

Write your name here

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| Surname | | | | | Other names | | | | |
| Edexcel Certificate | | | | | | | | | |
| Centre Number | | | | | Candidate Number | | | | |
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| Edexcel International GCSE | | | | | | | | | |
| <h1>Chemistry</h1> | | | | | | | | | |
| Unit: KCH0/4CH0 | | | | | | | | | |
| Paper: 2C | | | | | | | | | |
| Wednesday 16 January 2013 – Morning | | | | | | | Paper Reference | | |
| Time: 1 hour | | | | | | | KCH0/2C | | |
| | | | | | | | 4CH0/2C | | |
| You must have: | | | | | | | | Total Marks | |
| Ruler | | | | | | | | | |
| Calculator | | | | | | | | | |

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

P41539A

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PEARSON

THE PERIODIC TABLE

Period 1 2 3 4 5 6 7 0

| | | | | | | | | | | | | | | | | | | | | | | |
|---|--|-----------------------------|------------------------------|-----------------------------|-----------------------------|------------------------------|------------------------------|------------------------------|----------------------------|------------------------------|----------------------------|----------------------------|-----------------------------|-----------------------------|-----------------------------|------------------------------|-----------------------------|---------------------------|-----------------------------|-------------------------|------------------------------|-------------------------|
| 1 | <div style="display: flex; justify-content: space-between;"> <div style="border: 1px solid black; padding: 2px;"> ¹ H Hydrogen 1 </div> <div style="border: 1px solid black; padding: 2px;"> ⁴ He Helium 2 </div> </div> | | | | | | | | | | | | | | | | | | | | | |
| 2 | 7 Li Lithium 3 | 9 Be Beryllium 4 | | | | | | | | | | | | | | | 11 B Boron 5 | 12 C Carbon 6 | 14 N Nitrogen 7 | 16 O Oxygen 8 | 19 F Fluorine 9 | 20 Ne Neon 10 |
| 3 | 23 Na Sodium 11 | 24 Mg Magnesium 12 | | | | | | | | | | | | | | | 27 Al Aluminium 13 | 28 Si Silicon 14 | 31 P Phosphorus 15 | 32 S Sulfur 16 | 35.5 Cl Chlorine 17 | 40 Ar Argon 18 |
| 4 | 39 K Potassium 19 | 40 Ca Calcium 20 | 45 Sc Scandium 21 | 48 Ti Titanium 22 | 51 V Vanadium 23 | 52 Cr Chromium 24 | 55 Mn Manganese 25 | 56 Fe Iron 26 | 59 Co Cobalt 27 | 59 Ni Nickel 28 | 63.5 Cu Copper 29 | 65 Zn Zinc 30 | 70 Ga Gallium 31 | 73 Ge Germanium 32 | 75 As Arsenic 33 | 79 Se Selenium 34 | 80 Br Bromine 35 | 84 Kr Krypton 36 | | | | |
| 5 | 86 Rb Rubidium 37 | 88 Sr Strontium 38 | 89 Y Yttrium 39 | 91 Zr Zirconium 40 | 93 Nb Niobium 41 | 96 Mo Molybdenum 42 | 99 Tc Technetium 43 | 101 Ru Ruthenium 44 | 103 Rh Rhodium 45 | 106 Pd Palladium 46 | 108 Ag Silver 47 | 112 Cd Cadmium 48 | 115 In Indium 49 | 119 Sn Tin 50 | 122 Sb Antimony 51 | 128 Te Tellurium 52 | 127 I Iodine 53 | 131 Xe Xenon 54 | | | | |
| 6 | 133 Cs Caesium 55 | 137 Ba Barium 56 | 139 La Lanthanum 57 | 179 Hf Hafnium 72 | 181 Ta Tantalum 73 | 184 W Tungsten 74 | 186 Re Rhenium 75 | 190 Os Osmium 76 | 192 Ir Iridium 77 | 195 Pt Platinum 78 | 197 Au Gold 79 | 201 Hg Mercury 80 | 204 Tl Thallium 81 | 207 Pb Lead 82 | 209 Bi Bismuth 83 | 210 Po Polonium 84 | 210 At Astatine 85 | 222 Rn Radon 86 | | | | |
| 7 | 223 Fr Francium 87 | 226 Ra Radium 88 | 227 Ac Actinium 89 | | | | | | | | | | | | | | | | | | | |

Key

| |
|----------------------|
| Relative atomic mass |
| Symbol |
| Name |
| Atomic number |



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Answer ALL questions.

1 The melting points of three related compounds are

capric acid 32 °C

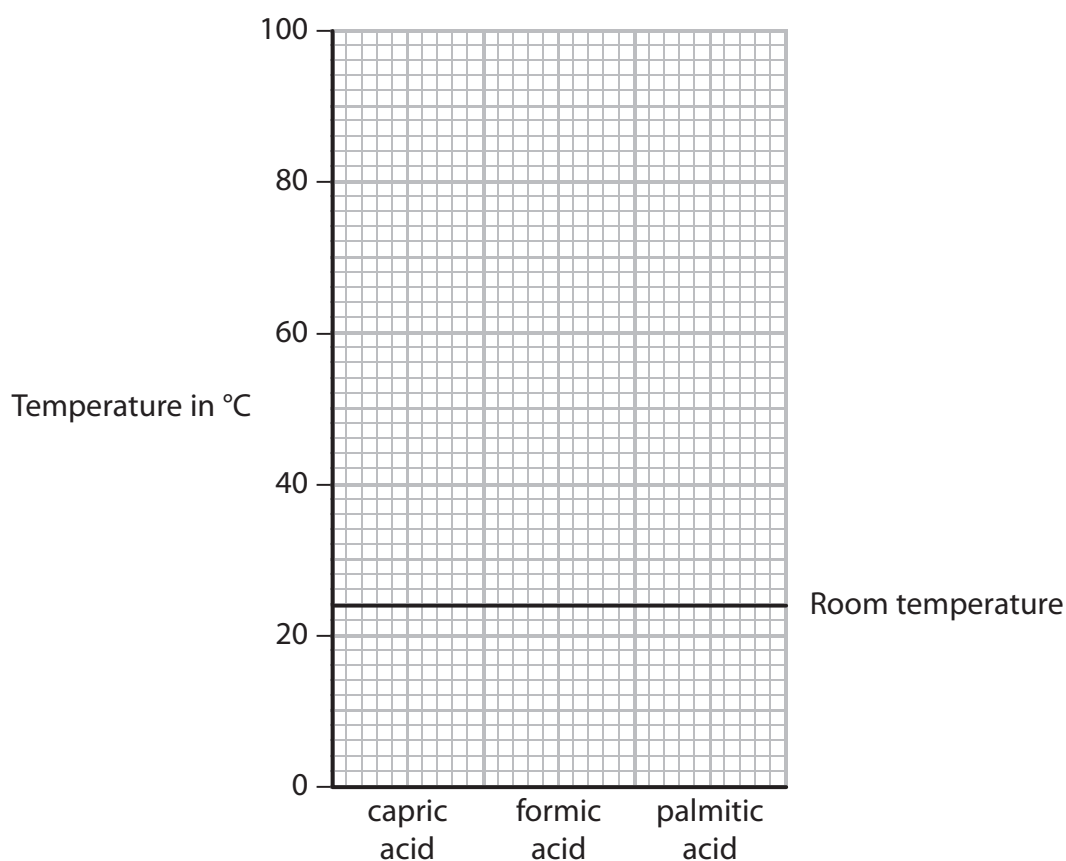
formic acid 8 °C

palmitic acid 63 °C

The boiling point of all these compounds is above 100 °C

(a) Use the grid to draw a bar chart of the melting points.

(2)



(b) Room temperature has been marked on the grid.

Use your bar chart to give the physical state of each acid at room temperature.

(2)

capric acid

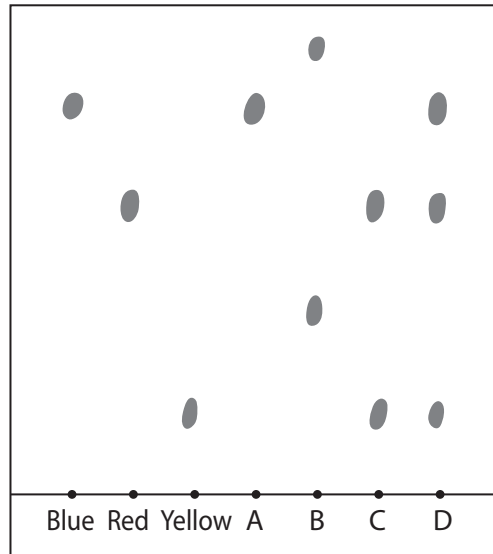
formic acid

palmitic acid

(Total for Question 1 = 4 marks)



2 A student produces this chromatogram for four dyes, **A**, **B**, **C** and **D**.



(a) Put a cross (☒) in a box to indicate your answer.

(i) Which one of the dyes contains three colours?

(1)

A

B

C

D

(ii) Which one of the dyes contains one colour only?

(1)

A

B

C

D

(b) Each dye is made from one or more of the colours blue, red and yellow.

The student thinks that the result for one dye is incorrect.

Suggest which result is incorrect. Explain your answer.

(2)

The incorrect result is

because

.....

(Total for Question 2 = 4 marks)



3 The photograph shows an aeroplane that has a rocket motor.



(a) One of the tanks on the aeroplane contains liquid oxygen.

(i) Complete the diagram to show the arrangement of the particles in a liquid. One particle has been drawn for you.

(2)



(ii) Much more oxygen can be stored in the tank when the oxygen is a liquid rather than a gas.

Give a reason for this in terms of the arrangement of the particles.

(1)

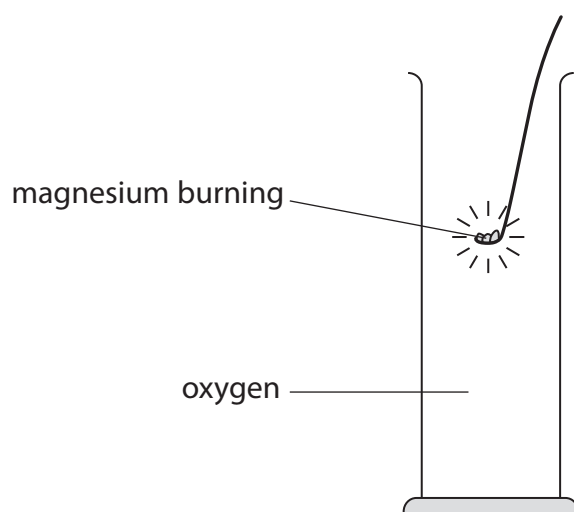
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(b) Magnesium burns in oxygen to form magnesium oxide.



(i) State **two** observations that can be made when magnesium burns in oxygen.

(2)

1

2

(ii) Give the formula of magnesium oxide.

(1)

(c) A small amount of magnesium oxide is dissolved in water. When universal indicator is added to this solution, the indicator turns blue.

(i) What does the observation with the indicator show about magnesium oxide?

(1)

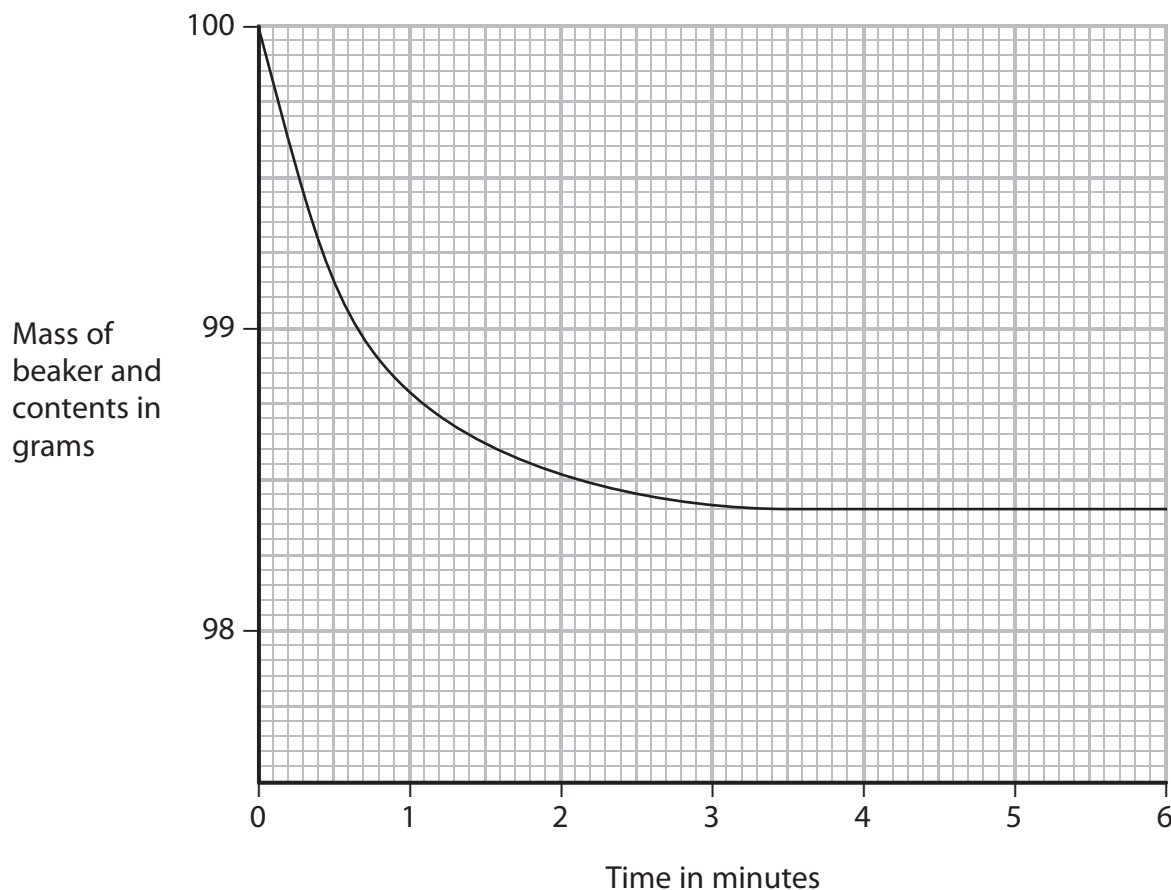
(ii) Identify the ion that is responsible for the universal indicator turning blue.

(1)

(Total for Question 3 = 8 marks)



- 4 An excess of dilute hydrochloric acid was added to a lump of calcium carbonate in a beaker. The mass of the beaker and contents was recorded every 30 seconds. The graph shows the results.



The equation for the reaction is



- (a) State **two** observations that can be made when dilute hydrochloric acid is added to calcium carbonate.

(2)

1

2

- (b) Give the test for carbon dioxide gas.

(2)

Test

Result



(c) Describe the relationship between the mass of the beaker and contents, and the time. (1)

(d) (i) After how many minutes did the reaction stop? (1)

(ii) State why the reaction eventually stopped. (1)

(e) Identify the compounds, other than water, present in the solution in the beaker
(i) after two minutes (1)

(ii) after five minutes (1)

(f) The experiment was repeated using the same mass of calcium carbonate, but as a powder instead of a single lump.

On the graph, sketch the curve you would expect to obtain from this second experiment. (2)

(Total for Question 4 = 11 marks)



5 **Soluble salts** can be made by reacting an acid with a metal hydroxide, a metal oxide, or a metal carbonate.

Insoluble salts can be made by using a precipitation reaction.

(a) Complete the table to show which acid or metal compound is used to make each salt listed.

For each metal compound, state whether it would be used as a solid or in aqueous solution.

(5)

| Salt made | Acid used | Metal compound | |
|--------------------|-------------------|---------------------|---------------------------|
| | | Name | Solid or aqueous solution |
| copper(II) sulfate | | copper(II) oxide | |
| silver chloride | hydrochloric acid | | aqueous solution |
| potassium nitrate | | potassium carbonate | |

(b) An acid is a source of hydrogen ions, H^+

Write an equation to show the ions formed when sulfuric acid is dissolved in water.

(2)



6 This is a recipe for making plum wine.

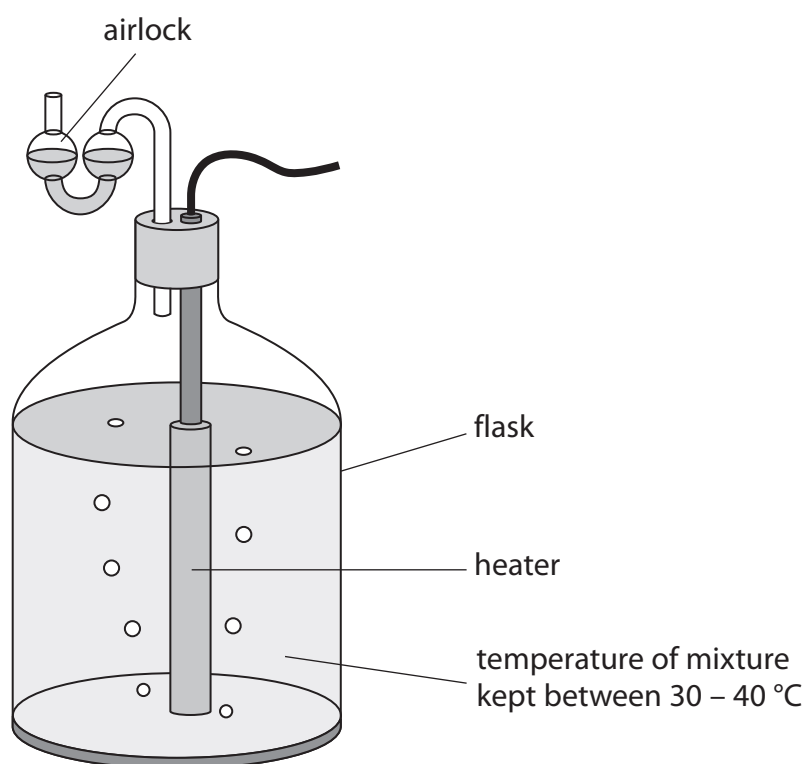
Dissolve 1.5 kg of sugar in 5 dm³ of warm water.

Add yeast and 8 kg of plums.

Pour the mixture into a flask.

Leave the flask for several weeks until the reaction has stopped.

Remove the solid yeast and pour the clear liquid into bottles.



(a) Sugar contains sucrose, $C_{12}H_{22}O_{11}$

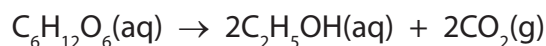
When yeast is added, water reacts with sucrose to form glucose, $C_6H_{12}O_6$

Write a chemical equation for this reaction.

(1)



(b) The glucose is then converted into ethanol by the yeast



(i) How would you know when the reaction has stopped? (1)

(ii) How could the solid yeast be removed from the mixture? (1)

(c) Ethanol can be converted into chloroethene, $\text{CH}_2=\text{CHCl}$, in three stages.

Stage 1 Ethanol is dehydrated to form ethene, $\text{CH}_2=\text{CH}_2$

Stage 2 Ethene is converted into 1,2-dichloroethane, $\text{CH}_2\text{ClCH}_2\text{Cl}$

Stage 3 1,2-dichloroethane is converted into chloroethene and hydrogen chloride

(i) Why is the reaction in **Stage 1** described as dehydration? (1)

(ii) Identify the catalyst used in the reaction in **Stage 1**. (1)

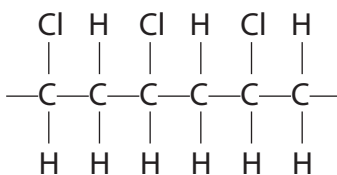
(iii) Suggest the name or formula of the substance used to react with ethene in **Stage 2**. (1)

(iv) Write a chemical equation for the reaction in **Stage 3**. (1)



(d) Chloroethene can be used to make the polymer poly(chloroethene), also known as PVC.

The displayed formula for part of the PVC molecule is



(i) Draw a displayed formula for a chloroethene molecule.

(1)

(ii) Describe, in terms of structure and bonding, what happens when chloroethene molecules are converted into poly(chloroethene).

(3)

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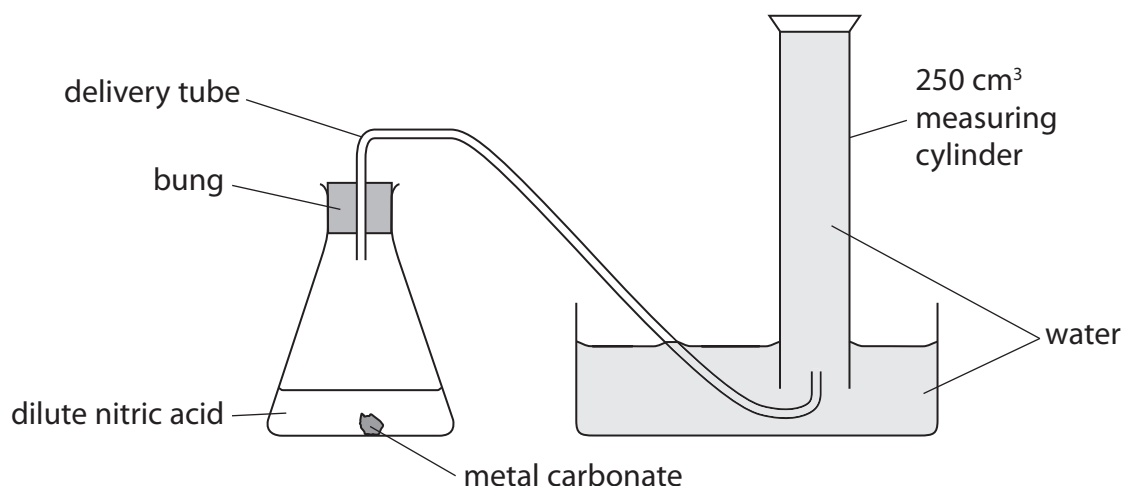
(Total for Question 6 = 11 marks)



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- 7 A student set up this apparatus to measure the volume of carbon dioxide given off when a sample of a carbonate of a Group 2 metal was reacted with dilute nitric acid.



She weighed out some of the carbonate and put it in a conical flask. She then added an excess of dilute nitric acid.

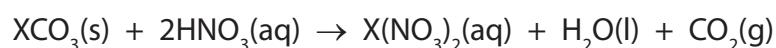
After adding the acid she placed the bung and delivery tube into the conical flask.

She measured the total volume of gas collected at room temperature and pressure (rtp) in the measuring cylinder.

Her results are shown in the table.

| | |
|---------------------------|---------------------|
| Mass of Group 2 carbonate | 0.888 g |
| Volume of gas collected | 144 cm ³ |

The equation for the reaction is



where X is the symbol for the Group 2 metal.



- (a) (i) Calculate the amount, in moles, of carbon dioxide gas collected.
(Assume that one mole of gas has a volume of 24 000 cm³ at rtp)

(2)

Amount of carbon dioxide gas collected = mol

- (ii) Deduce the amount, in moles, of the carbonate that reacted.

(1)

Amount of carbonate reacted = mol

- (iii) Using the mass of the carbonate and your answer to (a)(ii), calculate the relative formula mass (M_r) of this carbonate.

Give your answer to the nearest whole number.

(2)

Relative formula mass =

- (iv) Calculate a value for the relative atomic mass of the Group 2 metal, X, and use the Periodic Table on page 2 to suggest its identity.

(3)

Relative atomic mass of X =

Identity of X =



(b) After the student had completed the experiment she was told that the metal carbonate was calcium carbonate.

She calculated that 0.888 g of calcium carbonate would produce 213 cm³ of carbon dioxide.

She was certain that she had measured the mass of the metal carbonate correctly.

Suggest **two** reasons why the volume of gas she collected was less than 213 cm³.

(2)

1

.....

2

.....

(Total for Question 7 = 10 marks)

(TOTAL FOR PAPER = 60 MARKS)



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