Centre No.	Paper Reference Surname	Initial(s)
Candidate No.	7 0 8 1 / 0 2 Signature	
	Paper Reference(s) 7081/02 Exam	iner's use only
	London Examinations GCE Team L	eader's use only
	Chemistry	
	Ordinary Level	Question Leave Number Blank
	Paper 2	1
	Monday 18 January 2010 – Morning	2
	Time: 2 hours	3
		4
	Materials required for examination Items included with question papers	5
	Nil Nil	6
		7
		8

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature. Check that you have the correct question paper.

The paper is arranged in TWO sections, A and B.

In Section A, answer ALL questions.

In Section B, answer TWO questions. Write your answers in the spaces provided in this question

Indicate which question you are answering by marking the box (X). If you change your mind, put a line through the box (\boxtimes) and then indicate your new question with a cross (\boxtimes) .

Information for Candidates

A Periodic Table is printed on the back cover of this question paper.

Calculators may be used.

The total mark for this paper is 100.

The marks for individual questions and the parts of questions are shown in round brackets: e.g. (2). This paper has 9 questions. All blank pages are indicated.

One mole of any gas occupies 24 000 cm³ at room temperature and atmospheric pressure. One mole of electrons carries a charge of 96 500 coulombs or 1 faraday.

Advice to Candidates

Write your answers neatly and in good English. In calculations, show all the steps in your working.

This publication may be reproduced only in accordance with Edexcel Limited copyright policy. ©2010 Edexcel Limited.

 $\stackrel{\text{Printer's Log. No.}}{N36280A}$





Turn over

Total

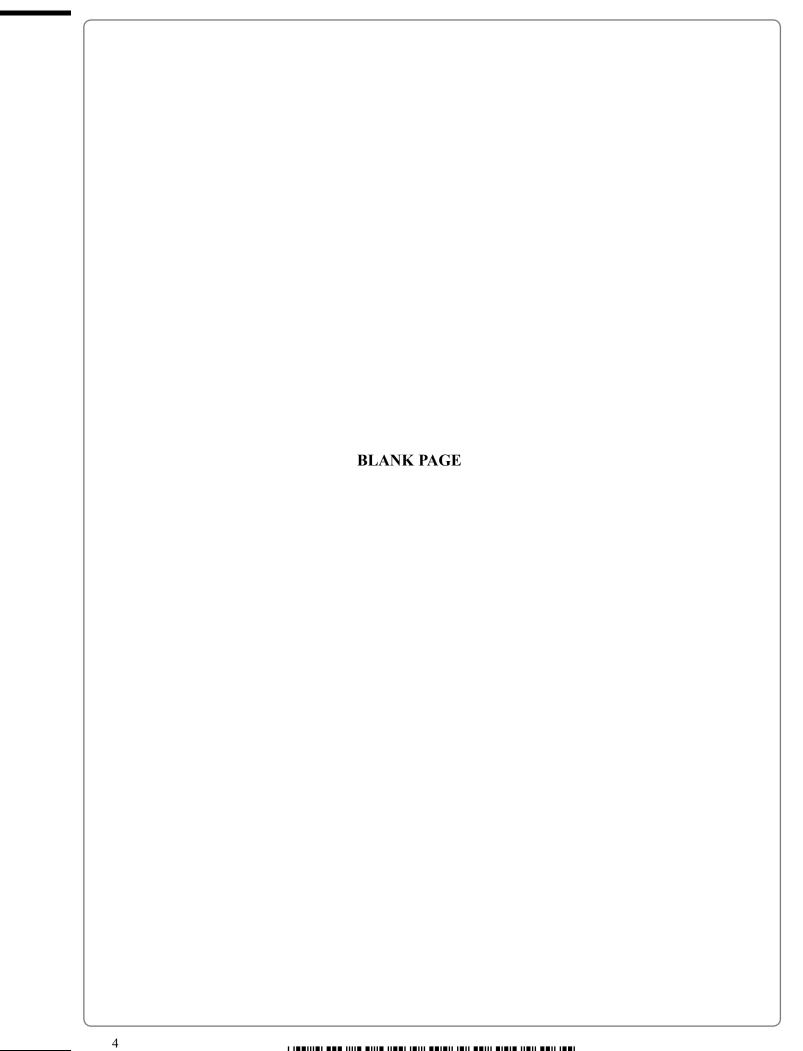
W850/U7081/57570 5/5/5/2/

SECTION A

Answer ALL the questions in this section.			
Thei	There is useful data on the front cover and a Periodic Table is printed on the back cover of this question paper.		
(a)	State how a dry sample of carbon dioxide can be prepared and collected in the laboratory using dilute hydrochloric acid as one of the reagents.		
	Other reagent:		
	Drying agent:		
	Method of collection: (3)		
(b)	Describe what is observed when carbon dioxide is passed into a saturated solution of calcium hydroxide until no further change occurs. Write equations for the reactions that occur.		
	First observation:		
	Equation:		
	Second observation:		
	Equation: (4)		
(c)	When carbon dioxide is passed over red-hot carbon, a colourless gas is produced. This gas burns with a blue flame. Identify the gas and write equations for the two reactions that occur.		
	Identity of gas:		
	Equation 1:		
	Equation 2:		
	(3)		
	(Total 10 marks)		

2.	Thi	s que	estion is about the elements magnesium and sulphur.	Le
	(a)	(i)	Write equations to show the formation of:	
			a magnesium ion from magnesium;	
			a sulphide ion from sulphur.	
		(ii)	State which of the above is oxidation and explain your answer.	
		(11)	State which of the above is oxidation and explain your answer.	
			(1)	
	(b)		ich element, magnesium or sulphur, would form an acidic oxide? Write equations how the formation of the acidic oxide and its reaction with water.	
		Elei	ment:	
		For	mation of the acidic oxide:	
		Rea	action of the oxide with water:	
			(3)	
	(c)		we a labelled diagram to show the arrangement of particles in the lattice of gnesium and state how it is possible for magnesium to conduct electricity.	
			(4)	
			(Total 10 marks)	





Describe how you would carry out the following separations us given. State how you would collect the named substance. Write equations for any reactions that occur.	
(a) Nitrogen from a mixture of nitrogen and oxygen using coppe	er.
	(4)
b) Oxygen from a mixture of oxygen and sulphur dioxide using	sodium hydroxide.
	(3)
c) Iodine from a mixture of iodine and sand.	
	(3)



4. (a) Calculate the empirical formula of the oxide of phosphorus that has the following composition by mass.

$$P = 56.4\%$$
 $O = 43.6\%$

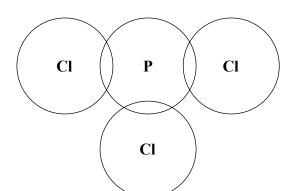
(3)

(b) Phosphorus(III) chloride, PCl₃, is a covalent compound.

(i) Give a reason why the bond between phosphorus and chlorine is covalent.

(1)

(ii) Complete the diagram below to show the outer shell arrangement of electrons in phosphorus(III) chloride.



(2)

(c) So	dium chloride is an ionic compound.
(i)	Give a reason why the bond between sodium and chlorine is ionic.
	(1)
(ii)	Explain why sodium chloride has a higher melting point than phosphorus(III) chloride.
	(3)
	(3)
	(Total 10 marks)

5. The table below gives the solubilities of sodium chloride, potassium chlorate and potassium nitrate at temperatures between 0°C and 90°C.

Temperature/°C	10	30	50	70	90
Solubility of sodium chloride/g per 100 g water	35	36	37	38	39
Solubility of potassium chlorate/g per 100 g water	4	10	17	31	46
Solubility of potassium nitrate/g per 100 g water	21	45	84	137	203

Use the table to answer the following. Do **not** draw graphs.

a) Which compound has the greatest rise in solubility with increase in temperature?
(1)
Suggest the temperature at which sodium chloride and potassium chlorate would have the same solubility.
(1)
e) What mass of potassium chlorate will crystallise from solution when a saturated solution in 100 g of water at 70 °C is cooled to 30 °C?
(1)
d) What is the minimum temperature at which 42 g of potassium nitrate will dissolve in 50 g of water?
(1)

8



Temperature:
Explanation:
(2
A mixture of 30 g of sodium chloride and 30 g of potassium nitrate is shaken wit 100 g of water at 10 °C. The temperature is then raised to the boiling point and 50 of water is evaporated off. (When answering the following questions, you do not need to perform calculations
(i) State what happens to each substance at 10°C.
(2
(ii) State what happens when the temperature is raised to 100°C.
(1
(iii) State what happens as the 50 g of water evaporates off.
(1
(Total 10 marks
TOTAL FOR SECTION A: 50 MARK



SECTION B

Answer TWO questions in this section.

Where appropriate, equations and diagrams should be given to clarify your answer.

If you answer Question 6, put a cross in this box \square .

6. (a) A good yield of copper(II) oxide can be obtained from copper metal if copper is converted to copper(II) nitrate which is then decomposed by heating. The equations for the reactions are:

Reaction 1: $Cu(s) + 4HNO_3(aq) \rightarrow Cu(NO_3)_2(aq) + 2NO_2(g) + 2H_2O(l)$

Reaction 2: $2Cu(NO_3)_2(s) \rightarrow 2CuO(s) + 4NO_2(g) + O_2(g)$

(i) State what would be observed when each of the reactions is carried out.

(ii) Describe how a pure, dry sample of copper(II) nitrate could be obtained by Reaction 1. Give practical details but do **not** draw diagrams.

(5)

(4)

	(iii) Starting from 12.7 g of copper metal, calculate the maximum mass of copper(II) oxide that could be obtained.
	(3)
))	4.83 g of copper(II) nitrate, $Cu(NO_3)_2.xH_2O$, was gently heated to remove the water of crystallisation and 3.75 g of anhydrous copper(II) nitrate was formed. Calculate the value of x .
	(4)

(-)	Copper(I) oxide is a red solid which reacts with aqueous sulphuric acid.
	$Cu_2O(s) + 2H^+(aq) \rightarrow Cu^{2+}(aq) + Cu(s) + H_2O(l)$
	State the type of reaction and describe what would be observed when this reaction takes place. State how the copper could be separated from the other products and give one physical test that would show that a metal has been formed.
	(5)
	occurs. Give the observation made if an excess of aqueous ammonia is now added and write the formula of the final product.
	-
	and write the formula of the final product.
	and write the formula of the final product. (4)
	and write the formula of the final product. (4)
	and write the formula of the final product. (4)
	and write the formula of the final product. (4)

If you answer Question 7, put a cross in this box \square .

7. (a) Crude oil can be converted by a series of reactions into ethanol.

crude oil hydrocarbon fractions	ethene -		ethanol
---------------------------------	----------	--	---------

Name each stage in the process and describe how each is carried out. Write equations where appropriate.

(i)	Crude oil to hydrocarbon fractions.							
	(5)							

	(5
(iii)	Ethene to ethanol.
	(6

0)	Write the name or formula of the organic compound formed when ethanol reacts with each of the following.
	(i) Sodium metal
	(ii) Acidified potassium dichromate(VI)
	(iii) Phosphorus pentachloride
	(3)
;)	Propanoic acid has the formula CH_3CH_2COOH . Give two essential conditions for its reaction with ethanol. Give the name of the ester formed and write an equation for the reaction. Draw the displayed formula of the ester and put a circle around the ester linkage.
	(6)
	(Total 25 marks)

	If you answer Question 8, put a cross in this box 🖾 .
(i)	In the first stage of the extraction of zinc metal from the ore zinc blende, ZnS, the ore is roasted in air to form zinc oxide and sulphur dioxide. The second stage is the conversion of the zinc oxide into zinc using coke.
	Write an equation for each stage of the reaction. Describe how the second stage is carried out to produce pure zinc and explain the role of the coke in this reaction.
	State one environmental problem associated with this extraction.
	(7)
(ii)	The sulphur dioxide produced as a by-product in the extraction can be used as a raw material in the production of sulphuric acid using the Contact Process. Describe with equations and details of conditions how this process is carried out.
(ii)	The sulphur dioxide produced as a by-product in the extraction can be used as a raw material in the production of sulphuric acid using the Contact Process. Describe with equations and details of conditions how this process is carried
(ii)	The sulphur dioxide produced as a by-product in the extraction can be used as a raw material in the production of sulphuric acid using the Contact Process. Describe with equations and details of conditions how this process is carried
(ii)	The sulphur dioxide produced as a by-product in the extraction can be used as a raw material in the production of sulphuric acid using the Contact Process. Describe with equations and details of conditions how this process is carried
(ii)	The sulphur dioxide produced as a by-product in the extraction can be used as a raw material in the production of sulphuric acid using the Contact Process. Describe with equations and details of conditions how this process is carried
(ii)	The sulphur dioxide produced as a by-product in the extraction can be used as a raw material in the production of sulphuric acid using the Contact Process. Describe with equations and details of conditions how this process is carried
(ii)	The sulphur dioxide produced as a by-product in the extraction can be used as a raw material in the production of sulphuric acid using the Contact Process. Describe with equations and details of conditions how this process is carried
(ii)	The sulphur dioxide produced as a by-product in the extraction can be used as a raw material in the production of sulphuric acid using the Contact Process. Describe with equations and details of conditions how this process is carried
(ii)	The sulphur dioxide produced as a by-product in the extraction can be used as a raw material in the production of sulphuric acid using the Contact Process. Describe with equations and details of conditions how this process is carried
(ii)	The sulphur dioxide produced as a by-product in the extraction can be used as a raw material in the production of sulphuric acid using the Contact Process. Describe with equations and details of conditions how this process is carried
(ii)	The sulphur dioxide produced as a by-product in the extraction can be used as a raw material in the production of sulphuric acid using the Contact Process. Describe with equations and details of conditions how this process is carried
(ii)	The sulphur dioxide produced as a by-product in the extraction can be used as a raw material in the production of sulphuric acid using the Contact Process. Describe with equations and details of conditions how this process is carried

(8)

give a test to identify the gas evolved. Write equations for the two reactions that occur.
(5)
rust. Explain how zinc is used to protect iron from rusting.
rust. Explain how zinc is used to protect iron from rusting.
rust. Explain now zinc is used to protect iron from rusting.
rust. Explain now zinc is used to protect iron from rusting.
(5)
(5)
(5)

If you answer Question 9, put a cross in this box \square .

(a)	When two pieces of cotton wool, one soaked in concentrated aqueous ammonia at the other soaked in concentrated hydrochloric acid, are placed at opposite ends of long glass tube, a white ring is formed closer to one end than the other.
	(
(b)	When two identical pieces of magnesium ribbon are placed in test tubes containing the same volumes of hydrochloric acid and ethanoic acid of equal concentration bubbles of gas evolve faster in one test tube than in the other.
(b)	When two identical pieces of magnesium ribbon are placed in test tubes containing the same volumes of hydrochloric acid and ethanoic acid of equal concentration
(b)	When two identical pieces of magnesium ribbon are placed in test tubes containing the same volumes of hydrochloric acid and ethanoic acid of equal concentration
(b)	When two identical pieces of magnesium ribbon are placed in test tubes containing the same volumes of hydrochloric acid and ethanoic acid of equal concentration
(b)	When two identical pieces of magnesium ribbon are placed in test tubes containing the same volumes of hydrochloric acid and ethanoic acid of equal concentration
(b)	When two identical pieces of magnesium ribbon are placed in test tubes containing the same volumes of hydrochloric acid and ethanoic acid of equal concentration
(b)	When two identical pieces of magnesium ribbon are placed in test tubes containing the same volumes of hydrochloric acid and ethanoic acid of equal concentration
(b)	When two identical pieces of magnesium ribbon are placed in test tubes containing the same volumes of hydrochloric acid and ethanoic acid of equal concentration

(c) When aqueous barium chloride is added to solutions of sodium sulphite and sulphate, both produce a white precipitate. When aqueous hydrochloric acid is	
added, one of the precipitates dissolves and a gas is evolved.	
	· • • • • • • • • • • • • • • • • • • •
	(6)
A) When manage months with allowing in alternation (1) 1 (1) 1 (1) (1)	(6)
d) When propane reacts with chlorine in ultra-violet light, two products with the molecular formula, C ₃ H ₇ Cl, can be formed.	; same
	(4)
(e) When aqueous bromine is added to aqueous sodium iodide, a black solid is form when aqueous bromine is added to aqueous sodium chloride, there is no reaction	
	(4)

	0	Z Heijum	Neon Soon 18 Argon	Kypton X 36	Xenon 131 86 Radon 222		
	7		Fluorine 19 17 17 Chlorine	35.5 35 Bromine 80 53	lodine 127 85 At Astatine 210		
	ဖ		8 O Oxygen 16 Sulphur	32 34 34 Selenium 79 79	Tellurium 128 84 Po Polonium 210		
	ß		Nitrogen 14 15 Phosphorus	31 AS Arsenic 75 51	Antimony 122 83 83 Bi Bismuth 209		
	4		Carbon 12 12 Silicon				
	ო		5 B Boron 11 13 Al				
				Zn Znc Znc 65 65	Cadmium 112 80 Hg Mercury 201		
THE PERIODIC TABLE					Silver 108 79 Au Gold 197		
IODIC				Nickel 89 99 59	Palladium 106 78 Platinum 195		
E PER					Rhodium 103 77 17 Iridium 192		
Ī					Ruthenium 76 OS Osmium 190		L 0
	Group	Hydrogen			Technetium Right State S	Key	Atomic number Symbol Name Relative atomic mass
	О	Í		24 Cr Chromium Me 52 42	Molybdenum Te		ш.
				23 Vanadium Ct 51 41	Niobium Mol 933 73 73 Tantalum T		
				22 Ti Titanium Va 48 40	Zirconium N 91 72 72 Hf Hafnium Ta		
				Scandium Tir	ا 5 ا	Actinium 227	
	8		Be Beryllium 9 9 12 Mg		£ c	Radium Ao 226	
				sium Ca	Original Strain		
	-	3	Lithium 7 7 7 7 8 8 8 8 8 8 8 8 9 9 9 9 9 9 9 9		2 3	Francium 223	
		-	a w	4 r	о о	7	