

Name : _____ ()

Class : 4E1



Greenridge Secondary School

Preliminary Examination 2008

Subject : Pure Chemistry (5072)

Secondary Four Express

Paper 2

Date : 19 Sep 2008

Duration : 1 h 45 min

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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 in the spaces provided.

Section B

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

Write your answers on any lined pages provided and/or a separate answer 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 12.

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

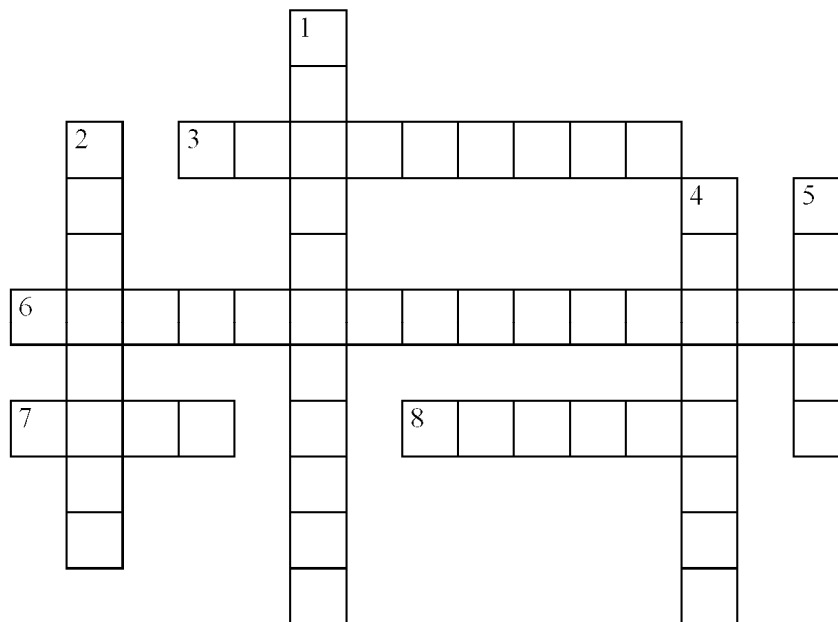
This paper consists of 12 printed pages, including this page.

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**

- 3 The existence of sets of two or more substances that have identical molecular formulas but different structural formula.
- 6 When their hydrocarbon chains contain more than one carbon-carbon double bond.
- 7 An element used for galvanizing iron.
- 8 Catalyst used in the formation of ethane by addition of hydrogen to ethene.

Down

- 1 Addition of bromine to alkenes.
- 2 An poisonous element found in CFC.
- 4 A substance which increases the speed of a chemical reaction and remains chemically unchanged at the end of the reaction.
- 5 A reaction whereby both reduction and oxidation take place at the same time.

[Total: 8]

A2 (a) Complete the table below to show the number of subatomic particles in each of the two ions.

[2]

ion	number of protons	number of neutrons	number of electrons
sodium ion			
fluoride ion			

- (b) Draw a 'dot-and-cross' diagram for sodium fluoride. You must draw all of the electrons.

[2]
[Total: 4]

A3 Precipitation may occur when two aqueous solutions are mixed.

- (a) Complete the following table.

[2]

Solution mixed together	Formula of precipitate formed	Colour of precipitate formed
(i) silver nitrate and hydrochloric acid		
(ii) potassium iodide and lead (II) nitrate		

- (b) Name the physical process used to obtain the precipitate from a(i).

[1]

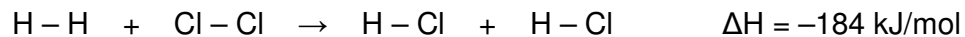
- (c) Write an ionic equation for reaction in (a)(ii).

[1]

- (d) 25cm³ of 1.5mol/dm³ aqueous silver nitrate was mixed with 20 cm³ of 2.0mol/dm³ dilute hydrochloric acid. Write a chemical equation for the reaction between aqueous silver nitrate and dilute hydrochloric acid. Find the mass of the precipitate formed.

[3]
[Total: 7]

- A4** Hydrogen reacts exothermically with chlorine to produce hydrogen chloride according to the equation below.



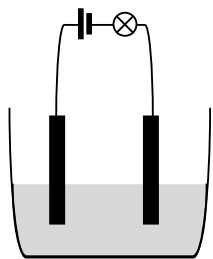
- (a) A mixture of 5.0 g of hydrogen and 142 g of chlorine is allowed to react.
(i) Which gas, hydrogen or chlorine, is in excess? Explain your answer. **[2]**

- (ii) Calculate the energy released when 5.0 g of hydrogen reacts completely with chlorine gas. **[2]**

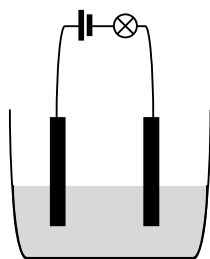
- (b) Explain why the reaction is exothermic, in terms of the energy changes that take place during bond breaking and bond making. **[3]**

[Total: 7]

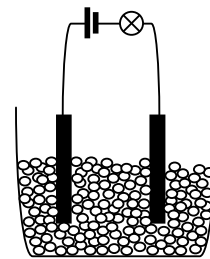
- A5** (a) A teacher performed a series of experiment on electrolysis by passing an electric current through some solids and liquids. The six experiments are represented by the diagrams below.



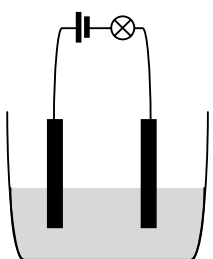
aqueous zinc chloride

A

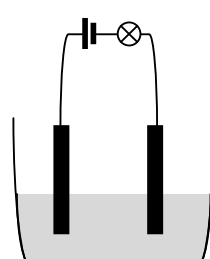
molten sodium chloride

B

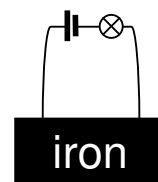
calcium chloride crystals

C

pure ethanol

D

distilled water

E

solid iron

F

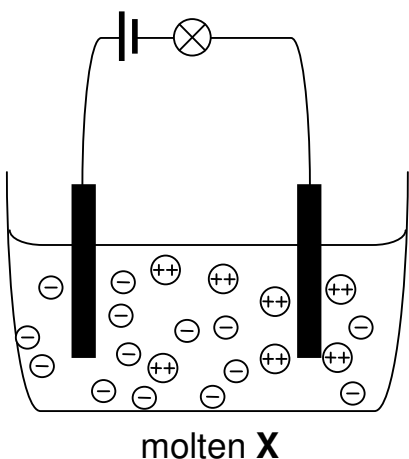
- (i) In which experiment(s) will the bulb light up? **[2]**

- (ii) Give the name of two electrolytes shown in the diagrams. **[2]**

- (iii) In which experiment(s) will oxygen be produced? **[1]**

- (iv) In which experiment(s) will chlorine be produced? **[1]**

- (b) The following diagram represents the electrolysis of molten substance, **X**.



- (i) Label the anode and cathode on the diagram. [1]
- (ii) Suggest a name for substance **X**. [1]
-
- (iii) State the formula of the cation in **X**, from your named **X** in b(ii). [1]
-
- (iv) Write ionic equations, with state symbols, for the reactions which take place at the anode and cathode. [2]
-
-
- (v) Explain why substance **X** conducts electricity when molten, but **not** when solid. [2]
-
-
-
-

[Total: 13]

- A6** (a) 5g of calcium carbonate, was added to 5cm³ of dilute hydrochloric acid at 30°C. The time taken for the reaction to stop was measured.



Similar experiments were performed always using 10cm³ of hydrochloric acid.

experiment	number of pieces of marble chips	concentration of acid in mol/dm ³	temperature / °C	time / s
1	1	2.0	30	60
2	1	2.0	50	40
3	1	3.0	30	45
4	powdered	2.0	30	30
5	powdered	3.0	30	20

Explain each of the following in terms of collisions between reacting particles.

- (i) Why is the rate in experiment 5 faster than in experiment 4? [2]

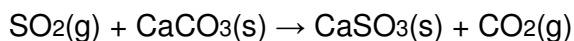
- (ii) Why is the rate in experiment 5 faster than in experiment 3? [2]

- (iii) Why is the rate in experiment 2 faster than in experiment 1? [2]

[Total: 6]

- A7** (a) Coal-burning power stations produce sulphur dioxide and nitrogen dioxide. These two gases cause acid rain. Write the equation for the formation of acid rain due to nitrogen dioxide gas. **[1]**
-
-

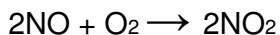
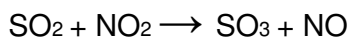
- (b) Many coal burning power stations are now fitted with a flue gas desulphurisation plant which removes sulphur dioxide and nitrogen dioxide from the waste gas. In a flue gas desulphurisation plant, powdered calcium carbonate reacts with sulphur dioxide as shown.



- (i) Calculate the mass of calcium carbonate needed to react with 64 tonnes of sulphur dioxide. [1 tonne = 1,000,000g] **[1]**

- (ii) Nitrogen dioxide also reacts with calcium carbonate. Write a similar equation for reaction between nitrogen dioxide and calcium carbonate. **[1]**
-

- (c) In the air sulphur dioxide reacts with nitrogen dioxide forming sulphur trioxide. The reactions that take place are shown in the equations.



- Suggest the role of nitrogen dioxide in these reactions. Explain your answer. **[2]**

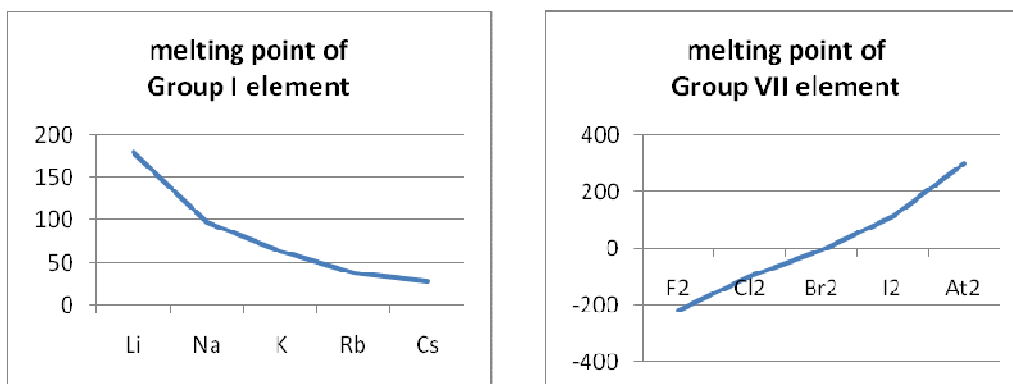
[Total: 5]

Section B

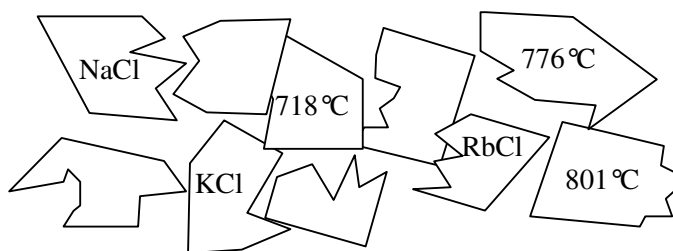
Answer **all three** questions from this section.

The last question is in the form of an either/or and only one of the alternatives should be attempted.
Write your answers on any lined pages provided and/or a separate answer paper.

B8 The graphs below show the melting points of the Group I and VII elements.



- (a) Explain the trend shown by the melting points, in terms of their bonding and structure, of the Group I elements as we go down the group from lithium to caesium. [4]
- (b) Explain the trend shown by the melting points, in terms of their bonding and structure, of the halogens as we go down the group from fluorine to astatine. [4]
- (c) Andy performed some experiments to investigate the melting point of some group I chlorides. Unfortunately, his baby sister tore his notes into bits before he could complete his assignment.



Match the melting points to the respective Group I chlorides. Give reasons for your answer. [3]

[Total: 11]

B9 Suggest explanations for the following observations

- (a) When granules of calcium carbonate is added to a solution of hydrogen chloride in methylbenzene, there is **no** visible reaction. However, when water is added and stirred, an effervescence occurred. **[3]**
- (b) Both dilute sulphuric acid and barium hydroxide are very good conductors of electricity. However, when dilute sulphuric acid is exactly neutralized by barium hydroxide solution, the resulting mixture is a **poor** conductor of electricity. **[3]**
- (c) Excess of magnesium ribbon is added to 20cm³ of dilute hydrochloric acid. After a very short delay, effervescence became increasingly rapid, then slowed down and eventually stopped. **[3]**

[Total: 9]

B10 EITHER

The table below shows some of the ores of iron.

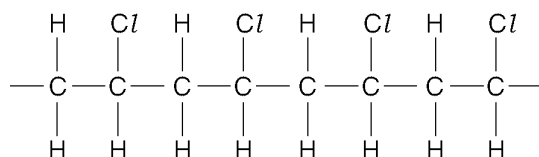
iron ore	formula
Wüstite	FeO
Haematite	Fe ₂ O ₃
Magnetite	Fe ₃ O ₄

- (a) Which ore in the table contains the greatest percentage by mass of iron? Explain your answer. [3]
- (b) Give the equations for the redox reactions taking place in the extraction of iron from haematite. In each case state which substance is oxidised and which is reduced. [3]
- (c) Pure iron is highly malleable. Describe how this property can be explained in terms of its structure. [2]
- (d) State and explain how the properties of iron can be changed by the addition of different amount of carbon. [2]

[Total: 10]

OR

Poly(chloroethene) is an addition polymer. Part of its structure is shown below.



Poly(chloroethene)

- (a) Name of the monomer from which poly(chloroethene) is formed. [1]
- (b) Draw the structure of the monomer named in (a). [1]
- (c) (i) Describe what you would observe when bromine reacts with the monomer named in (a) and state what type of reaction takes place. [2]
 (ii) Explain why bromine will **not** readily react with poly(chloroethene). [1]
- (d) The monomer is produced by reacting an alkene with chlorine. Name the reaction. [1]
- (e) The atoms in poly(chloroethene) are covalently bonded.
 (i) Explain what is meant by a covalent bond. [1]
 (ii) Poly(chloroethene) is used as an insulating cover for electrical wires. Explain why poly(chloroethene) does **not** conduct electricity. [1]
- (f) State and explain why poly(chloroethene) may cause problems of pollution. [2]

[Total: 10]

