

Centre No.						Paper Reference						Surname	Initial(s)	
Candidate No.						7	0	8	1	/	0	1	Signature	

Paper Reference(s)

7081/01

Examiner's use only

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Team Leader's use only

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London Examinations GCE Chemistry Ordinary Level

Paper 1

Monday 14 January 2008 – Afternoon

Time: 1 hour 15 minutes

Materials required for examination
Nil

Items included with question papers
Nil

Question Number	Leave Blank
1	
2	
3	
4	
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9	
10	
11	
12	
13	
Total	

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.

Some questions must be answered with a cross (X) in the box. If you change your mind about an answer, put a line through the box (X) and then mark your new answer with a cross (X).

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 parts of questions are shown in round brackets: e.g. (2)

This paper has 13 questions. There are no blank pages.

DATA

One mole of any gas occupies $24\,000\text{ cm}^3$ 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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Turn over

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Answer ALL questions.

1. Write the formula for:

(a) potassium nitrate (1)

(b) calcium hydroxide (1)

(c) ammonium sulphate (1)

(d) iron(III) chloride. (1)

(Total 4 marks)

Q1

2. Complete the table.

Particle	Number of protons	Number of neutrons	Number of electrons
$^{31}_{15}\text{P}$			15
$^{27}_{13}\text{Al}^{3+}$		14	
	35	46	36

(Total 7 marks)

Q2



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blank

3. Complete the sentences by inserting the name or formula of the appropriate element or compound.

(a) When copper(II) oxide is reacted with dilute nitric acid, the products are
..... and
(2)

(b) When sulphur dioxide reacts with aqueous sodium hydroxide, the products are
..... and water.
(1)

(c) A compound that turns a Bunsen flame orange-red is
chloride.
(1)

(d) Two colourless gases that combine to form a white smoke are
..... and
(1)

(e) Phosphorus(V) chloride, PCl_5 , reacts with
to form chloroethane.
(1)

(Total 6 marks)

Q3

3

Turn over



Leave
blank

4. Give the colour of each of the following substances.

(a) Sulphur (1)

(b) Nitrogen dioxide (1)

(c) Copper(II) carbonate (1)

(d) The precipitate formed when a few drops of aqueous ammonia are added to copper(II) sulphate solution.
..... (1)

(e) The solution formed when methyl orange is added to aqueous sodium hydroxide.
..... (1)

(f) The solid product formed when copper(II) hydroxide is heated.
..... (1)

(Total 6 marks)

Q4



<p>5. Give the number of:</p> <p>(a) atoms in one molecule of $(\text{CH}_3)_2\text{CHBr}$ (1)</p> <p>(b) electrons in the outer energy level of germanium (atomic number = 32) (1)</p> <p>(c) sulphate ions that would combine with two chromium(III) ions (1)</p> <p>(d) hydrogen atoms in one molecule of the alkene that contains seven carbon atoms (1)</p> <p>(e) moles of electrons needed to liberate 54 g of aluminium during the electrolysis of molten aluminium oxide (1)</p> <p>(f) moles of potassium hydroxide needed to neutralise 500 cm^3 of 0.25 mol dm^{-3} nitric acid. (1)</p> <p style="text-align: right;">(Total 6 marks)</p>	<p>Leave blank</p> <p style="text-align: center;">Q5</p> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>
<p>6. Identify each of the following elements, using the Periodic Table where necessary.</p> <p>(a) A gas that occupies about 20% of the air by volume. (1)</p> <p>(b) An inert gas that is used in domestic light bulbs. (1)</p> <p>(c) A solid non-metal with a very high melting point. (1)</p> <p>(d) A metal that forms $2+$ and $3+$ ions. (1)</p> <p>(e) An element in the third period that has 16 neutrons in its atomic nucleus. (1)</p> <p>(f) The fourth member of Group 2. (1)</p> <p style="text-align: right;">(Total 6 marks)</p>	<p style="text-align: center;">Q6</p> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto;"></div>



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7. Complete the sentences below, using words from the following list.

Each word may be used once or not at all.

solid	ions	atoms
molten	anions	electrons
aqueous	cations	bonds

Sodium chloride does not conduct electricity in the state because the are fixed in position. Sodium chloride does conduct electricity in the or state; current is carried to the negative electrode by the

Sodium metal conducts electricity due to the movement of

(Total 6 marks)

Q7



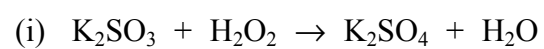
8. (a) Define **oxidation** in terms of the loss or gain of oxygen.

Oxidation is
(1)

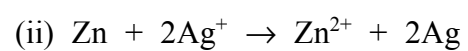
- (b) Define **oxidation** in terms of the loss or gain of electrons.

Oxidation is
(1)

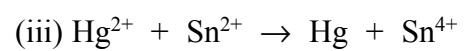
- (c) For each of the following equations, state with a reason which species has been oxidised.



.....
(1)



.....
(1)



.....
(1)



Leave
blank

(d) In the blast furnace, iron(III) oxide is reduced to produce iron.

(i) One of the reactions that takes place in the furnace is the reduction of carbon dioxide to carbon monoxide by coke. Write the equation for the reaction.

.....
(1)

(ii) The carbon monoxide then reduces the iron(III) oxide to iron. Write the equation for this reaction.

.....
(1)

(iii) How is the silicon dioxide impurity removed from the furnace?

.....
.....
.....
(2)

(iv) Write the equation(s) for this reaction.

.....
.....
(2)

(Total 11 marks)

Q8



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9. Draw diagrams to show the shapes of the following molecules. Use lines to represent covalent bonds and do **not** show the electron arrangements.

(a) Methane

(2)

(b) Ammonia

(2)

(c) Carbon dioxide

(2)

Q9

(Total 6 marks)

9

Turn over



10. (a) Two isomers have the percentage composition by mass:

C = 24.24% H = 4.04% Cl = 71.72%

(i) Use these figures to show that the empirical formula of the isomers is CH₂Cl.

.....

(3)

(ii) The relative molecular mass of the isomers is 99. Show that they have a molecular formula C₂H₄Cl₂.

.....

(1)

(iii) Draw the displayed formulae for the two isomers.

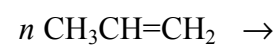
(2)

(b) Propene can polymerise to form poly(propene).

(i) Name the type of polymerisation involved.

(1)

(ii) Complete the equation for the polymerisation.



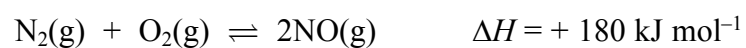
(2)

Q10

(Total 9 marks)



11. (a) Consider the formation of nitrogen monoxide using the reversible reaction:



In order to obtain the maximum yield of nitrogen monoxide at equilibrium, it is necessary to control the conditions very carefully.

(i) State, with a reason, whether a high or low temperature should be used.

Temperature

Reason

(2)

(ii) State, with a reason, what effect, if any, an increase in pressure would have on the equilibrium yield.

Effect of an increase in pressure

Reason

(2)

(iii) State, with a reason, what effect, if any, an increase in pressure would have on the rate of reaction.

Effect of an increase in pressure

Reason

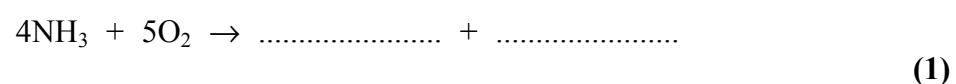
(3)



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(b) The process to make nitric acid starts with the catalytic oxidation of ammonia to form nitrogen monoxide.

(i) Complete the equation for the reaction.



(ii) What is the approximate temperature for the reaction? Put a cross (☒) in the correct box. If you change your mind, put a line through the box (☒) and then mark your new answer with a cross (☒).

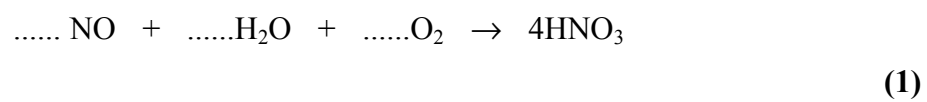
400 °C 600 °C 900 °C 1200 °C (1)

(iii) Identify the catalyst. (1)

(iv) Once this reaction has started, it requires no additional heat to maintain the optimum temperature. What does this indicate about the enthalpy change for the reaction?

..... (1)

(c) Nitrogen monoxide reacts with water and oxygen to make nitric acid. Balance the equation:



(Total 12 marks)

Q11



12. (a) Use the experimental results given below to identify, by name or formula, each of the substances **A** to **F**.

(i) **A** is a pale green solution that reacts with dilute sodium hydroxide to form a green precipitate **B**. When dilute hydrochloric acid is added to a fresh sample of **A**, followed by aqueous barium chloride, a white precipitate **C** is formed.

A is.....

B is

C is.....

(3)

(ii) When dilute hydrochloric acid is added to a colourless solution **D** and warmed, a colourless gas **E** is given off which turns solution **F** from orange to green. When a platinum wire is dipped in solution **D** and then put in a Bunsen flame, it produces a yellow colour.

D is.....

E is.....

F is

(3)

(b) Describe chemical tests to show that a solution contains NH_4^+ ions and Br^- ions.

(i) Test for NH_4^+ ions

.....

(3)

(ii) Test for Br^- ions

.....

(3)

(Total 12 marks)

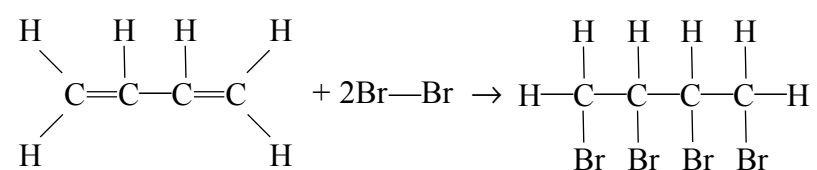
Q12



13. Some average bond energies are given in the table.

Bond	Average bond dissociation energy / kJ mol ⁻¹
C—C	350
C=C	610
C—H	410
C—Br	275
Br—Br	195

The reaction between an unsaturated molecule and bromine is shown in the equation below.



(a) (i) Calculate the energy needed to break all the bonds in 1 mole of the unsaturated molecule.

.....

.....

.....

.....

(2)

(ii) Calculate the energy needed to break the bonds in 2 moles of bromine molecules.

.....

(1)

(iii) Hence calculate the energy needed to break all the bonds in the reactants.

.....

(1)



Leave
blank

(iv) Calculate the energy released when all the bonds are formed in 1 mole of the product.

.....
.....
.....
.....

(2)

(v) Hence calculate the enthalpy change, ΔH , for the reaction.

.....
.....
.....
.....

(2)

(b) State the colour change observed when this reaction takes place.

.....

(1)

Q13

(Total 9 marks)

TOTAL FOR PAPER: 100 MARKS

END



THE PERIODIC TABLE

Period 1 2 3 4 5 6 7 0 Group

1																	2	He Helium 4						
2	3	4											5	6	7	8	9	10						
1	Li Lithium 7	Be Beryllium 9																	B Boron 11	C Carbon 12	N Nitrogen 14	O Oxygen 16	F Fluorine 19	Ne Neon 20
2	11	12											13	14	15	16	17	18						
3	Na Sodium 23	Mg Magnesium 24											Al Aluminium 27	Si Silicon 28	P Phosphorus 31	S Sulphur 32	Cl Chlorine 35.5	Ar Argon 40						
4	19	20											21	22	23	24	25	26	27	28	29	30		
4	K Potassium 39	Ca Calcium 40	Sc Scandium 45	Ti Titanium 48	V Vanadium 51	Cr Chromium 52	Mn Manganese 55	Fe Iron 56	Co Cobalt 59	Ni Nickel 59	Cu Copper 63.5	Zn Zinc 65	Ga Gallium 70	Ge Germanium 73	As Arsenic 75	Se Selenium 79	Br Bromine 80	Kr Krypton 84						
5	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54						
5	Rb Rubidium 86	Sr Strontium 88	Y Yttrium 89	Zr Zirconium 91	Nb Niobium 93	Mo Molybdenum 96	Tc Technetium 99	Ru Ruthenium 101	Rh Rhodium 103	Pd Palladium 106	Ag Silver 108	Cd Cadmium 112	In Indium 115	Sn Tin 119	Sb Antimony 122	Te Tellurium 128	I Iodine 127	Xe Xenon 131						
6	55	56	57	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86						
6	Cs Caesium 133	Ba Barium 137	La Lanthanum 139	Hf Hafnium 178	Ta Tantalum 181	W Tungsten 184	Re Rhenium 186	Os Osmium 190	Ir Iridium 192	Pt Platinum 195	Au Gold 197	Hg Mercury 201	Tl Thallium 204	Pb Lead 207	Bi Bismuth 209	Po Polonium 210	At Astatine 210	Rn Radon 222						
7	87	88	89																					
7	Fr Francium 223	Ra Radium 226	Ac Actinium 227																					

1
H
Hydrogen
1

Key
Atomic number
Symbol
Name
Relative atomic mass

