GREENRIDGE SECONDARY SCHOOL
2005 Preliminary Exam One

Pure Chemistry 5068
Paper 2
Secondary Four Express

Date : 11 May 2005 **1 h 45 mins**

Name: _____( ) Class: _____

Parent's signature & date: _____

INSTRUCTIONS TO CANDIDATES
Write your name and index number in the spaces at the top of this page and on all separate answer paper used.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer **three** questions. Do **not** answer both of **B15** and **B16**.
Write your answers on the separate foolscap paper.
At the end of the examination, hand up the foolscap papers separately from the question paper.

All essential working must be shown.

INFORMATION FOR CANDIDATES
The number of marks is given in brackets [ ] at the end of each question or part question.
A copy of the Periodic Table is printed on **page 10** .

FOR **EXAMINER'S** USE	
Section A	/50
Section B	/30
Total	/80

Name of Setter: Mr Victor Lee

This question paper consists of **10** printed pages including this cover page

Section A

Answer **all** the questions in this section in the spaces provided.

The total mark for this section is 50.

A1 Aqueous potassium chloride can be prepared by titrating aqueous potassium hydroxide with dilute hydrochloric acid. The equation for this reaction is shown below.

$$KOH_{(aq)} + HCl_{(aq)} \rightarrow KCl_{(aq)} + H_2O_{(l)}$$

(a) Name the two pieces of apparatus used to measure accurately the volumes of the solutions in this titration. [2]

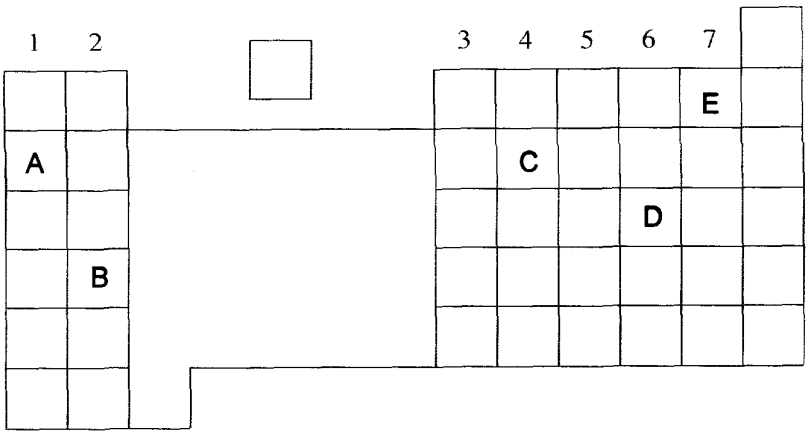
_____

(b) Give the meaning of the symbols ***(aq)*** and ***(l)*** in this equation. [2]

_____

_____

A2 Five elements represented by the letters **A**, **B**, **C**, **D** and **E** can be found in the Periodic Table below.



(The letters are **not** the correct symbols for the elements concerned.) Using only the given letters, give the formula of the compound formed between each of the following pairs of elements.

(a) **A** and **D** _____

(b) **C** and **E** _____

(c) **B** and **E** _____

(d) **D** and **E** _____ [4]

A3 (a) Why is steel more suitable than pure iron in most uses? [2]

(b) Why is stainless steel popularly used for making cutlery? [1]

(c) Why is recycling aluminium easier than recycling scrap iron? [3]

A4 Haber process is used for the manufacture of ammonia.

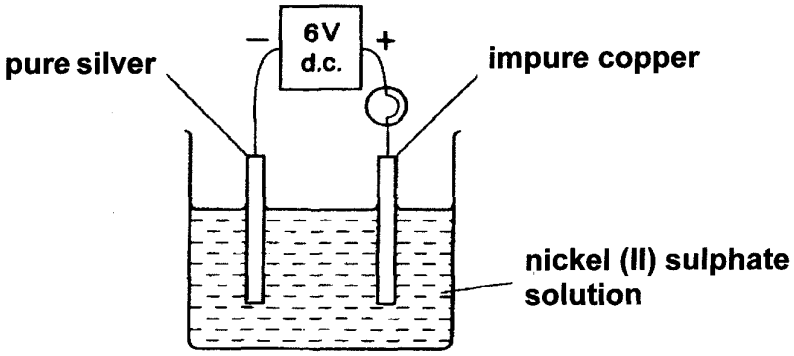
(a) State the essential conditions used in the Haber process. [2]

(b) Write the equation for the reaction used in the Haber process. [1]

(c) Write the formula for ammonium phosphate(V). [1]

(d) Name the gas which you would expect to be formed when ammonium phosphate(V) is warmed with aqueous sodium hydroxide. [1]

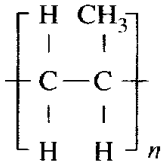
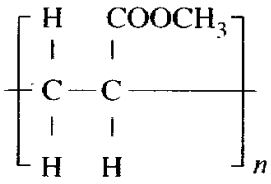
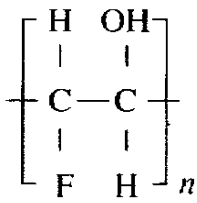
A5 The diagram shows an apparatus which was set up to purify a piece of copper. There are **two** mistakes in the way the apparatus has been set up.



(a) State **TWO** changes which need to be made to enable the copper to be purified. [2]

(b) When the correct apparatus is used, copper dissolves from the impure electrode. Write an ionic equation, including the state symbols, for this reaction. [2]

A6 Give the **structural** formula of the respective monomers that made up the polymers.

	Polymer	**Monomer**
(a)		
(b)		
(c)		

[3]

A7 Ethanol is an important organic liquid. It is widely used as fuel for cars in Brazil. It can be prepared in the laboratory by fermentation of sugar cane. Brazil is a tropical country with suitable weather and plenty of land suitable for growing sugar cane.

(a) Give **two** long term advantages of using ethanol as a fuel for cars in Brazil. [2]

(b) Ethanol can also be prepared from petroleum. Name the **two** processes that convert petroleum to ethanol. [2]

(c) Give another use of ethanol produced from petroleum, other than as a fuel in motor vehicles. [1]

A8 The reaction below is an example of a redox reaction.

$Cl_{2(g)} + 2KI_{(aq)} \rightarrow 2KCl_{(aq)} + I_{2(aq)}$

When chlorine gas is passed into aqueous potassium iodide solution, the yellow-green colour of the chlorine disappears and the solution turns brown.

(a) Construct an ionic equation for this reaction. [1]

(b) Name the oxidising agent in the reaction. [1]

(c) Explain why this is a redox reaction. [3]

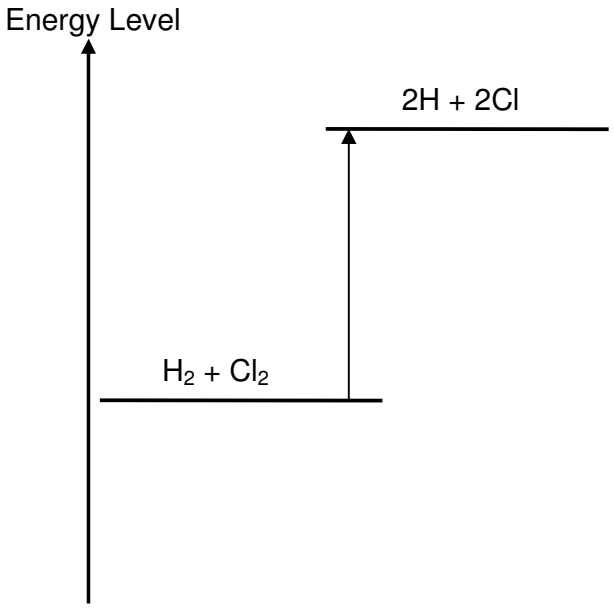
A9 The table below shows some bond energies, measured in kilojoules per mole. Bond energy is the energy (ΔH +ve) required to break the bonds between pairs of atoms.

Bond	Bond energy, in kJ/mol	Bond	Bond energy, in kJ/mol
H – H	436	Cl – Cl	242
H – Cl	431	C – H	412
C = C	612	C – C	348
N = N	409	N – N	163

One mole of hydrogen reacts with one mole of chlorine to form two moles of hydrogen chloride.

$$H_2 + Cl_2 \rightarrow 2HCl; \qquad \Delta H = ? \text{ kJ}$$

Complete the energy level diagram for the above reaction, showing energy level for intermediates and final products. [4]



A10 Give the formulae of the following compounds: [3]

(a) sulphuric acid: _____

(b) silver chloride: _____

(c) ammonium sulphate: _____

A11 Write a balanced chemical equation for the following reactions.

(a) copper (II) carbonate and hydrochloric acid [2]

_____

_____

(b) sodium hydroxide and sulphuric acid [2]

_____

_____

A12 Complete the following table. [3]

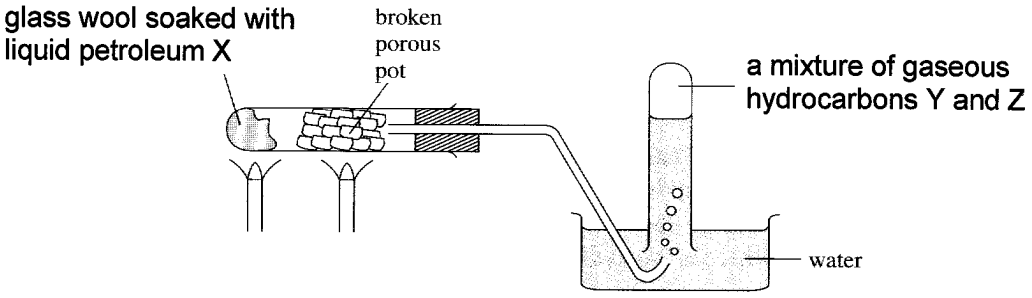
Symbol of particle	Atomic Number	Mass Number	Number of		
			Protons	Neutrons	Electrons
K^+	19		19	21	
O^{2-}	8		8	9	
N^{3-}	7	14		7	

~ End of Section A ~

Section B

Answer **three** questions
Answer **both** question **B13 and** question **B14**.
*Choose **either** question **B15 or** question **B16**.*

B13. In a laboratory experiment, liquid petroleum **X** was heated and passed over strongly heated broken porous pot, using the apparatus shown. **X** is a hydrocarbon with 7 carbon atoms and a general formula C_nH_{2n+2}.



(a) (i) Name the type of reaction which occurs in the apparatus. [1]
(ii) What is the purpose of the porous pot? [1]
(b) Hydrocarbon **Y** contains 2 carbon atoms and has the general formula C_nH_{2n}.
Give the structural formula and name of hydrocarbon **Y**. [2]
(c) Construct a balanced equation for the reaction named in a(i). [1]
(d) Hydrocarbon **Y** can be polymerised.
(i) Name the polymer formed. [1]
(ii) Name the type of polymerisation which takes place during this reaction, and draw the structure of the polymer, showing three repeating units. [2]
(iii) This polymer is non-biodegradable.
Explain the term non-biodegradable and the effect it has on our environment. [2]

B14. There are four stages in the conversion of sulphur into sulphuric acid.

Stage 1 - Sulphur is burned to produce sulphur dioxide.
Stage 2 - Sulphur dioxide is oxidised to sulphur trioxide.
Stage 3 - Sulphur trioxide is dissolved in concentrated sulphuric acid to form oleum.
Stage 4 - Oleum is diluted with water to form concentrated sulphuric acid.

(a) Give the name of the process in stage 2. [1]
(b) State the conditions and give the equation for stage 2. [3]
(c) Calculate the mass of sulphur needed to make 49kg of sulphuric acid. [2]
(d) Give **two** observations when dilute sulphuric acid reacts with zinc carbonate. [2]
(e) Explain why sulphur trioxide is dissolved in concentrated sulphuric acid instead of dissolving it in water directly. [2]

Either

B15. (a) Eutrophication of lakes is a problem which may occur if sufficient concentrations of nitrate ions are present in the water. Nitrates may be leached from adjacent land used for plantation.

(i) Explain how eutrophication of lakes can occur. [3]

(ii) Eutrophication can occur in a lake or pond, but **not** in the open sea. Why? [1]

(ii) Name another substance that can contribute to eutrophication of lakes. [1]

(b) Ozone is also a gas found high up in the atmosphere - in a layer referred to as the ozonosphere. It protects the earth by filtering out harmful ultraviolet rays. In the last few decades, the wide use of aerosol propellants resulted in the leakage of a chemical called CFC (chlorofluorocarbons) into the atmosphere. CFC reacts and destroys this ozone layer, producing ozone 'holes' in the sky.

(i) Name the three elements present in CFC. [1]

(ii) Discuss the importance of the ozone layer and the problems involved with the depletion of ozone by reaction with CFC. [3]

(iii) Name one of the products formed when CFC reacts with ozone? [1]

Or

B16. Copper (II) carbonate decomposes when it is heated, according to the equation:

$$CuCO_{3(s)} \rightarrow CuO_{(s)} + CO_{2(g)}$$

Jason conducted an experiment using 31g of copper (II) carbonate. He heated the carbonate strongly and the carbon dioxide produced was collected and measured using a gas syringe.

(a) Sketch a graph to show how the volume of carbon dioxide collected changes with time. [2]

(b) Explain your graph in part (a). [2]

(c) Calculate the maximum volume of carbon dioxide, measured at room temperature and pressure, that can be formed from 31g of copper (II) carbonate. [2]

(d) Jason decided to try producing carbon dioxide by reacting 31g of copper (II) carbonate with excess dilute hydrochloric acid. Would the maximum amount of carbon dioxide collected, at room temperature and pressure, be the same as in (c)? Explain. [2]

(e) Jason tried another experiment by reacting the same mass (31g) of magnesium carbonate with excess dilute hydrochloric acid. Would you expect the maximum total volume of carbon dioxide collected be the same as in (d)? Explain. [2]

~ The End ~

The Periodic Table of the Elements

Group																	
I	II										III	IV	V	VI	VII	0
						1 H Hydrogen 1										4 He Helium 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
23 Na Sodium 11	24 Mg Magnesium 12										27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
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	64 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
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yitrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 47	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
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57 *	178 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	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 +															

* 58 – 71 Lanthanoid series
\+ 90 – 103 Actinoid series

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

Key: a X b — a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.)