OXFORD

INTERNATIONAL
AQA EXAMINATIONS

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

INTERNATIONAL GCSE

CHEMISTRY

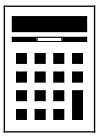
Paper 1

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a pencil and a ruler
- a scientific calculator
- the periodic table (enclosed).



Instructions

- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- Show all your working.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 90.
- You are expected to use a scientific calculator where appropriate.
- A periodic table is provided as a loose insert.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

Do not write outside the box

Answer **all** questions in the spaces provided.

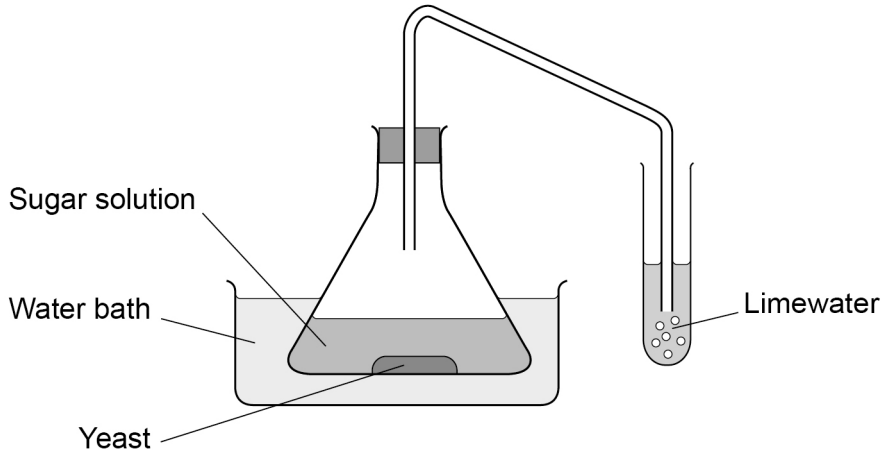
0 1 This question is about ethanol.

Figure 1 shows the apparatus used to produce ethanol from sugar.

The reaction in the conical flask produced ethanol and a gas.

The gas was identified using limewater.

Figure 1



0 1 . 1 What type of reaction produces ethanol from sugar?

Tick (✓) **one** box.

[1 mark]

Combustion ☐

Decomposition ☐

Fermentation ☐

Neutralisation ☐

0 1 . 2 Give a suitable temperature for the water bath.

[1 mark]

_____ °C

Do not write outside the box

0 1 . 3 Which gas is produced by the reaction?

Tick (✓) **one** box.

[1 mark]

- Carbon dioxide ☐
- Hydrogen ☐
- Nitrogen ☐
- Oxygen ☐

0 1 . 4 What happens to the limewater when the gas is bubbled through?

Tick (✓) **one** box.

[1 mark]

- Turns blue ☐
- Turns red ☐
- Turns white ☐
- Turns yellow ☐

Question 1 continues on the next page

Do not write outside the box

A solution of ethanol was left open to the air.

The ethanol was oxidised.

0 1 . 5 Suggest **one** substance that could oxidise ethanol.

[1 mark]

0 1 . 6 Which substance is produced when ethanol is oxidised?

Tick (✓) **one** box.

[1 mark]

Ethane ☐

Ethanoic acid ☐

Ethene ☐

Poly(ethene) ☐

0 1 . 7 Ethanol produced from sugar is used as a biofuel.

Explain why increasing the use of biofuels may cause a decrease in the production of food.

[2 marks]

Do not write outside the box

0 1 . 8 Ethanol can also be produced by reacting ethene with steam.

Ethene is produced from crude oil.

Give **one** disadvantage of producing ethanol from ethene compared with producing ethanol from sugar.

[1 mark]

_____

_____

9

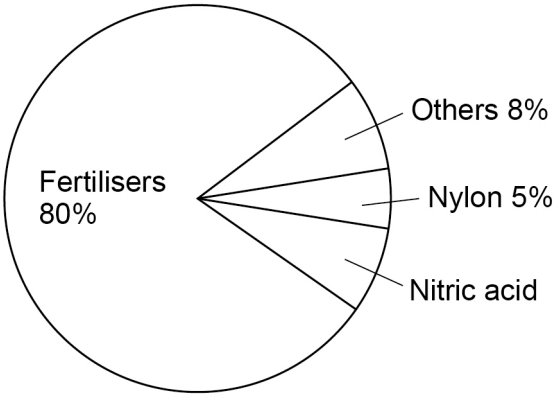
Turn over for the next question

Do not write outside the box

0 2 Ammonia is an important chemical.

0 2 . 1 **Figure 2** shows the uses of ammonia produced by a company.

Figure 2



Calculate the percentage (%) of ammonia used to manufacture nitric acid.

[1 mark]

Percentage used to manufacture nitric acid = _____ %

0 2 . 2 Describe a test for ammonia gas.

Give the result of the test.

[2 marks]

Test _____

Result _____

Do not write outside the box

0 2 . 3 Ammonia solution reacts with nitric acid to produce ammonium nitrate.

Ammonium nitrate is a salt.

What is the name of this type of reaction?

Tick (✓) **one** box.

[1 mark]

Combustion ☐

Decomposition ☐

Neutralisation ☐

Polymerisation ☐

0 2 . 4 The formula of ammonium nitrate is NH_4NO_3

How many atoms are in the formula NH_4NO_3?

[1 mark]

Number of atoms = _____

Question 2 continues on the next page

Do not write outside the box

0 2 . 5 The reaction of ammonia solution with nitric acid is exothermic.

Describe the measurements you would make to show that the reaction is exothermic.

Give the expected result.

[2 marks]

Measurements _____

_____

Result _____

_____

0 2 . 6 Describe how crystals of ammonium nitrate can be obtained from ammonium nitrate solution.

[2 marks]

_____

_____

_____

_____

0 2 . 7 Ammonium nitrate is a nitrogen fertiliser.

Calculate the percentage by mass of nitrogen in ammonium nitrate (NH_4NO_3).

Relative atomic masses (A_r): H = 1 N = 14 O = 16

[3 marks]

_____

_____

_____

_____

_____

_____

_____

Percentage by mass of nitrogen = _____ %

12

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Turn over for the next question

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ANSWER IN THE SPACES PROVIDED

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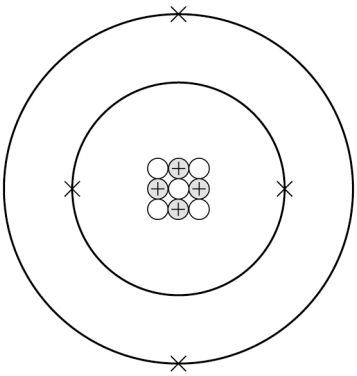
0 3 This question is about beryllium.

0 3 . 1 **Figure 3** represents the structure of a beryllium atom.

Figure 3



Give the numbers of electrons, neutrons and protons in this beryllium atom.

[3 marks]

Number of electrons _____

Number of neutrons _____

Number of protons _____

0 3 . 2 Beryllium is an element.

What is meant by the term element?

You should refer to atoms in your answer.

[1 mark]

_____

_____

Do not write outside the box

0 3 . 3 A beryllium nanoparticle has a diameter of 36 nm.

The nanoparticle is made of beryllium atoms.

Each beryllium atom in the nanoparticle has a diameter of 2.5×10^{-10} m.

Calculate the number of times bigger the diameter of the nanoparticle is compared with the diameter of one atom.

$1 \text{ nm} = 1 \times 10^{-9}$ m

[3 marks]

Number of times bigger = _____

0 3 . 4 A sample of a beryllium compound is made of:

- 5.4 g of beryllium
- 5.6 g of nitrogen

Calculate the empirical formula of the compound.

Relative atomic masses (A_r): Be = 9 N = 14

[4 marks]

Empirical formula = _____

11

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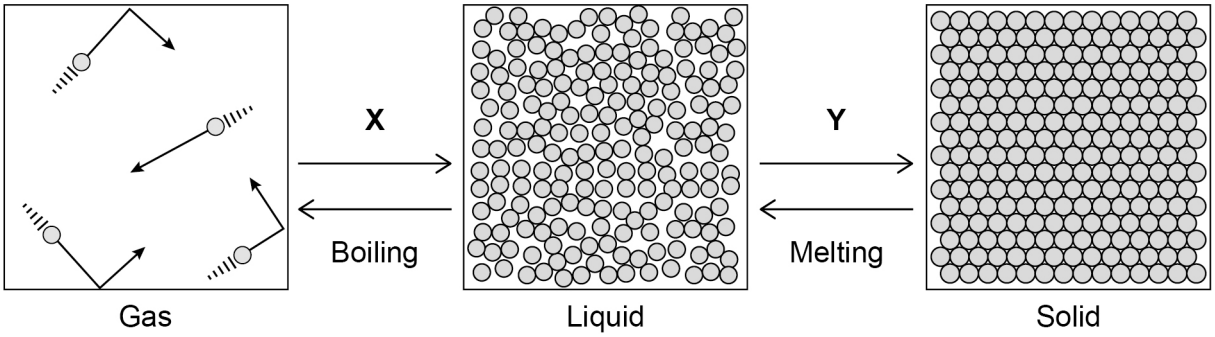
0 4 The three states of matter are solid, liquid and gas.

0 4 . 1 **Figure 4** represents the three states of matter.

Figure 4



X and **Y** represent changes of state.

Name change of state **X** and change of state **Y**.

[2 marks]

X = _____

Y = _____

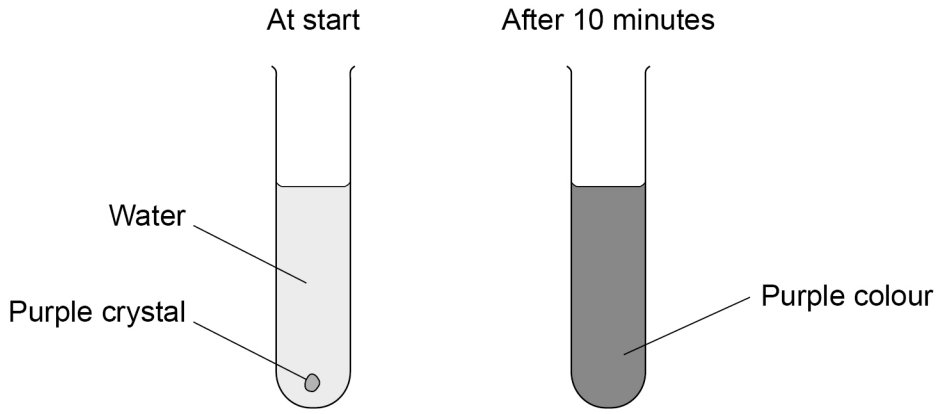
Do not write outside the box

0 4 . 2 A student added a purple crystal to a test tube of water.

The student observed the test tube for 10 minutes.

Figure 5 shows the observations made.

Figure 5



Explain the observations made in the student's experiment.

You should refer to particles in your answer.

[2 marks]

Question 4 continues on the next page

Do not write outside the box

The student investigated how changing the temperature of the water affected the time taken for the purple crystal to disappear.

This is the method used.

1 Add 5.0 cm^3 of water to a test tube.
2 Place the test tube in a water bath at 20 °C.
3 Add one purple crystal to the test tube.
4 Time how long it takes for the crystal to disappear.
5 Repeat steps **1** – **4** twice.
6 Repeat steps **1 – 5** at different temperatures.

Table 1 shows the results.

Table 1

Temperature of water in °C	Time taken for the crystal to disappear in seconds			
	Experiment 1	Experiment 2	Experiment 3	Mean
20	80	81	85	82
30	56	60	58	58
40	38	39	**X**	37
60	11	10	12	11
70	9	7	8	8

0 4 . 3 Suggest the mean time taken for the crystal to disappear when the temperature is 50 °C.

[1 mark]

Time taken = _____ seconds

Do not write outside the box

0 4 . 4 Calculate the value of **X** in **Table 1**.

[2 marks]

X = _____ seconds

0 4 . 5 Explain the trend in the results in **Table 1**.

You should refer to the energy of the particles in your answer.

[2 marks]

0 4 . 6 Give **one** control variable that the student should keep constant to make sure it is a valid investigation.

[1 mark]

10

Turn over for the next question

Do not write outside the box

0 5 Potassium chloride (KCl) is an ionic compound.

0 5 . 1 Potassium reacts with chlorine (Cl_2) to produce potassium chloride.

Complete the equation for the reaction.

Balance the equation.

[2 marks]

____ + ____ → ____ KCl

0 5 . 2 A student does a flame test on a solution of potassium chloride.

Give the colour of the flame produced.

[1 mark]

_____

0 5 . 3 Give the symbols of the ions in potassium chloride.

[1 mark]

_____ _____

0 5 . 4 Explain why potassium chloride has a high melting point.

Give your answer in terms of structure and bonding.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

Do not write outside the box

0 5 . 5 Explain why a solution of potassium chloride can conduct electricity.

[2 marks]

10

Turn over for the next question

Do not write outside the box

0 6 The elements in Group 7 of the periodic table are known as the halogens.

A student investigated the reactivity of the halogens.

The student added halogen solutions to metal halide solutions.

Table 2 shows the observations made.

Table 2

	Metal halide solution		
Halogen solution	**Potassium chloride solution**	**Potassium bromide solution**	**Potassium iodide solution**
Chlorine	No reaction	Orange colour produced	Brown colour produced
Bromine	No reaction	No reaction	**X**
Iodine	No reaction	No reaction	No reaction

0 6 . 1 What is the observation represented by **X** in **Table 2**?

Tick (✓) **one** box.

[1 mark]

Brown colour produced ☐

No reaction ☐

Orange colour produced ☐

0 6 . 2 What is the trend in melting point as you go down Group 7?

[1 mark]

Do not write outside the box

0 6 . 3 Write a word equation for the reaction between chlorine and potassium bromide.

[2 marks]

0 6 . 4 Explain the trend in reactivity of the halogens as you go down Group 7.

[4 marks]

8

Turn over for the next question

Do not write outside the box

0 7 Citric acid solution is a weak acid.

0 7 . 1 Describe how to test the pH of citric acid solution.

Give the result of the test.

[2 marks]

Test _____

_____

Result _____

_____

Students titrated citric acid solution with sodium hydroxide solution.

This is the method used.

1 Pipette 25.0 cm^3 of 0.15 mol/dm^3 sodium hydroxide solution into a conical flask.
2 Add a few drops of indicator to the sodium hydroxide solution.
3 Add citric acid solution from a burette to the solution until the end-point is reached.

0 7 . 2 A volumetric pipette is used to measure the volume of sodium hydroxide solution.

Explain why a burette rather than a volumetric pipette is used to measure the volume of citric acid solution.

[2 marks]

_____

_____

_____

_____

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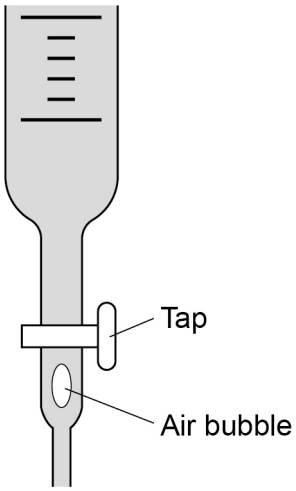
0 7 . 3 One of the students noticed an air bubble below the tap of the burette.

Figure 6 shows the air bubble.

Figure 6



Explain the effect this would have on the recorded volume of citric acid added to the conical flask.

[2 marks]

Question 7 continues on the next page

Do not write outside the box

0 7 . 4 The student removed the air bubble.

The student did the titration five times.

Table 3 shows the results.

Table 3

	Titration 1	**Titration 2**	**Titration 3**	**Titration 4**	**Titration 5**
Volume of citric acid solution added in cm^3	27.05	27.00	27.95	27.05	26.95

Calculate the mean volume of citric acid solution that the student should use in their calculation.

Do **not** include the anomalous result in your calculation.

[2 marks]

Mean volume of citric acid solution = _____ cm^3

Do not write outside the box

0 7 . 5 Another student did the same titration.

The equation for the reaction is:

$$C_6H_8O_7 + 3\,NaOH \rightarrow C_6H_5O_7Na_3 + 3\,H_2O$$

25.0 cm^3 of 0.15 mol/dm^3 sodium hydroxide solution was neutralised by 20.05 cm^3 citric acid solution.

Calculate the concentration of the citric acid solution in mol/dm^3

[4 marks]

Concentration of citric acid solution = _____ mol/dm^3

12

Turn over for the next question

Do not write outside the box

0 8 This question is about forms of carbon.

Diamond, graphite and fullerenes are different forms of carbon.

0 8 . 1 Explain why diamonds are very hard.

Give your answer in terms of structure and bonding.

[4 marks]

0 8 . 2 Explain why graphite is a good conductor of heat.

Give your answer in terms of structure and bonding.

[3 marks]

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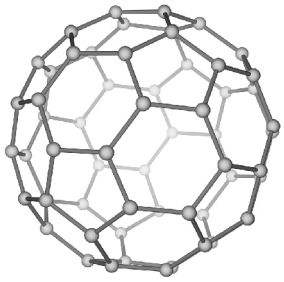
Figure 7 represents the structure of a fullerene molecule.

Figure 7



0 8 . 3 Suggest why fullerenes are used as lubricants.

Use **Figure 7**.

[2 marks]

0 8 . 4 Give **one** other use for fullerenes.

[1 mark]

10

Turn over for the next question

Do not write outside the box

0 9 This question is about equilibrium.

A reversible reaction in a closed system can reach a state of equilibrium.

0 9 . 1 Suggest what is meant by the term 'closed system'.

[1 mark]

0 9 . 2 Give **one** characteristic of a reversible reaction when equilibrium is reached.

[1 mark]

0 9 . 3 Methane and steam react to produce hydrogen in a reversible reaction.

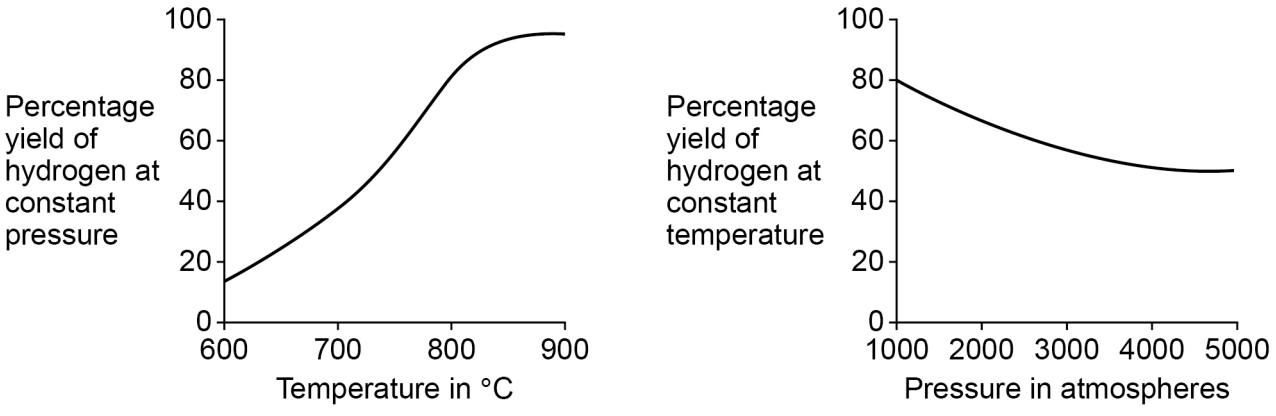
The equation for the reaction is:

$$CH_4(g) + H_2O(g) \rightleftharpoons CO(g) + 3\,H_2(g)$$

The forward reaction has an enthalpy change of +208 kJ/mol

Figure 8 shows the percentage yield of hydrogen under different conditions.

Figure 8



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A company produces hydrogen from methane and steam.

The conditions used are:

- 800 °C
- 1000 atmospheres.

Explain why these conditions are used.

[6 marks]

8

END OF QUESTIONS

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