



Cambridge IGCSE™

CHEMISTRY

0620/13

Paper 1 Multiple Choice (Core)

October/November 2025

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.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Any blank pages are indicated.

- 1 Substances exist as solids, liquids or gases.

In which states of matter are the particles a similar distance apart?

- A solid, liquid and gas
- B solid and liquid only
- C solid and gas only
- D liquid and gas only

- 2 A container with a fixed shape is filled with gas and then sealed. The container is then heated.

Which changes take place?

- 1 The volume of gas decreases.
- 2 The gas molecules move faster.
- 3 The pressure inside the cylinder increases.

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

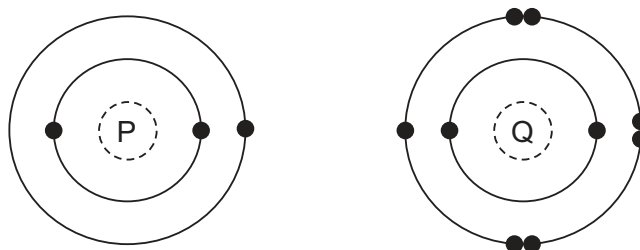
- 3 A crystal of sodium chloride is dropped into a beaker of water.

Over time, the sodium chloride particles become evenly distributed throughout the water.

Which processes occur in this experiment?

- A both dissolving and diffusion
- B dissolving only
- C diffusion only
- D neither dissolving nor diffusion

- 4 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	covalent	PQ_2
B	covalent	PQ
C	ionic	PQ
D	ionic	PQ_2

- 5 The electronic configuration of an ion is 2,8,8.

What could this ion be?

	S^{2-}	Ca^{2+}
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = yes

✗ = no

- 6 The table shows the nucleon number and the number of neutrons in one atom of isotopes W, X, Y and Z.

isotope	nucleon number	number of neutrons
W	35	18
X	37	20
Y	39	20
Z	40	22

Which statement about W, X, Y and Z is correct?

- A** W and X are isotopes of the same element.
- B** X and Y are isotopes of elements in the same group of the Periodic Table.
- C** Y and Z are isotopes of elements in the same period of the Periodic Table.
- D** Z has a higher proton number than Y.
- 7 Which statement about an ionic bond is correct?
- A** It is a strong electrostatic attraction between cations and anions.
- B** It is a strong electrostatic attraction between protons and electrons.
- C** It is a weak electrostatic attraction between cations and anions.
- D** It is a weak electrostatic attraction between protons and electrons.
- 8 Which row describes simple molecular compounds?

	melting point	electrical conductivity when molten
A	high	good
B	high	poor
C	low	good
D	low	poor

- 9 Boron nitride is a compound of the elements boron and nitrogen.

It has a similar structure to diamond.

What is likely to be a property of boron nitride?

- A It conducts electricity.
- B It is soluble in water.
- C It is used as a lubricant.
- D It is very hard.

- 10 Which statement defines the term molecular formula?

- A a formula that shows the total number of atoms in a molecule
- B a formula that shows the total number of elements in a molecule
- C a formula that shows the arrangement of different atoms in a molecule
- D a formula that shows the number and type of different atoms in a molecule

- 11 What is the relative formula mass, M_r , of calcium hydroxide, $\text{Ca}(\text{OH})_2$?

- A 38 B 58 C 74 D 114

- 12 Which statements explain why metal objects are electroplated?

- 1 Electroplating improves the appearance of the object.
- 2 Electroplating insulates the metal object.
- 3 Electroplating makes the metal object more resistant to corrosion.
- 4 Electroplating makes the metal object softer.

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

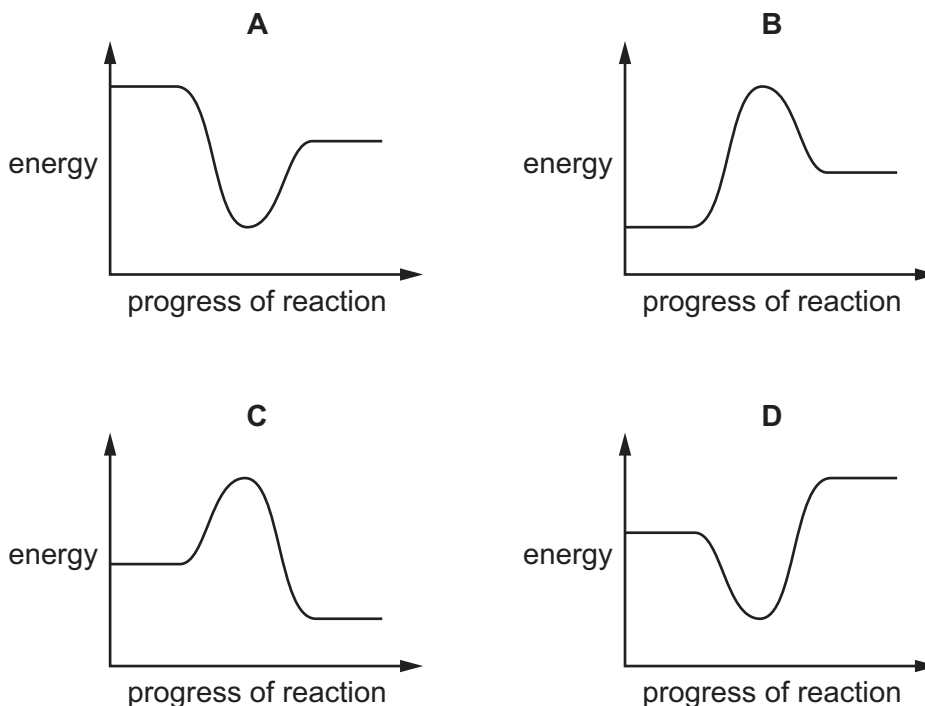
- 13 Three statements about a hydrogen–oxygen fuel cell are listed.

- 1 The overall equation for the reaction is $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$.
- 2 The hydrogen required comes from the air.
- 3 The waste gas causes respiratory problems.

Which statements are correct?

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

14 Which reaction pathway diagram represents an endothermic reaction?



15 Some physical and chemical changes are listed.

- 1 rusting of iron
- 2 condensing of steam
- 3 dissolving of sugar in water
- 4 cracking of alkanes

Which changes are physical changes?

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

16 Blue copper(II) sulfate crystals are heated in air until they turn into a white powder.

The powder is allowed to cool and after a few days it starts to turn blue.

Why does the white powder start to turn blue?

- A** Carbon dioxide in the air reacts with the powder to form copper(II) carbonate.
B The powder reacts with water in the air to form copper(II) hydroxide.
C The white copper compound is slowly oxidised.
D Water is absorbed from the air and causes the reaction to reverse.

- 17 Carbon reacts with silver oxide to form carbon dioxide and silver.

Which substance is reduced?

- A carbon
- B carbon dioxide
- C silver
- D silver oxide

- 18 Base Q dissolves in water to make aqueous Q.

Aqueous Q is tested with thymolphthalein.

Which row gives the colour of thymolphthalein in aqueous Q and the ion responsible for this colour?

	colour of thymolphthalein	ion
A	blue	H^+
B	colourless	H^+
C	blue	OH^-
D	colourless	OH^-

- 19 Solid calcium hydroxide is added to aqueous ammonium chloride and the mixture is warmed.

A gas is produced.

What is the name of the gas?

- A hydrogen
- B chlorine
- C carbon dioxide
- D ammonia

- 20 Elements L and M are in the same group of the Periodic Table.

Why do L and M have similar chemical properties?

- A They have the same number of electrons in the nucleus.
- B They have the same number of electrons in the outer shell.
- C They have the same number of neutrons in the nucleus.
- D They have the same number of neutrons in the outer shell.

21 The diagram shows elements W, X, Y and Z in a section of the Periodic Table.

A simplified periodic table with 18 columns and 4 rows. The first two columns are on the left, and the last six columns are on the right, with a gap in between. The elements are labeled as follows:

- Row 1: Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty.
- Row 2: X, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty.
- Row 3: Y, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty.
- Row 4: Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty, Empty.

Additionally, there is a box labeled 'W' in the 16th column, 2nd row, and a box labeled 'Z' in the 16th column, 3rd row.

Which statement about the reactivity of the elements is correct?

- A** X is more reactive than Y, and W is more reactive than Z.
- B** X is more reactive than Y, and Z is more reactive than W.
- C** Y is more reactive than X, and W is more reactive than Z.
- D** Y is more reactive than X, and Z is more reactive than W.

22 Which three compounds are all insoluble in water?

- A** ammonium carbonate, silver chloride and sodium sulfate
- B** barium sulfate, calcium chloride and magnesium hydroxide
- C** calcium nitrate, magnesium carbonate and lead(II) hydroxide
- D** calcium sulfate, magnesium hydroxide and silver chloride

23 18 carat gold contains 75% gold and 25% copper by mass.

Which statements about 18 carat gold are correct?

- 1 It is a mixture.
- 2 It is a compound.
- 3 It is an alloy.
- 4 It conducts electricity.

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

24 The properties of four metals, E, F, G and H, are shown.

E does **not** react with cold water, but reacts with steam.

F does **not** react with water or dilute acid, but the oxide of F is reduced by carbon.

The oxide of G is **not** reduced by carbon, but G reacts vigorously with cold water.

H does **not** react with water or steam, but reacts with dilute acid.

What is the order of reactivity of the metals starting with the most reactive?

	most reactive				least reactive
A	F	E	H		G
B	F	H	E		G
C	G	E	H		F
D	G	H	E		F

25 Four substances, or groups of substances, found in water from a natural source are listed.

- 1 some metal compounds
- 2 plastics
- 3 dissolved oxygen
- 4 nitrates and phosphates from fertilisers and detergents

Which substances found in water from a natural source can be beneficial to aquatic life?

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

26 Which element is used to remove tastes and odours in the treatment of the domestic water supply?

- A** chlorine
B carbon
C calcium
D copper

27 NPK fertilisers are mixtures of salts used to improve plant growth.

Which salt could be used as a component of an NPK fertiliser?

- A** sodium nitrate
- B** aluminium sulfate
- C** magnesium chloride
- D** calcium ethanoate

28 Plants produce glucose by photosynthesis.

What is essential for this process?

- 1 carbon dioxide
- 2 oxygen
- 3 light
- 4 water

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

29 Two reactions, M and N, both form carbon dioxide.



Which types of reaction are M and N?

	M	N
A	thermal decomposition	thermal decomposition
B	thermal decomposition	combustion
C	combustion	thermal decomposition
D	combustion	combustion

30 The molecular formulae of four compounds are shown.



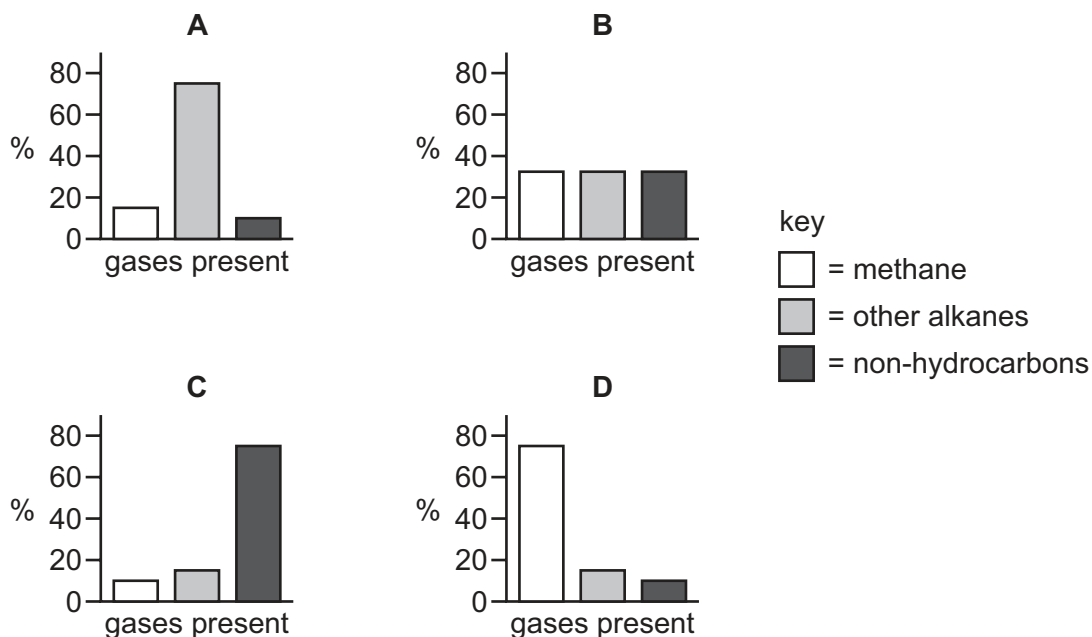
How many of these compounds are in the alkane homologous series?

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

31 Which type of reaction takes place when pentane reacts with chlorine?

- A polymerisation
- B addition
- C substitution
- D cracking

32 Which bar chart shows the percentage composition of natural gas?



33 Which statement about alcohols is correct?

- A Alcohols have the same functional group as carboxylic acids.
- B Ethanol is an alcohol that is formed by fermentation at 300 °C.
- C Ethanol is the alcohol produced in the addition reaction between ethene and hydrogen.
- D Water is produced from the combustion of alcohols.

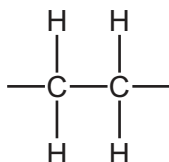
- 34 The equation shows the reaction between ethanoic acid and solid P to produce Q and hydrogen.



Which row identifies P and Q?

	P	Q
A	sodium	ethanol
B	sodium	sodium ethanoate
C	sodium oxide	ethanol
D	sodium oxide	sodium ethanoate

- 35 The diagram shows one repeat unit of a polymer.



Which row gives the name of the polymer and of the monomer used to make it?

	name of polymer	name of monomer
A	poly(ethane)	ethane
B	poly(ethane)	ethene
C	poly(ethene)	ethane
D	poly(ethene)	ethene

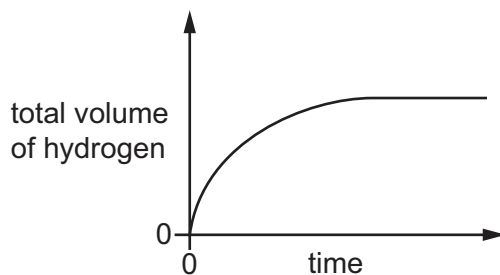
- 36 Some properties of a plastic pollutant are listed.

- 1 It is a poor conductor of electricity.
- 2 It does **not** react with water.
- 3 It is resistant to oxidation.
- 4 It has low density.

Which properties explain why this plastic is difficult to remove from the environment?

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

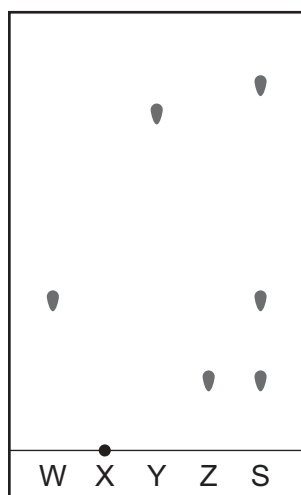
- 37 The graph shows the volume of hydrogen produced over time in a chemical reaction.



A student uses a stop-watch.

Which other item of apparatus is used to take measurements to produce this graph?

- A** beaker
B gas syringe
C pipette
D test-tube
- 38 A student uses paper chromatography to identify the food dyes in a coloured sweet, S.
 The student uses four known food dyes, W, X, Y, and Z, and ethanol as the solvent.
 The chromatogram obtained is shown.



Which statements are correct?

- 1 S contains only two dyes.
- 2 X is insoluble in ethanol.
- 3 S contains Y and Z.
- 4 S contains W.

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

- 39** An aqueous cation reacts with aqueous sodium hydroxide to form a white precipitate.

The precipitate is insoluble in excess sodium hydroxide.

What is the aqueous cation?

- A** aluminium ion
 - B** calcium ion
 - C** chromium ion
 - D** zinc ion
- 40** A piece of damp red litmus paper is put into a test-tube of gas. The litmus paper turns white.
- Which gas is in the test-tube?
- A** ammonia
 - B** carbon dioxide
 - C** chlorine
 - D** oxygen

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The Periodic Table of Elements

[illegible]

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).