Write your name here

Surname	Other names

Edexcel Certificate
Edexcel International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

Chemistry

Unit: KCH0/4CH0
Paper: 2C

Monday 10 June 2013 – Afternoon
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 ▶

P41555A

1/1/1/1/

P 4 1 5 5 5 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

Answer ALL questions.

1 The box shows some methods that can be used in separating mixtures.

crystallisation	dissolving	evaporation	filtration
paper chromatography	simple distillation	fractional distillation	

From the box, select the best method for each of the separations.

You may use each method once, more than once or not at all.

(a) Removing sand from a mixture of sand and water.

(1)

.....

(b) Obtaining pure water from a salt solution.

(1)

.....

(c) Extracting the red dye from a sample of rose petals.

(1)

.....

(d) Separating the coloured dyes in a sample of green ink.

(1)

.....

(e) Obtaining ethanol (alcohol) from a mixture of ethanol and water.

(1)

.....

(Total for Question 1 = 5 marks)

2 Part of the pH scale is shown.

pH	1 ---------- 7 ---------- 14		
	strongly acidic solution	neutral	strongly alkaline solution

Some of these experiments involve a pH change.

A sodium chloride (common salt) is dissolved in pure water

B carbon dioxide gas is dissolved in pure water

C sodium hydroxide solution is neutralised by adding dilute hydrochloric acid

D excess sodium hydroxide solution is added to a weakly acidic solution

E ammonia gas is dissolved in pure water

The table shows the pH at the start and at the end of the five experiments.
Complete the table by inserting the appropriate letter in each box. You may use each letter only once.

The first one has been done for you.

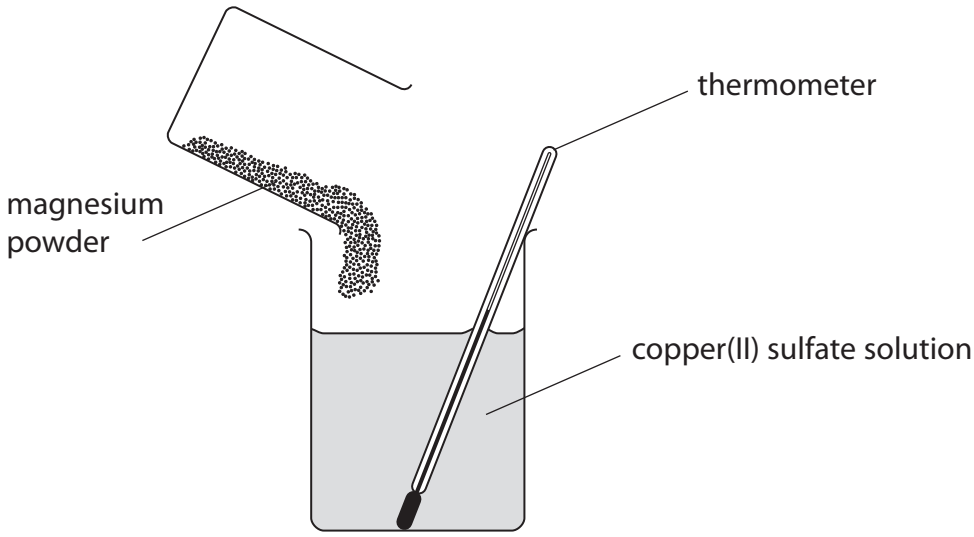
(4)

pH at start	pH at end	Experiment
5	14	D
7	7	
7	11	
14	7	
7	6	

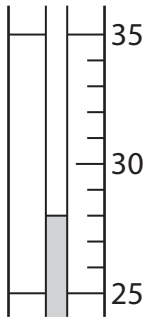
(Total for Question 2 = 4 marks)

3 A student measured the temperature change when 0.5 g of magnesium powder was added to 50 cm^3 of copper(II) sulfate solution.

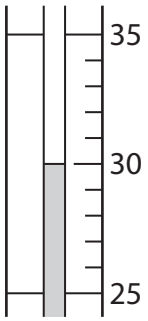
She repeated the experiment using 1.0 g, 1.5 g and 2.0 g of magnesium powder.



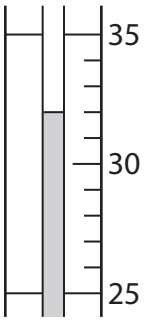
The diagrams of the thermometer show the highest temperature, in °C, reached in each of the experiments.



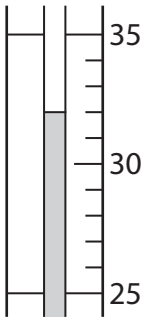
0.5 g of magnesium



1.0 g of magnesium



1.5 g of magnesium



2.0 g of magnesium

(a) Use the thermometer readings to complete the table of results.

(2)

Mass of magnesium in g	Initial temperature in °C	Highest temperature in °C	Temperature rise in °C
0.5	25		
1.0	24		
1.5	23		
2.0	23		

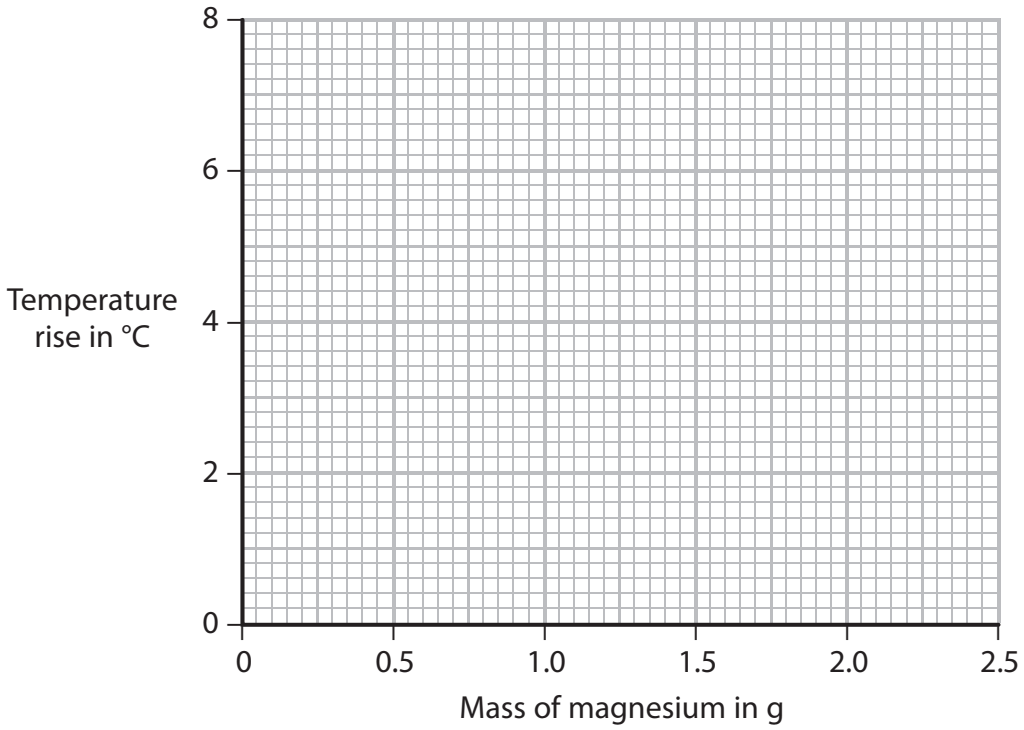
(b) A second student carried out the experiment. The table shows his results.

Mass of magnesium in g	Temperature rise in °C
0.5	2
1.0	4
1.5	6
2.0	6
2.5	6

(i) Plot the points on the grid.

Draw a straight line through the first three points and another straight line through the last two points. Make sure that the two lines cross.

(3)



(ii) Use your graph to find the mass of magnesium required to produce a temperature rise of 3 °C.

(1)

.....

(c) Suggest why the last three temperature rises were the same.

(1)

.....

(d) State and explain the effect on the temperature rises if the student were to repeat the experiment using the same masses of zinc powder instead of magnesium powder.

Do not refer to the difference in reactivity of the two metals.

[relative atomic masses: Mg = 24; Zn = 65]

(2)

.....

.....

.....

.....

(Total for Question 3 = 9 marks)

4 (a) Plastic bags used to store food are made from a polymer.

Ethene is the monomer used to make the polymer for some plastic bags.

(i) Name the polymer that is made from ethene.

(1)

.....

(ii) Use a word from the box to complete the sentence about ethene.

chromatography	condensing	cracking	crystallising

(1)

Ethene is made by breaking down large hydrocarbon molecules into smaller hydrocarbon molecules, using a process called .....

(b) The hydrocarbons used to make ethene are called alkanes.

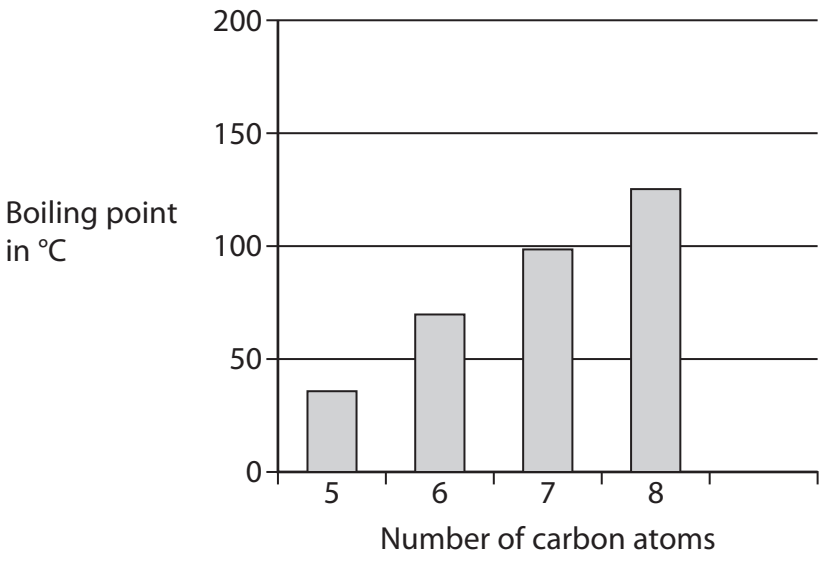
They are obtained from crude oil.

The boiling point of an alkane is related to the number of carbon atoms in the molecule.

Number of carbon atoms in molecule	5	6	7	8	9
Boiling point in °C	36	69	99	125	151

(i) Use the data in the table to complete the bar chart.

(2)



(ii) What is the relationship between the boiling point of an alkane and the number of carbon atoms in its molecule?

(1)

.....

.....

.....

.....

(c) Many plastic bags are not biodegradable.

Used plastic bags can be

A buried underground, which is called landfill

or

B burned to release energy, which also produces large amounts of gases.

Suggest which of these methods of disposal is better for the environment, giving two reasons for your choice.

(2)

Choice .....

Reason 1 .....

.....

.....

.....

Reason 2 .....

.....

.....

.....

(Total for Question 4 = 7 marks)

5 This information was taken from a label on a packet containing a pizza.

Nutritional information	**(per ½ pizza)**
Energy	1260 kJ
Protein	14.0 g
Carbohydrate	370 g
sugars	62 g
Fat	106 g
saturated	50 g
unsaturated	56 g

(a) (i) Which type of fat contains a double carbon to carbon (C═C) bond?

(1)

.....

(ii) The colour of bromine water is orange.

State the final colour of the mixture after bromine water is shaken with

(2)

an unsaturated fat .....

a saturated fat .....

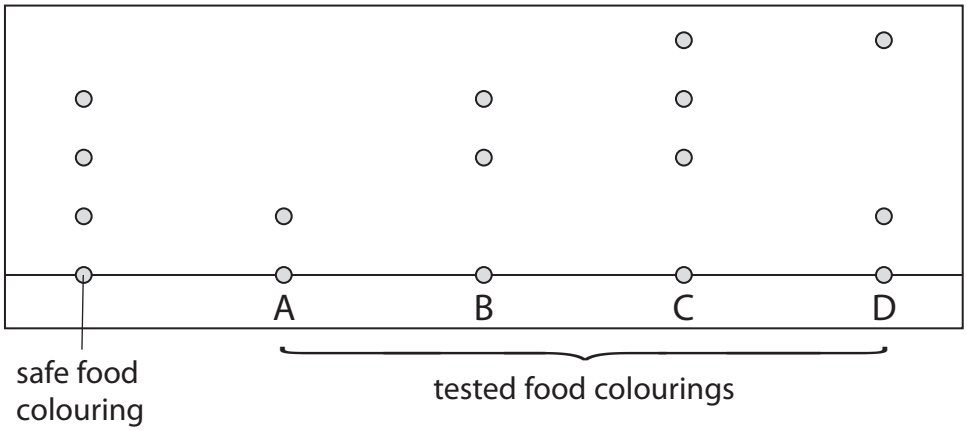
(iii) What type of reaction takes place when bromine reacts with a compound containing a C═C bond?

(1)

.....

(b) In February 2005, some companies had to remove their pizzas from sale because the food colourings in them were found to contain the artificial dye called Sudan 1, which is known to cause cancer.

The chromatogram shows how the dyes in the colourings were detected and identified.



(i) Which one of the food colourings, A, B, C or D, is made up of only one dye?

(1)

.....

(ii) Identify the food colourings that may have contained Sudan 1.

(1)

.....

(iii) Explain how the chromatogram shows that the five food colourings are different from each other.

(1)

.....

.....

.....

.....

.....

(Total for Question 5 = 7 marks)

6 Sodium (Na) and sodium chloride (NaCl) both have lattice structures.

Their melting points are shown in the table.

	Melting point in °C	Type of lattice structure
sodium	98	giant metallic
sodium chloride	801	

(a) Complete the table by stating the type of lattice structure in sodium chloride.

(1)

(b) Explain why sodium and sodium chloride have different melting points.

In your answer you should refer to

- the types of particle
- the types of forces between the particles in each substance

(5)

(c) The equation shows the reaction of sodium with water.

$$2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$$

A sample of sodium of mass 0.138 g reacts with excess water.

Calculate the volume of hydrogen, in cm^3, produced at room temperature and pressure (rtp).

[The volume of one mole of a gas at rtp is 24 000 cm^3]

(3)

Volume of gas produced = ... cm^3

(d) Sodium chloride can be made by many different reactions.

A student prepared a sample of sodium chloride using the following method.

Step 1 She added an excess of a solid sodium compound, X, to dilute hydrochloric acid. The mixture fizzed as the solid reacted.

Step 2 She filtered the mixture produced to remove the excess solid X. The filtrate was a colourless liquid.

Step 3 She evaporated the colourless liquid. A white solid remained.

(i) Describe a chemical test that the student could do to show that the colourless liquid in Step 2 contained chloride ions, Cl^-.

(3)

Test .....

.....

.....

Result .....

(ii) The student concluded that solid X was sodium hydroxide.

State one reason why this conclusion was **not** correct.

Suggest a possible identity of solid X.

(2)

Reason .....

.....

Solid X could be .....

(e) Sodium chloride can also be made by reacting sodium with chlorine gas.

Draw a dot and cross diagram to show the arrangement of the electrons in each of the ions in sodium chloride. Show the charge on each ion.

Show only the outer electrons.

(3)

(f) Potassium bromide can be made by reacting potassium with bromine gas.

Explain why it is difficult to be sure whether the reaction between potassium and bromine gas would be more vigorous than the reaction between sodium and chlorine gas.

(2)

.....

.....

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.....

.....

.....

.....

(Total for Question 6 = 19 marks)

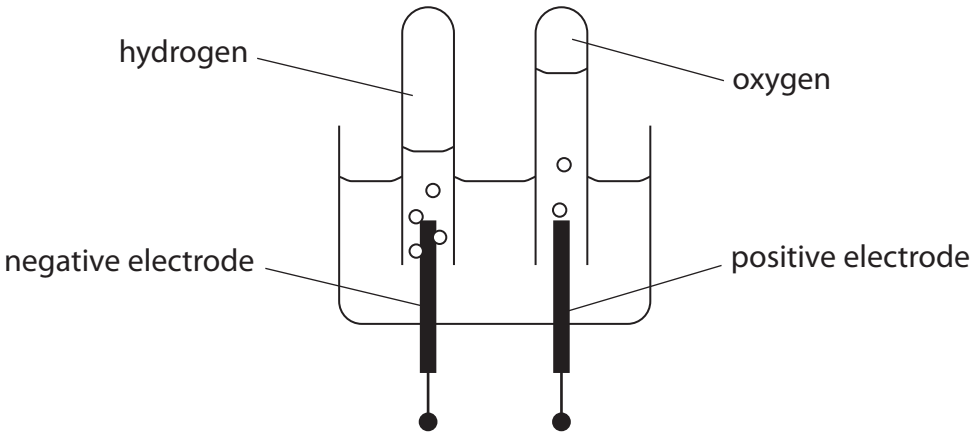
7 (a) The table shows some results of the electrolysis of aqueous solutions using inert electrodes. The solutions were electrolysed under the same conditions.

Use the information given to complete the table.

(3)

Solution	Product at the negative electrode	Product at the positive electrode	Substance left in solution at the end of the electrolysis
copper(II) sulfate	copper	oxygen	sulfuric acid
potassium sulfate	hydrogen	oxygen	potassium sulfate
silver nitrate	silver	oxygen	nitric acid
silver sulfate		oxygen	sulfuric acid
potassium nitrate	hydrogen		

(b) Water can be decomposed by electrolysis using this apparatus.



(i) Suggest a suitable element for the inert electrodes.

(1)

.....

(ii) Suggest why a small amount of dilute acid is added to the water before it is electrolysed.

(1)

.....

.....

(c) (i) The overall equation for the decomposition of water is

$$2H_2O(l) \rightarrow 2H_2(g) + O_2(g)$$

Use this equation to explain why the volume of hydrogen collected should be twice that of the volume of oxygen.

(1)

.....

.....

.....

(ii) The volume of oxygen collected is always slightly less than expected, even though there are no leaks in the apparatus.

Suggest a reason for this.

(1)

.....

.....

(d) The equation represents the formation of hydrogen gas at the negative electrode.

$$2H_2O(l) + 2e^- \rightarrow 2OH^-(aq) + H_2(g)$$

During electrolysis, 482 500 coulombs were passed through the solution.

Calculate the amount, in moles, of hydrogen gas formed.

[One faraday = 96 500 coulombs]

(2)

Amount of hydrogen gas formed = ... mol

(Total for Question 7 = 9 marks)

TOTAL FOR PAPER = 60 MARKS

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