

Name : \_\_\_\_\_ (      )

Class : 3E1



# Greenridge Secondary School

## Mid-Year Examination 2008

Pure Chemistry 5072

Paper 2

*Secondary Three Express*

Date : 30 Apr 2008

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.

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.

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 8.

Parent's Signature & Date
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FOR EXAMINER'S USE	
Section A	/50
Section B	/30
Total	/80

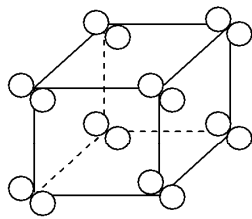
Setter : Mr Victor Lee

*This paper consists 8 printed pages, including this cover page.*

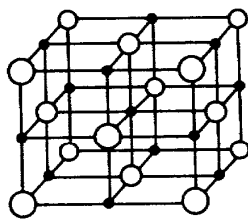
**Section A (50 marks)**

Answer ALL questions from this Section.

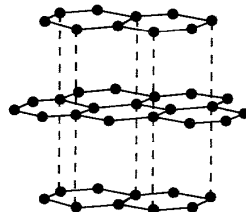
1. The diagrams below shows the structures of four solids **A**, **B**, **C** and **D**.



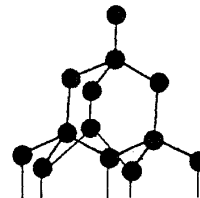
**A**



**B**



**C**



**D**

- (a) Name a substance, which has the same structure as

**A:** \_\_\_\_\_

**B:** \_\_\_\_\_

**C:** \_\_\_\_\_

**D:** \_\_\_\_\_

[4]

- (b) Name the type of particles present in the lattice of each of the following:

**A:** \_\_\_\_\_

**B:** \_\_\_\_\_

**C:** \_\_\_\_\_

**D:** \_\_\_\_\_

[4]

- (c) The melting point of **D** is very much higher than **A**. Explain, in terms of structure and bonding, why there is a large difference in melting point. [4]

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2. Imagine that a new element called 'Lycasium' has been discovered. It has a low density and is a solid which is soft and can easily be cut with a knife. It is extremely reactive with both air and water. It is a good conductor of heat and electricity and it has a low melting point.

(a) Which group in the Periodic Table would you place 'Lycasium' in? [1]

\_\_\_\_\_

(b) How many electrons would it have in the outermost shell of its atom? [1]

\_\_\_\_\_

(c) How would you store it? [1]

\_\_\_\_\_

(d) Given its symbol is 'Ly', what would be the symbol for its ion? [1]

\_\_\_\_\_

(e) Lycasium reacts readily with oxygen to form a white powdered oxide. Write a balanced chemical equation for its reaction with oxygen (air). [1]

\_\_\_\_\_

(f) Would you expect the oxide of Lycasium to be basic, acidic or neutral? [1]

\_\_\_\_\_

(g) Would you expect the oxide of Lycasium to be soluble in water? Why? [2]

\_\_\_\_\_

\_\_\_\_\_

3. (a) Complete the following table by filling in the blanks. [4]

Particle	Atomic Number	Mass Number	No. of neutrons	No. of electrons	Electronic configuration
<b>A</b>	<b>11</b>		<b>11</b>	<b>10</b>	
<b>B</b>	<b>17</b>	<b>37</b>			<b>2.8</b>
<b>C</b>		<b>32</b>	<b>16</b>		<b>2.8.8</b>
<b>D</b>		<b>13</b>		<b>7</b>	<b>2.5</b>

(b) Draw the 'dot' & 'cross' diagram of the compound formed between **A** and **C**, showing only outer electron shell. [3]

4. In both solid and liquid, the particles present are in continual random motion.
- (a) Compare the movements and the spacing between the particles in a solid with those in a liquid. [2]

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- (b) How does the movement of the particles change as the liquid is heated to its boiling point? [2]

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5. The table below lists the melting and boiling points of some elements. [4]

element	melting point / °C	boiling point / °C
aluminium	660	2478
bromine	-7	60
caesium	29	690
gallium	30	2400
mercury	-38	357
potassium	64	775

Use the data in the table to answer the following.

- (a) Which element(s) is/are a liquid at 30 °C?
- 
- (b) Which of the element(s) named in (a) changes from a liquid to a solid when placed in a refrigerator freezer compartment at -10 °C?
- 
- (c) Which element(s) would undergo melting when heated from 25 °C to 37 °C?
- 
- (d) Which element exists as a liquid for the largest range of temperature?
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6. Complete the following table. [3]

	Apparatus used for measurement	Physical quantity to be measured	Accuracy of the apparatus	Symbol of SI Unit
a	Laboratory thermometer	Temperature		
b		Mass	0.01g	
c	Burette			m <sup>3</sup>

7. (a) Chromatography is commonly used to separate and identify dyes in food colouring. State **two** advantages of using chromatography as a method of purification and analysis. [2]

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- (b) A student used a pen to draw a line across a piece of chromatography paper. He then placed a sample of dye mixture on the line drawn for analysis. Is he doing the right thing? Explain. [2]

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8. (a) Write a balanced **chemical** equations for the following reactions: [2]
- (i) zinc oxide + dilute hydrochloric acid

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- (ii) copper (II) carbonate + dilute sulphuric acid [2]

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- (b) Write the **ionic** equations for the following reactions: [2]
- (i) aqueous sodium hydroxide + dilute nitric acid

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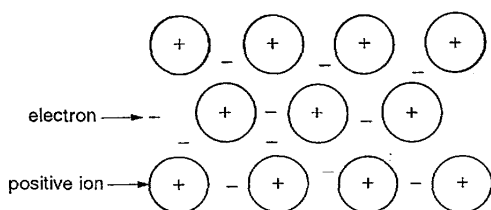
- (ii) aqueous silver nitrate + dilute hydrochloric acid [2]

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**Section B (30 marks)**

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

9. Calcium oxide is an ionic compound with a very high melting point. It is frequently used as a refractory material to line furnaces.
- (a) Draw a 'dot-and-cross' diagram (**showing only outer electron shell**) to show the bonding in
- (i) calcium oxide [2]  
(ii) oxygen [2]
- (b) Using the structure drawn in (a)(i), explain why calcium oxide can conduct electricity in molten state but **not** in solid state. [2]
- (c) The diagram represents the structure of calcium metal.



- Use the above structure to explain why calcium metal can conduct electricity in both solid and molten state. [1]
- (d) Give a difference between the electrical conduction by calcium metal and calcium oxide. [1]
- (e) Calcium metal has a melting point of 842°C while calcium oxide has a melting point of 2572°C. Explain why calcium oxide has a much higher melting point than calcium metal. [2]
10. Potassium phosphate can be made by reacting dilute phosphoric acid,  $\text{H}_3\text{PO}_4$ , with an alkali.
- (a) Give the chemical formula of potassium phosphate. [1]
- (b) (i) Name the alkali which reacts with phosphoric acid to make potassium phosphate. [1]  
(ii) Write a chemical equation for this reaction. [1]  
(iii) Hence, write an ionic equation for this reaction. [1]
- (c) (i) Name another substance that can react with dilute phosphoric acid to produce potassium phosphate, with carbon dioxide as a by-product. [1]  
(ii) Describe a chemical test for carbon dioxide. [2]  
(iii) Write a chemical equation for the reaction between dilute phosphoric acid and the substance you named in c(i). [1]  
(iv) Hence, write an ionic equation for this reaction. [1]
- (d) Calcium phosphate is used to make fertilisers.  
Deduce the chemical formula of calcium phosphate. [1]

11. Isopropyl alcohol solution is commonly used as disinfectant to clean external wounds or for bathing. It is a mixture of 70% isopropyl alcohol and 30% water by volume. Isopropyl alcohol ( $C_3H_8O$ ) has a boiling point of  $82.7^\circ C$  and is completely miscible in water. You are given  $100\text{cm}^3$  of isopropyl alcohol solution.
- (a) Can chromatography be used to separate the mixture? Explain. [2]
  - (b) Suggest a method to separate and obtain pure isopropyl alcohol from the mixture. [1]
  - (c) Explain why it is **not** possible to get 100% pure isopropyl alcohol using the method you suggested in (b). [1]
  - (d) Sketch the experimental setup used for this separation. Label all the important pieces of equipment. [3]
  - (e) Sketch a graph of temperature (vertical axis) against volume of filtrate collected (horizontal axis), from the start of the heating until all the liquids in the mixture are completely boiled off. Clearly mark the boiling point of isopropyl alcohol on the graph. [3]

~ The End ~

