- A** fewer genes being passed on to offspring
- B** higher-yielding food crops
- C** organisms better adapted to the environment
- D** sheep that produce better quality wool

11 In a food chain, which organism does **not** rely on another organism to supply it with energy?

- A carnivore
- B consumer
- C herbivore
- D producer

12 Which statements about X chromosomes in humans are correct?

| | present in body cells in males | present in body cells of females | carry genes |
|----------|--------------------------------------|--|-------------|
| A | ✓ | ✓ | ✓ |
| B | ✓ | x | ✓ |
| C | ✓ | x | x |
| D | x | ✓ | x |

13 What could deforestation cause?

- A a decrease in carbon dioxide levels and a decrease in flooding
- B a decrease in carbon dioxide levels and an increase in flooding
- C an increase in carbon dioxide levels and a decrease in flooding
- D an increase in carbon dioxide levels and an increase in flooding

14 Which statement describes an oxygen molecule?

- A It consists of two oxide ions.
- B It consists of two oxygen atoms.
- C It consists of two oxygen compounds.
- D It consists of two oxygen ions.

15 An excess of a soluble salt is mixed with water.

The mixture is filtered and the filtrate is distilled.

Which row describes the filtrate and the distilled liquid?

| | filtrate | distilled liquid |
|----------|----------|------------------|
| A | solution | solution |
| B | solution | solvent |
| C | solvent | solution |
| D | solvent | solvent |

16 A student completes four experiments.

Experiment 1 The student heats some ice and it melts.

Experiment 2 The student heats some blue copper sulfate crystals and a white solid is formed. Steam is given off.

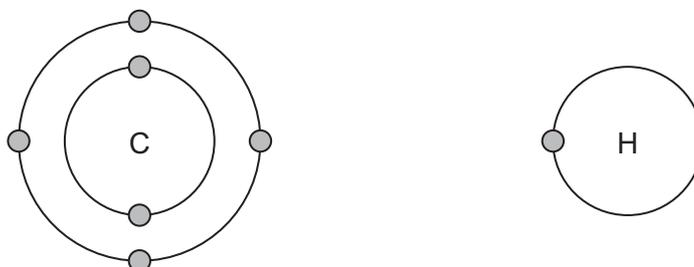
Experiment 3 The student grinds up a lump of chalk to a powder.

Experiment 4 The student heats green copper carbonate crystals and a black solid is formed. A gas is produced that turns limewater milky.

Which row describes the changes in the experiments?

| | physical changes | chemical changes |
|----------|------------------|------------------|
| A | 1 and 3 | 2 and 4 |
| B | 1 and 4 | 2 and 3 |
| C | 2 and 3 | 1 and 4 |
| D | 2 and 4 | 1 and 3 |

17 The electronic structures of carbon and of hydrogen are shown.



What is the formula of a compound formed between carbon and hydrogen?

A CH₂

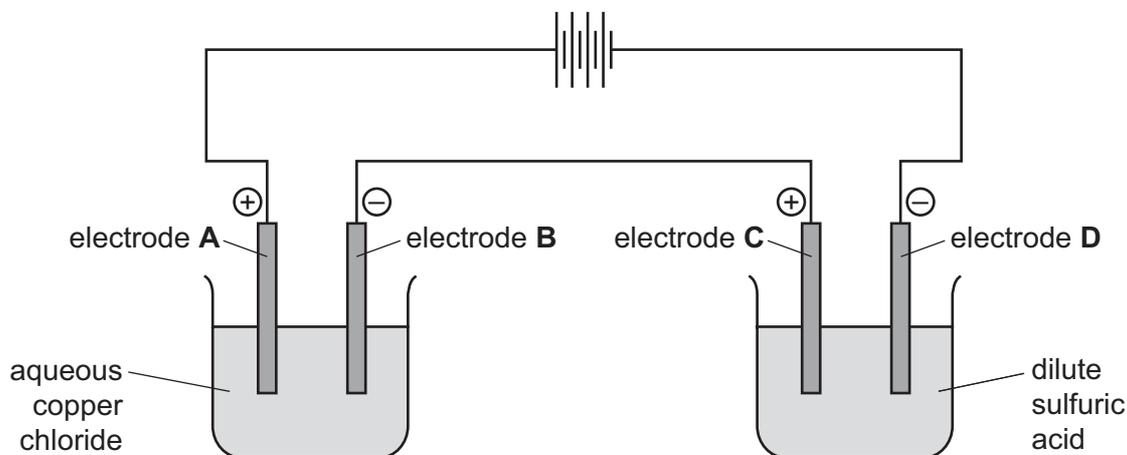
B CH₃

C CH₄

D C₄H

- 18 Electrolysis of two solutions, aqueous copper chloride and dilute sulfuric acid, is carried out using the apparatus shown.

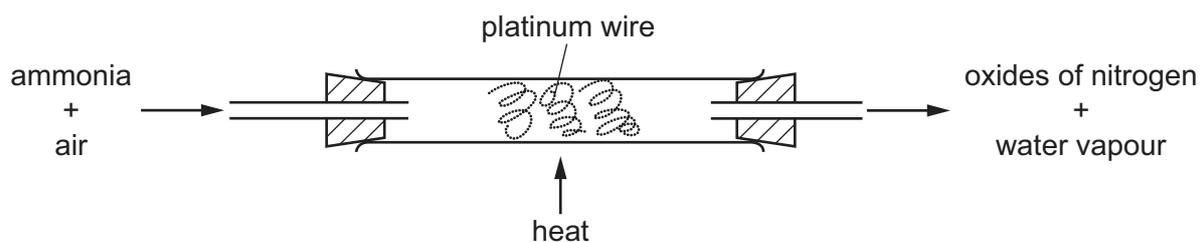
Which electrode produces a colourless gas that 'pops' with a lighted splint?



- 19 Some white anhydrous copper(II) sulfate powder is put into a beaker of water and stirred.

Which observation shows that the process is exothermic?

- A A blue solution forms.
 - B A colourless solution forms.
 - C The beaker becomes cooler.
 - D The beaker becomes warmer.
- 20 Ammonia is oxidised as shown.

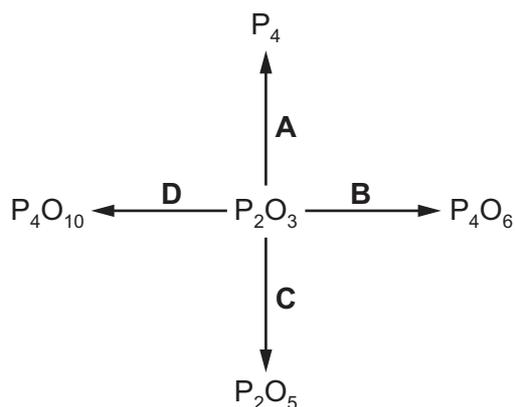


The platinum is chemically unchanged at the end of the reaction.

What is the reason for using platinum?

- A to absorb the heat from the reaction
- B to filter out oxygen from the air
- C to increase the rate of the reaction
- D to neutralise the ammonia

21 In which change is the oxide of phosphorus, P_2O_3 , reduced?



22 Which substances react with dilute sulfuric acid to form a salt?

| | magnesium | magnesium oxide | magnesium carbonate | magnesium chloride |
|----------|-----------|-----------------|---------------------|--------------------|
| A | ✓ | ✓ | ✓ | x |
| B | ✓ | ✓ | x | ✓ |
| C | ✓ | x | ✓ | ✓ |
| D | x | ✓ | ✓ | ✓ |

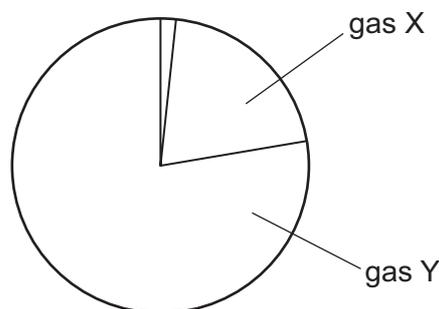
23 Compound X is heated with a mixture of aqueous sodium hydroxide and aluminium powder.

A gas is made which turns damp red litmus blue.

Which compound **cannot** be X?

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

- 24 Which trend is observed as the Periodic Table is crossed from left to right?
- A The elements change from metallic to non-metallic and the oxides of the elements change from acidic to basic.
- B The elements change from metallic to non-metallic and the oxides of the elements change from basic to acidic.
- C The elements change from non-metallic to metallic and the oxides of the elements change from acidic to basic.
- D The elements change from non-metallic to metallic and the oxides of the elements change from basic to acidic.
- 25 The diagram represents the composition of clean air.



Which row identifies gas X and gas Y?

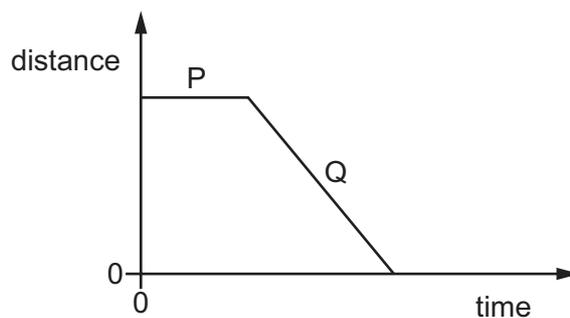
| | gas X | gas Y |
|----------|----------------|----------------|
| A | carbon dioxide | nitrogen |
| B | nitrogen | oxygen |
| C | oxygen | carbon dioxide |
| D | oxygen | nitrogen |

- 26 Which word equation describes the manufacture of lime from limestone?
- A calcium carbonate \rightarrow calcium hydroxide + carbon dioxide
- B calcium carbonate \rightarrow calcium oxide + carbon dioxide
- C calcium hydroxide \rightarrow calcium oxide + water
- D calcium oxide + carbon dioxide \rightarrow calcium carbonate

27 What are the products of the **complete** combustion of ethanol?

- A carbon dioxide + carbon monoxide + water
- B carbon dioxide + hydrogen
- C carbon dioxide + water
- D carbon monoxide + water

28 The diagram shows a distance-time graph for a vehicle.



Which row describes the motion of the vehicle in region P and in region Q of the graph?

| | P | Q |
|----------|----------------|----------------|
| A | at rest | changing speed |
| B | at rest | constant speed |
| C | constant speed | changing speed |
| D | constant speed | constant speed |

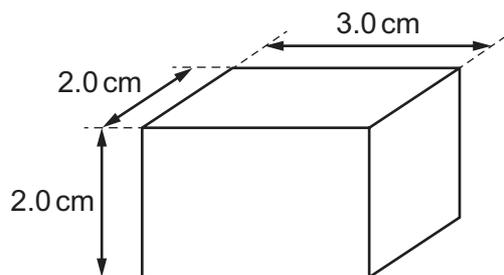
29 A metal block is heated until it is completely melted. None of the melted metal evaporates.

The metal now solidifies.

What happens to the mass of the metal during the changes of state?

| | mass during melting | mass during solidification |
|----------|---------------------|----------------------------|
| A | decreases | increases |
| B | increases | decreases |
| C | increases | stays constant |
| D | stays constant | stays constant |

30 The diagram shows a solid rectangular block made of material of density 2.0 g/cm^3 .



What is the mass of the block?

- A** 2.0g **B** 6.0g **C** 14g **D** 24g

31 A worker carries bricks up a ladder.

The following quantities are known.

- the height the bricks are lifted up
- the time taken for the worker to lift the bricks
- the volume of the bricks
- the weight of the bricks

Which quantities are needed to calculate the useful power produced by the worker as he carries the bricks up the ladder?

- A** height, time and volume
B height, time and weight
C height, volume and weight
D time, volume and weight

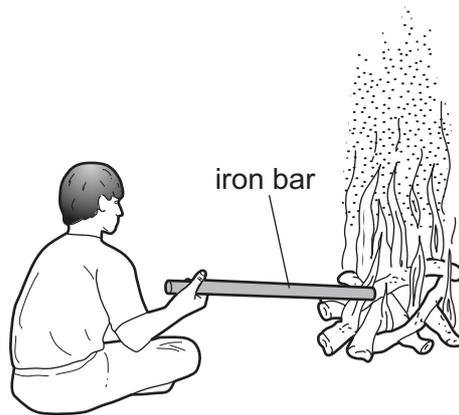
32 A gas is contained in a cylinder of constant volume.

The gas is cooled and this causes its pressure to change.

What happens to the speed of the molecules of the gas, and what happens to the pressure of the gas?

| | speed of molecules | pressure of gas |
|----------|--------------------|-----------------|
| A | decreases | decreases |
| B | decreases | increases |
| C | increases | decreases |
| D | increases | increases |

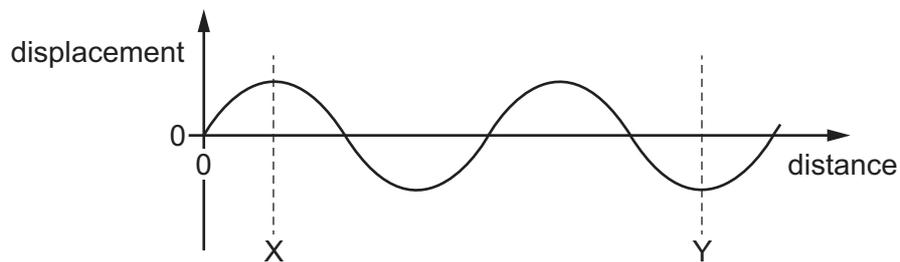
33 A boy sits near a campfire. He holds an iron bar with one end in the fire. His hand becomes hot.



In which ways does thermal energy (heat) from the fire reach his hand?

- A conduction and convection only
- B conduction and radiation only
- C convection and radiation only
- D conduction, convection and radiation

34 The diagram represents a wave.

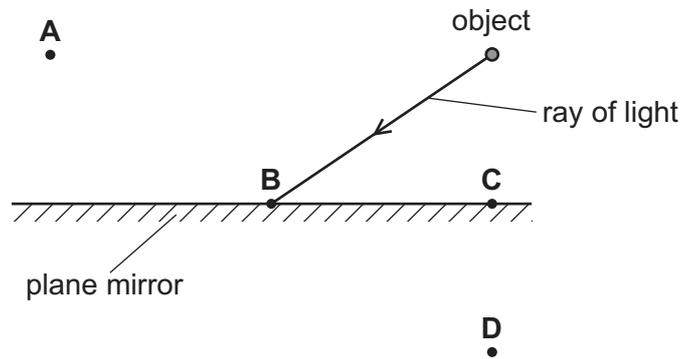


How many wavelengths are there between X and Y?

- A $\frac{2}{3}$
- B 1
- C $1\frac{1}{2}$
- D 3

35 A plane mirror is used to form an image of an object.

At which labelled point is the image formed?



36 Which group of electromagnetic radiations is arranged in order of increasing frequency?

- A infra-red, visible light, ultraviolet
- B ultra-violet, visible light, radio waves
- C X-rays, radio waves, γ -rays
- D γ -rays, X-rays, infra-red

37 Four loudspeakers each vibrate at the frequencies shown.

Which loudspeaker produces the highest-pitched sound that can be heard by a human?

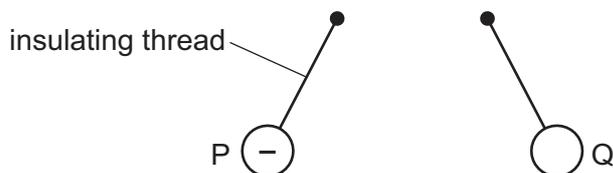
- A 5.0×10^3 Hz
- B 15×10^3 Hz
- C 25×10^3 Hz
- D 35×10^3 Hz

38 Which row gives the unit for energy and the unit for electromotive force (e.m.f.)?

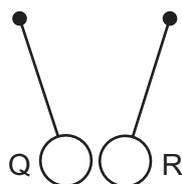
| | energy | e.m.f. |
|---|--------|--------|
| A | J | N |
| B | J | V |
| C | W | N |
| D | W | V |

- 39 Three charged balls P, Q and R are suspended by insulating threads. Ball P is negatively charged.

Ball Q is brought close to ball P. The balls move away from each other.



Ball Q is now brought close to ball R. The balls move closer to each other.

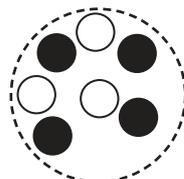
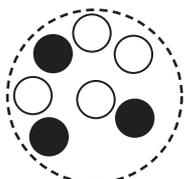


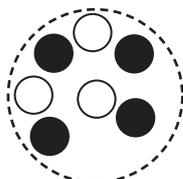
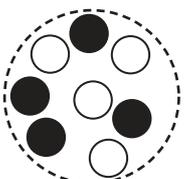
What are the signs of the charges on ball Q and ball R?

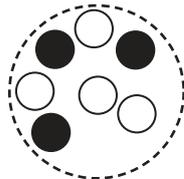
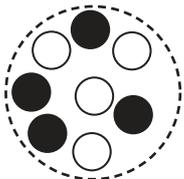
| | ball Q | ball R |
|----------|----------|----------|
| A | negative | negative |
| B | negative | positive |
| C | positive | negative |
| D | positive | positive |

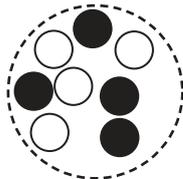
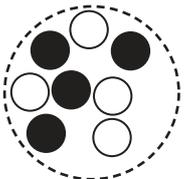
- 40 The diagrams represent pairs of nuclei of some atoms.

Which pair shows nuclei of different isotopes of the same element?

A  

B  

C  

D  

key
 neutron
 proton

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; width: fit-content; margin: auto;"> Key atomic number atomic symbol name relative atomic mass </div> | | | | | | | | | | 2 He helium 4 | | | | | |
| 11 Na sodium 23 | 12 Mg magnesium 24 | | | | | | | | | | | 5 B boron 11 | 6 C carbon 12 | 7 N nitrogen 14 | 8 O oxygen 16 | 9 F fluorine 19 | 10 Ne neon 20 |
| 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.).