

Write your name here

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Other names

**Pearson Edexcel**  
**International GCSE**

Centre Number

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Candidate Number

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# Chemistry

**Unit: 4CH0**

**Paper: 2C**

Wednesday 17 January 2018 – Afternoon

**Time: 1 hour**

Paper Reference

**4CH0/2C**

**You must have:**

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.
- 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

Group 1 2 3 4 5 6 7 0

Period

4	He	Helium	2
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1	H	Hydrogen	1
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1	7	Li	Lithium	3	9	Be	Beryllium	4	20	Ne	Neon	10
2	23	Na	Sodium	11	24	Mg	Magnesium	12	32	S	Sulfur	16
3	39	K	Potassium	19	40	Ca	Calcium	20	31	P	Phosphorus	15
4	86	Rb	Rubidium	37	88	Sr	Strontium	38	70	Ga	Gallium	31
5	133	Cs	Caesium	55	137	Ba	Barium	56	79	Se	Selenium	34
6	223	Fr	Francium	87	226	Ra	Radium	88	115	In	Indium	49
7	227	Ac	Actinium	89	227	Fr	Francium	87	119	Tl	Thallium	81
									112	Cd	Cadmium	48
									108	Ag	Silver	47
									106	Pd	Palladium	46
									103	Rh	Rhodium	45
									101	Ru	Ruthenium	44
									99	Tc	Technetium	43
									96	Mo	Molybdenum	42
									93	Nb	Niobium	41
									91	Zr	Zirconium	40
									89	Y	Yttrium	39
									88	Sr	Strontium	38
									86	Rb	Rubidium	37
									84	Kr	Krypton	36
									80	Br	Bromine	35
									79	Se	Selenium	34
									75	As	Arsenic	33
									73	Ge	Germanium	32
									70	Ga	Gallium	31
									65	Zn	Zinc	30
									63.5	Cu	Copper	29
									59	Ni	Nickel	28
									59	Co	Cobalt	27
									56	Fe	Iron	26
									55	Mn	Manganese	25
									52	Cr	Chromium	24
									51	V	Vanadium	23
									48	Ti	Titanium	22
									45	Sc	Scandium	21
									40	Ca	Calcium	20
									39	K	Potassium	19
									35.5	Cl	Chlorine	17
									32	S	Sulfur	16
									31	P	Phosphorus	15
									28	Si	Silicon	14
									27	Al	Aluminium	13
									20	Ne	Neon	10

Key

Relative atomic mass
Symbol
Name
Atomic number

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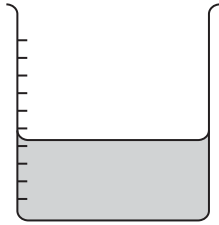
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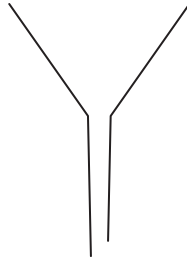


## Answer ALL questions.

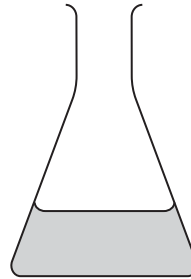
1 These pieces of apparatus are used in chemistry experiments.



P



Q



R



S

(a) Name these pieces of apparatus.

(4)

P .....

Q .....

R .....

S .....

(b) Apparatus P contains dilute hydrochloric acid.

Litmus indicator is added to this acid.

What is the final colour of the litmus?

- A blue       B green       C orange       D red

(1)

(c) Apparatus R contains potassium hydroxide solution.

Litmus indicator is added to this alkaline solution.

What is the final colour of the litmus?

- A blue       B green       C orange       D red

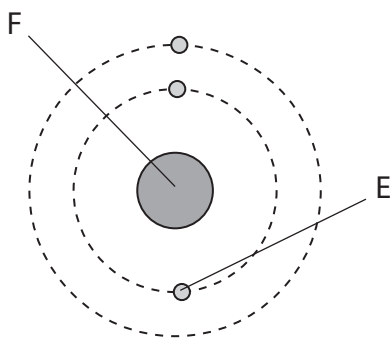
(1)

(Total for Question 1 = 6 marks)



P 5 3 1 4 6 A 0 3 1 6

2 The diagram shows an atom of lithium with atomic number 3 and mass number of 6.



(a) Name the particle labelled E.

(1)

(b) Name the part of the atom labelled F.

(1)

(c) Name the two types of particle found in part F.

(2)

1 .....

2 .....

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(d) Another type of lithium atom has atomic number 3 and mass number 7.

- (i) State the name given to atoms with the same atomic number but different mass numbers.

(1)

- (ii) Draw a diagram to show the arrangement of electrons in an atom of lithium with atomic number 3 and mass number 7.

(1)

(e) A sample of lithium contains 92.5% of atoms with mass number 7 and 7.5% of atoms with mass number 6.

Calculate the relative atomic mass of lithium.

(2)

relative atomic mass = .....

**(Total for Question 2 = 8 marks)**

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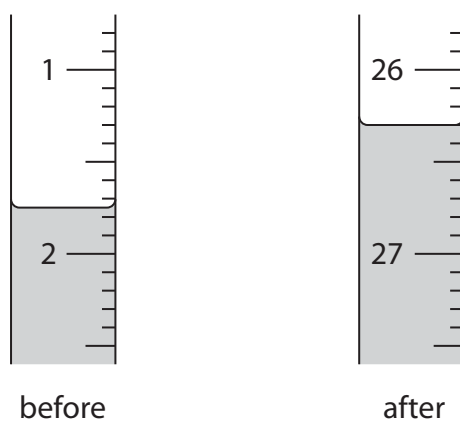
3 A student is provided with a solution of dilute sulfuric acid and a solution of sodium hydroxide. The student does a titration using  $25.0 \text{ cm}^3$  of the sodium hydroxide solution. She adds the acid from a burette.

(a) Which type of reaction occurs between dilute sulfuric acid and sodium hydroxide?

(1)

- A displacement
- B neutralisation
- C precipitation
- D redox

(b) The diagram shows the student's burette readings for the titration.



(i) Use the readings to complete the table, giving all values to the nearest  $0.05 \text{ cm}^3$ .

(3)

burette reading after adding acid	
burette reading before adding acid	
volume in $\text{cm}^3$ of acid added	

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(ii) Explain why the student needs to repeat the titration in order to obtain a reliable value for the volume of acid required to react exactly with 25.0 cm<sup>3</sup> of sodium hydroxide solution.

(2)

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**(Total for Question 3 = 6 marks)**

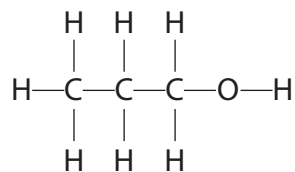
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- 4 (a) This is the displayed formula of an organic compound, X.



- (i) Give the molecular formula of compound X.

(1)

- (ii) A student describes compound X as a saturated hydrocarbon.

Explain whether the student is correct.

(3)

- (b) Compound X and ethanol are members of the homologous series of alcohols.

One property of members of a homologous series is that they have similar chemical reactions.

Give one other property of members of a homologous series.

(1)

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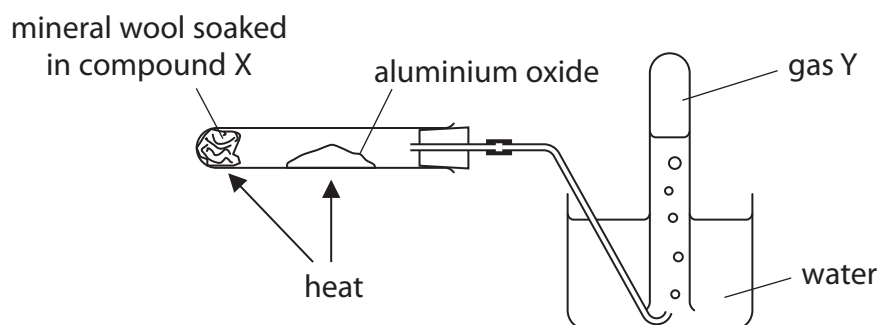
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(c) This apparatus is used for a dehydration reaction using compound X.

This reaction is similar to the dehydration reaction of ethanol.



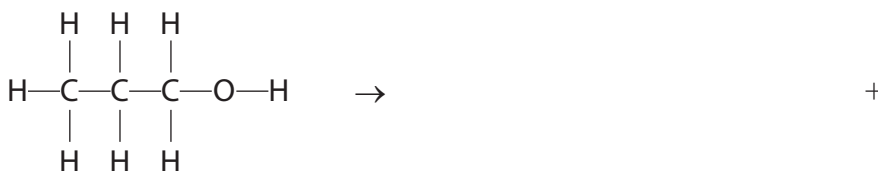
The reaction produces gas Y and one other product.

(i) State the purpose of the aluminium oxide. (1)

(ii) State a property of gas Y that allows it to be collected over water. (1)

(iii) Give a reason why the first sample of gas Y collected is not pure. (1)

(iv) Complete the equation for the dehydration reaction showing the displayed formula of gas Y and the molecular formula of the other product. (2)



(v) Give the name of gas Y. (1)

**(Total for Question 4 = 11 marks)**



5 Chromium is a shiny metal that has many uses.

Most chromium is extracted from the ore chromite,  $\text{FeCr}_2\text{O}_4$

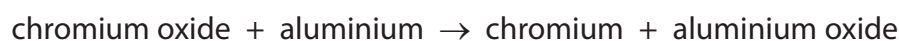
(a) Complete the table by giving the names of the elements in  $\text{FeCr}_2\text{O}_4$

(1)

Chemical symbol	Name of element
Fe	
Cr	
O	

(b) In the extraction process, chromite is converted into chromium(III) oxide,  $\text{Cr}_2\text{O}_3$

Chromium is made by this reaction



(i) Write a chemical equation for this reaction.

(2)

(ii) Explain what the reaction shows about the reactivity of chromium compared to the reactivity of aluminium.

(2)

(iii) Explain why the reaction between chromium oxide and aluminium is described as a redox reaction.

(2)

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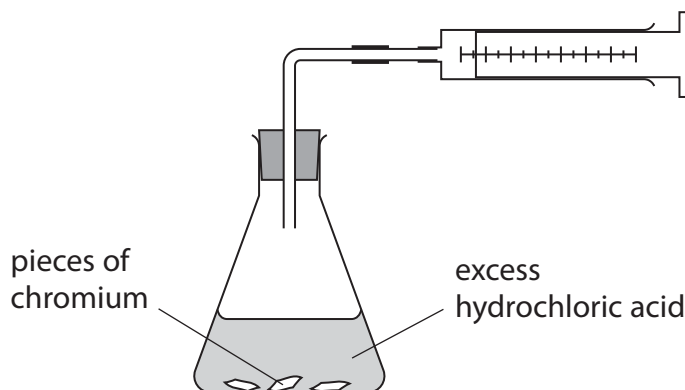
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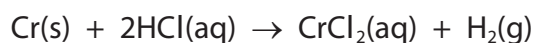


(c) Chromium metal reacts with dilute hydrochloric acid to form hydrogen gas.

This apparatus is used to investigate the reaction.



The equation for the reaction is



A student adds 0.13 g of a sample of chromium metal to excess dilute hydrochloric acid.

- (i) Calculate the maximum volume of hydrogen gas that the student could produce in this experiment at room temperature and pressure (rtp).

[molar volume of a gas is  $24 \text{ dm}^3$  at rtp]

(3)

maximum volume = .....  $\text{dm}^3$

- (ii) The student does the experiment at rtp and finds that the volume collected is less than the calculated maximum.

Give two possible reasons for this.

(2)

1 .....

2 .....

(Total for Question 5 = 12 marks)



6 Lithium fluoride, LiF, and magnesium oxide, MgO, are ionic compounds.

(a) (i) Calculate the relative formula mass ( $M_r$ ) of MgO.

(1)

$M_r =$  .....

(ii) Give the formulae of the two ions in LiF.

(1)

..... and .....

(b) Explain why

- ionic compounds have high melting points
- the melting point of magnesium oxide is much higher than the melting point of lithium fluoride

(4)

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(c) Explain why ionic compounds do not conduct electricity when solid, but do conduct electricity when molten or in aqueous solution.

(2)

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**(Total for Question 6 = 8 marks)**

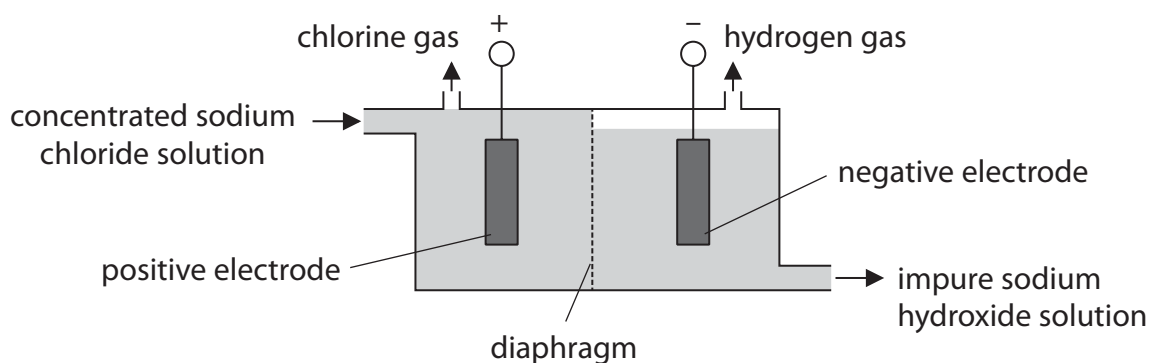
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7 The diagram shows the electrolysis of concentrated sodium chloride solution in a diaphragm cell.



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(a) (i) The ionic half-equation for the reaction at the positive electrode is



Use this equation to explain why oxidation occurs at the positive electrode.

(2)

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.....

(ii) At the negative electrode, water molecules gain electrons to form hydroxide ions and hydrogen gas.

Complete the ionic half-equation for this reaction.

(2)



(b) Chlorine reacts with sodium hydroxide to produce a mixture of water, sodium chloride and sodium chlorate(I), NaOCl.

Write a chemical equation for this reaction.

(1)

.....



(c) Chlorine is used in the manufacture of the addition polymer poly(chloroethene).

(i) Explain how an addition polymer is formed from its monomers.

(2)

.....

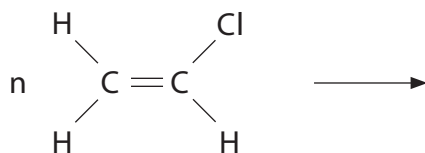
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(ii) Complete this equation by drawing the displayed formula of poly(chloroethene).

(2)



(Total for Question 7 = 9 marks)

**TOTAL FOR PAPER = 60 MARKS**

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