



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

COMBINED SCIENCE

0653/22

Paper 2 Multiple Choice (Extended)

February/March 2018

45 minutes

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

* 8 4 6 8 4 7 2 2 5 0 *

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.

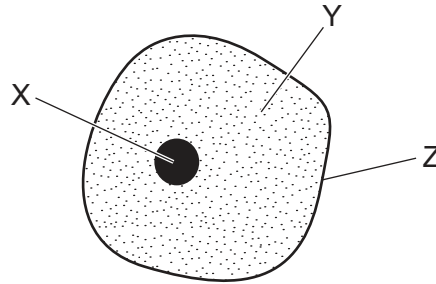
Electronic calculators may be used.

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

1 Which is a characteristic of all living organisms?

- A breathing
- B eating
- C egestion
- D movement

2 The diagram shows a typical animal cell.



What are the functions of structures X, Y and Z?

| | X | Y | Z |
|----------|---------------------------|--------------------------------------|--------------------------------------|
| A | traps light | contains genetic material | controls entry and exit of materials |
| B | traps light | site of chemical reactions | provides support |
| C | contains genetic material | site of chemical reactions | controls entry and exit of materials |
| D | contains genetic material | controls entry and exit of materials | provides support |

3 The statements explain the activity of a human enzyme as the temperature increases from 20 °C to 50 °C. The statements are in the wrong order.

- 1 The enzyme is working at its optimum rate.
- 2 The kinetic energy of the enzyme molecules begins to increase.
- 3 The enzyme begins to change shape.
- 4 The enzyme is completely denatured.

What is the correct order of the statements?

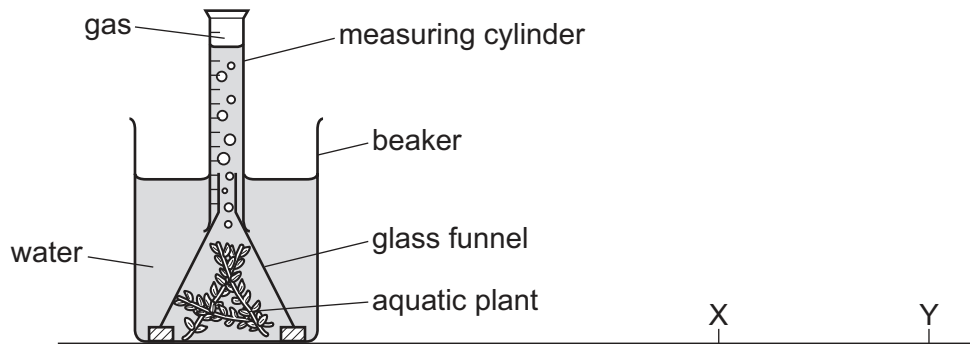
- A 1 → 3 → 2 → 4
- B 1 → 4 → 3 → 2
- C 2 → 1 → 3 → 4
- D 3 → 2 → 4 → 1

4 Tests were performed on four samples of food. The results are shown in the table.

Which food contains protein **only**?

| | results of food tests | | |
|----------|-----------------------|-------------|-------------|
| | Benedict's test | biuret test | iodine test |
| A | blue | blue | blue/black |
| B | blue | purple | brown |
| C | red | blue | blue/black |
| D | red | purple | brown |

5 A student is investigating how light affects photosynthesis.



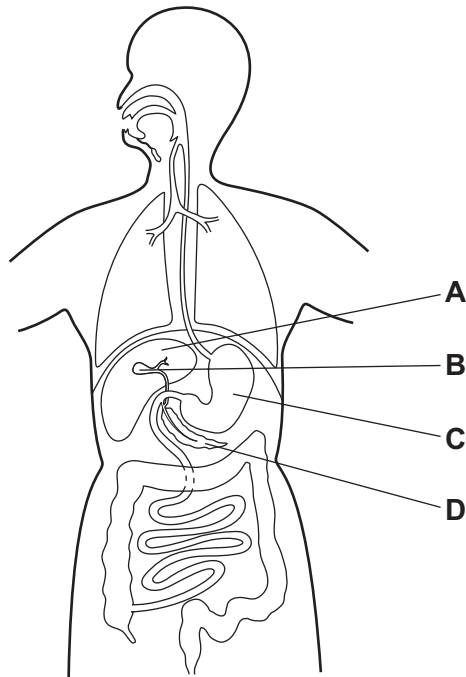
The student shines a light from point Y and measures the volume of gas produced in five minutes.

Which gas is produced and how does the rate of gas production change when the light is moved from Y to X?

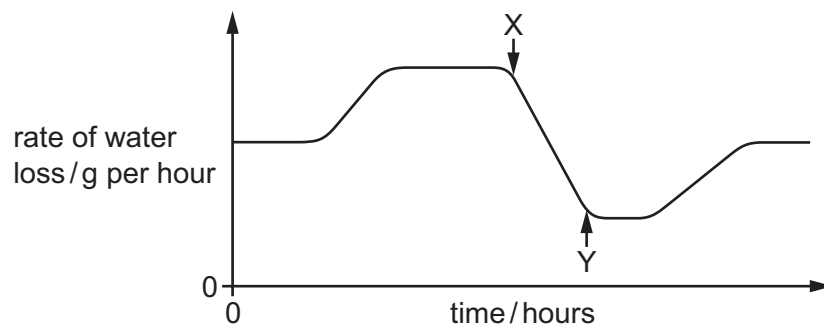
| | gas produced | rate of gas production |
|----------|----------------|------------------------|
| A | carbon dioxide | decreases |
| B | carbon dioxide | increases |
| C | oxygen | decreases |
| D | oxygen | increases |

6 The diagram shows the alimentary canal.

Which label shows where bile is stored?



7 The graph shows the rate of water loss from a plant during daylight hours.



What could cause the change in the rate of water loss between point X and point Y?

- A The air becomes cooler.
- B The air becomes drier.
- C The day becomes sunnier.
- D The stomata open wider.

8 What are possible causes of coronary heart disease?

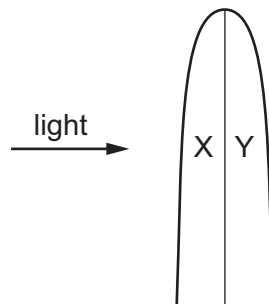
| | exercise | smoking | stress |
|----------|----------|---------|--------|
| A | ✓ | ✓ | x |
| B | ✓ | x | ✓ |
| C | x | x | x |
| D | x | ✓ | ✓ |

9 During aerobic respiration of glucose, oxygen is used up and water is produced.

How many molecules of oxygen are used and how many molecules of water are produced when one molecule of glucose is respired?

| | number of molecules of oxygen used | number of molecules of water produced |
|----------|------------------------------------|---------------------------------------|
| A | 1 | 1 |
| B | 1 | 6 |
| C | 6 | 1 |
| D | 6 | 6 |

10 Light shines on a shoot tip from the direction shown.



After three days the shoot tip has bent towards the light.

What is the reason for this change?

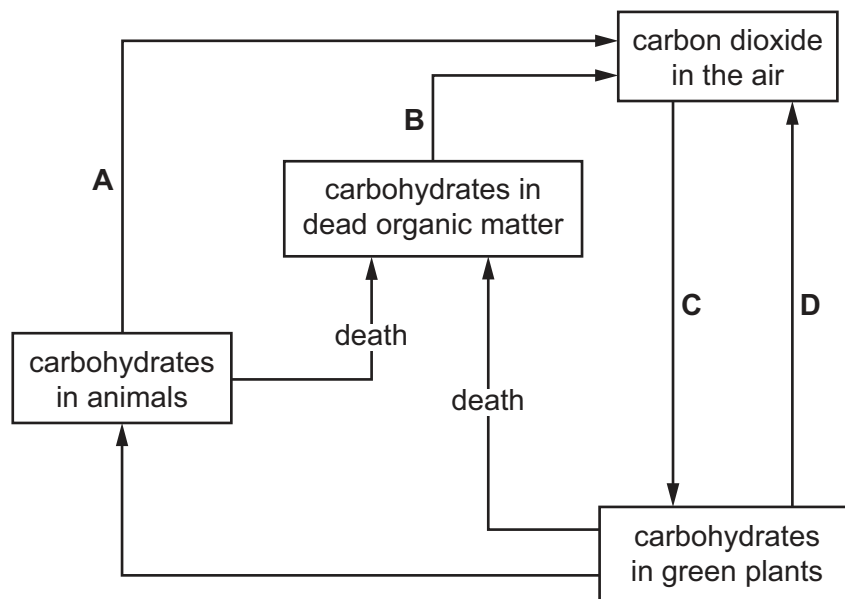
- A** Auxin moves away from the light causing cell elongation in area Y.
- B** Auxin moves away from the light preventing cell elongation in area Y.
- C** Auxin moves towards the light causing cell elongation in area X.
- D** Auxin moves towards the light preventing cell elongation in area X.

11 How do male gametes compare with female gametes?

| | size | move independently |
|----------|---------|--------------------|
| A | larger | ✓ |
| B | larger | x |
| C | smaller | ✓ |
| D | smaller | x |

12 The diagram shows part of the carbon cycle.

Which arrow represents a process that releases oxygen into the atmosphere?



13 Eutrophication occurs after fertiliser is washed into a lake.

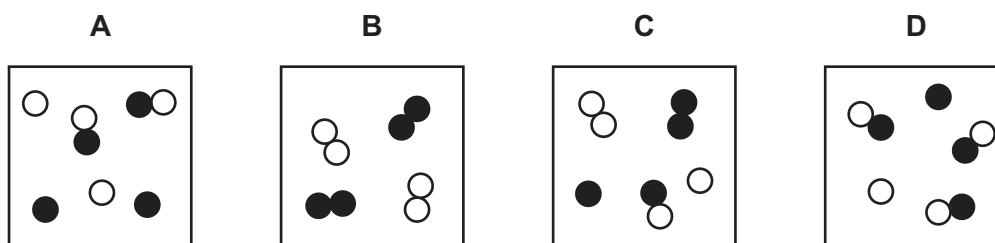
What is **not** true of eutrophication?

- A** Algae population in the lake decreases.
- B** Bacteria population in the lake increases.
- C** Nitrate concentration in the lake increases.
- D** Oxygen concentration in the lake decreases.

14 Which statement about atoms and molecules is correct?

- A Atoms gain or lose electrons to become molecules.
- B Atoms of the same element contain the same number of molecules.
- C Molecules are the simplest unit of an atom.
- D Molecules contain atoms which are covalently bonded.

15 Which diagram represents a mixture of two elements?



16 Which statement about atoms and ions is **not** correct?

- A A chlorine atom loses one electron to obtain a noble gas electronic structure.
- B A magnesium atom has two valency electrons.
- C A sodium ion, Na^+ , has eight electrons in its outer shell.
- D Oxygen atoms and oxide ions each have two occupied electron shells.

17 Which substance contains a multiple covalent bond?

- A hydrogen
- B methane
- C nitrogen
- D water

18 Which equation represents the reaction at the cathode during the electrolysis of aqueous copper(II) chloride?

- A $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$
- B $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$
- C $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$
- D $4\text{OH}^- \rightarrow \text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^-$

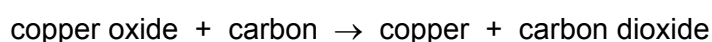
- 19 In the reaction between an acid and a metal, the rate of reaction decreases as the reaction proceeds.

A student suggests three reasons why the rate of this reaction decreases.

- 1 The concentration of the acid decreases as it gets used up.
- 2 The energy needed to break bonds is used up as the product forms.
- 3 The surface area of the metal increases as it gets smaller.

Which reasons are correct?

- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 only **D** 3 only
- 20 The equation shows the reaction of copper oxide with carbon.



In the reaction, the carbon is the1..... agent and is2..... during the reaction.

Which words complete gaps 1 and 2?

| | 1 | 2 |
|----------|-----------|----------|
| A | oxidising | oxidised |
| B | oxidising | reduced |
| C | reducing | oxidised |
| D | reducing | reduced |

- 21 Magnesium, magnesium oxide and magnesium carbonate are insoluble in water.

Which method is used to make **pure** crystals of magnesium sulfate?

- A** Add an excess of magnesium carbonate to dilute sulfuric acid, filter and evaporate the filtrate to dryness.
- B** Add an excess of magnesium oxide to dilute sulfuric acid and leave overnight to crystallise.
- C** Add magnesium oxide to an excess of dilute sulfuric acid and evaporate to dryness.
- D** Add magnesium ribbon to an excess of dilute sulfuric acid, filter and evaporate to dryness.

- 22** Solid X is warmed with dilute sodium hydroxide. A gas, which turns moist red litmus paper to blue, is given off.

Dilute hydrochloric acid is added to solid X. A gas, which turns limewater cloudy, is given off.

What is X?

- A** ammonium carbonate
 - B** ammonium chloride
 - C** sodium carbonate
 - D** sodium chloride
- 23** Astatine is at the bottom of Group VII of the Periodic Table.
- What happens if astatine is added to aqueous potassium chloride?
- A** A black precipitate is formed.
 - B** Chlorine is formed.
 - C** No reaction takes place.
 - D** The colour of the solution becomes darker.
- 24** The noble gases make up Group VIII of the Periodic Table.
- Which statement is correct?
- A** Argon exists as non-bonded atoms.
 - B** Krypton is very poisonous.
 - C** Neon burns in pure oxygen with a red flame.
 - D** The chemical formula of helium is He_2 .
- 25** Why is drinking water treated with chlorine?
- A** to improve the taste
 - B** to kill bacteria
 - C** to remove colour
 - D** to remove insoluble impurities

26 A gas that causes climate change is formed during the extraction of iron from iron ore.

Which solution reacts with this gas?

- A aqueous sodium chloride
- B hydrochloric acid
- C dilute sulfuric acid
- D limewater

27 Which statement about the rusting of iron is correct?

- A Iron becomes lighter when it rusts.
- B Iron is reduced when it rusts.
- C Rusting is a reaction involving iron, oxygen and water.
- D Rusting is a reaction involving iron and water only.

28 Diagrams 1, 2 and 3 each show either a distance-time graph or a speed-time graph.

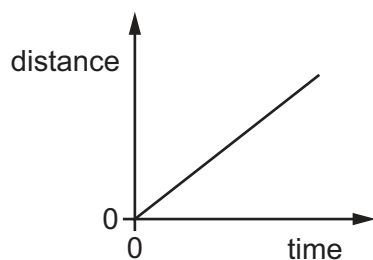


diagram 1

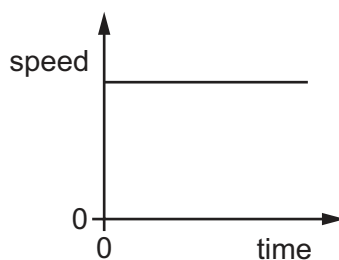


diagram 2

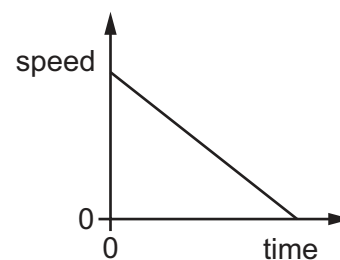


diagram 3

Which of the diagrams represent the motion of an object moving with a non-zero constant acceleration?

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

- 29 Two objects on Earth each have a mass of 20 kg.

One object is moved to a planet larger than Earth. The other object is moved into deep space.

What is the mass of the objects in these new positions?

| | mass of object on the other planet / kg | mass of object in deep space / kg |
|----------|---|-----------------------------------|
| A | 20 | 0 |
| B | 20 | 20 |
| C | more than 20 | 0 |
| D | more than 20 | 20 |

- 30 A spring that obeys Hooke's law has no load attached to it. The length of the spring is 8.0 cm and it has a spring constant k of 5.0 N/cm.

A load is now hung from the spring, and the length of the spring increases to 18 cm. The limit of proportionality is not reached.

What is the weight of the load?

- A** 2.0 N **B** 40 N **C** 50 N **D** 90 N
- 31 Which energy resource is non-renewable?
- A** geothermal energy
- B** hydroelectric energy
- C** nuclear energy
- D** wave energy
- 32 A force of 20 N does 10 J of work when it moves an object through a distance d in the direction of the force.

What is distance d ?

- A** 0.50 m **B** 2.0 m **C** 10 m **D** 200 m

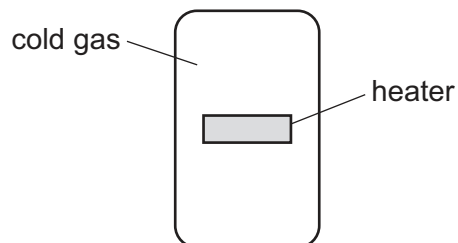
- 33 The molecules of a substance are far apart and move at high speed in straight lines until they hit something.

The temperature of the substance is changed and this causes the molecules to move more quickly.

What is the state of the substance, and how has its temperature changed?

| | state of substance | how temperature has changed |
|----------|--------------------|-----------------------------|
| A | gas | decreased |
| B | gas | increased |
| C | liquid | decreased |
| D | liquid | increased |

- 34 The diagram shows a cold gas in a tank. The tank contains a heater that is switched off.

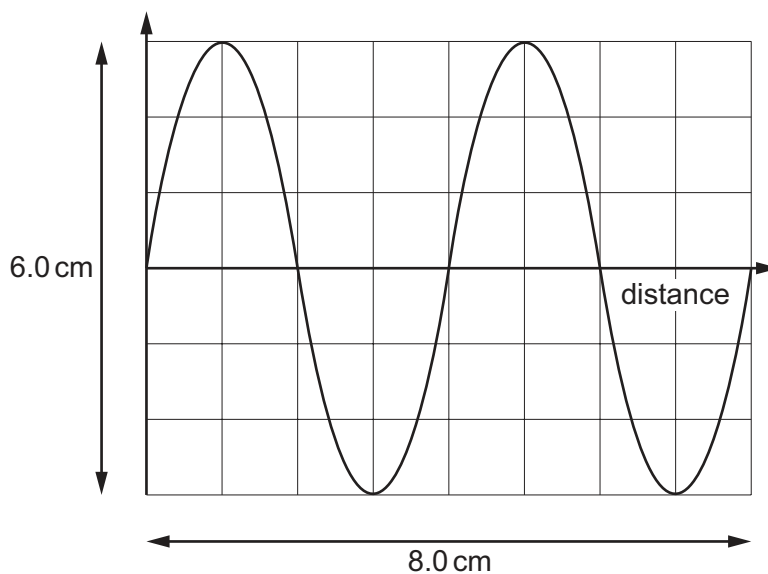


The heater is now switched on.

What happens to the density of the gas near the heater, and in which direction does the heated gas start to move?

| | density | direction of movement |
|----------|-----------|-----------------------|
| A | decreases | downwards |
| B | decreases | upwards |
| C | increases | downwards |
| D | increases | upwards |

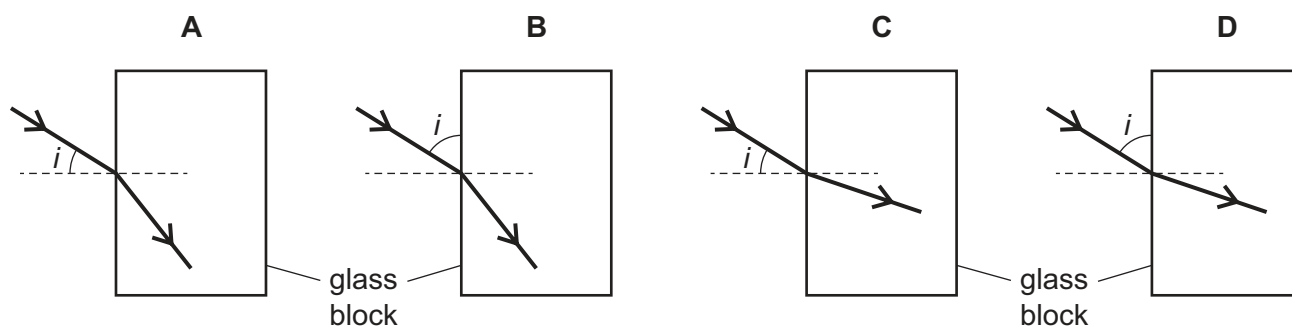
35 The diagram represents a wave.



What is the wavelength of the wave?

- A** 3.0 cm **B** 4.0 cm **C** 6.0 cm **D** 8.0 cm

36 Which diagram shows how a ray of light passes from air into a glass block, and shows the angle of incidence labelled i ?



37 A sound wave travels in substance P. The sound wave then passes into a different substance Q and the speed of the sound wave decreases.

What are possible substances for P and Q?

| | P | Q |
|----------|-------|-------|
| A | air | steel |
| B | air | water |
| C | water | air |
| D | water | steel |

38 A lamp is labelled 12 V, 25 W.

How much electrical energy does the lamp convert in 4.0 minutes when lit at its normal brightness?

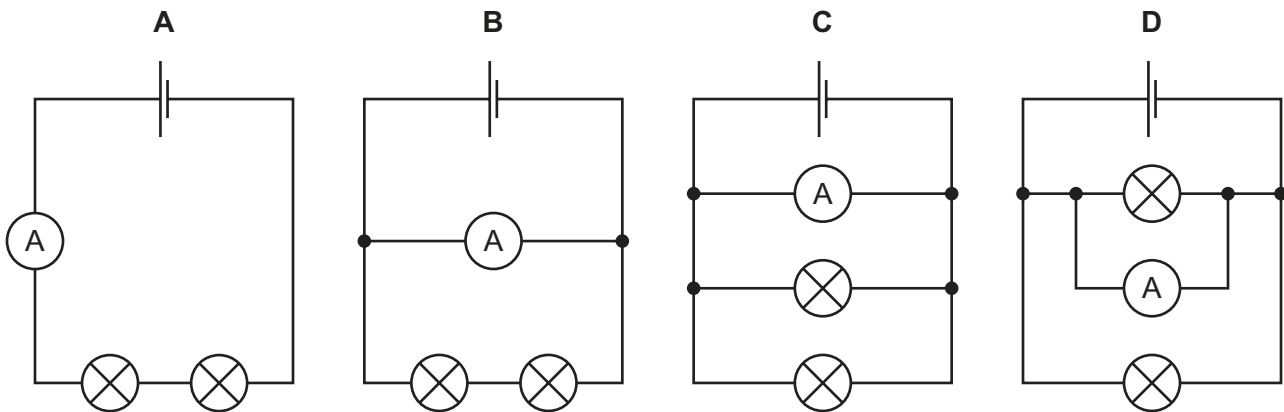
- A 100 J B 1200 J C 6000 J D 72000 J

39 Why is the electricity supply to a house fitted with a fuse?

- A to increase the current in the circuit
 B to increase the resistance of the circuit
 C to maintain a constant current in the circuit
 D to prevent overheating of the cables in the circuit

40 The diagrams show four circuits, each containing an ammeter and two lamps with different resistances.

Which circuit shows an ammeter with a reading equal to the current in each lamp?



BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

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 unbinetium — | 120 Uub ununbium — | 121 Uut ununtrium — |

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