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Pearson Edexcel
International GCSE

Centre Number | | | | | |

Candidate Number | | | | |

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

Period	1	2	Group										3	4	5	6	7	0
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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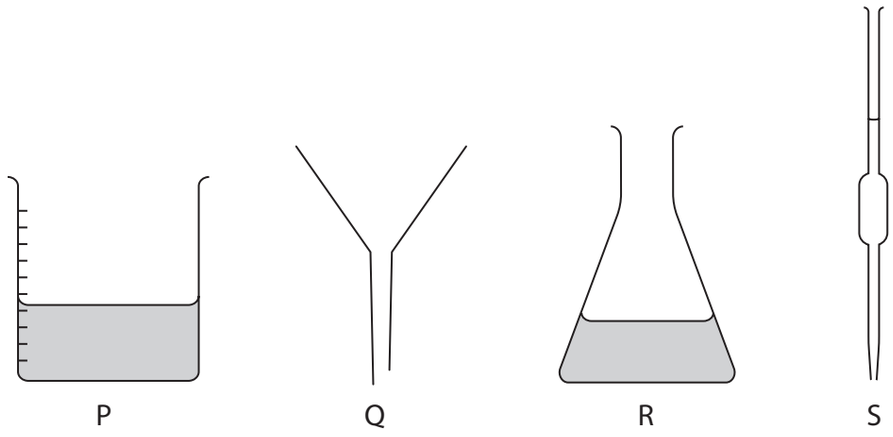
Answer ALL questions.

1 These pieces of apparatus are used in chemistry experiments.



(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?

(1)

☒ **A** blue ☒ **B** green ☒ **C** orange ☒ **D** red

(c) Apparatus R contains potassium hydroxide solution.

Litmus indicator is added to this alkaline solution.

What is the final colour of the litmus?

(1)

☒ **A** blue ☒ **B** green ☒ **C** orange ☒ **D** red

(Total for Question 1 = 6 marks)

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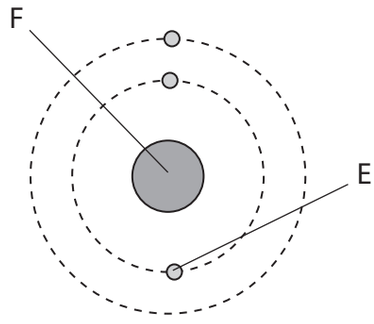
2 The diagram shows an atom of lithium with atomic number 3 and mass number of 6.



(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 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)

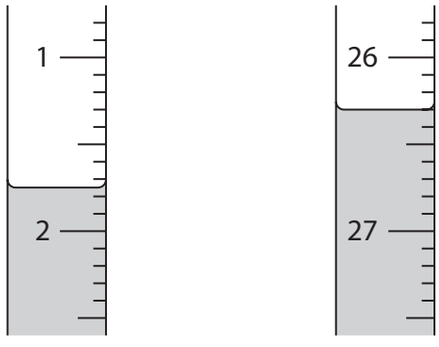
☒ **A** displacement

☒ **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 cm^3.

(3)

burette reading after adding acid	
burette reading before adding acid	
volume in 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^3 of sodium hydroxide solution.

(2)

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(Total for Question 3 = 6 marks)

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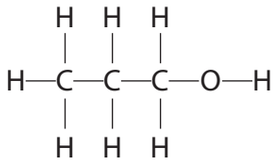
4 (a) This is the displayed formula of an organic compound, X.



(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)

.....

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.....

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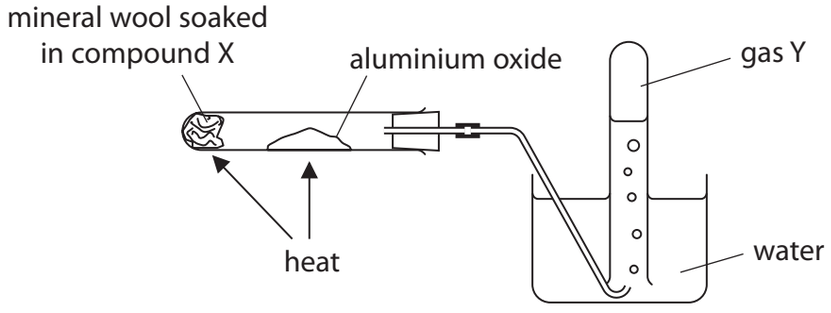
(c) This apparatus is used for a dehydration reaction using compound X.

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)

.....

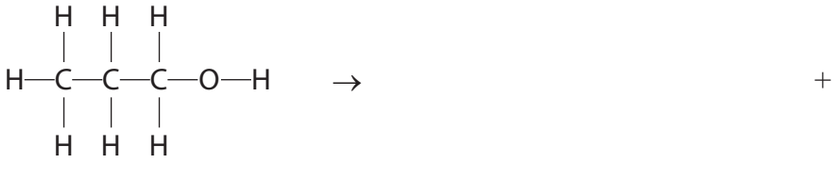
(iii) Give a reason why the first sample of gas Y collected is not pure.

(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)

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5 Chromium is a shiny metal that has many uses.

Most chromium is extracted from the ore chromite, $FeCr_2O_4$

(a) Complete the table by giving the names of the elements in $FeCr_2O_4$

(1)

Chemical symbol	Name of element
Fe	
Cr	
O	

(b) In the extraction process, chromite is converted into chromium(III) oxide, Cr_2O_3

Chromium is made by this reaction

chromium oxide + aluminium → chromium + aluminium oxide

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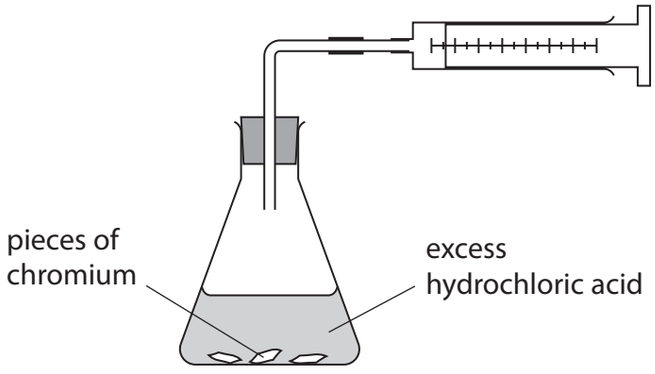
(c) Chromium metal reacts with dilute hydrochloric acid to form hydrogen gas.

This apparatus is used to investigate the reaction.



The equation for the reaction is

$$Cr(s) + 2HCl(aq) \rightarrow CrCl_2(aq) + H_2(g)$$

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 dm^3 at rtp]

(3)

maximum volume = ... 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)

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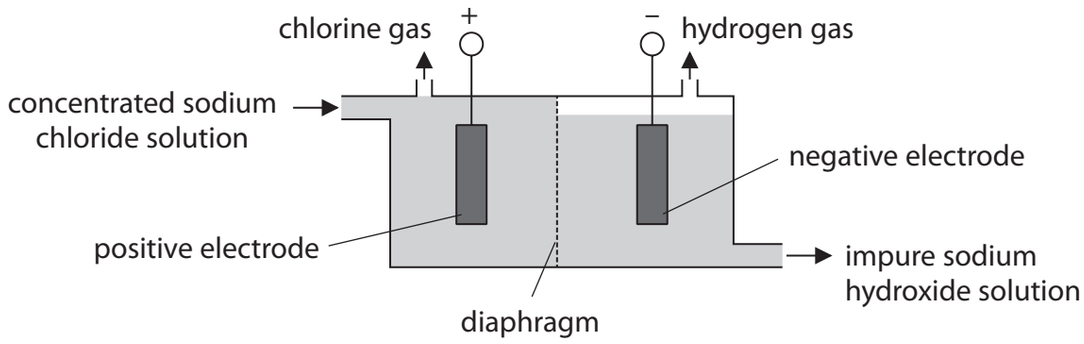
7 The diagram shows the electrolysis of concentrated sodium chloride solution in a diaphragm cell.



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

$$2Cl^- \rightarrow Cl_2 + 2e^-$$

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

(2)

.....

.....

.....

.....

(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)

$2H_2O$ + ... → ..... + ...

(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)

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(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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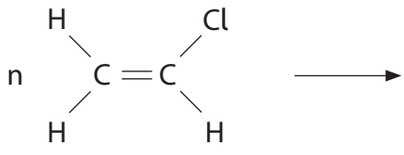
.....

(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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