

Write your name here

Surname

Other names

**Pearson Edexcel Certificate**

Centre Number

Candidate Number

**Pearson Edexcel  
International GCSE**

--	--	--	--	--

--	--	--	--

# Chemistry

**Unit: KCH0/4CH0**

**Paper: 2C**

Wednesday 15 June 2016 – Afternoon

**Time: 1 hour**

Paper Reference

**KCH0/2C  
4CH0/2C**

**You must have:**

Calculator, ruler

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.
- 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 ►

P45729A

©2016 Pearson Education Ltd.

1/1/1/



**PEARSON**

# THE PERIODIC TABLE

Period 1 2 3 4 5 6 7 0

1												<b>4</b> He Helium 2						
2	Li Lithium 3	Be Beryllium 4											Ne Neon 10					
3	Na Sodium 11	Mg Magnesium 12											Ar Argon 18					
4	K Potassium 19	Ca Calcium 20	Sc Scandium 21	Ti Titanium 22	V Vanadium 23	Cr Chromium 24	Mn Manganese 25	Fe Iron 26	Co Cobalt 27	Ni Nickel 28	Cu Copper 29	Zn Zinc 30	Ga Gallium 31	Ge Germanium 32	As Arsenic 33	Se Selenium 34	Br Bromine 35	Kr Krypton 36
5	Rb Rubidium 37	Sr Strontium 38	Y Yttrium 39	Zr Zirconium 40	Nb Niobium 41	Mo Molybdenum 42	Tc Technetium 43	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Ag Silver 47	Cd Cadmium 48	In Indium 49	Sn Tin 50	Sb Antimony 51	Te Tellurium 52	I Iodine 53	Xe Xenon 54
6	Cs Caesium 55	Ba Barium 56	La Lanthanum 57	Hf Hafnium 72	Ta Tantalum 73	W Tungsten 74	Re Rhenium 75	Os Osmium 76	Ir Iridium 77	Pt Platinum 78	Au Gold 79	Hg Mercury 80	Tl Thallium 81	Pb Lead 82	Bi Bismuth 83	Po Polonium 84	At Astatine 85	Rn Radon 86
7	Fr Francium 87	Ra Radium 88	Ac Actinium 89															

1	H
Hydrogen	1

Relative atomic mass
Symbol
Name
Atomic number

## Key

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

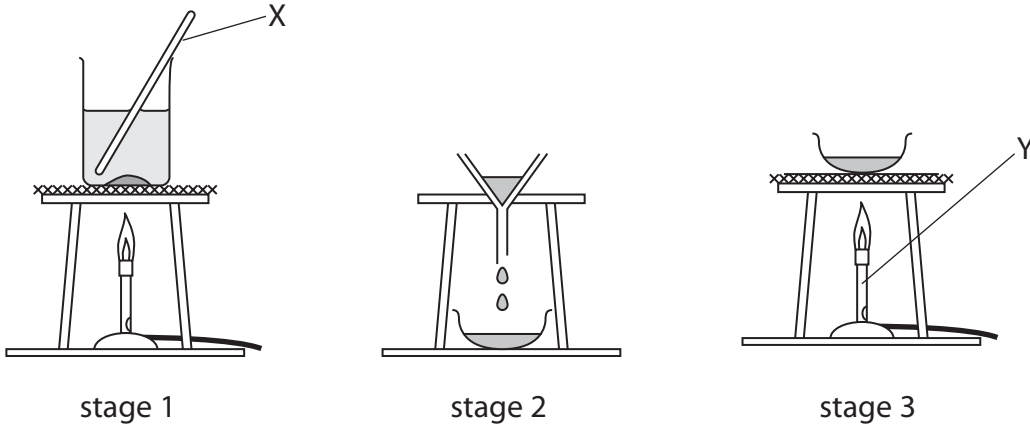
**BLANK PAGE**



**Answer ALL questions.**

**1** The diagram shows the apparatus a student uses to separate a mixture of salt and sand.

She adds the mixture to water in a beaker and then carries out the three stages shown.



(a) Give the names of the pieces of apparatus labelled X and Y.

(2)

X .....

Y .....

(b) (i) A liquid that dissolves substances is a

(1)

- A** solute
- B** solution
- C** solvent
- D** suspension

(ii) The clear liquid that forms in stage 1 is a

(1)

- A** solute
- B** solution
- C** solvent
- D** suspension



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(c) (i) At which stage, 1, 2 or 3, is the sand collected?

(1)

(ii) At which stage, 1, 2 or 3, is the salt collected?

(1)

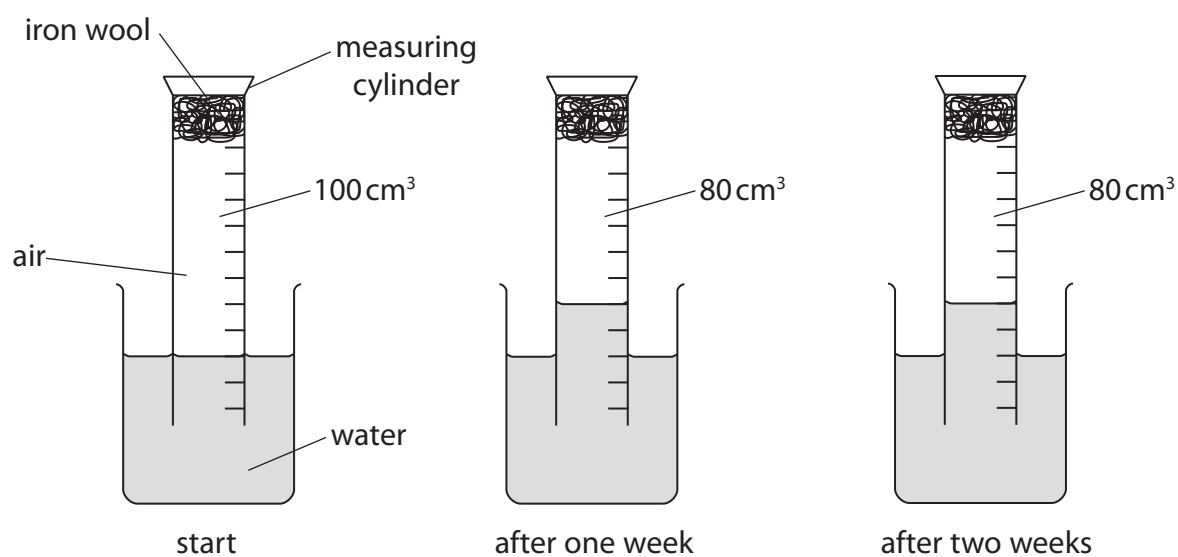
(d) What happens to the water in stage 3?

(1)

**(Total for Question 1 = 7 marks)**



2 The apparatus in the diagram was set up to demonstrate the rusting of iron.



- (a) One week after the start of the experiment the volume of gas in the measuring cylinder has decreased.

After two weeks there is no further decrease in volume of gas in the measuring cylinder.

Explain these observations.

(2)

.....

.....

.....

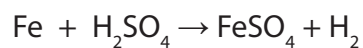
.....

.....

.....

.....

- (b) Iron reacts with dilute sulfuric acid. The chemical equation for this reaction is



Complete the word equation for the reaction.

(2)

Iron + sulfuric acid  $\rightarrow$  ..... + .....



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(c) Aqueous sodium hydroxide can be used to distinguish between solutions containing iron(II) ions ( $\text{Fe}^{2+}$ ) and iron(III) ions ( $\text{Fe}^{3+}$ ).

State the observation made when aqueous sodium hydroxide is added separately to each solution.

(2)

$\text{Fe}^{2+}(\text{aq})$ .....

$\text{Fe}^{3+}(\text{aq})$ .....

**(Total for Question 2 = 6 marks)**



3 The diagram shows the elements in Period 3 of the Periodic Table.

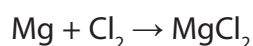
Na	Mg	Al	Si	P	S	Cl	Ar
----	----	----	----	---	---	----	----

(a) (i) Identify an element in Period 3 that forms a basic oxide. (1)

(ii) Identify an element in Period 3 that forms an acidic oxide. (1)

(b) Magnesium and chlorine react together to form magnesium chloride, a compound with ionic bonding.

The equation for the reaction is



(i) Complete the dot and cross diagram to show the arrangement of the outer electrons in the magnesium and chloride ions formed.

Show the charge on each ion.



(ii) State what is meant by the term **ionic bonding**. (2)





(iii) Explain why magnesium chloride has a high melting point.

(3)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(c) Aluminium is extracted from aluminium oxide using electrolysis.

Calculate the mass, in grams, of aluminium formed when a charge of 20 faradays is passed through aluminium oxide dissolved in molten cryolite.

The ionic half-equation for the formation of aluminium is



(2)

mass of aluminium = ..... g

**(Total for Question 3 = 12 marks)**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



4 Crystals of copper(II) nitrate,  $\text{Cu}(\text{NO}_3)_2$ , can be prepared by reacting solid copper(II) oxide,  $\text{CuO}$ , with dilute nitric acid.

(a) Write a chemical equation for this reaction.

(1)

(b) A student is given a sample of copper(II) oxide containing small amounts of insoluble impurities.

The passage is from her notebook and describes the method she uses to prepare some pure, dry crystals of copper(II) nitrate from her sample of copper(II) oxide.

Stage 1: Place  $50\text{cm}^3$  of dilute nitric acid into a beaker and warm.

Stage 2: Add the impure copper(II) oxide a little at a time and stir, until it is in excess.

Stage 3: Filter the mixture.

Stage 4: Heat the filtrate until the crystallisation point is reached.

Stage 5: Allow the filtrate to cool.

Stage 6: Filter off the crystals and dry with filter paper.

(i) Why is the acid warmed in stage 1?

(1)

(ii) How will the student know when the copper(II) oxide is in excess in stage 2?

(1)



(iii) How will the student know when the crystallisation point is reached in stage 4? (1)

(iv) In which stage are the insoluble impurities removed? (1)

**(Total for Question 4 = 5 marks)**

DO NOT WRITE IN THIS AREA

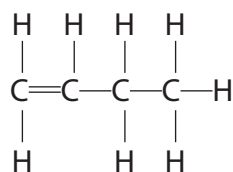
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



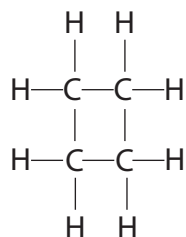
5 But-1-ene is a member of the homologous series of alkenes.

The displayed formula of but-1-ene is



The saturated compound cyclobutane is an isomer of but-1-ene.

The displayed formula of cyclobutane is



(a) (i) State what is meant by the term **isomers**.

(2)

.....

.....

.....

.....

(ii) Draw the displayed formula of another isomer of but-1-ene.

(1)

(iii) Describe a test that would distinguish between but-1-ene and cyclobutane.

(3)

.....

.....

.....

.....

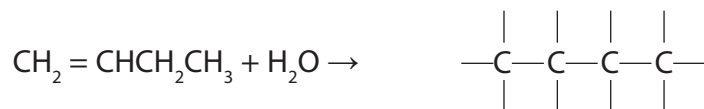
.....



(b) Using your knowledge of the reactions of ethene, complete the two chemical equations to show the formula of the organic product.

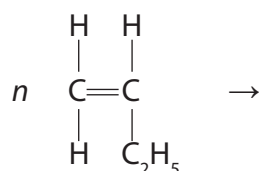
(i) The reaction between but-1-ene and steam.

(1)



(ii) The polymerisation of but-1-ene.

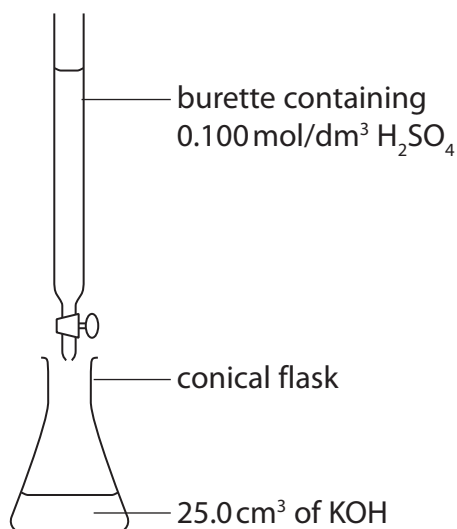
(2)



(Total for Question 5 = 9 marks)



- 6 This apparatus can be used in a method to find the volume of sulfuric acid required to neutralise a solution of potassium hydroxide (KOH).



- (a) What name is given to this method?

(1)

- (b) Which piece of apparatus should be used to measure the 25.0 cm<sup>3</sup> of KOH?

(1)

- A beaker
- B measuring cylinder
- C pipette
- D syringe

- (c) State the colours that are seen if methyl orange is used as the indicator.

(2)

colour before adding the acid.....

colour after KOH is neutralised.....

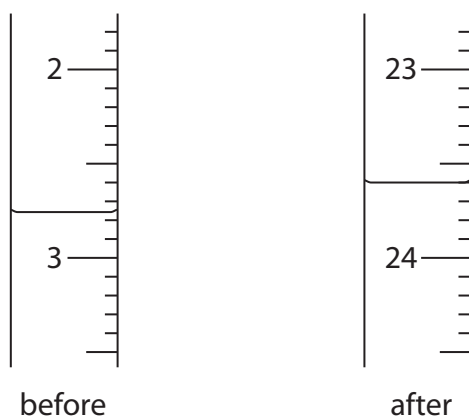


DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(d) A student carries out the experiment. His burette readings are shown in the diagram.



Use the diagram to complete the table. Give the readings to the nearest 0.05 cm<sup>3</sup>.

(3)

Burette reading after adding the acid	
Burette reading before adding the acid	
Volume in cm <sup>3</sup> of acid added	

(e) A second student did the experiment four times, using a different solution of potassium hydroxide. The table shows her results.

Volume in cm <sup>3</sup> of acid added	22.90	22.60	22.45	22.55
Concordant results (✓)				

Concordant results are those within 0.20 cm<sup>3</sup> of one another.

(i) Place ticks in the table to indicate which results are concordant with one another.

(1)

(ii) Use your ticked results to calculate the average (mean) volume of acid added.

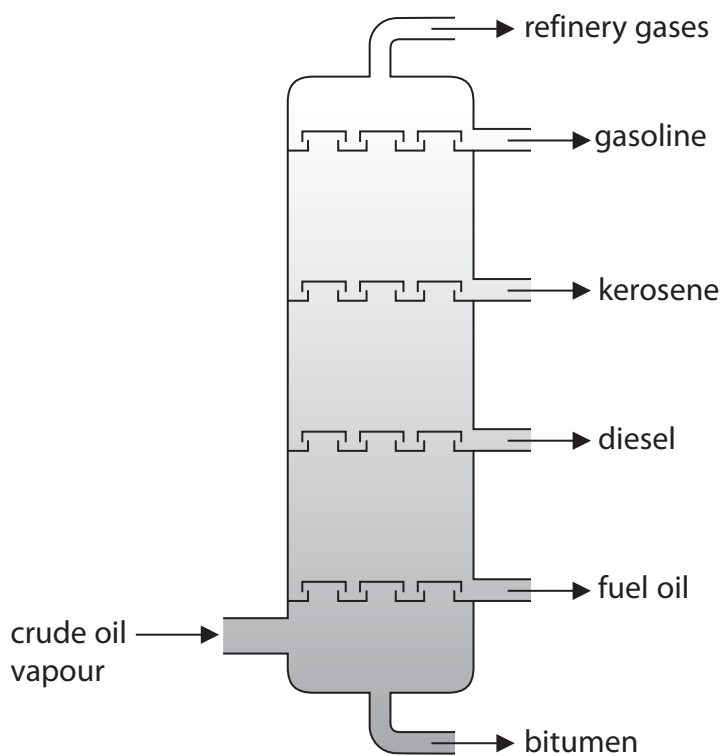
(2)

average (mean) volume of acid = ..... cm<sup>3</sup>

**(Total for Question 6 = 10 marks)**



- 7 Crude oil is a complex mixture of organic compounds called hydrocarbons. It is separated into fractions using a fractionating tower.



- (a) Which fraction has the lowest boiling point?

(1)

- (b) Which fraction is the most viscous?

(1)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA





- (c) (i) Some fractions containing long-chain hydrocarbons are cracked. The cracking of octadecane, (C<sub>18</sub>H<sub>38</sub>), produces octane, (C<sub>8</sub>H<sub>18</sub>), and one other product.

Write a chemical equation for this cracking reaction.

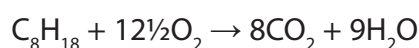
(1)

- (ii) Explain why it is important to crack long-chain hydrocarbon fractions.

(2)

- (d) Octane is one of the hydrocarbons in the petrol used in cars.

The equation for the complete combustion of octane is



The incomplete combustion of octane produces a poisonous gas that reduces the capacity of blood to carry oxygen.

Write a chemical equation for this incomplete combustion of octane.

(2)

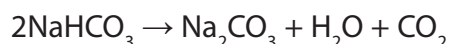
**(Total for Question 7 = 7 marks)**



8 This is a recipe for making Irish soda bread.

- add 170 g of wholemeal flour, 170 g of plain flour, 10 g of salt and 10.5 g of bicarbonate of soda (sodium hydrogencarbonate,  $\text{NaHCO}_3$ ) to a bowl and stir
- pour in  $290\text{ cm}^3$  of buttermilk and stir quickly to form a soft dough
- form the dough into a round ball and slightly flatten it
- cut a cross in the top and bake for 30 minutes in an oven at  $200^\circ\text{C}$

When sodium hydrogencarbonate is heated, it forms carbon dioxide gas.



- (a) Calculate the mass, in grams, of carbon dioxide that would be produced by completely decomposing 10.5 g of sodium hydrogencarbonate.

$[M_r \text{ of } \text{NaHCO}_3 = 84]$

(2)

mass of carbon dioxide = ..... g

- (b) Use your answer from part (a) to calculate the volume, in  $\text{cm}^3$ , at room temperature and pressure, of carbon dioxide that would be produced by completely decomposing 10.5 g of sodium hydrogencarbonate.

Assume one mole of carbon dioxide has a volume of  $24\,000\text{ cm}^3$  at room temperature and pressure.

(2)

volume of carbon dioxide = .....  $\text{cm}^3$

**(Total for Question 8 = 4 marks)**

**TOTAL FOR PAPER = 60 MARKS**



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**BLANK PAGE**

Every effort has been made to contact copyright holders to obtain their permission for the use of copyright material. Pearson Education Ltd. will, if notified, be happy to rectify any errors or omissions and include any such rectifications in future editions.

