

Write your name here

Surname

Other names

Pearson Edexcel
International GCSE

Centre Number

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Candidate Number

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Chemistry

Unit: 4CH0

Paper: 2CR

Tuesday 9 June 2015 – Afternoon

Time: 1 hour

Paper Reference

4CH0/2CR

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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PEARSON

THE PERIODIC TABLE

Group 1 2 3 4 5 6 7 0

Period

1	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 1 H Hydrogen 1 </div>							<div style="border: 1px solid black; padding: 2px; text-align: center;"> 4 He Helium 2 </div>									
2	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 7 Li Lithium 3 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 9 Be Beryllium 4 </div>						<div style="border: 1px solid black; padding: 2px; text-align: center;"> 19 F Fluorine 9 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 20 Ne Neon 10 </div>								
3	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 23 Na Sodium 11 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 24 Mg Magnesium 12 </div>						<div style="border: 1px solid black; padding: 2px; text-align: center;"> 32 S Sulfur 16 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 35.5 Cl Chlorine 17 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 40 Ar Argon 18 </div>							
4	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 39 K Potassium 19 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 40 Ca Calcium 20 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 48 Ti Titanium 22 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 51 V Vanadium 23 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 52 Cr Chromium 24 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 55 Mn Manganese 25 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 56 Fe Iron 26 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 59 Co Cobalt 27 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 59 Ni Nickel 28 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 63.5 Cu Copper 29 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 65 Zn Zinc 30 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 70 Ga Gallium 31 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 73 Ge Germanium 32 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 75 As Arsenic 33 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 79 Se Selenium 34 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 80 Br Bromine 35 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 84 Kr Krypton 36 </div>
5	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 86 Rb Rubidium 37 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 88 Sr Strontium 38 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 91 Zr Zirconium 40 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 93 Nb Niobium 41 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 96 Mo Molybdenum 42 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 99 Tc Technetium 43 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 101 Ru Ruthenium 44 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 103 Rh Rhodium 45 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 106 Pd Palladium 46 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 108 Ag Silver 47 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 112 Cd Cadmium 48 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 115 In Indium 49 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 119 Sn Tin 50 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 122 Sb Antimony 51 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 128 Te Tellurium 52 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 127 I Iodine 53 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 131 Xe Xenon 54 </div>
6	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 133 Cs Caesium 55 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 137 Ba Barium 56 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 179 Hf Hafnium 72 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 181 Ta Tantalum 73 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 184 W Tungsten 74 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 186 Re Rhenium 75 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 190 Os Osmium 76 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 192 Ir Iridium 77 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 195 Pt Platinum 78 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 197 Au Gold 79 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 201 Hg Mercury 80 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 204 Tl Thallium 81 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 207 Pb Lead 82 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 209 Bi Bismuth 83 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 210 Po Polonium 84 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 210 At Astatine 85 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 222 Rn Radon 86 </div>
7	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 223 Fr Francium 87 </div>	<div style="border: 1px solid black; padding: 2px; text-align: center;"> 226 Ra Radium 88 </div>			<div style="border: 1px solid black; padding: 2px; text-align: center;"> 227 Ac Actinium 89 </div>												

Key

Relative atomic mass
Symbol
Name
Atomic number



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Answer ALL questions.

1 An atom of an element has an atomic number of 6 and a mass number of 12.

(a) Using this information, complete the table to show the numbers of protons, neutrons and electrons in one atom of this element.

(2)

number of protons	
number of neutrons	
number of electrons	

(b) The Periodic Table shows the positions of five elements, J, Q, T, X and Z.

The letters do **not** represent the symbols for the elements.

Period	1	2	Group										3	4	5	6	7	0		
1			<input type="text"/>																	
2	J																		Q	
3	T																			
4														X		Z				
5																				
6																				

(i) How many electrons are there in the outer shell of an atom of X?

(1)

(ii) There are 31 protons in an atom of X.

Using this information, explain how many protons there are in an atom of Z.

(2)

.....

.....

.....

.....

.....



(iii) What is the electronic configuration of an atom of Q?

(1)

(iv) State one similarity and one difference between the electronic configurations of atoms of J and T.

(2)

similarity

difference

(Total for Question 1 = 8 marks)



2 Ethene is an unsaturated hydrocarbon.

(a) (i) The molecular formula of ethene is

(1)

- A CH_4
- B C_2H_6
- C C_2H_4
- D C_3H_6

(ii) Ethene is bubbled into bromine water until there is no further change.

What is the appearance of the solution formed?

(1)

- A brown
- B colourless
- C purple
- D red

(iii) Ethene can be formed from ethanol.

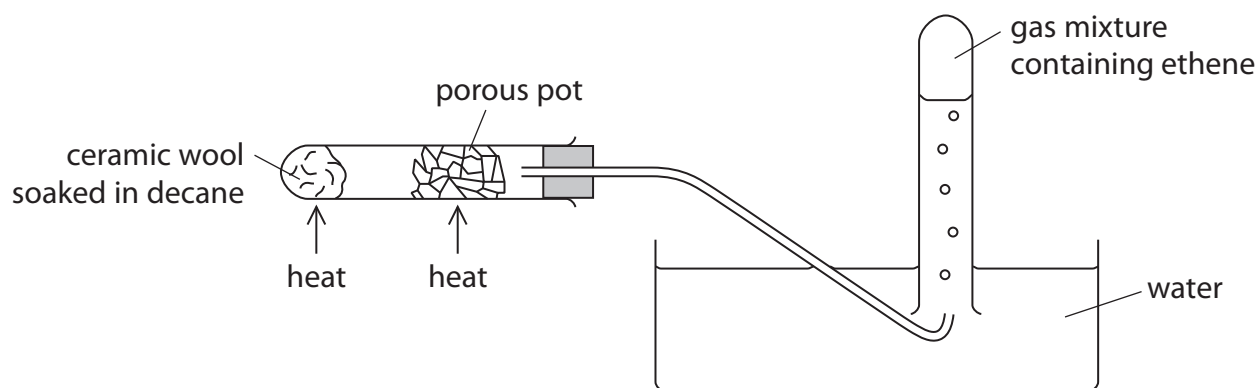
This type of reaction is called

(1)

- A dehydration
- B oxidation
- C reduction
- D substitution



(b) This apparatus can be used to decompose decane ($C_{10}H_{22}$).



(i) What name is given to this type of thermal decomposition?

(1)

(ii) Porous pot contains oxides such as silica and alumina.

What is the purpose of the porous pot in this experiment?

(1)

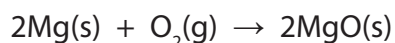
(iii) Suggest why the gas collected is a mixture and not pure ethene.

(1)

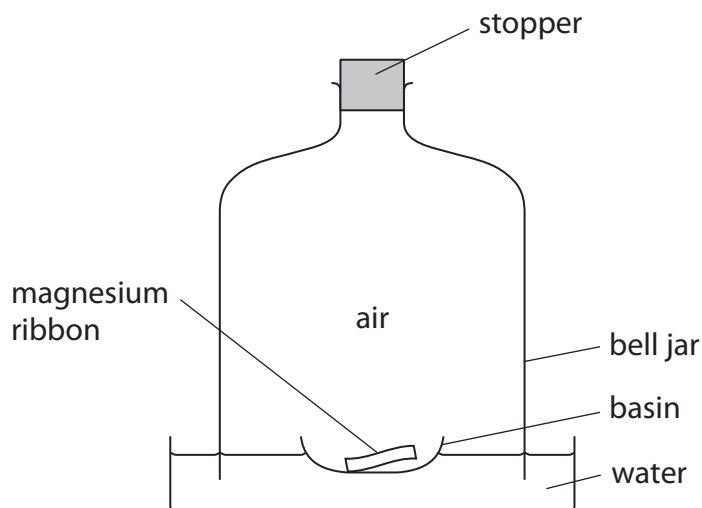
(Total for Question 2 = 6 marks)



3 Magnesium reacts with oxygen in the air to form magnesium oxide.



The apparatus in the diagram can be used to investigate the decrease in the volume of gas when magnesium burns in air.



The stopper is removed and the magnesium is lit. The stopper is then quickly replaced.

After the flame goes out there is some magnesium left in the basin.

After the apparatus has cooled to its original temperature, the water level in the bell jar is higher than shown in the diagram.

(a) What is the colour of the flame produced when the magnesium burns?

(1)

(b) What is the colour of the solid produced when the magnesium burns?

(1)



(c) The volume of air in the bell jar at the start of the experiment is 1000 cm^3 .

Calculate the volume of gas you would expect to remain in the bell jar at the end of the experiment. Assume all the oxygen in the air is used up.

(2)

volume of gas remaining = cm^3

(d) In another experiment, the mass of magnesium that burned was 0.12 g .

Calculate the maximum mass of magnesium oxide that could be formed in this experiment.

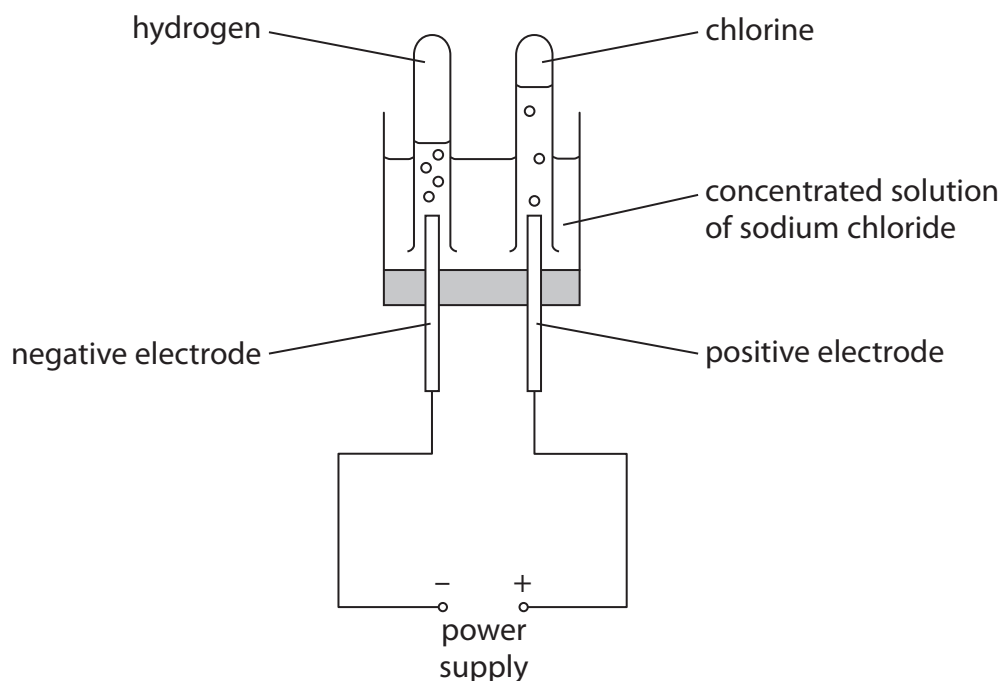
(2)

mass of magnesium oxide formed = g

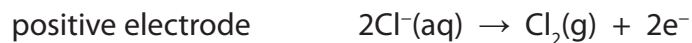
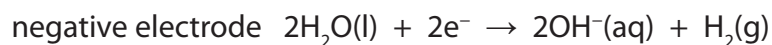
(Total for Question 3 = 6 marks)



4 This apparatus is used to electrolyse a concentrated solution of sodium chloride.



(a) The ionic half-equations for the reactions at the electrodes are



(i) State how these ionic half-equations show that equal volumes of the two gases should be collected.

(1)

.....

.....

.....

(ii) Suggest why the volume of chlorine collected is less than expected.

(1)

.....

.....

.....



(iii) A sample of the solution near to the negative electrode is tested with phenolphthalein indicator.

Explain why the phenolphthalein turns pink.

(2)

.....

.....

.....

.....

(b) The table shows two methods of testing for chlorine.

Complete the table by giving the observation made in each test.

(2)

Test	Observation
add damp blue litmus paper	
bubble chlorine into a solution of potassium iodide	

(c) (i) State why chlorine is sometimes added to water supplies.

(1)

.....

.....

(ii) Chlorine is used to manufacture hydrogen chloride gas, HCl(g).

Write a chemical equation to show the formation of hydrogen chloride from hydrogen and chlorine.

(1)

.....

.....

(iii) How is hydrogen chloride gas converted into hydrochloric acid?

(1)

.....

.....

(Total for Question 4 = 9 marks)



5 A teacher investigates the temperature changes that occur when sodium hydroxide solution is added to dilute hydrochloric acid.

This is the method she uses.

- place some of the acid in a glass beaker and measure its temperature
- add a known volume of sodium hydroxide solution
- stir the mixture and record the highest temperature reached
- repeat the experiment with different volumes of sodium hydroxide solution

(a) State two factors that the teacher must keep constant to make this a valid investigation (a fair test).

(2)

1

2

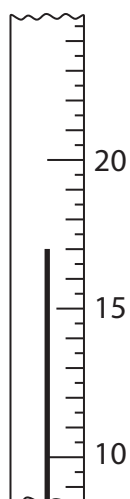
(b) Explain how the use of a polystyrene cup, in place of a glass beaker, will affect the accuracy of the results.

(2)

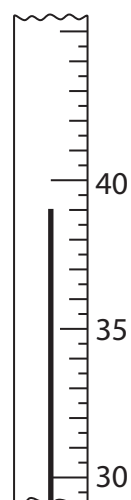
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(c) (i) The diagram shows the thermometer readings for one of the experiments.



initial temperature



final temperature

Record the temperatures and calculate the temperature change.

(3)

final temperature of mixture °C
initial temperature of acid °C
temperature change °C

(ii) State how the temperature change shows whether the reaction between sodium hydroxide and hydrochloric acid is exothermic or endothermic.

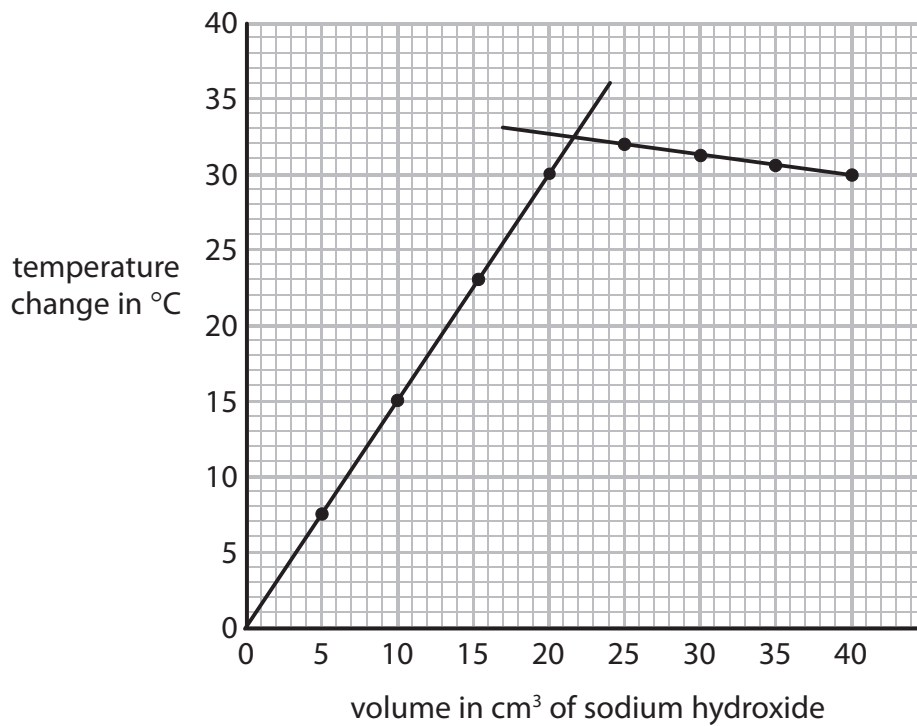
(1)

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(d) The graph shows the result of the teacher's investigation.



Explain the shape of the graph.

(2)

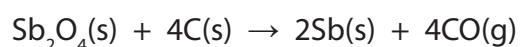
(Total for Question 5 = 10 marks)



6 This question is about the reactions of compounds of antimony and phosphorus.

(a) Antimony (Sb) can be obtained from its oxide (Sb_2O_4) by heating it with carbon.

The equation for this reaction is



(i) Give the name of the gas produced in this reaction.

(1)

(ii) State why this gas is poisonous to humans.

(1)

(b) Phosphorus sulfide (P_4S_3) is one of the reactants used in match heads.

When a match is struck, energy is transferred to the reactants in the match head, starting a reaction.

(i) Balance the equation that represents this reaction.

(2)



(ii) What term is used to describe the energy required to start a reaction?

(1)

(Total for Question 6 = 5 marks)



7 Bromine and iodine are halogens.

(a) Complete the table by giving the colour and physical state of each of these halogens at room temperature.

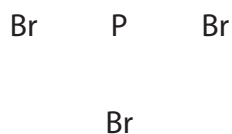
(2)

Halogen	Colour	Physical state
bromine	red-brown	
iodine		solid

(b) Bromine reacts with phosphorus to form the covalent compound phosphorus tribromide.

Draw a dot and cross diagram to show the outer electrons in a molecule of phosphorus tribromide.

(2)



(c) Phosphorus tribromide reacts with water to form a mixture of two acids, HBr and H_3PO_3

Write a chemical equation for this reaction.

(2)

(Total for Question 7 = 6 marks)



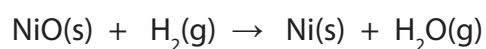
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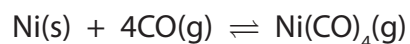
8 Nickel is an important metal.

(a) Three of the stages in the extraction of nickel from its ore are

stage 1 nickel(II) oxide is reduced by heating with H_2 to produce impure nickel



stage 2 the impure nickel is reacted with CO



stage 3 Ni(CO)_4 is decomposed by heating to produce pure nickel



(i) State why the reaction in stage 1 is described as reduction.

(1)

(ii) Suggest why a low temperature produces a high yield of Ni(CO)_4 in stage 2.

(2)



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