



Cambridge IGCSE™

CHEMISTRY

0620/13

Paper 1 Multiple Choice (Core)

October/November 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.



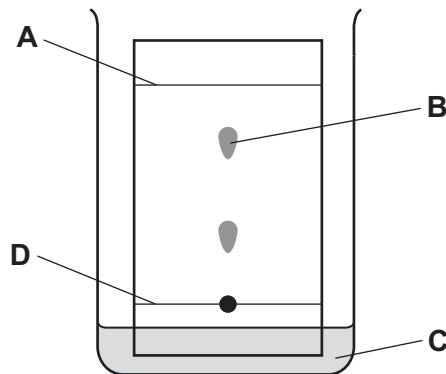
- 1 'The movement of a substance **very slowly** from an area of high concentration to an area of low concentration.'

Which process is being described?

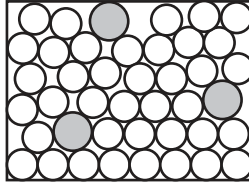
- A a liquid being frozen
 - B a solid melting
 - C a substance diffusing through a liquid
 - D a substance diffusing through the air
- 2 When a dark grey solid element is heated, it changes directly into a purple gas.

Which word describes this change?

- A boiling
 - B evaporation
 - C melting
 - D sublimation
- 3 Nickel(II) sulfate is a green solid that is soluble in water.
- Which method is used to obtain a pure sample of nickel(II) sulfate crystals from a mixture of nickel(II) sulfate and sand?
- A Heat the mixture with water and distil it to give nickel(II) sulfate.
 - B Heat the mixture with water and leave it to crystallise.
 - C Heat the mixture with water and filter off the nickel(II) sulfate.
 - D Heat the mixture with water, filter and allow the solution to crystallise.
- 4 In the chromatography experiment shown, which label represents the solvent front?



- 5 What is the meaning of the term *nucleon number*?
- A the number of neutrons in the nucleus of an atom
- B the number of protons in the nucleus of an atom
- C the total number of protons and electrons in the nucleus of an atom
- D the total number of protons and neutrons in the nucleus of an atom
- 6 The diagram represents the structure of a solid.



What could the solid be?

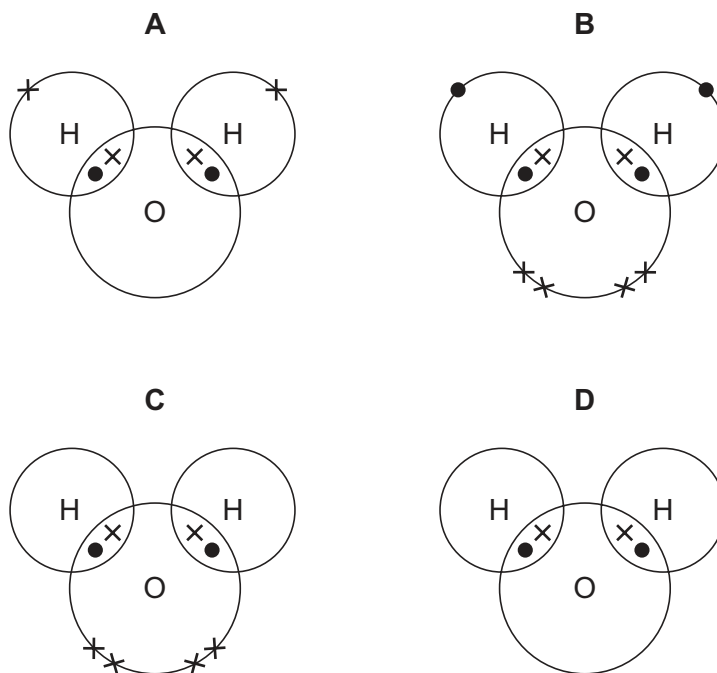
| | brass | graphite | sodium chloride |
|----------|-------|----------|-----------------|
| A | ✓ | ✓ | x |
| B | ✓ | x | x |
| C | x | ✓ | ✓ |
| D | x | x | ✓ |

- 7 Magnesium reacts with sulfuric acid.

What are the formulae of the products formed in this reaction?

- A MgSO_4 and H_2
- B MgSO_4 and H_2O
- C $\text{Mg}(\text{SO}_4)_2$ and H_2
- D $\text{Mg}(\text{SO}_4)_2$ and H_2O

8 Which diagram shows the arrangement of the outer shell electrons in a molecule of water?



9 Rubidium is in Group I of the Periodic Table and bromine is in Group VII.

Rubidium reacts with bromine to form an ionic compound.

Which row shows the electron change taking place for rubidium and the correct formula of the rubidium ion?

| | electron change | formula of ion formed |
|----------|-----------------|-----------------------|
| A | electron gained | Rb^+ |
| B | electron gained | Rb^- |
| C | electron lost | Rb^+ |
| D | electron lost | Rb^- |

10 Which statement explains why graphite is used as a lubricant?

- A** All bonds between the atoms are weak.
- B** It conducts electricity.
- C** It has a low melting point.
- D** Layers in the structure can slide over each other.

11 The relative atomic mass of chlorine is 35.5.

When calculating relative atomic mass, which particle is the mass of a chlorine atom compared to?

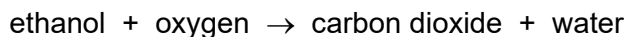
- A a neutron
- B a proton
- C an atom of carbon-12
- D an atom of hydrogen-1

12 Molten sodium chloride is electrolysed using inert electrodes.

Which row shows the products formed at the cathode and anode?

| | cathode | anode |
|----------|----------|----------|
| A | chlorine | hydrogen |
| B | chlorine | sodium |
| C | hydrogen | chlorine |
| D | sodium | chlorine |

13 Ethanol is used as a fuel.



Which statements are correct?

- 1 The reaction is endothermic.
- 2 The products have more energy than the reactants.
- 3 The oxygen for this reaction comes from the air.
- 4 The temperature of the reaction mixture rises during this reaction.

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

14 Hydrogen and the isotope uranium-235 are both used to generate electricity.

Which term describes the change that occurs for **both** substances in this context?

- A combustion
- B endothermic
- C exothermic
- D decomposition

15 Which substance does **not** require oxygen in order to produce energy?

- A coal
- B hydrogen
- C natural gas
- D ^{235}U

16 When calcium carbonate reacts with dilute hydrochloric acid, carbon dioxide gas is given off.

This causes the reaction mixture to lose mass.

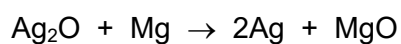
Four separate experiments are performed.

The starting mass, and the mass after five minutes, are measured for each reaction mixture.

In which experiment is carbon dioxide produced at the greatest rate?

| | starting mass /g | mass after five minutes /g |
|----------|------------------|----------------------------|
| A | 14.37 | 11.89 |
| B | 16.52 | 15.29 |
| C | 16.76 | 14.12 |
| D | 16.99 | 15.21 |

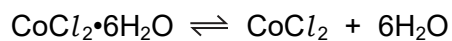
17 Silver oxide reacts with magnesium to make silver and magnesium oxide.



Which substance is oxidised in this reaction?

- A magnesium
- B magnesium oxide
- C silver
- D silver oxide

- 18 When pink crystals of cobalt(II) chloride are heated, steam is given off and the colour of the solid changes to blue.



What happens when water is added to the blue solid?

| | colour | temperature |
|----------|-----------------|-------------|
| A | changes to pink | decreases |
| B | changes to pink | increases |
| C | remains blue | decreases |
| D | remains blue | increases |

- 19 Which oxide is used to neutralise acidic gases in a power station?

- A** calcium oxide
- B** carbon dioxide
- C** nitrogen oxide
- D** sulfur dioxide

- 20 Period 3 of the Periodic Table contains the elements sodium to argon.

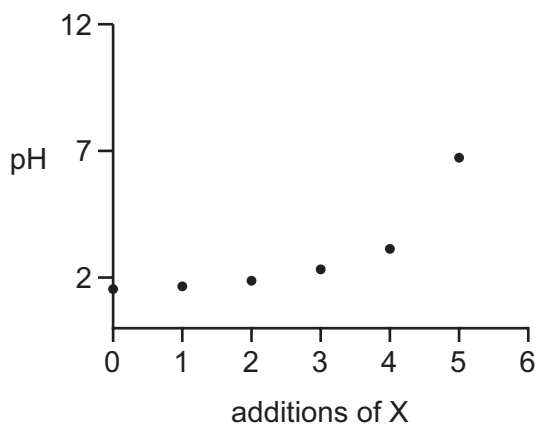
Element Q is a non-metal from this period.

Which statement about Q is correct?

- A** It conducts electricity.
- B** It has a lower proton number than sodium.
- C** It has electrons in only three shells.
- D** It is malleable.

21 Equal masses of a solid, X, are added in turn to an aqueous solution, Y.

The pH of the solution is measured after each addition until the pH becomes 7. The readings are plotted as shown.



What are X and Y?

| | X | Y |
|----------|-------------------------|----------|
| A | Cu(s) | HCl(aq) |
| B | Mg(s) | HCl(aq) |
| C | NH ₄ Cl(s) | NaOH(aq) |
| D | Zn(OH) ₂ (s) | NaOH(aq) |

22 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

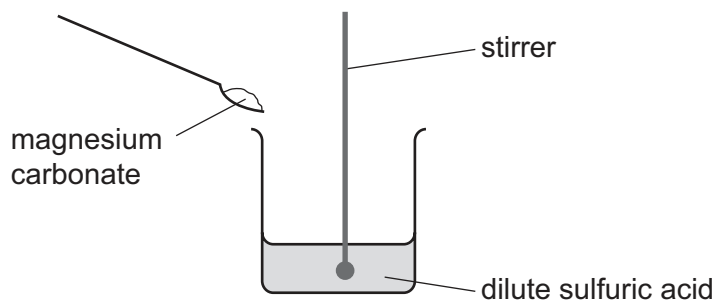
23 Vinegar has a pH of 3.

Which statement about vinegar is correct?

- A** It forms a salt with sulfuric acid.
- B** It reacts with some metals to form hydrogen gas.
- C** It reacts with ammonium compounds to give ammonia gas.
- D** It turns red litmus blue.

24 A student carries out an experiment to prepare pure magnesium sulfate crystals.

The diagram shows the first stage of the preparation.



He adds magnesium carbonate until no more reacts.

Which process should he use for the next stage?

- A crystallisation
 - B evaporation
 - C filtration
 - D neutralisation
- 25 Which statement about the halogens and their compounds is correct?
- A The colour of the element gets lighter going down Group VII.
 - B The elements get less dense going down Group VII.
 - C When chlorine is added to sodium iodide solution, iodine is formed.
 - D When iodine is added to sodium bromide solution, bromine is formed.
- 26 Which compound contains a transition metal ion and a halide ion?
- A aluminium iodide
 - B calcium fluoride
 - C iron(III) oxide
 - D nickel(II) chloride

27 A flammable gas needs to be removed from a tank at an industrial plant.

For safety reasons, an inert gas is used.

Which gas is suitable?

- A argon
- B hydrogen
- C methane
- D oxygen

28 A substance, X, has the following properties.

- 1 It has a high melting point.
- 2 It conducts electricity in the solid and liquid states.
- 3 It is malleable.
- 4 It has a high density.

What is X?

- A a ceramic
- B copper
- C graphite
- D sodium chloride

29 A metal M is between sodium and magnesium in the reactivity series.

Which reactions occur with M and its oxide?

| | M reacts with steam | M can be extracted by heating its oxide with carbon |
|---|---------------------|---|
| A | no | no |
| B | no | yes |
| C | yes | no |
| D | yes | yes |

30 Mild steel and stainless steel are two alloys containing the element iron.

Which row identifies a use of each alloy?

| | a use of mild steel | a use of stainless steel |
|----------|---------------------|--------------------------|
| A | car bodies | cutlery |
| B | car bodies | electrical wiring |
| C | food containers | cutlery |
| D | food containers | electrical wiring |

31 Coke (carbon) and limestone are two raw materials used in the extraction of iron from hematite.

Which type of reaction occurs when each substance is heated during the process?

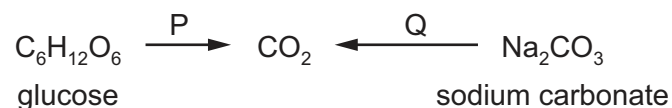
| | coke | limestone |
|----------|-----------------------|-----------------------|
| A | redox | redox |
| B | redox | thermal decomposition |
| C | thermal decomposition | redox |
| D | thermal decomposition | thermal decomposition |

32 Oxides of nitrogen are given out from car exhausts.

Which row best shows why oxides of nitrogen are unwanted in the atmosphere?

| | acidic | toxic |
|----------|--------|-------|
| A | no | no |
| B | no | yes |
| C | yes | no |
| D | yes | yes |

33 Two reactions, P and Q, produce carbon dioxide.



Which types of reaction are P and Q?

| | P | Q |
|----------|----------------|----------------|
| A | neutralisation | neutralisation |
| B | neutralisation | respiration |
| C | respiration | neutralisation |
| D | respiration | respiration |

34 Which gas is used as a food preservative?

- A** methane
- B** fluorine
- C** oxygen
- D** sulfur dioxide

35 Which calcium compound does **not** neutralise an acid soil?

- A** calcium oxide
- B** calcium sulfate
- C** calcium hydroxide
- D** calcium carbonate

36 Petroleum is separated into fractions by fractional distillation.

Separation occurs in a fractionating column.

Some properties of three of these fractions are shown.

| fraction | boiling point range / °C | number of carbon atoms in the molecules |
|----------|--------------------------|---|
| 1 | | 5–10 |
| 2 | 320–350 | 16–24 |
| 3 | 120–210 | |

Which statement is correct?

- A Fraction 1 has a higher boiling point range than fraction 2.
- B Fraction 2 is removed from a higher point in the fractionating column than fraction 1.
- C Molecules in fraction 3 have shorter chains than those in fraction 2.
- D None of the fractions are liquid at room temperature.

37 How many atoms are there in one molecule of ethanoic acid?

- A 5
- B 6
- C 8
- D 11

38 The flow chart shows the preparation of ethanol and some important chemistry of ethanol.



What are X, Y and Z?

| | X | Y | Z |
|---|---------|----------------|---------|
| A | yeast | combustion | oxygen |
| B | glucose | combustion | steam |
| C | glucose | polymerisation | water |
| D | yeast | fermentation | glucose |

39 Which substance is **not** a fraction obtained from the fractional distillation of petroleum?

- A ethene
- B fuel oil
- C naphtha
- D refinery gas

40 Some plastics are non-biodegradable.

What is the meaning of the term *non-biodegradable*?

- A cannot be recycled for further use
- B gives off greenhouse gases when burnt
- C harmful to animals and plants
- D not broken down by natural processes

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The Periodic Table of Elements

| Group | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| 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 | 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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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Key
 atomic number
 atomic symbol
 name
 relative atomic mass

| | | | | | | | | | | | | | | | |
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The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).