Write your name here

Surname	Other names

Edexcel Certificate
Edexcel International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Chemistry

Unit: KCH0/4CH0
Paper: 2C

Wednesday 16 January 2013 – Morning
Time: 1 hour

Paper Reference
KCH0/2C
4CH0/2C

You must have:
Ruler
Calculator

Total Marks

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

1/1/1/1/1/

P 4 1 5 3 9 A 0 1 2 0

PEARSON

THE PERIODIC TABLE

Period	1	2											3	4	5	6	7	0
	Group																	
1	1 H Hydrogen 1																	4 He Helium 2
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.

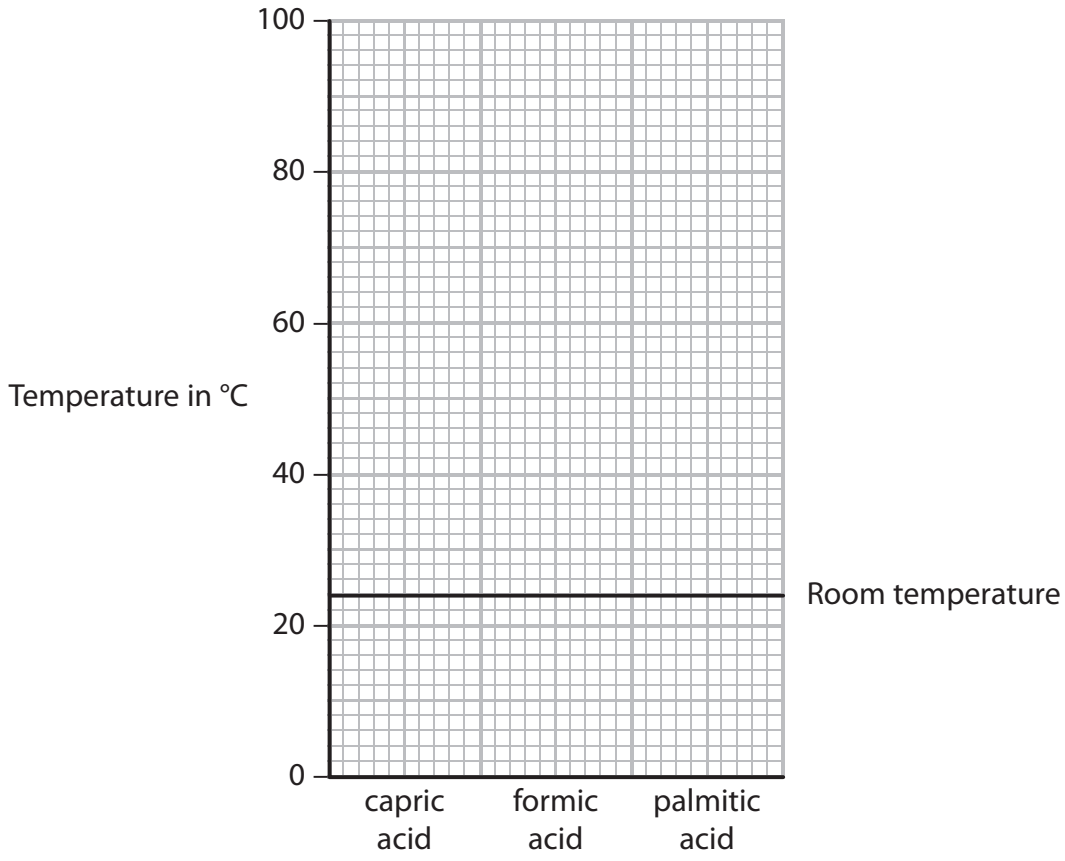
1 The melting points of three related compounds are

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)

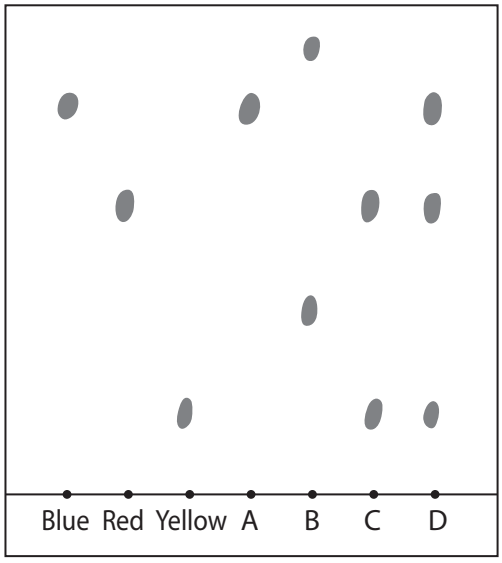
capric acid .....

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 .....

.....

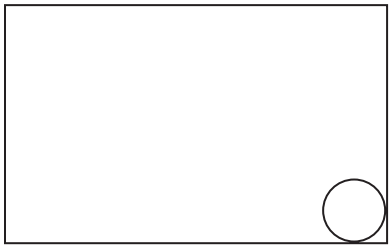
(Total for Question 2 = 4 marks)

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.

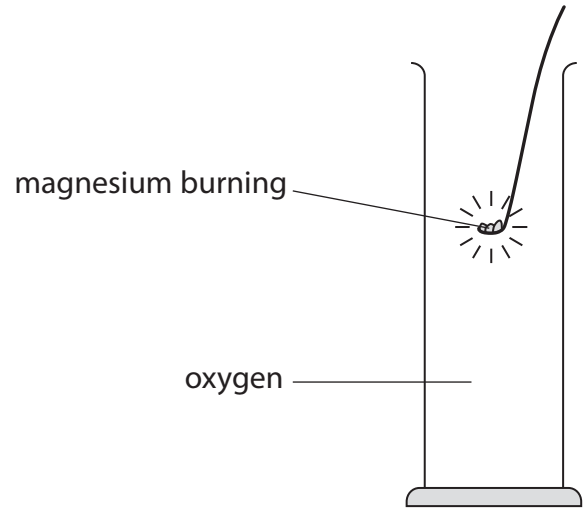
(1)

.....

.....

.....

(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)

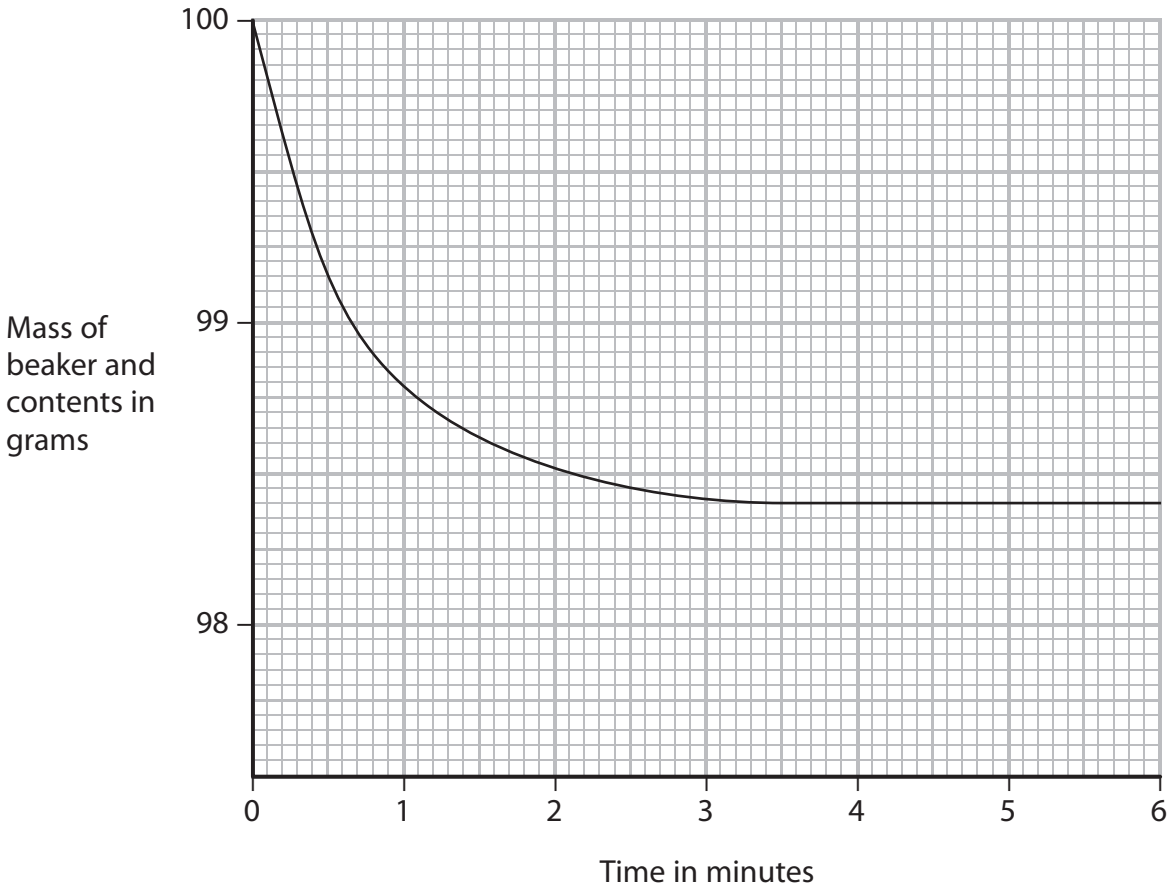
.....

(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

$$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$$

(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)

(c) Lead(II) chloride is an insoluble salt that can be prepared by reacting lead(II) nitrate with sodium chloride.

Describe how you would prepare a **pure**, **dry** sample of lead(II) chloride starting from solid lead(II) nitrate and solid sodium chloride.

(5)

(Total for Question 5 = 12 marks)

6 This is a recipe for making plum wine.

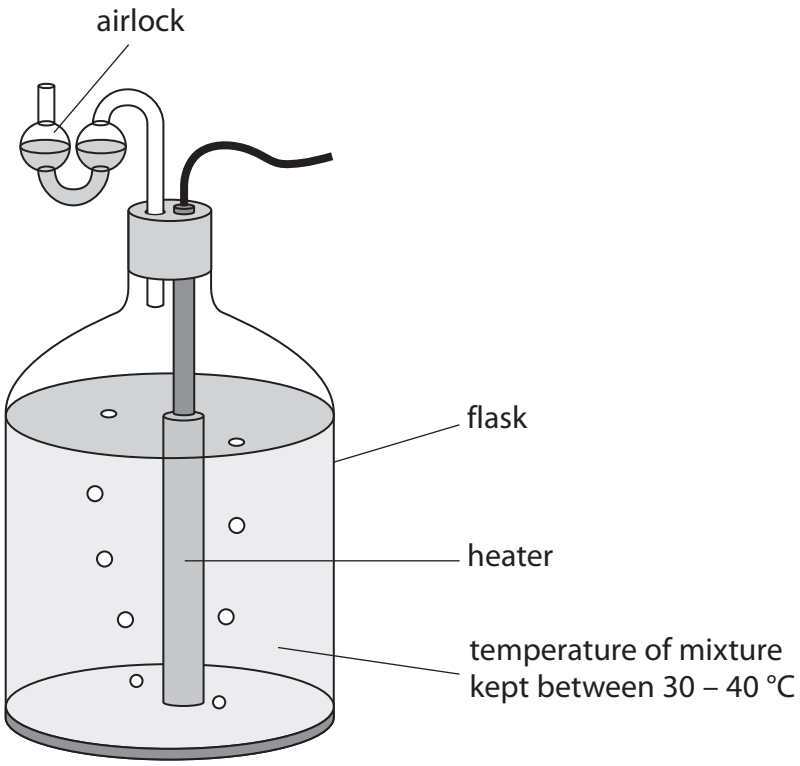
Dissolve 1.5 kg of sugar in 5 dm^3 of warm water.

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

$$C_6H_{12}O_6(aq) \rightarrow 2C_2H_5OH(aq) + 2CO_2(g)$$

(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, $CH_2{=}CHCl$, in three stages.

Stage 1 Ethanol is dehydrated to form ethene, $CH_2{=}CH_2$

Stage 2 Ethene is converted into 1,2-dichloroethane, CH_2ClCH_2Cl

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)

.....

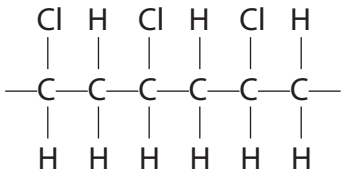
(iv) Write a chemical equation for the reaction in **Stage 3**.

(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)

(Total for Question 6 = 11 marks)

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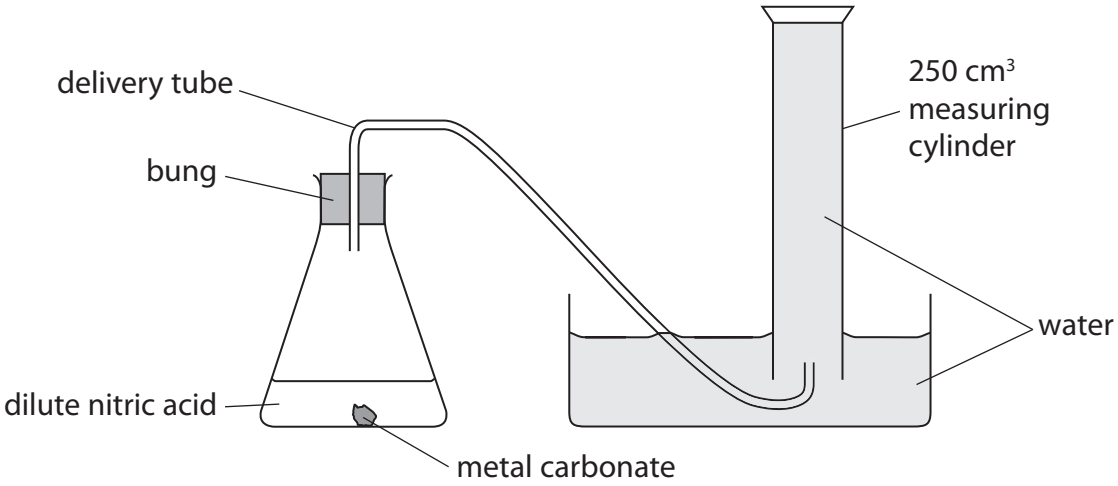
7 A student set up this apparatus to measure the volume of carbon dioxide given off when a sample of a carbonate of a Group 2 metal was reacted with dilute nitric acid.



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

$$XCO_3(s) + 2HNO_3(aq) \rightarrow X(NO_3)_2(aq) + H_2O(l) + CO_2(g)$$

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 cm^3 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 cm^3 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 cm^3.

(2)

1 .....

.....

2 .....

.....

(Total for Question 7 = 10 marks)

(TOTAL FOR PAPER = 60 MARKS)

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