Centre No.					Pape	er Refer	ence			Surname	Initial(s)
Candidate No.			7	0	8	1	/	0	1	Signature	

Paper Reference(s)

7081/01

London Examinations GCE

Chemistry

Ordinary Level

Paper 1

Wednesday 13 January 2010 – Afternoon

Time: 1 hour 15 minutes

laterials required for examination	Items included with question papers
il	Nil

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.

Answer ALL questions. Write your answers in the spaces provided in this question paper.

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 13 questions. Any blank pages are indicated.

DATA

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.

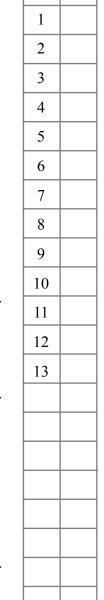
Advice to Candidates

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

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Examiner's use only

Team Leader's use only

Turn over



Leave blank

Answer ALL questions.

1. (a) Complete the table.

A, B, C and D are not the symbols for the elements.

Element	Number of electrons in outer shell	Formula of cation or anion usually formed
A	1	A^+
В	3	
С	6	
D		D-

(3)

(b)	Name	the	foll	owing	com	pound	S
(0)	1 (011110	CIIC	101		COIII	pouriu	

(1)	MgBr ₂	• • • •
		(1)

		(1)

(iv) CH₃CH₂Br

(1)

(Total 7 marks)

Q1

		Leave blank
2.	Name each of the following processes.	
	(a) A gas changes to a liquid	
	(1)	
	(b) Hydrogen reacts with an alkene	
	(1)	
	(c) An acid and an alkali react to form a solution of pH 7	
	(1)	
	(d) A liquid slowly disappears when left in an open dish	Q2
	(Total 4 marks)	



WOI	
(a)	A horizontal row in the Periodic Table is known as a(1)
(b)	All the elements in Group 5 have
	in their outer shell. (1)
(c)	Elements in the same group have
(d)	The element with an Atomic Number of 24 is(1)
(e)	Two transition metals with the same Relative Atomic Mass are
	and
(f)	The elements helium to radon are known as the
(g)	An atom of titanium contains protons
	and neutrons. (1)
(h)	When an element in Group 4 combines with an element in Group 7,
	a
	(Total 8 marks)

(a) The black solid formed when copper(II) hydroxide is heated. (I) (b) The colourless gas that is formed when oxygen and nitrogen react at high temperature. (I) (c) A hydrocarbon polymer in which the repeating unit has three carbon atoms. (I) (d) A yellow solid that has two allotropic forms. (I) (e) A blue solid that turns pink when water is added to it. (I) (f) A colourless gas that turns red litmus paper blue. (I) (g) A gas used in packet foods to keep the contents fresh.	4.	Ide	ntify the element or compound that fits each of the following descriptions.	Le bl
(b) The colourless gas that is formed when oxygen and nitrogen react at high temperature. (1) (c) A hydrocarbon polymer in which the repeating unit has three carbon atoms. (1) (d) A yellow solid that has two allotropic forms. (1) (e) A blue solid that turns pink when water is added to it. (1) (f) A colourless gas that turns red litmus paper blue. (1) (g) A gas used in packet foods to keep the contents fresh.		(a)	The black solid formed when copper(II) hydroxide is heated.	
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(f) A colourless gas that turns red litmus paper blue. (g) A gas used in packet foods to keep the contents fresh. (1) (2)				
(f) A colourless gas that turns red litmus paper blue. (1) (g) A gas used in packet foods to keep the contents fresh.		(e)	A blue solid that turns pink when water is added to it.	
(g) A gas used in packet foods to keep the contents fresh. (1) Q4				
(g) A gas used in packet foods to keep the contents fresh. (1) Q4		(1)	A colourless gas that turns red litmus paper blue.	
(1) <u>Q</u> 4		()		
		(g)	A gas used in packet foods to keep the contents fresh.	
(1otal 7 marks)				Q4
			(Total / marks)	



Cal	culate the number of:
(a)	atoms in a molecule of CH ₃ CH ₂ C(CH ₃) ₂ COOH
	(1)
(b)	moles of hydrogen molecules that will react with three moles of propene, C ₃ H ₆
(c)	moles of carbon dioxide formed by the complete combustion of one mole of pentane,
	C_5H_{12} (1)
(d)	moles of steam formed by the complete combustion of one mole of ethane, C_2H_6
	(1)
(e)	moles of oxygen atoms in two moles of potassium manganate(VII), KMnO ₄
	(1)
	(Total 5 marks)

6.	Complete the following statements about graphite and diamond.	Leave blank
	Graphite is soft because it consists of layers of atoms held together in a hexagonal	
	arrangement by bonds but with	
	between the layers. The layers are able to	
	It is a conductor of electricity because it has	
	Each carbon atom in diamond has four covalent bonds arranged in a	
	shape around the carbon and this makes the crystal very	
	It does not conduct electricity because all four outer shell	
	electrons are	Q6
	(Total 7 marks)	

ues	cribe what you would observe.
(a)	Aqueous calcium chloride and aqueous calcium iodide.
	Test:
	Observation for calcium chloride:
	Observation for calcium iodide:
	(3)
(b)	Aqueous sodium carbonate and aqueous sodium nitrate.
	Test:
	Observation for sodium carbonate:
	Observation for sodium nitrate:
	(3)
(c)	Anhydrous copper(II) sulphate and anhydrous sodium sulphate. Test:
	Observation for anhydrous copper(II) sulphate:
	Observation for anhydrous sodium sulphate:
	(3)

Ure	ea is a fertiliser that is made from carbon dioxide and ammonia.
	$CO_2 + 2NH_3 \rightarrow CO(NH_2)_2 + H_2O$
(a)	Calculate the mass of urea formed from 88 kg of carbon dioxide.
	(3)
(b)	Calculate the percentage by mass of nitrogen in urea.
	(2)
(c)	Urea is only slightly soluble in water. Give one advantage of using urea rather than ammonium nitrate as a fertiliser in tropical regions.
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When manganese(IV) oxide, MnO_2 , is added to aqueous hydrogen peroxide, H_2O_2 , oxygen is evolved.
(i) Write the equation for the reaction.
(1)
(ii) State the function of manganese(IV) oxide in this reaction.
(1)
(iii) Give a test, and the result, for oxygen.
(1)
When manganese(IV) oxide is heated with concentrated hydrochloric acid, chlorine is evolved.
(i) Complete the equation for the reaction.
$MnO_2 + \dots + \dots + \dots + \dots$ $ (1)$
(ii) State the function of manganese(IV) oxide in this reaction.
(1)
(iii) Give a test, and the result, for chlorine.
(iv) Give a characteristic property of a transition metal that the compounds MnO ₂ and MnCl ₂ illustrate.
(1)

10.	The first	stage in	the 1	production	of 1	nitric	acid	is the	oxidation	of	ammonia
		~~~~		P - C					01110101011	-	***********

$$4NH_3(g) + 5O_2(g) \implies 4NO(g) + 6H_2O(g) \quad \Delta H = -910 \text{ kJ mol}^{-1}$$

(a) Complete the table to show what effect, if any, each of the changes in conditions will have on the position of equilibrium and on the rate at which equilibrium is reached.

Change in conditions	Effect on position of equilibrium	Effect on rate at which equilibrium is reached
Increasing the temperature		
Increasing the pressure		
Adding a catalyst		

**(6)** 

(b) State the temperature and identify the catalyst used in industry for the above reaction.

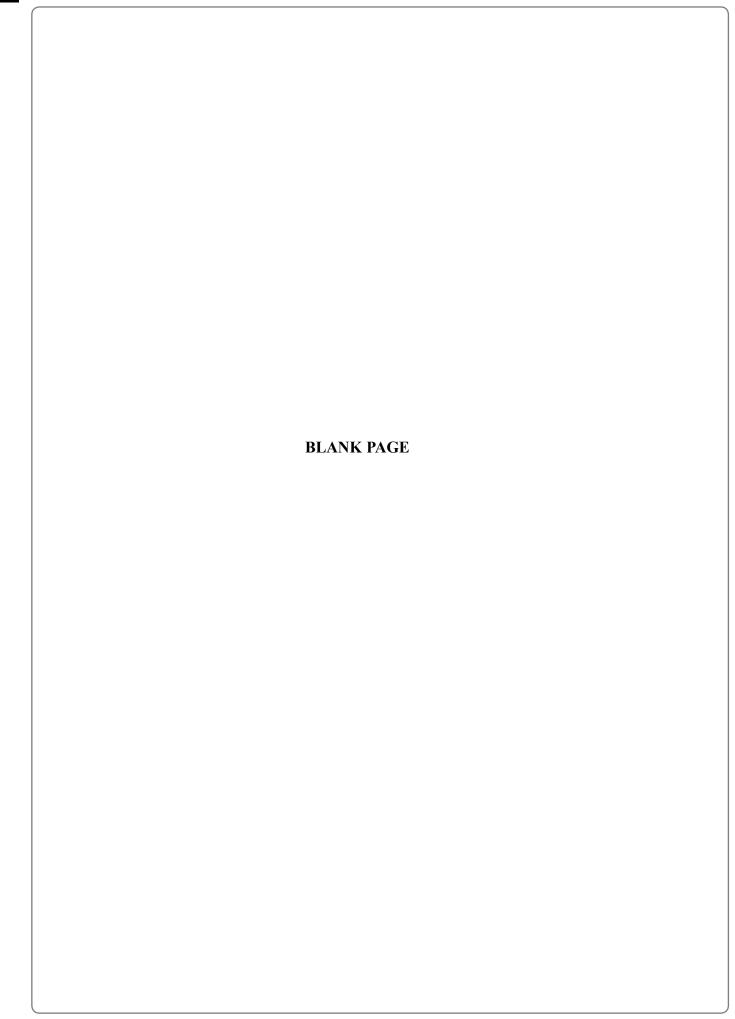
Temperature:

Identity of catalyst: **(2)** 

(c) Explain why, once the reaction has started, no further heating is required.

Q10 **(1)** 

(Total 9 marks)



gas C that extinguished a burning splint.  A	(a)	A green powder A was heated and it turned into a black solid B and a colourless	
B	· · ·		
C		A	
(b) When a small piece of a silvery metal <b>D</b> was dropped onto water, a lilac flame was seen. A colourless gas <b>E</b> and an alkaline solution <b>F</b> were produced.  D		B	
(b) When a small piece of a silvery metal <b>D</b> was dropped onto water, a lilac flame was seen. A colourless gas <b>E</b> and an alkaline solution <b>F</b> were produced.  D			
E	(b)	When a small piece of a silvery metal <b>D</b> was dropped onto water, a lilac flame was	
F		D	
(c) When aqueous ammonia was added to a yellow solution <b>G</b> , a brown precipitate <b>H</b> was formed and a solution of ammonium sulphate remained.  G		E	
(c) When aqueous ammonia was added to a yellow solution <b>G</b> , a brown precipitate <b>H</b> was formed and a solution of ammonium sulphate remained.  G		F	
formed and a solution of ammonium sulphate remained.  G		(3)	
H(2)	(c)		
(2)			
		G	
		Н	
(Total 8 marks)		Н(2)	
		Н	
		Н(2)	
		Н(2)	C
		Н(2)	



12. (a) (i)	Draw a displayed formula for $C_4H_{10}$ and for $C_4H_8$ . Use the formulae to explain	
	the difference between <i>saturated</i> and <i>unsaturated</i> hydrocarbons in terms of the bonds present in the molecules.	
	$C_4H_{10}$ $C_4H_8$	
	Saturated hydrocarbon:	
	Unsaturated hydrocarbon:	
	(4)	
(ii)	Draw a different displayed formula for $C_4H_{10}$ . Use the two formulae for $C_4H_{10}$ to explain what is meant by <i>isomerism</i> .	
	Isomerism:	
	(2)	

(b) (i)	Give a test, and the observations, that would distinguish between C ₄ H ₁₀ and	
( ) ( )	$C_4H_8$ .	
	Test:	
	Observation for C ₄ H ₁₀ :	
	Observation for C ₄ H ₈ :	
	(3)	
(ii)	Write an equation for a reaction that occurs when the test is performed.	
	(1)	
	(Total 10 marks)	

Leave blank

**13.** A solution of a metal nitrate, represented as M(NO₃)₂, was mixed with aqueous potassium iodide, KI, and the precipitate, MI₂, formed was separated, dried and weighed. The results are shown in the table below.

Volume of 0.100 mol dm ⁻³ KI used/cm ³	40.0	40.0	40.0	40.0	40.0
Volume of 0.100 mol dm ⁻³ M(NO ₃ ) ₂ used/cm ³	10.0	15.0	20.0	25.0	30.0
Mass of precipitate, MI ₂ , formed/g	0.461	0.692	0.922	0.922	0.922

The equation for the reaction is:

$$M(NO_3)_2 + 2KI \rightarrow MI_2 + 2KNO_3$$

(a) Write the ionic equation for the reaction, including state symbols.

(2)

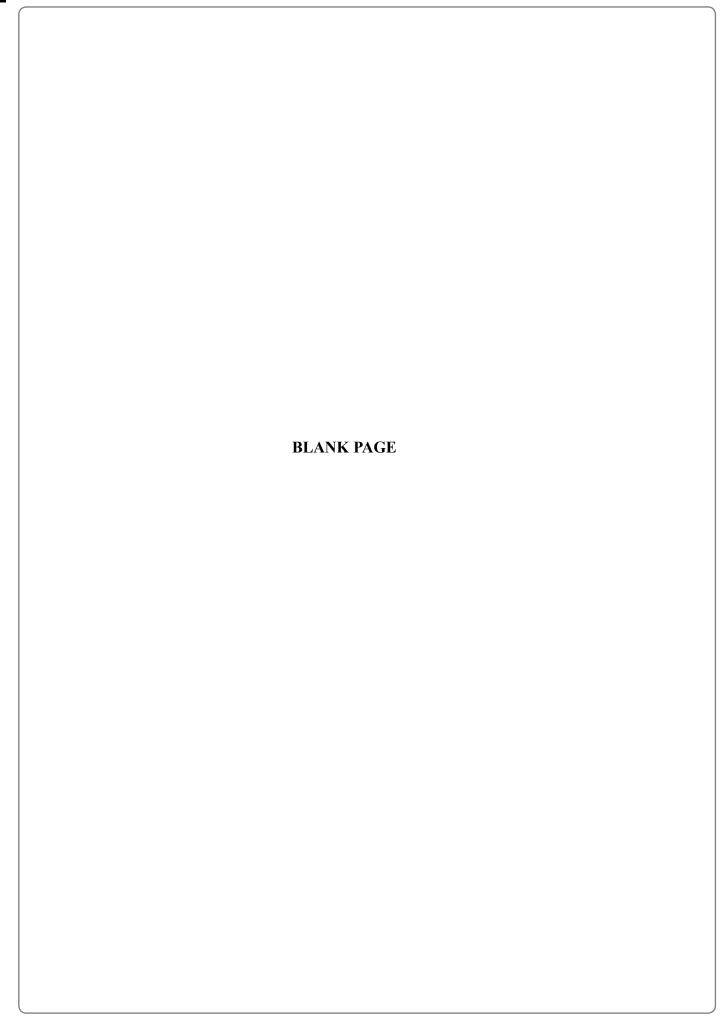
(b) Calculate the number of moles of KI in 40.0 cm³ of 0.100 mol dm⁻³ solution.

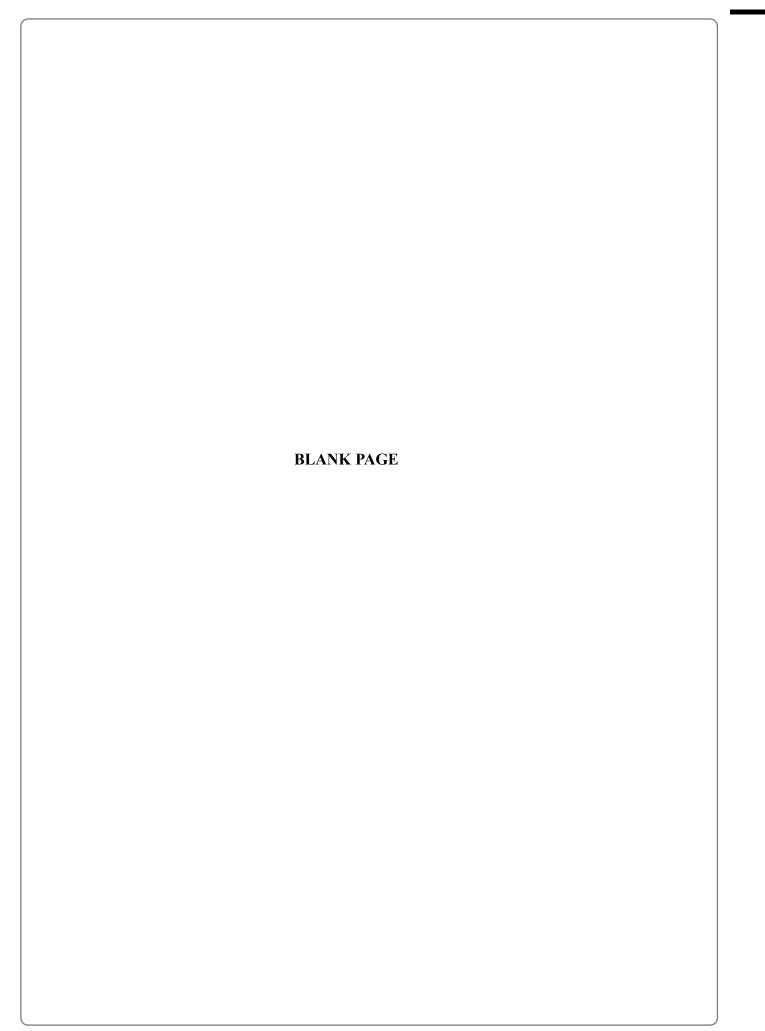
(1)

(c) Calculate the number of moles of  $M(NO_3)_2$  in  $10.0~\text{cm}^3$  of  $0.100~\text{mol}~\text{dm}^{-3}$  solution.

(1)

		Leave blank
(	d) Explain why the mass of the precipitate initially increased but then became constant.	
	(3)	
(	e) Given that $0.922~g$ of $MI_2$ is $0.002~mol$ , calculate the relative atomic mass of M and identify the metal.	
	Calculation:	
	Identity of M:	
	(5)	Q13
	(Total 12 marks)	
	TOTAL FOR PAPER: 100 MARKS	
	END	







						_	
	0	2 Helium 4	Neon Neon 20 20 Argon	84 Krypton 84	Xenon 131 131 86 Radon 222		
	7		Fluorine 19 Clorine	35.5 Bromine 80 53	lodine   127   85   Attaine   210		
	9		Oxygen 16 Sulphur				
	2		Nitrogen 14 15 Phosphorus				
	4		Carbon 12 12 Silicon Silicon				
	ო		B Boron 11 13 Aluminium			4	
щ				30 Zinc 65 48	Cadmium 112 2 2 112 2 Mercury 201 201		
THE PERIODIC TABLE					Ag Silver 108 79 Au Gold 197	4	
RIODI					Palladium 195	-	
H. B.					Rhodium 103 77 77 192 192	_	
F				85 Ton 88 4	Ruthenium 101 76 OS Osmium 190	┥	mber ol tomic
	Group	Hydrogen		25 Mn Manganese 55	Tc Tc 99 75 Re Rhenium 186		Atomic number Symbol Name Relative atomic mass
				Chromium 52	Molybdenum T 96 74 W		
					Niobium 93 73 73 Tantalum 181		
					Zrconium 91 72 72 Hf Hafnium 179		
				Scandium 45	Yttrium 89 85 57 Lanthanum 139	Actinium 227	
	α		Be Beryllium 9 9 12 12 Mg Magnesium	24 Calcium 40 38	Strontium 88 88 56 Barium 137		
	-		3 Lithium 7 7 7 7 7 8 8 Sodium Sodium	19 19 <b>K</b> Potassium 39	Rubidium 86 85 55 Caesium 133	Francium 223	
		Period 1	a e	4	യ വ	<b>~</b>	