

Write your name here

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Pearson Edexcel Certificate
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International GCSE

Centre Number

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Candidate Number

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Chemistry

Unit: KCH0/4CH0

Paper: 2C

Thursday 16 January 2014 – 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.
- Some questions must be answered with a cross in a box (☒). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒).

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 ►

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THE PERIODIC TABLE

Period 1 2 3 4 5 6 7 0

Group

4	He	Helium	2
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1	H	Hydrogen	1
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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
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
39	K	Potassium	19	40	Ca	Calcium	20	70	Ga	Gallium	31	73	Ge	Germanium	32	75	As	Arsenic	33	79	Se	Selenium	34	80	Br	Bromine	35	84	Kr	Krypton	36
86	Rb	Rubidium	37	88	Sr	Strontium	38	115	In	Indium	49	119	Sn	Tin	50	122	Sb	Antimony	51	128	Te	Tellurium	52	127	I	Iodine	53	131	Xe	Xenon	54
133	Cs	Caesium	55	137	Ba	Barium	56	204	Tl	Thallium	81	207	Pb	Lead	82	209	Bi	Bismuth	83	210	Po	Polonium	84	210	At	Astatine	85	222	Rn	Radon	86
223	Fr	Francium	87	226	Ra	Radium	88	201	Hg	Mercury	80	197	Au	Gold	79	195	Pt	Platinum	78	192	Ir	Iridium	77	197	Au	Gold	79	227	Ac	Actinium	89
								59	Co	Cobalt	27	59	Ni	Nickel	28	59	Ni	Nickel	28	56	Fe	Iron	26	63.5	Cu	Copper	29	65	Zn	Zinc	30
								103	Rh	Rhodium	45	106	Pd	Palladium	46	108	Ag	Silver	47	112	Cd	Cadmium	48	108	Ag	Silver	47	112	Cd	Cadmium	48
								190	Os	Osmium	76	192	Ir	Iridium	77	195	Pt	Platinum	78	196	Re	Rhenium	75	197	Au	Gold	79	201	Hg	Mercury	80
								184	W	Tungsten	74	186	Re	Rhenium	75	192	Ir	Iridium	77	196	Os	Osmium	76	197	Au	Gold	79	201	Hg	Mercury	80
								91	Zr	Zirconium	40	93	Nb	Niobium	41	96	Mo	Molybdenum	42	101	Ru	Ruthenium	44	106	Pd	Palladium	46	112	Cd	Cadmium	48
								179	Hf	Hafnium	72	181	Ta	Tantalum	73	184	W	Tungsten	74	190	Os	Osmium	76	192	Ir	Iridium	77	195	Pt	Platinum	78
								89	Y	Yttrium	39	89	Nb	Niobium	41	93	Nb	Niobium	41	101	Ru	Ruthenium	44	106	Pd	Palladium	46	112	Cd	Cadmium	48
								139	La	Lanthanum	57	139	La	Lanthanum	57	184	W	Tungsten	74	190	Os	Osmium	76	192	Ir	Iridium	77	195	Pt	Platinum	78
								227	Ac	Actinium	89	227	Ac	Actinium	89	184	W	Tungsten	74	190	Os	Osmium	76	192	Ir	Iridium	77	195	Pt	Platinum	78

Key

Relative atomic mass
Symbol
Name
Atomic number



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Answer ALL questions.

1 The table shows the numbers of particles in two atoms, L and M.

	Atom L	Atom M
number of electrons	6	6
number of neutrons	8	6
number of protons	6	6

(a) Which particles are present in the nuclei of both atoms?

(1)

- A electrons and neutrons
- B electrons and protons
- C neutrons and protons
- D neutrons, protons and electrons

(b) (i) The atomic number of atom L is

(1)

(ii) The mass number of atom L is

(1)

(c) Atoms L and M are neutral because

(1)

- A the numbers of electrons and neutrons are equal
- B the numbers of electrons and protons are equal
- C the numbers of neutrons and protons are equal
- D the numbers of electrons, neutrons and protons are equal



(d) Use information from the table to explain why atoms L and M are isotopes of the same element.

(2)

.....

.....

.....

.....

(e) The electronic configuration of atom M is

(1)

- A** 2.2.2
- B** 2.4
- C** 2.4.6
- D** 4.2

(Total for Question 1 = 7 marks)



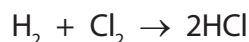
2 Bromine, chlorine, fluorine and iodine are elements in Group 7 of the Periodic Table.

(a) Which two of these elements have the darkest colours?

(1)

..... and

(b) The equation for the reaction between hydrogen and chlorine is



Different names are used for the product, depending on its state symbol.

(i) What are the names used for HCl(g) and HCl(aq)?

(2)

HCl(g)

HCl(aq)

(ii) The presence of HCl(g) can be confirmed by adding ammonia (NH₃) gas.

State the observation in the reaction between HCl(g) and ammonia gas and write a chemical equation for the reaction.

(2)

observation

.....

chemical equation

(iii) The presence of chloride ions in HCl(aq) can be shown by mixing it with silver nitrate solution and dilute nitric acid.

State the result of this test and complete the chemical equation for the reaction by adding the state symbols.

(3)

result

.....



(c) Solution X is made by dissolving HCl(g) in water.

Solution Y is made by dissolving HCl(g) in methylbenzene.

A student added magnesium ribbon and blue litmus paper to separate samples of each solution.

The table shows her results.

Test	Solution X	Solution Y
magnesium ribbon added	bubbles	no change
blue litmus paper added	goes red	stays blue

(i) What substance is responsible for the bubbles?

(1)

(ii) State one change to the magnesium ribbon that could be seen after adding it to solution X.

(1)

(iii) What does the colour change of the litmus paper show about solution X?

(1)

(iv) Why does the litmus paper stay blue in solution Y?

(1)

(Total for Question 2 = 12 marks)

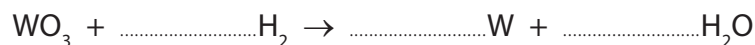


3 Tungsten is a useful metal. It has the chemical symbol W.

(a) One method of extracting tungsten involves heating a tungsten compound (WO_3) with hydrogen.

(i) Suggest the chemical name of WO_3 (1)

(ii) Balance the equation for the reaction between WO_3 and hydrogen. (1)



(iii) Why is this reaction described as reduction? (1)

(b) Scheelite is an ore of tungsten.

The main compound in scheelite has the percentage composition by mass
Ca = 13.9%, W = 63.9%, O = 22.2%.

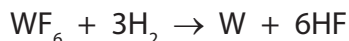
Calculate the empirical formula of this compound. (3)

empirical formula =



(c) Tungsten can also be obtained by reacting tungsten fluoride with hydrogen.

The equation for this reaction is



(i) In an experiment, a chemist used 59.6 g of tungsten fluoride.

What is the maximum mass of tungsten he could obtain from 59.6 g of tungsten fluoride?

Relative formula mass of tungsten fluoride = 298

(2)

maximum mass = g

(ii) Starting with a different mass of tungsten fluoride, he calculates that the mass of tungsten formed should be 52.0 g. In his experiment he actually obtains 47.5 g of tungsten.

What is the percentage yield of tungsten in this experiment?

(2)

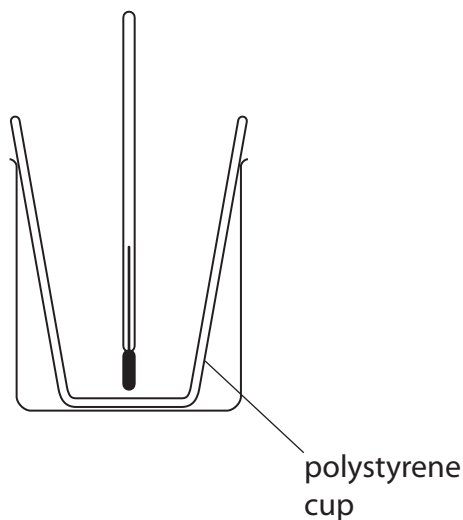
percentage yield = %

(Total for Question 3 = 10 marks)



4 A student investigated the neutralisation of acids by measuring the temperature changes when alkalis were added to acids of known concentrations.

He used this apparatus to add different volumes of sodium hydroxide solution to a fixed volume of dilute nitric acid.



He used this method.

- measure the temperature of 25.0 cm³ of the acid in the polystyrene cup
- add the sodium hydroxide solution in 5.0 cm³ portions until a total of 30.0 cm³ has been added

(a) State two properties of the sodium hydroxide solution that should be kept constant for each 5.0 cm³ portion.

(2)

1

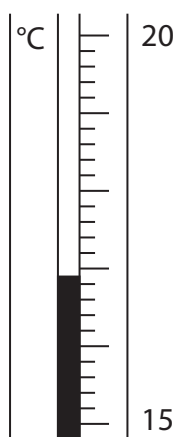
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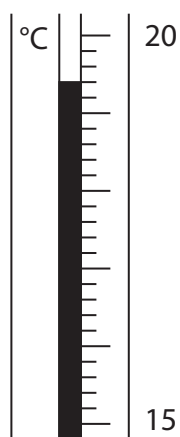
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(b) The diagram shows the thermometer readings in one experiment.



before adding alkali



after adding alkali

Write down the thermometer readings and calculate the temperature change.

(3)

temperature after adding alkali °C

temperature before adding alkali °C

temperature change °C



(c) The student carried out the experiment three times.

The table shows his results.

Volume of alkali added in cm ³	Temperature in °C		
	experiment 1	experiment 2	experiment 3
0.0	17.4	16.6	15.9
5.0	18.5	21.0	18.0
10.0	19.6	24.5	20.0
15.0	20.5	23.6	22.2
20.0	21.4	22.7	23.6
25.0	22.5	21.4	22.8
30.0	23.4	20.5	22.0

The teacher said that only the results for experiment 3 showed the expected increase and decrease in temperature.

(i) Why was there no temperature decrease in experiment 1?

(1)

- A The alkali was added too quickly
- B The starting temperature of the acid was too high
- C The acid concentration was half what it should have been
- D The volume of acid used was 50.0 cm³ instead of 25.0 cm³

(ii) Why were the temperature increases in experiment 2 much greater than expected?

(1)

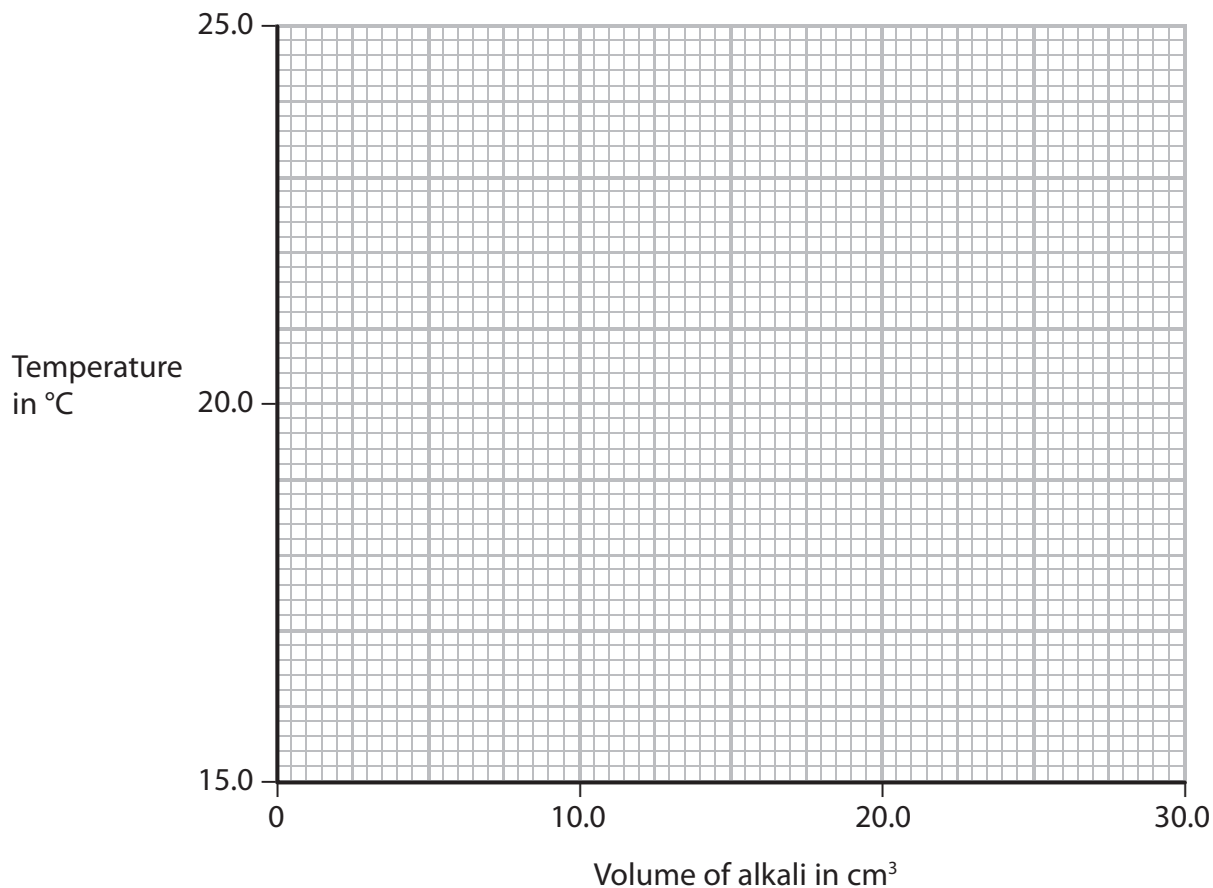
- A The starting temperature of the acid was too high
- B The acid concentration was double what it should have been
- C The volume of acid used was 50.0 cm³ instead of 25.0 cm³
- D The alkali was added in 10.0 cm³ portions but were recorded as 5.0 cm³ portions



(d) Plot the results of experiment 3 on the grid.

Draw a straight line of best fit through the first four points, and another straight line of best fit through the last three points. Make sure that the two lines cross.

(4)



(e) The point where the lines cross indicates the volume of alkali added to exactly neutralise the acid and also the maximum temperature reached.

Record these values.

(2)

volume of alkali..... cm³

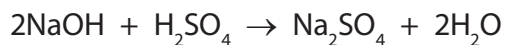
maximum temperature..... °C



- (f) Another student used sulfuric acid instead of nitric acid in her experiments. She started with 25.0 cm³ of sulfuric acid of concentration 0.650 mol/dm³.

She added 0.500 mol/dm³ sodium hydroxide solution until the acid was completely neutralised.

The equation for this reaction is



- (i) Calculate the amount, in moles, of sulfuric acid used.

(2)

amount = mol

- (ii) Calculate the amount, in moles, of sodium hydroxide needed to neutralise this amount of sulfuric acid.

(1)

amount = mol

- (iii) Calculate the volume, in cm³, of sodium hydroxide solution needed to neutralise this amount of sulfuric acid.

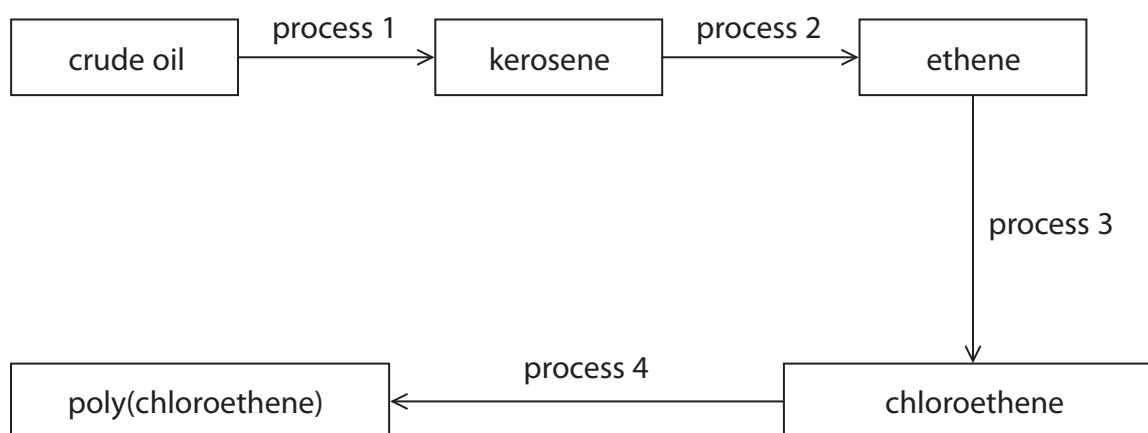
(2)

volume = cm³

(Total for Question 4 = 18 marks)



5 The diagram shows some important conversion processes used in the oil industry.



(a) Process 1 is called

(1)

- A catalytic cracking
- B condensation polymerisation
- C fractional distillation
- D thermal decomposition

(b) Describe the differences between crude oil and kerosene. In your answer you should refer to

- the average size of the molecules in the two liquids
- the covalent bonding in the molecules
- the viscosities of the two liquids

(3)

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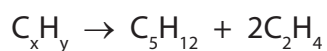
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(c) The equation for one reaction that could occur in process 2 is



(i) Deduce the formula of C_xH_y (1)

(ii) Give the name of the compound C_5H_{12} (1)

(iii) Draw the displayed formula of C_2H_4 (1)

(d) The structural formula of chloroethene formed in process 3 is $CH_2=CHCl$

The polymer formed in process 4 is poly(chloroethene).

Draw the **displayed** formula for the repeat unit of poly(chloroethene). (2)



(e) Poly(chloroethene) is formed by addition polymerisation.

Nylon is formed by condensation polymerisation.

(i) How does condensation polymerisation differ from addition polymerisation? (1)

.....

.....

(ii) Poly(chloroethene) and nylon do not biodegrade easily.

What is meant by the term **biodegrade**? (2)

.....

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.....

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(iii) What feature of addition polymers makes it difficult for them to biodegrade? (1)

.....

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(Total for Question 5 = 13 marks)

(TOTAL FOR PAPER = 60 MARKS)



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