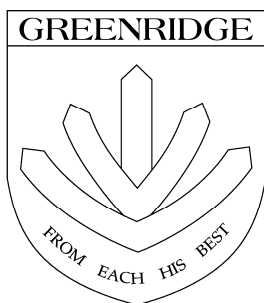


Name : _____ ()

Class : 3E1



Greenridge Secondary School

End-of-Year Examination 2008

Subject : Pure Chemistry (5072)
Secondary Three Express
Paper 2

Date : 6 Oct 2008 (Monday)

Duration : 1 h 45 min

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READ THESE INSTRUCTIONS FIRST

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

Write in dark blue or black pen.

You may use a pencil for any diagrams, graphs or rough working.

Section A

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

Section B

Answer **all** three questions, the **last** question is in the form **either/or**.

Write your answers on foolscap paper provided.

Start each question on a fresh page of the foolscap paper.

All essential working must be shown.

At the end of the examination, hand up the foolscap papers separately from the question paper.

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 **14**.

Parent's Signature & Date

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

Setter : Mr Victor Lee

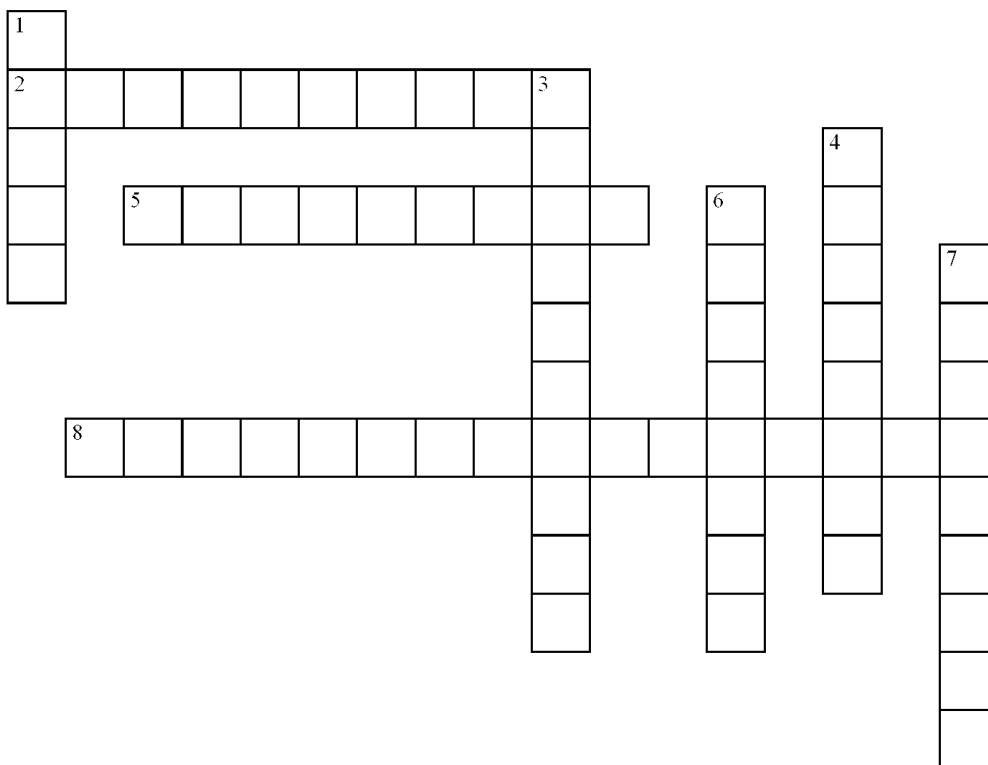
*This paper consists **14** printed pages, including this page.*

Section A

Answer **all** the questions in this section in the spaces provided.
The total mark for this section is **50**.

A1 Use the following clues to complete the crossword.

[8]



Across

- 2 The ' \rightleftharpoons ' in a chemical equation indicates that the reaction is _____ .
5 A reaction whereby iron (III) oxide is converted to iron.
8 A process that removes sulphur dioxide from flue gas.

Down

- 1 A gas used to fill filament bulbs
3 A reaction whereby heat energy is given out to the surrounding.
4 The most reactive metal of all elements.
6 _____ change is the amount of energy involved in a reaction.
7 A metal used to provide sacrificial protection to underground iron pipe.

[Total: 8]

A2 Calcium reacts with fluorine to form calcium fluoride.

- (a) Calcium fluoride is an ionic compound. Draw a 'dot and 'cross' diagram to show the arrangement of electrons in calcium fluoride. Show **only outershell** electrons. **[3]**

*Use x to represent an electron from a calcium atom.
Use o to represent an electron from a fluorine atom.*

- (b) In the lattice of calcium fluoride, the ratio of calcium ions to fluoride ions is 1:2.

- (i) Explain the term lattice. **[2]**

- (ii) Explain why the ratio of ions is 1:2. **[1]**

- (iii) The reaction between calcium and fluorine is a redox reaction. Explain. **[4]**

[Total: 10]

A5 (a) Some properties of four metals are shown in the table below.



Metal	Electrical Conductivity ($S m^{-1}$)	Density ($kg m^{-3}$)	Notes
Silver	63.01×10^6	10490	Highest electrical conductivity of any known metal
Copper	59.6×10^6	8930	
Gold	45.2×10^6	19320	Gold is commonly used in electrical contacts.
Aluminium	37.8×10^6	2600	Commonly used in overhead electrical cables

SI Unit for conductivity is siemens per metre ($S m^{-1}$). The higher the value, the better the electrical conductivity of the material. Electrical conductivity in the table above is measured at $20^{\circ}C$.

(i) Explain why aluminium is used as overhead electrical cables instead of copper? **[2]**

(ii) Explain why copper is commonly used as underground electrical cables instead of silver which has a higher electrical conductivity? **[2]**

(iii) Below is some information on audio parts sold on internet.

	Part Number: 091-1120 Dayton RCA-CHRB Chassis Mount RCA Jack Pair Gold plated RCA jacks from Dayton Audio. Solder-on design. Works with materials up to 3/16" thick.
	Part Number: 091-180 Gold RCA Right Angle Adapter Short Gold right angle RCA.

Explain why gold is commonly used to plate connectors even though it may increase the cost of the parts, especially in high quality audio or video system? [2]

(b) Aluminium is more expensive than iron although aluminium is the most abundant metal in the Earth's crust. Explain. [2]

(c) Give **three** factors in which the **availability** of a metal depends mainly on. [3]

[Total: 11]

A6 There are three methods of preparing salts.

Method A – use a pipette, a burette and a pH indicator.

Method B – by precipitation using two aqueous solutions

Method C – add an excess of base/metal/carbonate to a dilute acid and remove the excess by filtration.

For each of the following salt preparations, choose one of the *methods A, B or C*, name any *additional reagent* needed and then write a balanced chemical and/or ionic *equation*.

(a) the soluble salt, zinc sulphate, from the insoluble base, zinc oxide

(i) method _____

(ii) additional reagent _____

(iii) chemical equation

_____ [3]

(b) the insoluble salt, barium sulphate, from the soluble salt, barium nitrate

(i) method _____

(ii) additional reagent _____

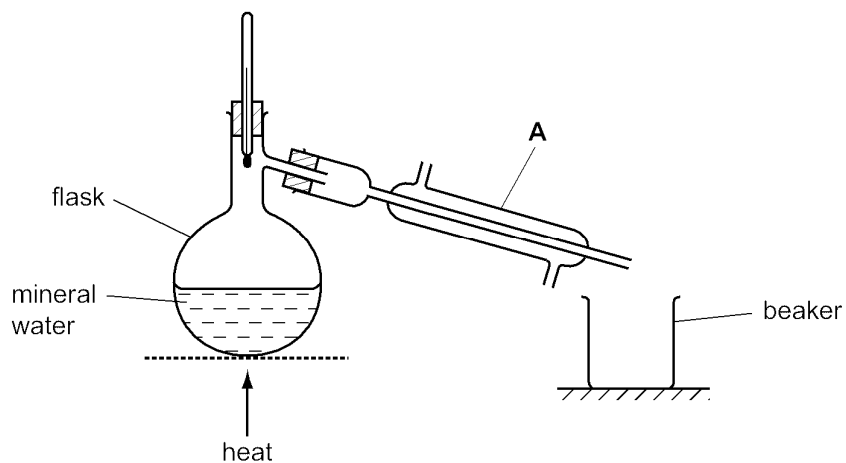
(iii) chemical equation

(iv) ionic equation

_____ [4]

[Total: 7]

A7 Pure water can be obtained by distilling the mineral water using the apparatus shown below.



(a) State the name of the piece of apparatus labelled **A**. [1]

(b) State and explain the temperature recorded by the thermometer when pure water is being collected in the beaker. [1]

(c) How does the boiling point of the mineral water in the flask compare with the temperature recorded in (b) when pure water is being distilled over? [1]

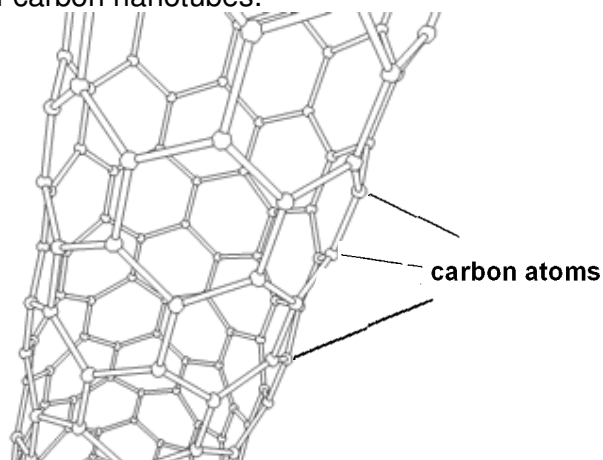
(d) This method can be used to separate water from the dissolved minerals. However, it **cannot** be used to separate two miscible liquid like a mixture of ethanol and water. Why? [1]

[Total: 4]

Section B

Answer **all three** questions from this section.
The **last question** is in the form of an either/or and
only one of the alternatives should be attempted.
Write your answers on foolscap provided.

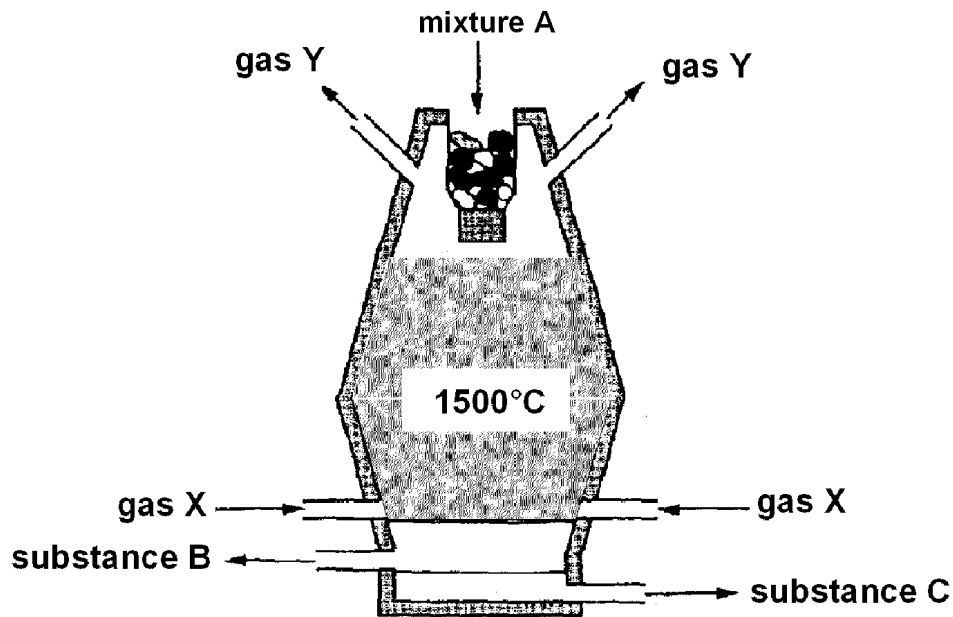
- B8** In recent years scientists have made tube-shaped structures of carbon called nanotubes. Carbon nanotubes (CNTs) are **allotropes of carbon** with a nanostructure that can have a length-to-diameter ratio greater than 1,000,000. These cylindrical carbon molecules extraordinary strength and unique electrical properties, and are efficient conductors of heat. The diagram below shows the structure of carbon nanotubes.



- (a) State two **differences** between the *structure* of a carbon nanotube and the structure of diamond. **[2]**
- (b) Carbon nanotubes are fifty times stronger than steel. Use ideas about structure and bonding to suggest why these nanotubes are so strong. **[2]**
- (c) Carbon nanotubes are good electrical conductors.
- (i) Explain, in terms of its bonding and structure, why carbon nanotubes are good conductors of electricity. **[3]**
- (ii) Name the other form of carbon which can conduct electricity. **[1]**
- (iii) Carbon nanotubes conduct electricity nearly as well as copper. Explain, in terms of its bonding and structure, why copper is a good conductor of electricity. **[3]**

[Total: 11]

B9. The diagram shows the Blast Furnace.

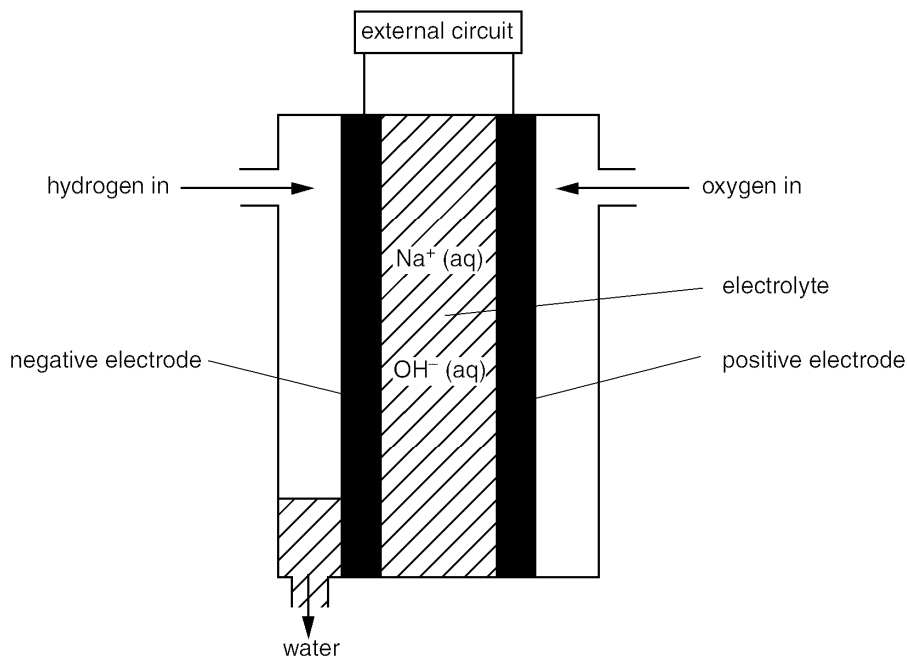


- (a) (i) Name the components that made up mixture A. [1]
(ii) Name the gas X. [1]
(iii) Explain why gas X **cannot** be pure oxygen. [2]
- (b) The reduction of haematite to iron occurs at a temperature of 1500°C.
Explain what produces the high temperature of 1500°C. [1]
- (c) (i) Name the gaseous reducing agent in the furnace. [1]
(ii) Construct an equation for a reaction in which it is produced. [1]
- (d) The iron produced by the Blast Furnace is converted into alloys used in building constructions and car manufacturing industries.
(i) Explain what is meant by an alloy. [1]
(ii) Name the 3 elements added to iron to produce stainless steel. [1]

[Total: 9]

B10 Either

The NASA space shuttle uses fuel cells to generate electricity. The diagram below shows a hydrogen-oxygen fuel cell.



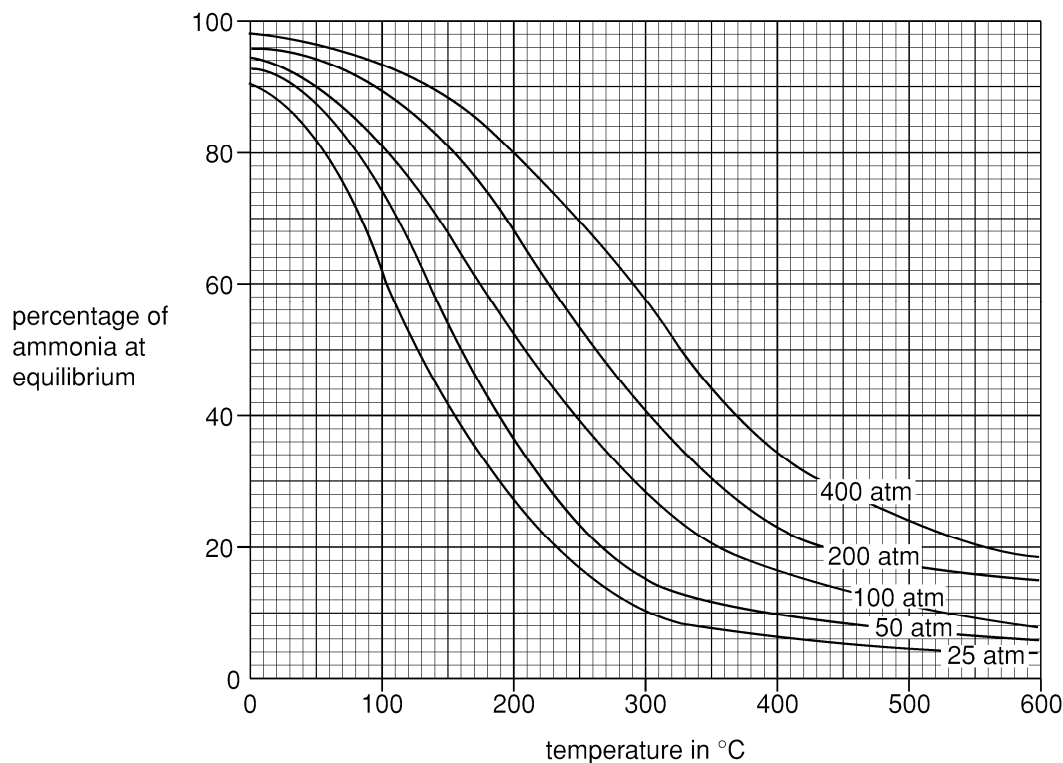
- (a) At the positive electrode, oxygen reacts with water. Write the ionic equation for the reaction at the positive electrode. [1]
- (b) At the negative electrode, hydrogen reacts with hydroxide ions. Write the ionic equation for the reaction at the positive electrode. [1]
- (c) Write the overall equation for the reaction between hydrogen and oxygen in the fuel cell. [1]
- (d) Suggest **one** source for hydrogen and **one** source for oxygen for use in a fuel cell. [2]
- (e) What type of reaction takes place, reduction or oxidation, at the positive electrode? Explain your answer. [2]
- (f) Describe some advantages and disadvantages of using a fuel cell power motor car. [3]

[Total: 10]

OR

Ammonia is manufactured by the Haber process.

- (a) The graphs below give information about the percentage of ammonia present in the equilibrium mixture at different temperatures and pressures.



The reaction requires the use of a catalyst, which operates most efficiently within the temperature range 280 °C to 450 °C.

- (i) Other than temperature, state the other two essential conditions used in the Haber process. **[2]**
- (ii) Write the equation for the reaction used in the Haber process. **[1]**
- (iii) Which conditions of temperature and pressure give the highest percentage of ammonia at equilibrium within the catalyst operating temperature range? **[2]**
- (iv) Suggest why the normal working temperature used in the Haber process is often over 400 °C. **[1]**

- (b) Ammonia is commonly used to make nitrogenous fertilisers such as ammonium nitrate and ammonium phosphate (V). Ammonia produced from the Haber process is reacted with nitric acid and phosphoric (V) acid to form ammonium nitrate and ammonium phosphate (V) respectively.
- (i) Write the chemical formula for ammonium nitrate. **[1]**
 - (ii) Given that the chemical formula of ammonium phosphate (V) is $(\text{NH}_4)_3\text{PO}_4$, suggest the chemical formula for phosphoric (V) acid. **[1]**
 - (iii) Name the gas which you would expect to be produced when ammonium phosphate(V) is warmed with aqueous sodium hydroxide. **[1]**
 - (iv) Suggest a test for the gas mentioned in b(iii) and state the observation. **[1]**

[Total: 10]

~ The End ~

The Periodic Table of the Elements

Group		I	II	III	IV	V	VI	VII	0
		1 H Hydrogen							4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4								
23 Na Sodium 11	24 Mg Magnesium 12							19 F Fluorine 9	20 Ne Neon 10
39 K Potassium 19	40 Ca Calcium 20							32 S Sulphur 16	35.5 Cl Chlorine 17
85 Rb Rubidium 37	88 Sr Strontium 38							73 Ge Germanium 32	79 Se Selenium 34
133 Cs Caesium 55	137 Ba Barium 56							115 In Indium 49	122 Sb Antimony 51
226 Fr Francium 87	226 Ra Radium 88							204 Tl Thallium 81	207 Pb Lead 82
								201 Hg Mercury 80	209 Bi Bismuth 83
								197 Au Gold 79	201 Po Polonium 84
								195 Pt Platinum 78	208 At Astatine 85
								192 Ir Iridium 77	
								186 Re Rhenium 75	
								184 W Tungsten 74	
								181 Ta Tantalum 73	
								178 Hf Hafnium 72	
								172 * 72	
								139 La Lanthanum 57	
								101 Ru Ruthenium 44	
								103 Rh Rhodium 45	
								106 Pd Palladium 47	
								108 Ag Silver 47	
								112 Cd Cadmium 48	
								119 Sn Tin 50	
								127 I Iodine 53	131 Xe Xenon 54
								128 Te Tellurium 52	
								75 As Arsenic 33	
								77 Br Bromine 35	
								79 Se Selenium 34	
								80 Kr Krypton 36	
								84 Kr Krypton 36	
								88 Sr Strontium 38	
								91 Zr Zirconium 40	
								93 Nb Niobium 41	
								96 Mo Molybdenum 42	
								99 Y Yttrium 39	
								101 Ru Ruthenium 44	
								103 Rh Rhodium 45	
								106 Pd Palladium 47	
								108 Ag Silver 47	
								112 Cd Cadmium 48	
								119 Sn Tin 50	
								127 I Iodine 53	
								128 Te Tellurium 52	
								131 Xe Xenon 54	
								137 Ba Barium 56	
								139 La Lanthanum 57	
								141 Pr Praseodymium 59	
								144 Nd Neodymium 60	
								147 Pm Promethium 61	
								150 Sm Samarium 62	
								152 Eu Europium 63	
								157 Gd Gadolinium 64	
								162 Dy Dysprosium 66	
								165 Ho Holmium 67	
								167 Er Erbium 68	
								169 Tm Thulium 69	
								173 Yb Ytterbium 70	
								175 Lu Lutetium 71	
								178 * 72	
								181 Ta Tantalum 73	
								184 W Tungsten 74	
								186 Re Rhenium 75	
								192 Ir Iridium 77	
								195 Pt Platinum 78	
								197 Au Gold 79	
								201 Hg Mercury 80	
								204 Tl Thallium 81	
								207 Pb Lead 82	
								208 At Astatine 85	
								209 Bi Bismuth 83	
								210 Po Polonium 84	
								211 At Astatine 85	
								212 Rn Radon 86	
								217 Ts Tennessine 115	
								218 Og Oganesson 116	
								219 Nh Nihonium 113	
								220 Fl Flerovium 114	
								221 Mc Moscovium 115	
								222 Lv Livermorium 116	
								223 Ts Tennessine 115	
								224 Og Oganesson 116	
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								226 Fl Flerovium 114	
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