Paper Reference(s)

4CH0/2C

Edexcel IGCSE

Chemistry

Chemistry Paper 2

Sample Assessment Material

Time: 1 hour

Materials required for examination	**Items included with question papers**
Nil	Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
Show all the steps in any calculations and state the units. Calculators may be used.

Information for Candidates

The marks for individual questions and the parts of questions are shown in round brackets: e.g. **(2)**.
There are 6 questions in this question paper. The total mark for this paper is 60.
There are 16 pages in this question paper. Any blank pages are indicated.

Advice to Candidates

Write your answers neatly and in good English.

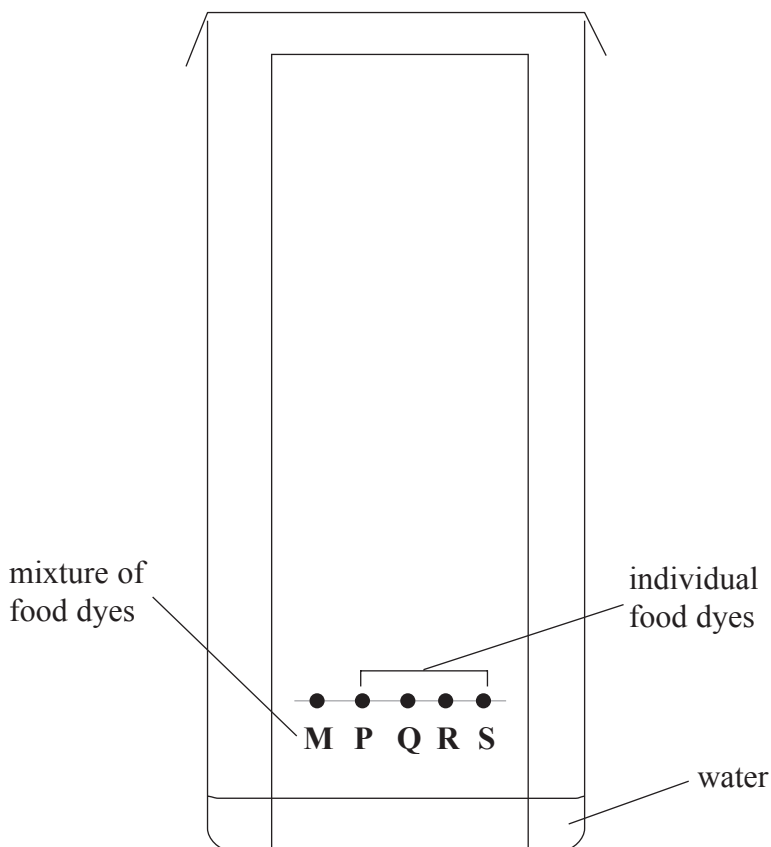***Turn over***

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Answer ALL questions

1. Paper chromatography can be used to separate a mixture of food dyes (**M**), and identify which dyes are present. The diagram shows the apparatus used.

(a) The food dyes are placed on the paper about 2 cm up from the bottom edge. Why is it important **not** to place them at the bottom of the paper?

....

....

(1)

(b) State **two** observations you would make during the experiment.

1 ....

....

2 ....

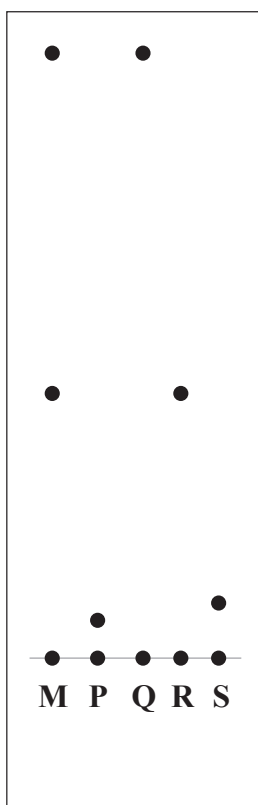...

(2)

(c) At the end of the experiment the paper is removed and dried. The diagram shows the paper.

(i) Measure the distance moved, in centimetres, by food dye **R** during the experiment.

....

(1)

(ii) Which of the food dyes **P**, **Q**, **R** and **S** are present in **M**?

....

(1)

(iii) Food dyes **P** and **S** did not move very far. Suggest **one** change you could make to this experiment to help them move further.

....

(1)   Q1

(Total 6 marks)

2. The diagram shows apparatus for preparing carbon dioxide gas in the laboratory.
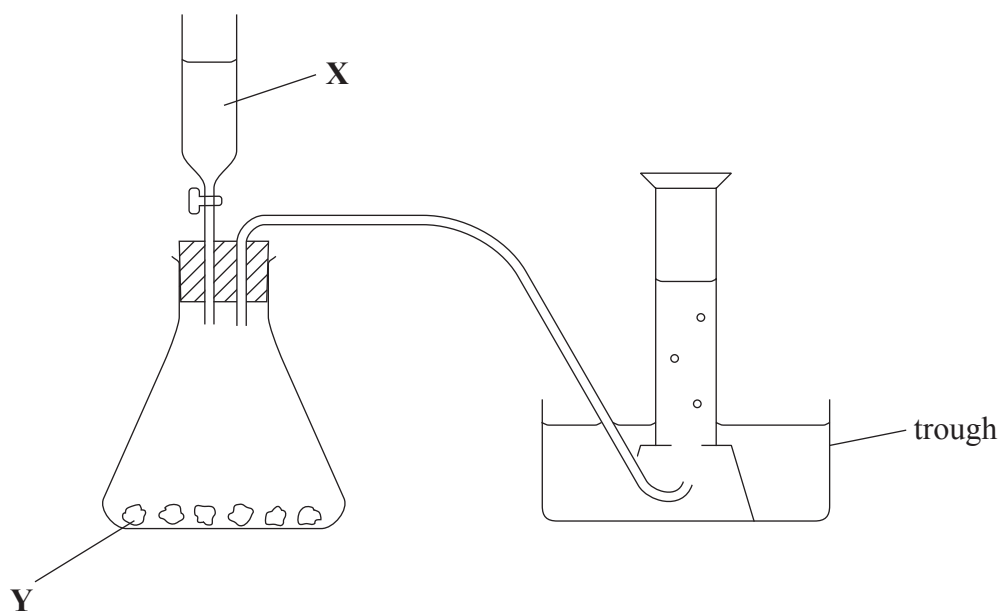
(a) Calcium chloride and water are also products of this reaction.
Identify the reactants **X** and **Y**.

X ....

Y ....

(2)

(b) The diagram shows carbon dioxide gas being collected over water. Suggest one other way to collect the gas.

....

(1)

(c) By the end of the experiment the water in the trough is acidic. A sample is tested with universal indicator.

(i) State the colour of universal indicator at the end of the test.

....
(1)

(ii) Name the acid formed in the water and give its formula.

Name ....

Formula ....
(2)

(d) The melting point of calcium chloride is very much higher than that of water. State the type of bonding in

calcium chloride ....

water ....
(2)

(e) State one industrial use of carbon dioxide.

....
(1)

(f) Suggest why carbon dioxide used in industry is **not** obtained from air.

....
(1)

(Total 10 marks)

Q2

3. Sugar can be converted into poly(ethene) as follows:

| sugar | Reaction 1 → | ethanol | Reaction 2 → | ethene | Reaction 3 → | poly(ethene) |
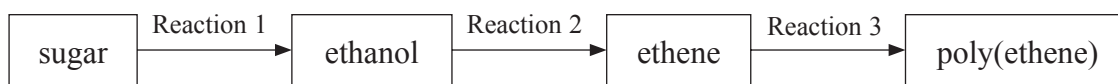
(a) (i) State the type of reaction occurring in

Reaction 1 ....

Reaction 2 ....

(2)

(ii) What type of polymerisation occurs in Reaction 3?

....

(1)

(b) State **two** conditions used in the conversion of sugar to ethanol in Reaction 1.

1 ....

2 ....

(2)

(c) Write a chemical equation for Reaction 2.

....
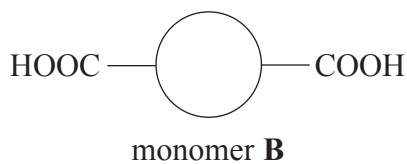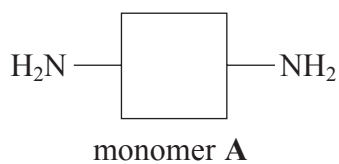
(2)

(d) Draw the displayed formula of ethanol.

(1)

(e) Nylon can be made using the monomers **A** and **B** represented in the diagrams.

H_2N —[ ]— NH_2 HOOC —( )— COOH

        monomer **A**   monomer **B**

(i) What type of compound is monomer **A**?

....
                                                                         (1)

(ii) Draw a diagram to show the structure of the polymer formed from **A** and **B**. You must draw enough of the structure to make the repeat unit clear.

                                                                                     (3)

(f) Nylon has a simple molecular structure. Use words from the box to complete the sentences below.

Each word may be used once, more than once or not at all.

ions	**high**	**low**
molecules	**strong**	**weak**

Nylon has a .... melting point. This is because there are

.... forces between the .... that make up
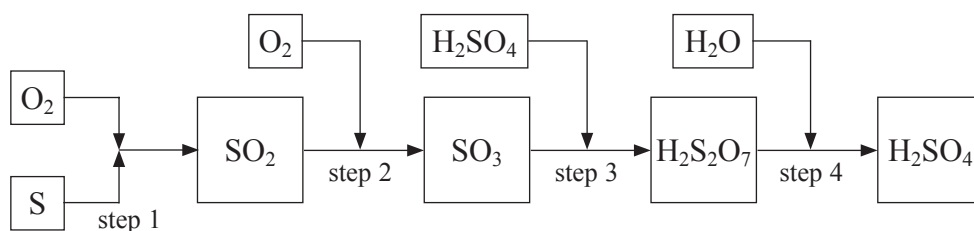
the structure.

                                                                          (3)   **Q3**

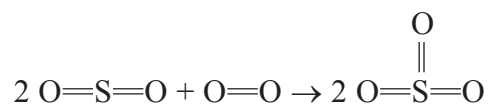   **(Total 15 marks)**

4. The flow chart shows the steps in the manufacture of sulfuric acid.

(a) Balance the equation to give the overall reaction that occurs.

$$\text{....... S + ... O}_2 \text{ + ... H}_2\text{O} \rightarrow \text{....... H}_2\text{SO}_4$$

(1)

(b) The following equation represents what happens in step 2.

$$\text{2 O}\text{=}\text{S}\text{=}\text{O} + \text{O}\text{=}\text{O} \rightarrow \text{2 O}\text{=}\overset{\displaystyle \text{O}}{\overset{\|}{\text{S}}}\text{=}\text{O}$$

The table shows some average bond energies.

Bond	Average bond energy (kJ/mol)
O=O	496
S=O	493

(i) Calculate the energy change, ΔH, for the reaction in step 2.

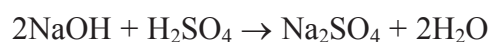| Energy taken in to break bonds	Energy given out from making bonds

$\Delta H =$ ....

(3)

(ii) Draw a fully labelled energy level diagram for the reaction in step 2.

(3)

(c) The following equation shows the reaction between sodium hydroxide solution and dilute sulfuric acid:

$$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$$

A 10.0 cm^3 sample of dilute sulfuric acid was titrated with 0.100 mol dm^{-3} sodium hydroxide solution. It was found that 16.70 cm^3 of the sodium hydroxide solution were needed to neutralise the acid.

Outline how, in this titration, you would

- measure the volumes of the solutions used
- accurately determine the end-point.
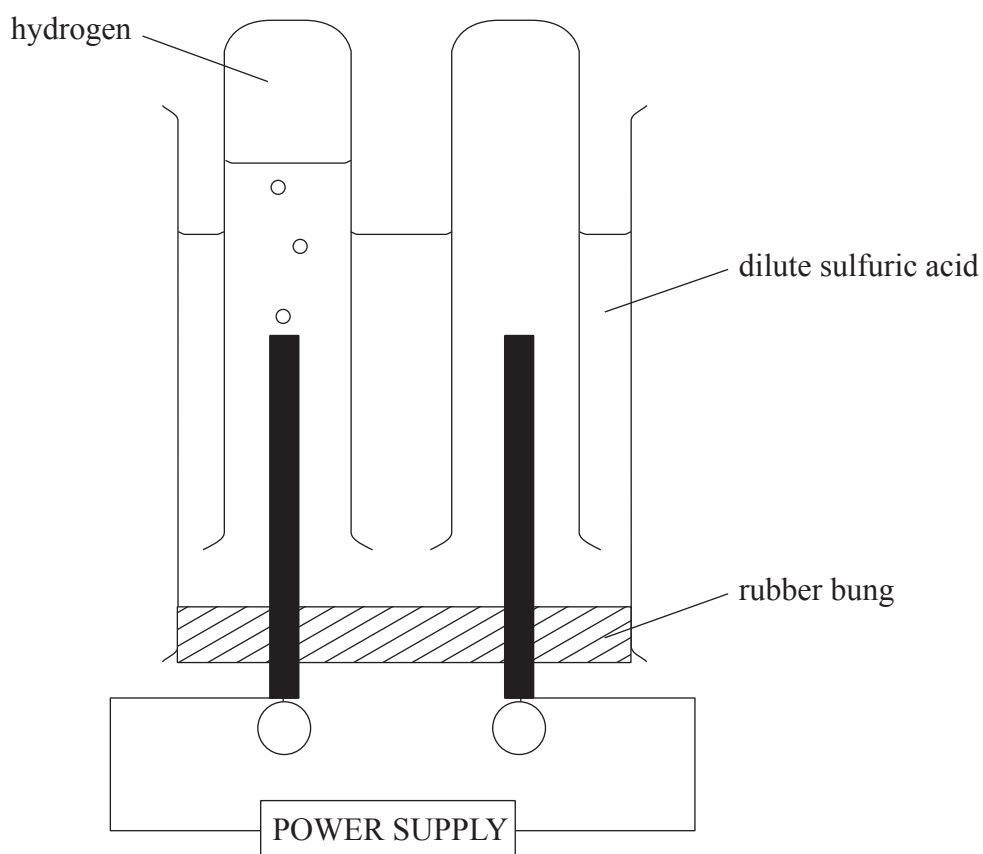
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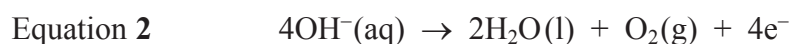
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....

....

(4)

(Total 11 marks)

Q4

5. The diagram shows apparatus that can be used to electrolyse dilute sulfuric acid.

hydrogen

dilute sulfuric acid

rubber bung

POWER SUPPLY

(a) (i) Label the electrodes in the diagram by writing the symbols + and − in the circles.

(1)

(ii) The equations for the reactions occurring at the electrodes are

Equation **1** $2H^+(aq) + 2e^- \rightarrow H_2(g)$

Equation **2** $4OH^-(aq) \rightarrow 2H_2O(l) + O_2(g) + 4e^-$

Give the formula of the ion being reduced.
Give a reason for your choice.

Ion ....

Reason ....

....

(2)

(iii) The volume of hydrogen gas collected after a few minutes is shown on the diagram.

Draw another line on the diagram to show the volume of oxygen gas collected after the same length of time.
Explain your choice with reference to Equations **1** and **2**.

....

....

....

(3)

(b) In one experiment, the amount of charge passed was 0.40 faraday.

(i) Calculate the amount, in moles, of hydrogen gas formed.

(1)

(ii) Calculate the volume, in dm^3, of this amount of hydrogen gas at room temperature and pressure (rtp).
(Molar volume of any gas $= 24$ dm^3 at rtp)

(2)

(c) In a second experiment, the amount of charge passed was 0.80 faraday.

(i) Calculate the amount, in moles, of oxygen formed.

(1)

(ii) Calculate the mass, in g, of oxygen formed.

(2) **Q5**

(Total 12 marks)

6. The ions present in ionic compounds can be identified using simple tests.

The first table shows the flame test colours for three cations.

Cation	Flame test colour
lithium	red
sodium	yellow-orange
strontium	red

The next table shows three tests that may be used to identify anions in solution.

Anion	Result of tests when		
	nitric acid is added	magnesium sulphate solution is added	universal indicator is added
carbonate	effervescence	precipitate forms	blue
hydrogencarbonate	effervescence	no precipitate forms	dark green
hydrogensulfate	no effervescence	no precipitate forms	red
hydroxide	no effervescence	precipitate forms	blue
sulfate	no effervescence	no precipitate forms	green

Two ionic compounds, **P** and **Q**, are known to contain only anions and cations listed in the tables. They were analysed using some of the tests in the tables.

(a) Compound **P** gave a yellow-orange flame test and produced effervescence when nitric acid was added.

Suggest **two** possible identities for compound **P**.

1 ....

2 ....

(3)

(b) Compound **Q** gave a red flame test and caused universal indicator to turn blue.
A student concluded that compound **Q** was strontium hydroxide.

(i) Give **two** reasons why we cannot be certain this conclusion is correct.

1 ....

....

2 ....

....

(2)

(ii) Using the information in the tables, give one further test that could be done to
show that compound **Q** is a hydroxide. Give the expected result of the test.

....

....

....

....

....

....

(1) Q6

(Total 6 marks)

TOTAL FOR PAPER: 60 MARKS

END