Name : _____( ) Class : 3E1

Greenridge Secondary School

Mid-Year Examination 2007

Subject : Chemistry (5072)
Secondary Three Express
Paper 2

Date : 8 May 2007 **Duration : 1 h 45 min**

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.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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 papers provided.

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 **10**.

Parent's Signature & Date

_____

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

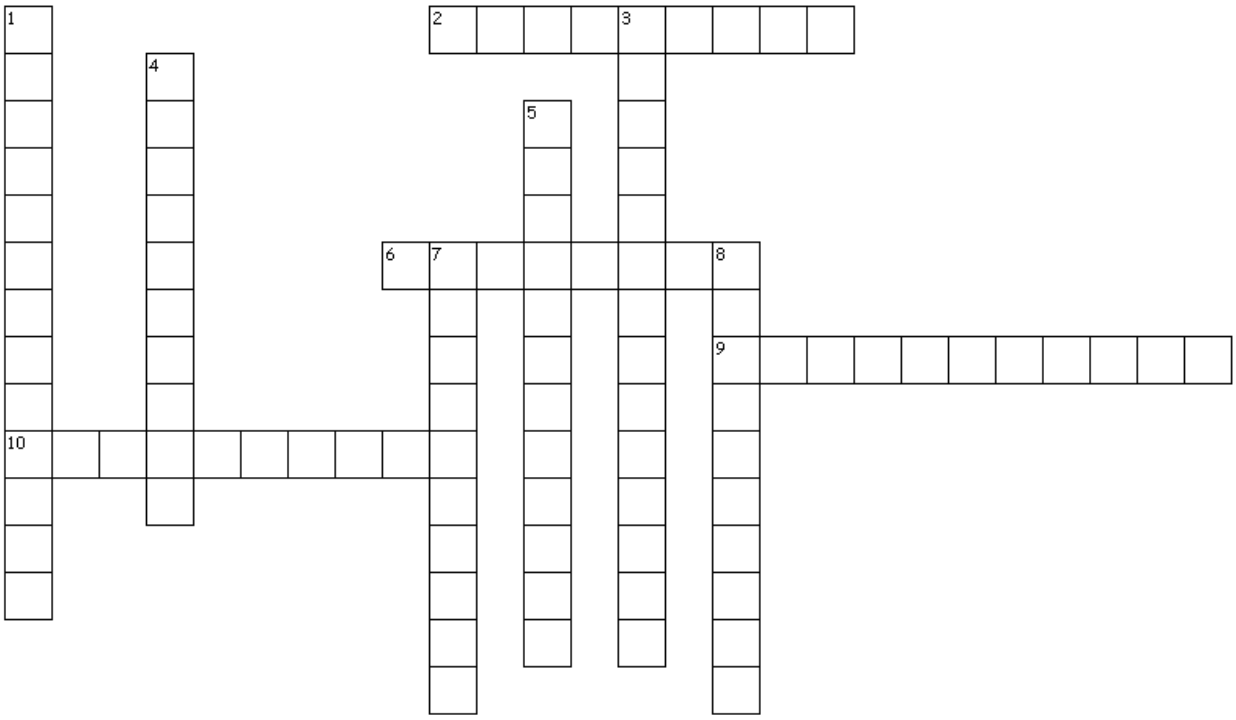
Setter : Mr Victor Lee

This paper consists 10 printed pages, including this page.

Section A (50 marks)

*Answer **ALL** questions from this Section.*

1. Use the following clues to complete the crossword. **[10]**



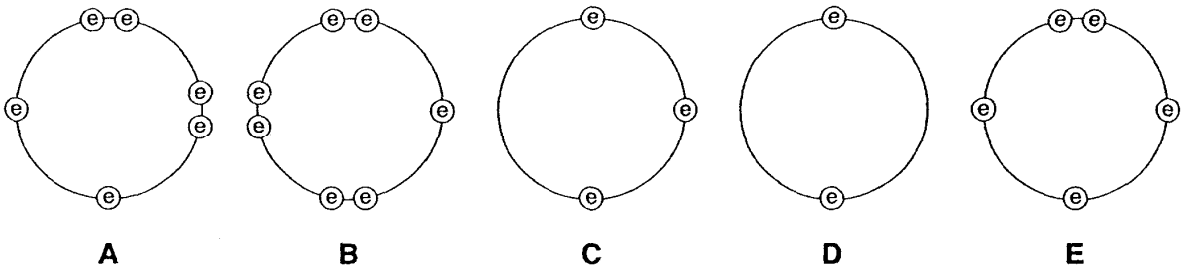
Across

2. Molecules made from two or more different atoms linked together by covalent bonding are called covalent or _____ compounds.
6. The liquid or solution that passes through the filter paper is called the_____.
9. Solid salt may be recovered from salt solution by _____ until all of the water has boiled away.
10. Graphite and diamond are _____ of each others as they are different forms of the same element.

Down

1. Positive sodium ions and negative chloride ions are attracted to one another by _____ attraction to form sodium chloride.
3. It is a technique which can be used to separate the components in a sample and to identify the number of substances in it.
4. A liquid which contains solid particles is called a _____.
5. A pure solvent can be separated from a solution by simple _____.
7. Oil arid water do not mix well so they form two separate layers when mixed., they are said to be _____.
8. The mass of a substance is measured with an _____ balance.

2. These diagrams show the electron arrangement in the outer shells of five elements, **A** to **E**. All elements are from Period 3 of the Periodic Table.



A **B** **C** **D** **E**

(a) Put the letters **A** to **E** in the table to show which elements are metals and which are non-metals. **[2]**

	Metals	**Non–metals**
Elements		

(b) Which element is most likely to be in Group VI? **[1]**

_____

(c) Which element will form an ion of the type $\mathbf{X}^{2+}$? **[1]**

_____

(d) Which element has an atomic number of 15? **[1]**

_____

(e) Which two elements will form an ionic compound with a formula of the type $\mathbf{YZ_2}$? **[1]**

_____

3. Four elements represented by the letters **A**, **B**, **C** and **D** can be found in Groups I, II, VI and VII respectively of the Periodic Table. (The letters are **not** the correct symbols for the elements concerned.) **Using only the given letters**, give the formulae of the compounds formed between each of the following pairs of elements.

(a) **A** and **C** _____

(b) **C** and **D** _____

(c) **B** and **D** _____

(d) **B** and **C** _____ **[4]**

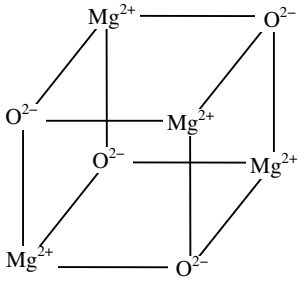
4. Complete the following table. **[4]**

	Apparatus used for measurement	Physical quantity to be measured	Accuracy of the apparatus	Symbol of SI Unit
a	Burette	Volume of liquid		
b	Electronic balance			
c	Clinical thermometer			

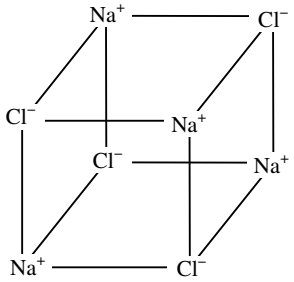
5 Complete the following table by filling in the blanks. **[4]**

Atom	Atomic Number	Mass Number	No. of protons	No. of neutrons	No. of electrons	Electronic configuration
A	***7***		***7***	***8***	***7***	
B	***9***	***20***			***9***	***2,7***
C			***3***	***3***	***3***	***2,1***
D		***14***	***7***		***7***	***2,5***

6. The structures of two ionic lattices are shown below.



Magnesium oxide



Sodium chloride

(a) Explain why these two solids do **not** conduct electricity. **[2]**

(b) (i) Explain why magnesium oxide has a very high melting point. **[2]**

(ii) Suggest why the melting point of magnesium oxide is much higher than that of sodium chloride. **[3]**

(c) Draw the electronic structure of magnesium oxide, showing all electron shells. **[3]**

7. In both liquids and gases, the molecules present are moving.

(a) Compare the movements and the spacing between the molecules in a gas with those in a liquid. **[2]**

(b) How do these movements change as the liquid is cooled to a temperature below its melting point? **[2]**

8. The following experiment was carried out to illustrate diffusion. A few drops of concentrated nitric acid were added to pieces of copper in the bottom of a tall gas jar. Nitrogen dioxide, a red-brown gas, was formed and all the copper reacted in a very short time. The red-brown colour slowly moved up the gas jar but initially the colour remained darkest at the bottom. After about 30 minutes, the red-brown colour was uniform throughout the gas jar.
[Relative atomic masses: N=14, O=16, Br=80]

(a) Explain the meaning of diffusion. **[1]**

(b) Give the chemical formula of nitrogen dioxde. **[1]**

(c) Why is the gas initially darkest at the bottom? **[1]**

(d) Explain how and why the results would differ if

(i) the gas jar were placed in hot water before carrying out the experiment, **[2]**

(ii) bromine (Br_2) had been used instead of copper and concentrated nitric acid. **[3]**

Section B (30 marks)

*Answer ALL **THREE** questions from this Section.*
*Each question is allocated **TEN marks***

9. (a) "Water is a common chemical substance, that is essential to all known forms of life. In typical usage water refers only to its liquid form or state, but the substance also has the solid state, ice, and gaseous state, water vapour. Saltwater oceans hold 97% of surface water, glaciers and polar ice caps 2.4%; and other land surface water such as rivers and lakes 0.025%."

Internet Source: Wikipedia

(i) How do you know that water is a compound and **not** an element? **[1]**

(ii) You are given a sample of water. Describe how you could prove if the water is pure or impure. **[2]**

(iii) Pure water can be obtained from sea water by the process called distillation. Sketch a diagram to show how distillation could be carried out to obtain pure drinking water. **[3]**

(b) Objects have been made out of bronze for thousands of years. The composition of the bronze used to make three different cups at about 1200 BC was analysed. The results are given in the table below.

Cup	% copper by mass	% tin by mass
1	85	15
2	81	19
2	88	12

(i) What type of substance is bronze? **[1]**

(ii) Explain how you can tell from the table that bronze is **not** a compound. **[1]**

(iii) Brass is another commonly used object.
Name the **two** elements that made up brass. **[2]**

10. The structures of carbon dioxide, water and ethanol are shown in figures below.

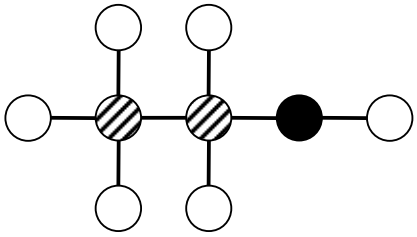


Fig. A

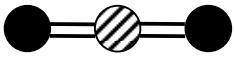


Fig. B

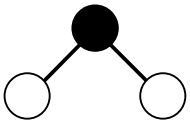


Fig. C

(a) Which figure represents a molecule of water? Explain. **[2]**

(b) How many different types of atoms are contained in a molecule of ethanol? **[1]**

(c) Draw the electronic structure diagram of ethanol, showing only the outermost electron shell. **[3]**

(d) Ethanol burns in air to produce carbon dioxide and water.
Write a balanced equation, with state symbols, for this combustion. **[2]**

(e) Using similar structures as shown above, draw the structure of an ethene (C_2H_4) molecule. **[2]**

11.
EITHER

Fluorine can form either covalent or ionic bonds.

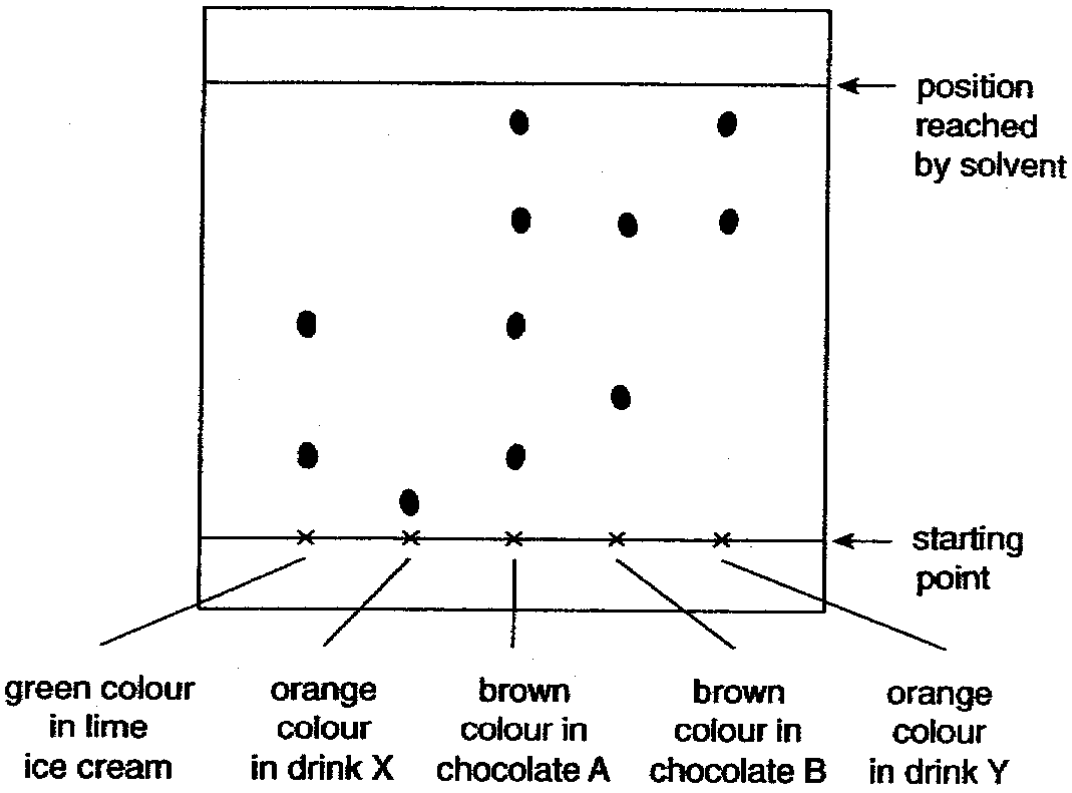
(a) Draw a 'dot-and-cross' diagram (*showing only outer electron shells*) to show the bonding in
  (i) sodium fluoride, NaF, **[2]**
  (ii) fluorine gas, F_2 **[2]**

(b) Explain why sodium fluoride has a higher melting point than fluorine. **[3]**

(c) Explain why sodium fluoride can conduct electricity only in molten and aqueous state but **not** in solid state. **[3]**

OR

(a) Paper chromatography can be used to identify the dyes used to colour food. The result of an experiment is shown in figure below.



(i) Which food colours consist of a single dye? **[1]**

(ii) Calculate the R_f values of the dyes present in the green colour in lime ice cream. **[2]**

(iii) Which other colours could be mixed together to make the brown colour in chocolate A? **[1]**

(iv) The orange colour in drink X is a natural dye. All the other dyes are artificial dyes. Suggest why some countries only allow natural dyes in food. **[1]**

(b) Methanol (boiling point 65°C) and water are completely miscible. A mixture of $20cm^3$ methanol and $50cm^3$ water can be completely separated by fractional distillation.

(i) Sketch the apparatus used for this separation. Label all the important pieces of equipment. **[3]**

(ii) Sketch a graph of temperature (vertical axis) against volume of filtrate collected (horizontal axis), from the start of the heating until half the water in the mixture is distilled.
Clearly mark the boiling point of pure methanol on the graph. **[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 27	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
232 Th Thorium 90	Pa Protactinium 91	238 U Uranium 92

Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63
Np Neptunium 93	Pu Plutonium 94	Am Americium 95

157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66
Cm Curium 96	Bk Berkelium 97	Cf Californium 98

165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69
Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101

173 Yb Ytterbium 70	175 Lu Lutetium 71
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.)